



CULTURE AND COMMUNICATION IN GLOBAL SOFTWARE DEVELOPMENT

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By:

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ABSTRACT

Global Software Development (GSD) is a growing sector in Mauritius and South Africa. With a constantly increasing number of IT investors, both countries are gradually being recognised as IT hubs in the Southern African region. They offer advantages like cheap and highly skilled labour, and a good IT infrastructure to support the work. GSD is however not easy to orchestrate. Due mostly to cultural disparities and complex communication settings, this particular software development configuration faces numerous issues. In spite of being rich mediums for investigation, no prior GSD research has to date been performed in Mauritius and South Africa. This research has therefore been undertaken in an attempt to shed light on the intricacies of GSD practices followed by these two countries.

The purpose of this study is to explore GSD in the South African and Mauritian context, to understand how different forms of Software Development Practices, Cultural Coping strategies, and Communication Practices are being used to overcome the GSD issues and mediate differing cultural affiliations. In addition, the study also looks at the role served by communication technologies to improve the communication process and bridge distance.

The study has been performed through multiple qualitative case studies within 4 GSD organisations located in South Africa and Mauritius. The Grounded Theory techniques have been applied to analyse the data through a general inductive approach. The results show that SA and Mauritius face numerous GSD challenges. However based on past experiences and failures they devised several practices to overcome those issues and achieve success. The categories uncovered during the study include GSD Governance, Communication Practices, GSD Team, Software Development Practices, GSD Project, GSD Process Issues, GSD Value Issues, Technology, and Culture.

One major finding relates to the fact that different software methods, like the Waterfall model, Prototyping or RUP, can be used to fit specific cultural requirements and mediate cultural issues. These methods are beneficial due to their ability to provide flexibility and rigour in the GSD setting. Flexibility is perceived in the way in which they have been adapted to fit the SA and Mauritian GSD context while rigour is demonstrated in the promotion of standards and rules that should be followed to achieve GSD project success.



The second major finding relate to the form of communication employed to mediate both cultural and communication issues. In essence, if only one key person offshore is allowed to communicate with team members onshore, communication issues and cultural issues are no longer felt due to non-existing interactions between the team members. This however shifts the high need for communication towards the offshore team members, who have to collaborate tightly with the designated key person and inform him of all pertinent details of the project.

Secondary findings reveal that people have a major role to play during GSD orchestration..GSD team members should be carefully chosen and should possess high adaptability level, good communication skills and expertise level. These features can be improved through regular training.

Finally a wide range of technologies are employed within GSD, each fitting for one specific form of work or communication. In addition, each organisation seems to favour one form of communication technology, in spite of employing a palette of tools. The preference is explained by the cost incurred while employing the tool, the infrastructure effectiveness, and the type of work process followed. One technology can also be used to mediate the disadvantages of others.



INTRODUCTION

Various factors are affecting and driving organisational change. Some include global competition, reengineered product life cycles, mass customisation, or the vital need to constantly meet or even exceed the customers' expectations. These issues entice organisations to pursue more success (Grenier & Metes, 1995). Software companies are no exception. Many have thus opted for Global Software Development (GSD) as a means to enhance their competitiveness in the market. In doing so, they aim for cost reductions, access to more sophisticated skills and labour market, improved operational performance, flexibility and operating efficiency, and strategic advantage in the market place (Aron & Singh, 2005; Dibbern, Goles, Hirschheim, & Javatilaka, 2004; Gopal, Mukhopadhyay & Krishnan, 2002; Krishna, Sahay, & Walsham, 2004; Tas & Sunder, 2004; Pfannenstien, & Tsai, 2004). GSD is a network of interactions between people, organisation and technology. It involves a variety of human and social issues, such as relationships of people, teams, organisations, and nations with different backgrounds, language and working styles (Herbsleb & Mockus, 2003). In a GSD setting, the tasks involved in the software development lifecycle are generally split and implemented at different dispersed locations. The whole process is then coordinated by information and communication technologies (Sahay, 2003).

Two ways in which companies perform GSD are through Offshoring and Global Virtual Teams (GVT). GVT can be defined as a group of geographically, organisationally, and/or time dispersed workers, brought together by information and telecommunications technologies, to accomplish one or more organisational tasks (DeSanctis & Poole, 1997; Jarvenpaa & Leidner, 1999). In addition, participants of GSD often work and live in different countries which might often express different cultures.

Offshore sourcing, commonly known as offshoring, encompasses a wide range of options including outsourcing, joint venture/core-sourcing and outsourcing (Bhide, 2005). Offshore outsourcing refers to contracting services to a third party vendor located in another country, while offshore insourcing refers to an internal group within a global corporation (Carmel & Agarwal, 2002). According to the U.S Government Accountability Office, offshoring generally occurs when an organisation replaces or supplements the services produced domestically with imported services.



1.1. Reasons for Global Software Development

GSD is increasingly recognised as the most cost-effective software development setup for the delivery of high-quality software among all major software companies worldwide (Casey & Richardson, 2006). Software companies primarily embark on GSD for economic benefits and seek to take hold of the various advantages offered by such a scheme. For instance, while investing in countries like South Africa or Mauritius, the availability of well-educated and talented staff provide companies with a large supply of vendors and significant costs savings of 30% - 50% (Tas & Sunder, 2004). Coupled with the promise of near continuous software development due to the time difference (Carmel, 1999), project costs are expected to decrease. The costs associated with coordinating onshore clients and offshore vendors have also significantly decreased. Communication infrastructures available offshore have improved and are being provided to organisations at a lower cost than what is available onshore. Cost reductions are also noticeable during the coordination of onshore and offshore vendors, since the technologies available for the management of such relationships have also matured (Carmel & Agarwal, 2002).

Through GSD, some organisations also expand their strategy to global markets, thus consolidating the organisations' trademark in other countries (Prikkladnicki, Audy, & Evaristo, 2004). This is sometimes achieved through mergers and acquisitions, whereby previously disparate teams, from differing geographical locations, are required to work in collaboration (Herbsleb, Mockus, Finholt, & Grinter, 2000). However, external circumstances also exist, whereby software companies are forced into GSD. Examples include a limited pool of trained workforce in the current location, or the necessity to get closer to customers to provide more specific expertise (Carmel, 1999).

1.2. Purpose of the Research

The number of organisations involved in GSD is constantly increasing (Casey & Richardson, 2006) both in Mauritius and South Africa. However, instead of being the golden solution to improve organisations' profit margin, GSD comes with a price, paid mostly through the numerous challenges faced by all the parties involved in this setup. The problems generally experienced in software development are exacerbated when applied to the GSD context. Difficulties in understanding the requirements (Toaff, 2002) are compounded by several challenges. Examples include cultural and language differences, lack of communication, distance between the customer and the GSD team, different process maturity levels, lack of standards, and poor technical ability and experience (Casey &



Richardson, 2006). The purpose of this study is thus to explore GSD through interpretive case studies to understand how different forms of software development practices, cultural difference coping strategies, and communication practices, are being used to overcome these GSD issues and mediate differing cultural affiliations. In addition, the study also looks at the role served by communication technologies in improving the communication process and bridging distance during GSD.

1.3. Research Objectives

The aim of this study is:

- ❖ To find out how GSD is being practiced within South African and Mauritian offshore companies and what specific coping strategies have been devised within these contexts to overcome and prevent GSD issues.
- ❖ To find out the ways in which GSD programs are being designed to counteract the issues/problems/situations of concern being experienced during GSD in South Africa and Mauritius
- ❖ To find out the possible benefits drawn from some form of communication and cultural practices within these GSD contexts.
- ❖ To determine the effectiveness of the technologies employed within the Mauritian and South African GSD contexts.
- ❖ To report on the issues identified in the South African and Mauritian GSD contexts. These will then be singularly or in combination, compared to the global issues being experienced.

1.4. Justification and Importance of the Research

In spite of the numerous benefits offered by Global Virtual Teams (Townsend, DeMarie, & Hendrickson, 1998) and GSD, challenges still prevail. This particular work context calls for the collaboration of individuals from differing cultures. The resulting cultural affiliations might influence the choice of software development methods. In turn, by meeting specific cultural requirements, the chosen software development method might support GSD work and drive the organisations towards a higher project success rate. GSD also faces numerous communication challenges. It is therefore important for organisations to adequately address these issues, in order to optimally benefit from this work setting (Iacono & Weisband, 1997; Victor & Stephens, 1994). The findings of this study could provide



guidelines as to how these can be achieved within the South African and Mauritian GSD companies.

1.5. Research Context

The study has been undertaken within South African and Mauritian GSD companies. Both countries are increasingly being recognised as IT hubs within the region. For instance, SA has a stable economic growth and a number of world-class companies. It is therefore known as Africa's economic superpower. The South African business has become increasingly integrated into the international community (Knight, 2006) and according to the Global Outsourcing Report (Minevich & Richter, 2005), South Africa lies among the 20 best countries marked as "global opportunity" for IT offshore investment. It is predicted to rise to the 15th place by 2015. Mauritius is also emerging as an IT Outsourcing and Offshoring destination. It is located in the South West Indian Ocean, and the population comprises a medley of all races, ethnic backgrounds and cultures. Having promoted IT offshore investment for a reasonable amount of time, South Africa and Mauritius have experienced GSD investors. This study has therefore been conducted in a rich context involving different forms of cultures, and within mature GSD organisations.

1.6. Research Methodology

The research method adopted for this study is qualitative and empirical in nature, using more specifically case studies. The Grounded Theory techniques have been applied for analysis (Strauss & Corbin, 1998) but through a more general inductive approach (Thomas, 2003). Four case studies have been undertaken in two Mauritian and two South African companies respectively and interviews have been used as research instruments.

1.7. Definition of Terms

It is important to note the definition of the following terms which are repeatedly used throughout this dissertation paper and which are at the basis of the discussion:

- ❖ Global Software Development (GSD): GSD is a network of interactions between people, organisation and technology, engaged in the development software projects. It involves a variety of human and social issues, such as relationships of people, teams, organisations, and nations with different backgrounds, language and working styles (Herbsleb & Mockus, 2003)
- ❖ Offshore site: The offshore sites relate to Mauritius or South Africa.



- ❖ Onshore site: The onshore site relates to the location of the mother company having invested in Mauritius or South Africa. In the context of this study, the onshore site can either be Denmark, Belgium, UK, the US, Canada, France or India.

1.8. Organisation of Paper

This dissertation is organised in seven chapters. In Chapter 2, previous studies on GSD will be comprehensively analysed. Based on these previous studies, a very high level research model is being proposed and presented in the research methodology chapter (Chapter 3). The third chapter also provides information on the research approach, paradigm and method. Chapter 4 presents a brief and concise description of the different cases studied while the results and their analysis are detailed in Chapter 5. Chapter 6 provides a discussion of the findings in light of the research questions and reveals the resulting implications. Finally, Chapter 7 concludes the thesis and provides some recommendations for future research.



LITERATURE REVIEW

This chapter presents a survey and discussion on the existing GSD literature. The numerous issues prevailing in this particular context are first described, followed by the sets of practices put forward by researchers to overcome them. This is followed by the description of the different software methods employed within GSD to support the work process. Communication is crucial for the proper functioning of a GSD environment. The communication process, as described by Cockburn (2002), is therefore next detailed, and is followed by an outline of the different media capacity theories, and their use in GSD as reported in previous studies. Cultural differences have a deep impact on the GSD context. Various conceptualisations of culture are thus presented along with a report on their effect on the GSD process. The potential benefits derived from these software development methods to fit particular cultural features, are also put forward. Finally, identified gaps and the relevant alternatives for the research are proposed.

2.1. Global Software Development Challenges

Researchers have observed that organisations face numerous challenges when involved in GSD. These challenges relate mostly to communication, culture, and coordination practices. They mostly occur as the change from collocated to distributed software development impacts on the way products are conceived, designed, constructed, tested, and delivered to the customers (Herbsleb & Moitra, 2001). The different GSD issues relating to Communication, Coordination and Planning, Distance, Cultural Diversity, Requirements Engineering, Lack of Standards, and Technical Expertise, are described below.

2.1.1. Communication

Communication, particularly informal communication (Herbsleb & Mockus, 2003), plays a critical role in GSD success (Carmel & Agarwal, 2001; Mockus & Herbsleb, 2001). The main forms of communication needs can be categorised as problem solving, informing (Stahl, Killich, & Luczak, 1998) and monitoring, relationship building, decision-making, and coordination (Stahl, Killich, & Luczak, 1998; Paasivaara, 2003). Furthermore, the importance of each need depends on the project type and phase (Paasivaara, 2003). There exist various barriers hindering informal communication flow (Herbsleb & Grinter, 1999). They are mainly due to the physical distance existing between the team members, as seen in the Table 1.



Barriers	Description
The lack of unplanned contact	❖ Developers rarely meet face-to-face during GSD. They have less unplanned contact during hallway or lunch conversations, thus leading to loss of opportunities for rich interactions. ❖ Issues and conflicts are less rapidly recognised. ❖ The difficulty of the task increases due to the lack of background information across sites including, how work is usually done, issues priority, or who is responsible for a particular component.
The cost of initial contact	❖ When developers are dispersed, contact is difficult to initiate. ❖ It is difficult to determine someone's availability. ❖ When emails and voice-mails are not promptly answered, issues are escalated. ❖ Time difference issues prevail. Some sites may have small or non-existing overlaps, thus restricting communication to asynchronous methods like emails or voice mails.
The inability to communicate effectively	❖ Describing and explaining what cannot be seen over the phone can be a very difficult task.
The Lack of trust or willingness to communicate effectively	❖ Fear of losing ones job. ❖ Uncharitable attributions and hard feelings prevail. ❖ Delay in issue resolution is introduced.

Table 1 - Communication Flow Inhibitors

2.1.2. Coordination and Planning

The process of coordination consists of splitting tasks into subtasks, allocating tasks to team members, ordering of the subtasks over time, and combining or integrating the results of the subtasks (Mockus & Herbsleb, 2001). Coordination issues arise due to differences in project planning and tracking discipline across different sites. This further introduces substantial problems like late projects, and unrealistic or poor project details. In addition, if managers have no control on who gets assigned to projects at the remote site, no actions can be undertaken about low competency level (Herbsleb, Paulish, & Bass, 2005). Coordination issues are also introduced by the lack of, or differences in infrastructure at different development site. Such differences might include network connectivity, development environment, and test and build labs. This is compounded by any change and version management issues, and interdependencies among work items (Mockus & Herbsleb, 2001). Finally, the time difference that sometimes exists across dispersed sites, affects



coordination, especially when there is a need for fast-paced interactions. Examples include the delay and difficulty encountered during projects with frequent reviews or regularly requiring information about how the codes are written (Herbsleb, Paulish, & Bass, 2005).

2.1.3. Distance

Distance, which relates to *temporal, geographical and socio-cultural aspects*, has a negative impact on performance (Curtis, Krasner, & Iscoe, 1998; Herbsleb & Moitra, 2001). Temporal distance causes issues while controlling projects (Herbsleb & Mockus, 2003; Damian, 2002). This is due to differences in time zones, which introduce difficulties while scheduling meetings and prevent rapid interactions (Herbsleb, Paulish, & Bass, 2005). Geographical distance hinders the establishment of trust among team members (Herbsleb & Grinter, 1999), which is fundamental to the fostering of team effectiveness (Alexander, 2000; Kezsbom, 2000; Lipnack & Stamps, 2000; Solomon, 2001). The virtual software team being complex and dynamic requires effective coordination, visibility, communication, and cooperation (Karolak, 1999). These are however negatively impacted by distance and therefore increases barriers and complexity (Cassey & Richardson, 2006), as depicted in Figure 1.

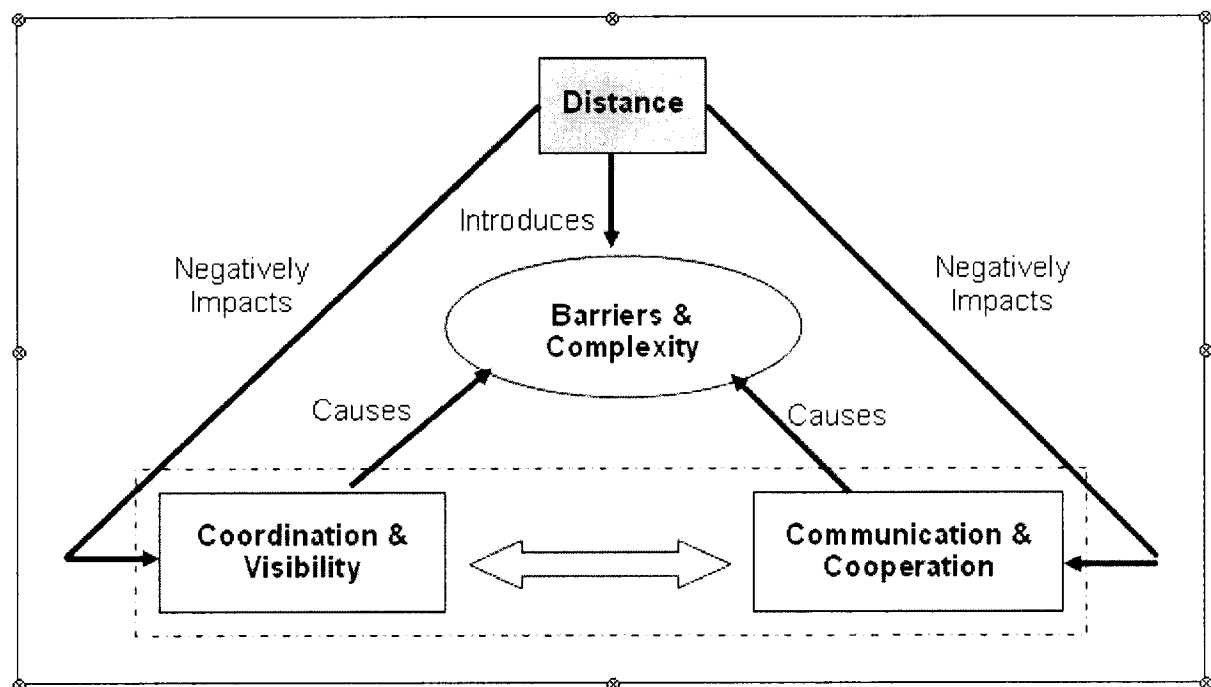


Figure 1 - Communication and Cooperation barriers (Cassey & Richardson, 2006)

An overview of opportunities and challenges in GSD in relation to distance, communication, coordination and control is presented in Appendix A. As can be seen in the table (Appendix A), socio-cultural distance relates to organisational culture, national culture and language, politics, and individuals motivations. These dimensions have implications for communication, coordination and control. They are also said to hinder mutual understanding between team members (Kayworth & Leidner, 2000; Maznevski & Chudoba, 2000). Socio-cultural distance is discussed in details below.

2.1.4. Cultural Diversity

Cultural issues at stake during GSD are founded in the fundamental differences in values governing people's life. For instance, based on their cultures, individuals have different attitudes towards hierarchy, sense of time, communication styles and structural needs. This further leads to increased communication issues (Perry, Staudenmayer, & Votta, 1994; Prickladnicki, Audy, & Evaristo, 2003b). This is demonstrated in different corporate cultures, where staffs at one site do not quickly respond to emails from team members at another remote site. This might be perceived as rude and even "obstructionist", according to the study undertaken by Herbsleb, Paulish, and Bass (2005).

Cultural diversity also causes differences in the choice of abstractions and the architectural patterns employed (Borchers, 2003). In essence, different people give different meanings to situations according to their socio-cultural backgrounds. Along with national culture, these are seen as barriers to effective communication (Ågerfalk, Fitzgerald, Holmström, Lings, Lundell, & Ö. Conchūr, 2005). For instance, people from different countries have different ways of expressing agreements and disagreements, or of asking questions, and acknowledgements can sometimes be mistaken for agreements (Herbsleb, Paulish, & Bass, 2005). Such misunderstandings might cause frictions and frustrations among the team members. In addition, when coming from different cultures, language may seem rude or strange to people and questions are less likely to be answered. Therefore, it is also quite difficult to communicate urgency in one's second language (Mockus & Herbsleb, 2001).



2.1.5. Requirements Engineering

At the requirements engineering level, issues are encountered during elicitation, analysis, specification, validation, and management (Prikladnicki, Audy, & Evaristo, 2003a). Various factors impact on the requirements engineering process (Damian & Zowghi, 2003). For instance, due to language barriers, a shared understanding of the required functionality is not easily achieved. This is further affected by multicultural interactions between developers and clients, time delays, and the inability to maintain a full awareness of the working context at remote sites. If the requirements engineering is not properly and fully undertaken, budget and schedule overrun and the client-supplier relationship is damaged (Damian & Zowghi, 2003).

2.1.6. Lack of Standards and Well-Defined Software Processes

The lack of standardised activities between distributed teams (code standard, documentation, templates) and the lack of well-defined and common software development processes across development sites, pose issues during GSD (Prikladnicki, Audy, & Evaristo, 2004). These relate to interdependencies among distributed work items, difficulties of coordination, difficulties of driving the work into modules to be assigned to different locations, and conflicting implicit assumptions which are not noticed as fast as in collocated work (Mockus & Herbsleb, 2001). In addition, communication practices needed for collaboration across distances and organisations are not properly established. These mainly occur when companies involved in GSD underestimate the need for proper standardised infrastructures (Paasivaara, 2003).

2.1.7. Technical Expertise

The lack of technical expertise and ability to cope with technical problems have a negative impact on individual satisfaction and performance (Kayworth & Leidner, 2000). Coupled with the fact that participants are less likely to have participated in the same projects and have different experiences, (Mockus & Herbsleb, 2001) project success is hindered. This was clearly demonstrated during the investigation of GSD practices at Siemens (Bass & Paulish, 2004) where the staffs usually developed Unix-based local user interface. However, for the purpose of a distributed project, Windows-based applications with web-based interfaces were required. As a result, measures had to be taken to mitigate the resulting issues.



2.2. Global Software Development Practices

There is a strong need to address the different challenges encountered during GSD (Damien, 2002) and various sets of practices have been prescribed, or are being used for that matter. These practices are meant to alleviate communication, coordination and cultural issues, among others. For instance, people have attempted to increase cultural awareness through various programs of intercultural or diversity training (Kayworth & Leidner, 2000; Sarker & Sahay, 2002; Jarvenpaa & Leidner, 1999). The various strategies recommended by literature include the use of cultural liaisons (Carmel & Agarwal, 2001) bridgehead teams, technical or managerial liaisons (Heeks, Krishna, Nichol森, & Sahay, 2001), and rotation of management to cope with cultural diversity (Ebert & De Neve, 2001). Another approach includes assigning more experienced and culturally aware individuals onshore as they are more apt to understand customers' requirements in the local context. These are then translated to the offshore developers for coding and implementation (Cockburn, 2002). Cultural awareness is however not sufficient to overcome all the obstacles that cultural differences bring to GSD (Krutchen, 2004).

Communication issues which still need to be resolved are handled through frequent meetings. These meetings can either be ad-hoc or regularly planned, project steering groups, or organised through weekly video-conference sessions (Paasivaara & Lassenius, 2004). These regular encounters improve the team's project definition (Ramesh & Dennis, 2002), foster socialisation, trust, and respect among team members (Maznevski & Chudoba, 2000), and enhance subsequent electronic communication (Krumpel, 2000; Paasivaara, 2003). However, since it is most likely that team members have never met physically before, front load travel are not postponed and people are brought together earlier on (Herbsleb & Grinter, 1999). Gregarious people are sent as ambassadors and are given the explicit task of meeting people in a variety of groups at the other sites. These early face-to-face meetings are crucial, especially in the beginning of projects. Furthermore, it increases the chance of having urgent and important questions answered (Paasivaara, 2003). It also lays the foundation for trust in the relationship (Prikladnicki, Audy, & Evaristo, 2003b). If early face-to-face meetings are not feasible, a shared language and a shared mental model are built, by relying on a common database which provide all information pertinent to the team assignment (Suchan & Hayzak, 2001). Proper presence awareness information is also provided. This is achieved through tools like common calendars and instant messaging systems. Common practices on how to answer the phone and respond to email messages are also set up (Mockus & Herbsleb, 2001). Good infrastructure for collaboration is however



made available (Mockus & Herbsleb, 2001). The supporting structures for communication within inter-organisational projects are given in Appendix B.

Teams also collaborate by using various communication tools, ranging from traditional face-to-face meetings, telephone calls (Hindus, Ackerman, Mainwaring, & Starr, 1996), fax, chat, (Handel & Herbsleb, 2002), instant messaging (Nardi, Whittaker, & Bradner, 2000), video conference (Dourish & Bly, 1992; Fish, Kraut, & Root, 1992; Obata & Sasaki, 1998), email and groupware applications (Majchrak, Rice, King, & Ba, 2000; Maznevski & Chudoba, 2000). These practices are used to support the four communication needs of GSD, namely *problem solving, informing and monitoring, relationship building, and decision-making and coordination* (Paasivaara, 2003). However, their success is limited and they face challenges like poor design to adoption (Shami, Bos, Wright, Hoch, Kuan, Olson, & Olson, 2004). Furthermore, the synchronicity of the communication tools is of no use in some cases. For instance, if in spite of the tools' availability, individuals forget to communicate changes and updates made during the day to other dispersed team members (Prikladnicki, Audy, & Evaristo, 2003b), this result in repeated work, and time wastage (Ramesh & Dennis, 2002).

Special attention is paid to software processes that focus on explicit and visible mechanisms for coordination (Boehm, 1996; Osterweil, 1986). These include planning, defining and following a process, careful requirement management and design specification, process characteristics measurement, and regular status meetings for progress tracking (Herbsleb, Zubrow, Goldenson, Hayes, & Paulk, 2003). However, it must be noted that as software development is unstable, several factors limit the effectiveness of any potential planning, including volatile requirements, unstable specification, staff turnover etc. (Shami, Bos, Wright, Hoch, Kuan, Olson, & Olson, 2004).

Coordination and distance issues are also bypassed through the notion of software modularity (Parnas, 1972). This builds on Conway's law (Conway, 1968) which states that the product architecture mirrors the organisation that designed it. Through modularity, design decisions about each 'work items' or module are being made in isolation from other modules (Parnas, 1972). As such, the need for coordination and communication among the different teams is reduced as the tasks associated with each component are loosely coupled. Instead, individuals involved in the development of a common component can be collocated. However, the use of models to overcome cross-site communication does not bypass all coordination issues (Grinter, Herbsleb, & Perry, 1999). Due to complexities of communication in real development projects, conflicts between the sites still prevail.



The requirements engineering stage, being one of the main challenges from the software development point of view (Prikladnicki, Audy, & Evaristo, 2004) has to be properly tackled. It defines the conditions that the system must satisfy (Oberg, Probasco, & Ericsson, 2000). The compliance to these conditions determines the project success. Proper requirements definition is used to reduce the need for change and rework during development. Furthermore, modular methodologies or the remote execution of programming and testing tasks are then easily used (Karamouzis, 2003).

The planning phase is important in order to properly organise and manage distributed projects (Prikladnicki, Audy, & Evaristo, 2004). Proper coordination of task allocation is also required for project success (Amrit, 2005). A practical approach is to distribute drafts of the proposed schedule and task assignments for each incremental release, to team members. Feedback on feasibility is then obtained (Bass & Paulish, 2004). Project goals are also specified to the dispersed teams (Kayworth & Leidner, 2000). This helps managers in making the inevitable trade-offs decisions before a release (Bass & Paulish, 2004). The team's strategy and agenda for task completion, and the media strategy are also formulated (Suchan & Hayzak, 2001).

Project management involves the "application of knowledge, abilities and techniques to plan activities that can reach the needs and expectations of all stakeholders involved in the project" (Prikladnicki, Audy, & Evaristo, 2004). According to Herbsleb, Paulish, and Bass (2005) proper project management from the service provider is required and the management infrastructure of detailed milestones and tracking metrics are agreed upon early on (Herbsleb, Paulish, & Bass, 2005). For instance, in order to prevent overlapping of responsibility for project managers at different development sites, individual work assignments are negotiated. In a successful management infrastructure at Siemens (Bass & Paulish, 2004) the chief architect was responsible for decision making and resolving technical conflicts. He was also the overall technical manager. Key technical decisions were resolved by both the technical and project manager. An engineer was assigned responsibility for each subsystem and project status tracking was done through weekly teleconference. Finally, each team member was encouraged to report on his development progress.

Risk management involves identification, treatment and elimination of risk sources (Prikladnicki, Audy, & Evaristo, 2004). If effectively undertaken, it can be an alternative to solve existing problems in distributed projects. Risk management is part of any project, but tend to be more centred on non-visible aspects (Karolak, 1999). As such, it is performed, at



both organisational and project level. Risk management is used to decide whether a particular project can be developed through globally dispersed teams. Any potential risks identified at that level is passed to the project manager, who then plans the proper response actions (Prikladnicki & Yamaguti, 2004). Offshore distribution model is also implemented as it provides a better control on the project allocation and planning (Prikladnicki & Yamaguti, 2004).

A 360 degree view of project information is made available through regular updates of project management information, FAQs, team web pages, and expertise locators (Mockus & Herbsleb, 2001). Through internationally aware calendars, dispersed team members might know of each others availability while waiting for response to queries (Bass & Paulish, 2004). Other attempts to resolve GSD issues include the need for standardise processes across different sites (Prikladnicki, Audy, & Evaristo 2004). Shared repositories are also used during GSD as a means to control the codes and design document versioning and sharing among dispersed team members (Ramesh & Dennis, 2002). A common development environment can be set up, involving change, problem and version tracking, build, and test (Mockus & Herbsleb, 2001). In order to mitigate the lack of technical expertise, projects can exploit the knowledge of team members located at different dispersed sites. Training courses can also be invested in, early in the development phase (Bass & Paulish, 2004).

It can be seen from these practices that carefully planned work processes, proper handling of cultural disparities, and the use of adequate communication processes among others, are crucial to the success of GSD. As this study particularly focuses on the use and effectiveness of software methods and practices for GSD with differing cultural affiliations, the next section further probes literature on that particular area. Results from studies explaining the use of different forms software development methods in GSD are provided and analysed.

2.3. Software Methods

The software development process has a major influence on the quality of the systems developed. According to Pressman (2001), it should incorporate good documentation on what is being done (product), when (steps), for whom (actors) the artifacts used (input) and the developed artifacts (output/result) (Pressman, 2001). Corroborated by Prikladnicki, Audy & Evaristo (2004), projects without well defined processes have difficulties relating to requirements, configuration management and testing. In GSD projects, tight communication is required between the parties involved. Issues often arise as the practices



and processes needed for collaboration across distance and organisation are not properly understood (Paasivaara, 2003). This can lead to disastrous consequences as the project progress rate is linked to the time taken to get information from one person's mind to another (Cockburn, 2002). By understanding the fundamentals of software development, intelligent organisational decisions can be made, efforts can be standardised, and reuse and consistency can be promoted between project teams. Industry best practices, including code inspections, configuration management, change control, and architectural modelling can also be introduced to the development environment (Ambler, 2000). As demonstrated in the previous section, major issues are encountered during communication and coordination activities in GSD. These activities are critical during software development phases like requirements, analysis and negotiations. This section focuses on Monolithic, Unified and Agile software processes and on the implications when used in GSD.

2.3.1. Monolithic Models in Global Software Development

The main software process models within the monolithic approach include the Waterfall model, the V Model, Prototyping model, Operational Specification and the Transformation Model. In the Waterfall model, the stages are depicted as cascading into one another (Royce, 1970). The Waterfall model can be used to take advantage of the cost-speed tradeoff offered by GSD (Kogut & Meitu, 2000). It allows for the overcoming of various overheads generally encountered in GSD. For instance, code modularity, which is one of the prescribed practices (Parnas, 1972), can easily be achieved. Not much communication and coordination are also required among the team members as one step only starts when the previous one is fully completed (Kogut & Meitu, 2000). Furthermore, there is little concern over shared context with the end-user and the module tasks are easily distributed to different sites (Kogut & Meitu, 2000). By favouring documentation, which is produced at the end of each phase, it abides to the prescribed set of GSD practices which highlights the needs for standardised set of documentation (Prickladnicki, Audy, & Evaristo, 2004).

The main issues arising from the waterfall model is that it does not reflect the way in which code is really developed. Except for very well understood problems, software development involves a great deal of iterations (Curtis, Krasner, Shen, & Iscoe, 1987). Furthermore, no guidance is provided on how to handle the changes to products and activities (e.g. changes to requirements) occurring during development (Pfleeger & Atlee, 2006). This drawback might have bad consequences in GSD for which the requirement engineering process has to be carefully devised (Prickladnicki, Audy, & Evaristo, 2004).



As a means to overcome these issues, the waterfall model has been adapted to include prototyping. In this case, the requirements analysis, the system analysis and the system design can be prototyped (Pfleeger & Atlee, 2006). For instance, design prototypes can be created to help developers to assess alternative design strategies and decide which is best for a particular project. When designing the user interface as a prototype, the users can understand what the new system will be like and the designers can have a better sense of how the users will interact with the system. Along with the use of prototyping model, operational specification model, and the transformation model which all focus on proper requirements elicitation, GSD project success can be promoted (Oberg, Probasco, & Ericsson, 2000).

The V-model makes some of the iteration and rework that are hidden in the waterfall depiction more explicit. It focuses on activity and correctness whereas the waterfall model focuses on documents and artefacts. The V-model being test driven, might help to keep development across multiple sites consistent with changing requirements (Sengupta, Sinha, Chandra, Sampath, & Prasad, 2004).

2.3.2. IID and UP in Global Software Development

Two main software models that are said to be iterative and incremental are the Unified Process and the Iterative and Incremental Development (IID) process model. IID is a development model mostly used for collocated projects (Larman, 2003; Larman & Basili, 2003). GSD literature however contains some report of good experiences with IID (Battin, Crocker, Kreidler, & Subramanian, 2001; Ebert, & De Neve, 2001). After having studied the use of iterative approaches in distributed projects they are said to eliminate some problems brought about by distribution (Simons, 2002). For instance, continuous integration and build verification tests help to resolve integration problems at the end of the project. The project status is also visible, which helps in following project progress (Simons, 2002). Some researchers propose a minimum iteration length of two weeks and a maximum of two months due to the communication overheads encountered within distributed environments (Fowler, 2004). Very frequent builds have also successfully been employed. For instance, Karlsson, Andersson, and Leion (2000) report the successful use of daily builds at Ericsson. IID presents benefits like transparency of progress, flexibility, joint understanding of requirements and the avoidance of issues encountered during integrations (Paasivaara & Lassenius, 2004). However, integration issues can only be avoided if a proper strategy



based on clusters and shared incremental milestones is used (Battin, Corcker, Kreidler, & Subramanian, 2001).

UP is a large and complex method, which requires a significant learning curve before being adopted within an organisation. The adoption success depends on the amount of resources available to provide training, be it within a GSD environment or not. Furthermore, the existing culture might resist or accept the strict discipline required (Bennett, McRob, & Farmer, 2005). GSD involves teams with potentially different cultures. Issues might thus arise if the approach does not fit the cultural requirements of all the teams involved. However, by dealing with ongoing changes in requirements, it abides to the G+SD requirements specification (Oberg, Probasco, & Ericsson, 2000). UP is also said to facilitate risk management at each increment as the most critical risks can be addressed early in the project life cycle. The goal is to mitigate risks to the maximum during each iteration. Consequently, fewer risks of less importance are later encountered (Scott, 2001).

2.3.3. Agile Approaches and Global Software Development

The major issues encountered with more traditional approaches to software development are the fact that they are unresponsive to change and have a “very bureaucratic approach to analysis and design that is heavy on documentation” (Bennett et al, 2005). Agile approaches have thus been devised to overcome these problems. By being more iterative and lightweight, agile methods emphasise on “close collaboration between the programming team and business experts, face-to-face communication, frequent delivery of new deployable business value, tight self-organising teams, and better ways to craft the code and the team changes in requirements” (Agile Alliance 2001). Examples of Agile methodologies include Extreme Programming (Beck, 1999), Adaptive Software Development (Highsmith, 2000), and Crystal (Cockburn, 2004). The overall goal of agile development is to satisfy the customer by “early and continuous delivery of valuable software (Agile Alliance 2001).

Due to temporal, geographical, and socio-cultural distance in GSD, agile methods are more difficult to realise in that context (Maurer & Martel, 2002; Kirscher, Jain, Corsaro, & Levine, 2001). They support a high level of interactions between team members and help to uncover flaws and new solutions (Agile Alliance 2001). These are mostly undertaken via informal communications such as day-to-day interactions among organisational team members (Ibarra & Andrews, 1993). However, informal communication, conveyed via face-to-face interactions, rarely or sometimes never occurs in global software development



(Carmel & Agarwal, 2001; Mockus & Herbsleb, 2001). Video conference tools can be proposed as a solution, as they convey a form of face-to-face communication. Nevertheless, they still might not help to overcome language and time difference issues prevailing in GSD.

Agile approaches also rely on a set of values that might conflict with dispersed teams' respective national and organisational culture. For instance, Indian teams who are usually used to structure, might encounter difficulties while using agile methods. Conversely, this might not be the case for American teams, who could thus be more willing to accept the method (Batra, Nguyen, & Simpson, 2006). In cases where these two teams are collaborating, agile approaches might not be the best solution to adopt.

However, some researchers still argue about the need to investigate on how to alleviate the negative influence of distance (Maurer & Martel, 2002) through the application of agile methods characteristics (Conboy & Fitzgerald, 2004). Some preliminary research on the application and use of XP to GSD (e.g. Ngo-The, Hoang, Nguyen, & Mai, 2005; Kirscher et al., 2001) have proposed some adaptation of the method to the distributed context. For instance, an extension of XP, known as Distributed eXtreme Programming (DXP) has been recommended for GSD (Kirscher et al., 2001). Eight of the XP practices are seen as being independent of the team locality and are thus said to be applicable to GSD. They include small releases, metaphor, simple design, testing, refactoring, collective ownership, 40-hour week, and coding standards. The remaining four practices being dependent on team collocation require alternative solutions to work in GSD. According to the authors, DXP integrates the remote team members in the development process.

Another approach, similar to XP that has been proposed for GSD is the CORD (Component-Oriented Rapid Development) process (Repenning, Ioannidou, Payton, Ye, & Roschelle, 2001). With this model, development occurs in parallel prediction cycles, which involves different subsets of stakeholders aligned in a pipeline fashion. Completed software is then outputted at a weekly rate. It involves distributed teams working on sets of components, in parallel. The components are small, highly parallel and iterative.

XP has also been said to increase communication efficiency and the morale of team members, decrease overtime, and provide a strong customer commitment during software development projects outsourcing (Ngo-The et al., 2005). This argument is based on the assumption that if some practices are not convincing, it does not prevent the application of the overall method. This contradicts Beck's (1999) original claim that all XP proponents have to be used, due to synergetic relationships between them. Scrum was also found useful for



improving communication, coordination and control within GSD (Holmstrom, Fitzgerald, Ågerfalk, & Ó. Conchúir, 2006). Table 2 reports the benefits that can be driven from the use of agile methods in GSD.

Agile Practice	Benefits	
XP pair programming	✓ High code quality (and code quality earlier in projects) ✓ Fresh viewpoint in testing/debugging ✓ Facilitates collective ownership of code	
XP Simple design	✓ Design document in parallel with code implementation	
XP refactoring	✓ Early elimination of bugs	
XP coding standard	✓ Consistency in coding/code inspection	
Scrum simple planning	✓ Low-tech techniques ✓ Shared visualisation of project activities	
Agile Practices	Benefits	GSD Distance
XP pair programming	Help increase time overlap	Reduce temporal distance
Scrum simple planning	Help increase “teamness”	Reduce geographical distance
XP pair programming and Scrum pre-game phase	Help increase mutual understanding and collaboration within and between teams	Reduce socio-cultural distance

Table 2 - Agile Practices Benefits

As mentioned in the prescribed set of GSD practices, adequate software methods practices and work processes would be of no use without good communication processes that are put in place across the dispersed sites. The next section therefore focuses on the different forms of communication that might prevail during GSD.

2.4. Communication Process

The communication process is a central part of GSD. Perry, Staudenmayer and Votta (1994) found during a case study that informal communication take up an average of 75 minutes per day per software developer, and Robillard and Robillard (2000) shed in another case study that ad hoc collaborative activities can occupy up to 41% of the developers' time. Seaman (1996) supports the need for this type of communication if developers are to carry out their tasks adequately. The various aspects of the communication process are described below. These include, parsing patterns, the shared experience and the different existing communication styles.

2.4.1. Parsing Patterns

While living through various experiences, individuals tend to chop the event into separate meaningful chunks, which are stored for later retrieval. This process is known as *parsing* (Cockburn, 2002). Individuals tend to parse experiences using different patterns, based on cultural or political values among others. This produces different information chunks that vary from person to person. Each person has a unique perception of the experience. Each one will describe the information chunks using different vocabulary expressions. Attempting to combine these information chunks would provide a distorted, simplified and incomplete version of the experience, as shown in Figure 2.

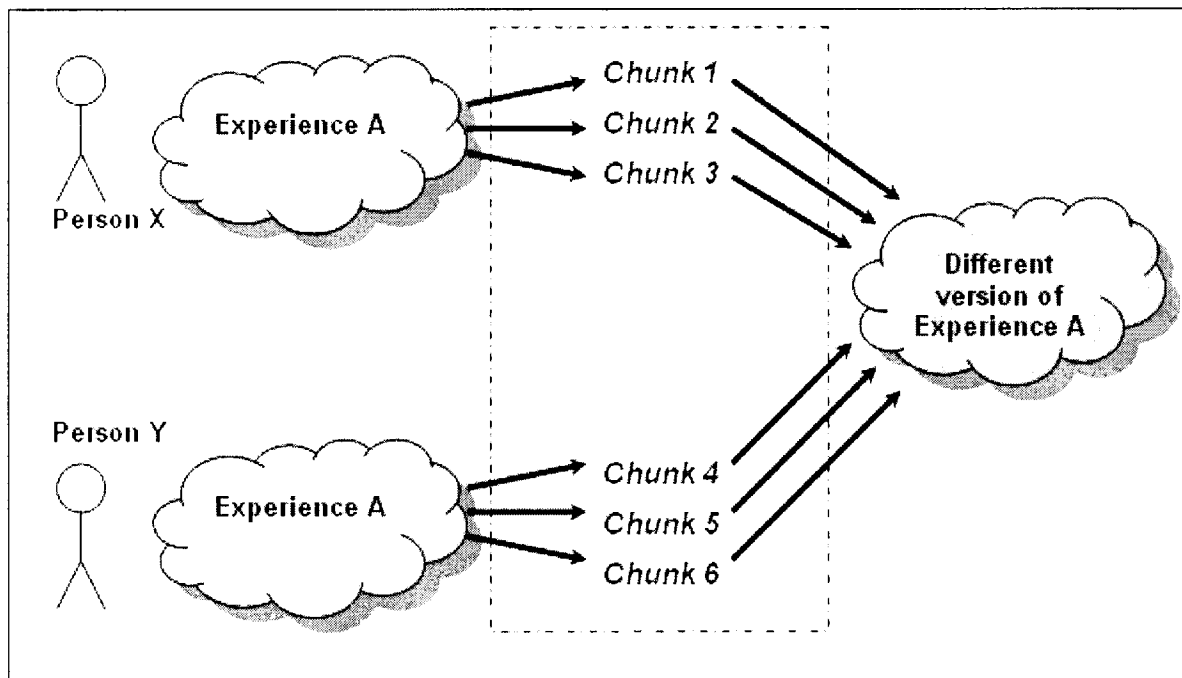


Figure 2 - Communication Parsing Pattern

It can therefore be stated that communication is limited by experience and language skill. The phenomenon of communication does not depend on what is transmitted but on what happens to the person who receives it (Maturana & Varela, 1998). The information transmitted might cause the receiver's perception or predictive model of the world to change, thus causing some internal restructuring.

2.4.2. The Shared Experience

People generally know that their intended message is correctly passed on to the listener, according to the return messages passed on by the latter. However, these return messages can be misinterpreted, leading the sender to falsely conclude that the message is understood. In such cases, a common experience to refer to, among the sender and the

receiver, can decrease the risk of misunderstanding and increase the chances of having successful communication (Cockburn, 2002). The shared experience is a missing important factor in GSD. This is due to the fact that individuals are less likely to have participated in the same projects (Mockus & Herbsleb, 2001). Consequently, there is a higher risk of having incomplete or incorrect information being passed among team members. This leads to a higher probability of misunderstanding and communication failures. The importance of the shared context has also been highlighted by Kogut & Meito (2000) in relation to product requirements elicitation and in the case of creative tasks.

Communication is never a perfect and complete process. According to Cockburn (2002), people don't even know what it is that they wish to communicate. Even if they did, receivers always have to bridge a gap at some point. In globally distributed teams, the situation is often worsened by the fact that members come from different cultures. As such, they are different from each other, and the greater the difference, the smaller the gap that can be bridged.

2.4.3. Communication Style

Communication style reflects how individuals send and interpret both verbal and non-verbal messages. It is identified by four stylistic modes (Gudykunst & Matsumoto, 1996) namely: direct vs. indirect, elaborate vs. succinct, personal vs. contextual and instrumental vs. affective. In a global environment, culturally driven preference for one style may explain the perceptions of fit between communication tasks and technology. The different styles are described in Table 3.

Communication style	Communication style description
Direct-Indirect style	Direct-Indirect style refers to the extent to which the intention of the sender is revealed during the communication process. Intention refers to the sender's wants, needs, and desires in the discourse process. In direct style, the true intentions are revealed in the message while being concealed in indirect ones (Massey, Hung, & Ramesh, 2001).
Elaborate-Succinct	Elaborate-Succinct style refers to the <i>quantity</i> of message that is valued. The three stylistic variations that have been identified by past studies include: elaborate style, exacting style and succinct style. Elaborate style refers to cases where very expressive languages are used for communication purposes. In exacting style the contribution



	in language interaction is only what is required (Grice, 1975). For succinct style the message sender includes understatement, pauses and silences during the interaction (Gudykunst & Ting-Toomey, 1988).
Personal-Contextual	In Personal-Contextual style, linguistic devices are used to enhance the sense of personal identity. For instance, a contextual style favours a role-centred use of language. Conversely, Personal style expresses meaning, for the purpose of focusing on self of "personhood" (Gudykunst & Ting-Toomey, 1988).
Instrumental-Affective	Instrumental style is sender-oriented, and tends to focus on goal achievement whereas an affective style is receiver-focused and tends to emphasise on processes and negotiations (Massey et al., 2001).

Table 3 - Communication Style Description

The communication process and the work process in GSD are further supported by various communication technologies. Moreover, the infrastructure available offshore has significantly improved and is being provided to organisations at a lower cost than is available onshore. A wide range of technologies are available, each providing specific and tailored advantages based on the communication requirements and situations of use. These communication technologies can be categorised through the Media Capacity Theories, which are described in the following section.

2.5. Media Capacity Theories

Previous studies show that globally dispersed teams cope with distance-related issues by using a palette of tools, ranging from phone, video conferencing, email and groupware (Carmel, 1999). These technologies increase effectiveness, facilitate communication across people and can be used to simulate "presence and awareness" during GSD (Herring & Rees, 2001; Karolak, 1999). Various kinds of communication tools are available to help distributed teams, and Media Capacity Theories refer to the list of theories relating to their effectiveness. They posit that different media have different abilities to convey communication cues. They are selected for use, based on the congruence of the message requirements and their capability to meet these requirements (Massey, Hung, & Ramesh, 2001). Media Capacity Theories generally comprise of Media Richness Theory,



Social Presence Theory, Symbol Variety Theory, and Rehearsability Theory. Each is individually described below.

2.5.1. Media Richness Theory

The richness of a particular media is based on the extent to which it conveys verbal and non-verbal cues and facilitates shared meaning in a timely manner (Massey, Hung, & Ramesh, 2001). Rich media are said to reduce the probability of having multiple and conflicting interpretation for a message (i.e. message equivocality), and uncertainty in communication (Daft, Lengel, & Trevino, 1987). As such, rich communication tools are more appropriate for messages with high equivocality (Daft & Lengel, 1986).

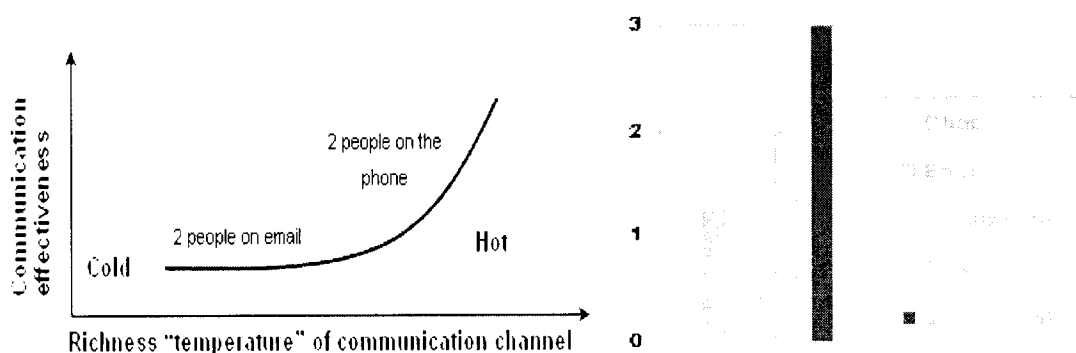


Figure 3 - Media Richness Level Graph

Richness in a medium depends on the speed of feedback, the ability to communicate multiple cues, the ability to convey feelings and emotions via body language, facial expression and tone of voice, the personal quality of the source, and the use of natural language rather than symbols or numbers (Straub, 1994). As can be seen in Figure 3, communication effectiveness rises with the richness of the communication channel, which in turn is affected by the ability offered by the tool to ask and answer questions (Cockburn, 2002).

Media richness is said to decrease along a continuum from face-to face, visual media, audio media, to computer-based interactions (Fulk & Collins-Jarvis, 2001). The graph below depicts the different richness levels of some communication tools used during GSD. Face-to-face communication tools like video conference and telephone are information rich channels (Sproull & Kiesler, 1986) as they convey wide variety of social cues to the listener and provide high speed of feedback. While using the telephone, feelings and emotions can be conveyed by the tone of voice, which explains the richness level to be medium. On the other hand, fax and groupware applications carry only verbal information and can be termed

as lean channels (Straub, 1994). No personal presence is conveyed by these tools. Chat applications have a slightly higher level of richness than email as they allow for rapid feedback. In initial studies, email applications were also termed as being lean channels (Straub, 1994), but nowadays, emotions and feelings are also conveyed via the use of emoticons, as is the case in chat applications.

2.5.2. Social Presence Theory

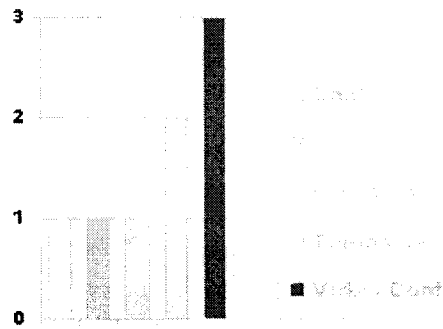


Figure 4 - Social Presence Graph

Social Presence Theory refers to the degree to which individuals feel close to each other (Massey, Hung, & Ramesh, 2001), or experience others as being psychologically present (Fulk, Steinfield, Schmitz, & Power, 1987). It can be defined as the cognitive synthesis of combination of cues, attributed to the medium by the individual. Similarly to Information Richness Theory, Social Presence posits that media are chosen for specific types of interactions and for the media “fit” of the task requirement (Short, Williams, & Christie, 1976). High social presence tools enable the communication social cues while those with low social presence filter them out (Sroull & Kiesler, 1986).

Social Presence is based on the salience of the interpersonal relationship between the persons communicating. It is conveyed by the use of multiple, non-verbal communication channels, and continuous feedback (Rogers, 1986). Thus, socially-present media are known for their ability to “transmit information about facial expression, direction of looking, posture, dress and non-verbal cues” (Short et al., 1976, p65).

According to theory, media with high social presence are useful for interpersonal tasks like negotiation and conflict resolutions. Inversely, social presence is not important for less sensitive task such as straight forward information exchange (Sherblom, 1988). Figure 4 represents the different level of social presence conveyed by different communication tools. According to Wiesenfeld, Raghuram, & Garud, (1998), social presence is based on

accessibility, synchronicity with respect to space and time, formality, shared interpretive context, and social context cues. As such, face-to-face communication tools like video conference convey high level of social cues and are synchronous with respect to time and place, are highly effective in creating social presence (Sproull & Kiesler, 1986). Tools which are asynchronous with respect to time (e.g. emails) are less effective in creating social presence. Interestingly however, in their study examining communication among 96 people, Sproull & Kiesler (1986) found that electronic media allowed for information that would not have been relayed using traditional media to be conveyed.

2.5.3. Interactivity Theory

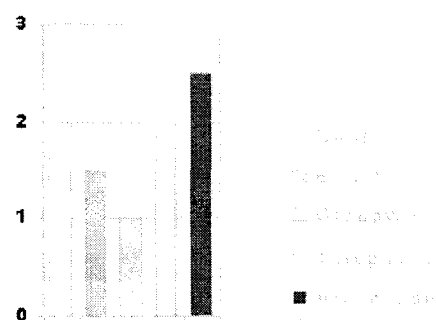


Figure 5 - Media Interactivity Level Graph

Interactivity refers to the extent to which rapid feedback is allowed (Massey et al., 2003). During communication processes, information are created and shared between participants in order to reach mutual understanding. Such information sharing, over time, leads individuals to converge or diverge from each other, in their mutual understanding of a certain topic (Rogers, 1986). For such communication processes to be effective, enough background knowledge about the participants should be shared. This will in turn make the message mutually meaningful (Tannen, 1989).

Interactivity is based on the ability to simultaneously and continuously exchange information when two people are talking (and listening) at the same time. According to Schegloff (1992), by making use of non-verbal cues given *while* the participants are speaking, individuals can judge whether they are succeeding or failing to get their message across. Adjustments are thereof made accordingly while they speak. The aforementioned cues, conveyed mostly during face-to-face encounters, refer to the “glances, gestures, positioning, tone of voice, restarts, and the variously positioned pauses” (Goffman, 1981).

The potentially spontaneous, unpredictable, and emergent progression of remarks (Garfinkle, 1964) and the ability to interrupt or pre-empt during the communication process also affects the level of interactivity. Interruption can be defined as one of the means available for giving simultaneous or immediate feedback (parenthetical remarks, or well-placed quips) (Goffman, 1981). Finally, Interactivity is based on mutuality, patterns of turn-taking, and on the use of adjacency pairs. Mutuality could for instance refer to the extent to which a particular tool allows one speaker to find the right word to fill in a sentence during a conversation (Goffman, 1981). Patterns for Turn-taking imply that speakers typically make remarks in turn during a conversation, and the management of these turns is particularly important (Sacks, Schegloffand, & Jefferson, 1974). It is a way to initiate minor side conversation to explain something before continuing with the main conversation (Goldberg, 1990).

As shown in Figure 5 video-conference tools support a high level of interactivity. They provide for simultaneous exchange of information and sharing of non-verbal cues. Furthermore, interruption can occur and feedback can be provided rapidly. However, it does not have the maximum level of interactivity as the speaking order is difficultly controlled, which leads to people frequently speaking over one another (Liebie, Rhodes, & McGrath, 1996). Chat applications and the telephone are slightly less interactive than the Video Conference due to the lack of explicit visual and non-verbal cues. However, people can still interrupt each other if need be. Email and Groupware applications have the lowest level of interactivity as no interruptions are possible and most often, only plain text can be transferred.

2.5.4. Symbol Variety Theory

The Symbol Variety Theory refers to the number of ways in which information can be communicated by the tool (Dennis & Valacich, 1999). Email and Groupware applications have the highest level of symbol variety as they allow information to be conveyed through tables, graph pictures or simple text. Chat and Video conference tools have a medium level of symbol variety. Telephone has the lowest level as the tool only caters for verbal communication (see Figure 6).



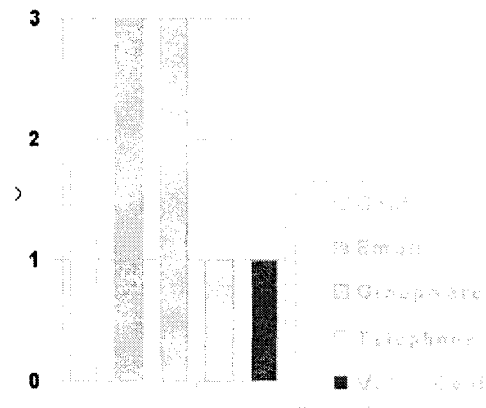


Figure 6 - Media Symbol Variety Level Graph

2.5.5. Rehearsability

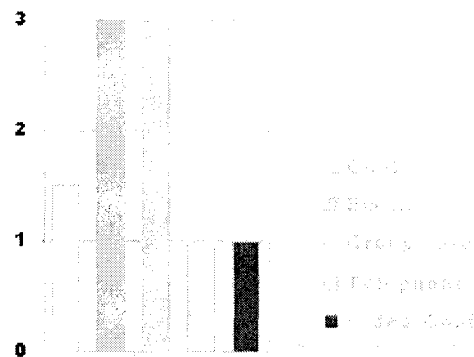


Figure 7 - Media Rehearsability Level Graph

Rehearsability refers to the extent to which individuals can fine-tune a message before sending (Dennis & Valacich, 1999). In a study undertaken by Kiel (2003) and involving German team members, there was reluctance by people to engage in arguments over the telephone. Instead, they requested the time to formulate their positions, write it down, check it, ensure that they were saying what they really meant to and finally send it off in an email. In this case, the email tool proved to be of high rehearsability while telephone did not. This is reflected in the Figure 7. The same applies for groupware applications where individuals have the time to think about what they really want to transmit before posting any new information. Chat applications have a medium level of rehearsability while telephone and video conference tools, the lowest.

2.5.6. Media capacity Theories in Global Software Development

According to previous studies, media richness is said to be particularly important while coordinating work between team members. For instance, information about work progress during the day can be exchanged through telephone conversations, at which point,

the other person at the other location continues with the work. Less information rich media are used to exchange the content of the project work or to issue and respond to queries (Ramesh & Dennis, 2002). However, in a study undertaken within a small team of developers working in a distributed environment between US and Ireland, net-meeting applications were not used due to the difficulty in setup. Instead, the telephone was preferred. The authors thus concluded that some of the technologies commonly used for GSD collaboration do not provide the required level of richness (Boland & Fitzgerald, 2004). It must also be noted that ambiguous tasks, often present during GSD, have a higher level of communication requirements as opposed to routine ones (Daft & Lengel, 1986). In such cases, emoticons only provide a low-quality substitute for what humans normally do with nonverbal cues (McGrath & Hollingshead, 1994). Interactivity can be very useful in GSD. For instance, the use of chat applications between developers is regarded as a very useful way of communicating in problem solving situations (Paasivaara, 2003) instead of using email which sometimes have to be sent several times for question clarification purposes before obtaining an answer.

Communication is essential for the proper functioning of Virtual Teams, which face a more difficult challenge in attaining effective communication. This is due to reduced social cues (Sproull & Kiesler, 1986) and the lack of non-verbal communication (Sproull & Kiesler, 1991) as the media used by dispersed teams are lower in media richness and synchronicity. Furthermore, it diminishes the amount of informal or non-task communication (Lebie, Rhoades, & McGrath, 1996). The efficiency of communication technologies is reduced when used within a distributed environment (Kiel, 2003) and the whole communication process, as well as the context in which it is taking place, is affected. (Turoff, Hiltz, Bahgat, & Rana, 1993). Various communication issues are thus introduced (Johansson, Dittrich, & Juustila, 1999; Lurey & Raisinghani, 2001), including time delays in sending feedback, difference in interpretation of common text and lack of assurance of participation from remote members (Cramton, 2002; Mark, 2001). These difficulties are compounded when the virtual team is global in nature (Hightower, Sayeed, Warkentin, & McHaney, 1997; McDonough, Kahn, & Barczak, 2001)

Studies focusing on the use of media richness during distributed communication demonstrate that a high level of media richness positively impacts on the amount of communication among team members (Carlson & Zmud, 1999; Hinds & Kiesler, 1995; May & Carter, 2001) and the Task-Technology-Structure fit (Hollingshead, McGrath, & O'Connor, 1993; Robey, Khoo & Powers, 2000; Majchrzak, Rice, King, Malhotra, & Ba, 2000). As the



group's shared interpretive context increases, less rich technologies are required for communication (Zack & McKenney, 1993). However, should the interpretive context be low, technology can be applied to stimulate "presence and awareness" (Herring & Rees, 2001). As the message content complexity increases, richer mediums are more appropriate, but if a rich medium is not available, the most accessible one is used (Maznevski & Chudoba, 2000). General details about some communication tools are given in Appendix C.

Task-Technology-Structure fit refers to the possible fit between technologies and the various tasks that dispersed teams are called upon to execute. The benefit of using a more complex communication technology increases as the task becomes more complex (DeSanctis & Jackson, 1994). For instance, Face-to-Face meetings or phone calls are best suited for ambiguous tasks, managing conflicts, managing external resources, brainstorming, and for setting strategic directions. Conversely, electronic communication is best suited for more structured tasks such as routine analysis (i.e. comparing competing concepts, examining design trade offs) or monitoring project status (Majchrzak et al., 2000)

Virtual teams that have no access to synchronous meetings are able to overcome these limitations and adapt the technology to accomplish ambiguous tasks after having successfully developed a shared language (Hollingshead et al., 1993; Chidambaram, 1996; Maznevski & Chudoba, 2000; Sharda, Barr, & McDonnell, 1988). However, the diminished non-verbal and visual cues associated with increased technology usage, have been cited as reasons why dispersed teams take longer to make decisions, are less able to make inferences about members' knowledge, and are less able to anticipate other members' responses (Cramton, 2002; Hollingshead, 1998; Sproull & Kiesler, 1986). For instance, electronic chat groups took significantly longer to reach a decision and arrived at less accurate decisions than did teams working in face-to-face or teleconferencing contexts (Graetz, Boyle, Kimble, Thompson, & Garloch 1998). In line with the above, the addition of video resources results in significant improvements to the quality of a team's decision (Baker, 2002).

Another major factor influencing the GSD context and which has been investigated during the course of this study is the culture. The next section thus provides an insight on the different cultural paradigms and their respective impact within the GSD context.

2.6. Culture

According to previous studies, cultural differences emerge as one of the main issue occurring in GSD. Culture is said to partially pre-determine a person's communication



preferences and behaviours (Hofstede, 1993; Triandis, 1994). It moulds the way people think, what their motivations are, how they categorise things, what inference and decision procedures they use, and the basis on which they evaluate themselves (Fiske, Kitayama, Markus, & Nisbett, 1998). It is the boundary condition for all personal communication (Gudykunst, & Matsumoto, 1996). Cultural styles affect the collaboration patterns in software development (Cockburn, 2002). For instance, if a Japanese development methodology is applied onto an Indian team conflictive situations might occur as each culture might have different development styles and requirements. The project team might also at time, create a form of mini-culture that sits within the organisational culture. This mini-culture might be different from the organisational culture or even the national culture in which it lies (Cockburn, 2002).

2.6.1. National Culture

National culture is the collectivist mindset that distinguishes members of one nation from another (Hofstede, 1993). Hofstede (2001) has pointed out five dimensions of national culture, namely the Power Distance Index (PDI), Individualism (IDV), Masculinity (MAS), Uncertainty Avoidance Index (UAI) and Long Term Orientation (LTO). *Power Distance*, *Masculinity v/s Femininity*, and *Long term v/s Short Term Orientation* relate to interpersonal power or influence between the boss and the subordinate, assertiveness and competitiveness versus modesty and caring within cultures, and society's perception on the importance of past and present versus the future, respectively. These concepts do not fundamentally affect the way in which software is being developed in a dispersed environment. The study does not focus on networks of power involving the boss and the developers, nor does it focuses on competitiveness or modesty among the stakeholders involved in a project. It also ignores any perceptions that people could have on the importance of past, present or future. On the other hand, the remaining two dimensions seem more appropriate. For instance, the desire to work as a group or individually, as per the Individualism dimension, has a fundamental impact on software project success. The same applies for the level of tolerance to uncertainty demonstrated by the team members, as uncertainty management is important during software development projects. Therefore, as mentioned by Watson, Hua Ho, and Raman (1994), the relative importance of each cultural dimension varies depending on the topic under investigation. Based on their theoretical description (as provided below), the two dimensions that seem most appropriate for this study are Individualism and the Uncertainty avoidance index. A third dimension proposed by Hall (1976), namely Communication Contextualism is also being described below.



❖ Individualism and Collectivism

Individualism refers to the preference to act as individuals rather than as members of a group. A high Individualism ranking indicates that people in the society prefer to achieve task on their own rather than working as a group or in a team. A low Individualism ranking indicates a strong bond among team members. Tasks are achieved together and collectivism is favoured (Hofstede, 2001). Team members from collectivist cultures might prefer technologies that allow for more “real-time” interactions to accomplish their team tasks. Conversely, members from individualist culture may be comfortable with the division of labour and the parallel conduct of work. The norm prevalent in a given society as to the degree of individualism or collectivism expected from its members will strongly affect the nature of the relationship between a person and the organisation to which he or she belongs (Hofstede, 2001). Appendix D gives an overview of collectivist cultures characteristics as compared to individualist cultures (Hofstede, 1980; Gudykunst & Matsumoto, 1996).

❖ Uncertainty Avoidance Index (UAI)

Uncertainty Avoidance Index (UAI) refers to the level of tolerance for uncertainty and ambiguity within the society. In cultures with high uncertainty avoidance ranking, members do not tolerate uncertainty and ambiguity and many details about planning etc., are usually required. Furthermore, situations focusing on laws, rules, regulations and controls are favoured, as a means to reduce the uncertainty level. Conflicts are generally avoided and members have a strong desire for consensus (Hofstede, 1980). On the other hand, societies with low Uncertainty Avoidance Index level have more tolerance for a variety of opinions, are less rule-oriented, more readily accept change, and take greater risks (Hofstede, 2001). The inclination of members of a culture to avoid uncertainty and ambiguity, profoundly affects the way in which institutions are organised and managed (Hofstede, 1993). In an attempt to reduce ambiguity, team members belonging to cultures with high Uncertainty Avoidance Index level, might prefer technologies that allow for time to detail the task or to create record of discussions and decisions. Appendix E gives an overview of cultures with Low Uncertainty Avoidance level as compared to those with High uncertainty avoidance level (Hofstede, 2001).

❖ Communication Contextuality

The third dimension of national culture that will be considered during the course of this study is Communication Contextuality. It was proposed by Hall (1976) as a means to distinguish between different types of cultures (e.g. American and Northern European cultures are typically low-context, while Mediterranean and Eastern cultures are high-

context). It refers to the amount of additional information required by individuals before making a decision versus “just the facts” (Hall, 1976). Context refers to how the different cues (verbal and non-verbal) available during communication are perceived by the individuals. For instance, individuals belonging to low communication context cultures do not give more details than necessary while communicating (Gudykunst et al., 1996). Alternatively, those from high context cultures require historical information and subjective personal opinions. Information about the team members involved, are also required (Hall, 1976; Levine, 1985). The opposite of contextuality may be called “formality”. Formal language explicitly states the necessary references, assumptions, and background knowledge into the expression. These would have remained tacit in a contextual expression of the same meaning (Heylinghen & Dewaele, 2001). The choice between a formal and a contextual language depends on the amount of knowledge about the context, available by the persons to whom the message is addressed. The less they know, the more important it is to avoid contextual expressions and to replace them by explicit characterisations (Heylinghen & Dewaele, 2001). Technologies required by those belonging to high communication context should provide the impression of social presence, especially when the team members have never met (Duarte & Snider, 1999). Conversely, task-oriented technologies might be more appropriate to low context cultures. Appendix F gives an overview of characteristics of cultures with Low Communication contextuality as compared to those with High communication contextuality level (Hofstede, 2001).

2.6.2. Organisational Culture

Organisational culture differs from national culture and can be defined as “the differences in collective mental programming, found among people from different organisations, or parts thereof, within the same national context” (Hofstede, 2001). Organisational culture differs mainly at the level of ‘practices’ while national culture mostly differs at the level of ‘values’ (Hofstede, 2003). While managing international businesses, both national and organisational cultures are handled at the same time. As such, both organisational and national culture could have an impact on the use of software development methods.

Hofstede (2003) proposed six independent dimensions to organisational culture, namely, process-oriented versus results oriented, job-oriented versus employee-oriented, professional versus parochial, open systems versus closed systems, tightly versus loosely controlled, and pragmatic versus normative. Based on their description, the most relevant

dimensions of organisational culture for this study are described below. These include Process Oriented vs. Result Oriented, Employee Oriented vs. Job Oriented and Normative vs. Pragmatic. Although individuals may have similar national or ethnic backgrounds, they may still exhibit radically different cultural assumptions as engendered by the organisation for which they work (Kayworth & Leidner, 2000).

❖ **Process-Oriented vs. Result-Oriented**

In Process-oriented cultures individuals perceive themselves as risk-avoiding and spend only limited effort in their jobs. In result-oriented cultures, people perceive themselves as comfortable in unfamiliar situations and put in maximum effort. The major characteristics of Result-Oriented cultures are mentioned below (Hofstede, 2001). The opposite applies for Process-Oriented ones.

- ❖ Employees are told when good job is done
- ❖ Typical member fast
- ❖ Comfortable in unfamiliar situations
- ❖ Typical member initiating
- ❖ Informal style of dealing with each other
- ❖ Typical member warm
- ❖ Typical member direct
- ❖ People put in maximal effort

❖ **Employee–Oriented vs. Job-Oriented**

Employee-oriented organisational cultures favour concerns for people as opposed to concerns for getting the job done. Furthermore, important decisions are made by groups or committees and not by individuals. In job-oriented units, individuals experience a strong pressure for getting the job done, and important decisions are mostly made by individual people. The major characteristics of Job-Oriented cultures are mentioned below (Hofstede, 2001). The opposite applies for Employee-Oriented ones.

- ❖ Important decisions are made by individuals
- ❖ Decisions centralised at top
- ❖ Management dislikes union members

❖ **Normative vs. Pragmatic**

The Normative versus Pragmatic dimension corresponds to the notion of “customer orientation” and deals with the amount of structuring in the unit’s *external* contacts. In Normative units as opposed to pragmatic ones, the major emphasis is on correctly following

organisational procedures, which are more important than results. In pragmatic cultures, major emphasis is placed on meeting the customers' needs, and results are more important than correct procedures. The major characteristics of Pragmatic cultures are mentioned below (Hofstede, 2001). The opposite applies for normative cultures.

- ❖ Pragmatic, not dogmatic in matters of ethics
- ❖ Major emphasis on customer needs
- ❖ Results more important than procedures

2.6.3. Group Culture Conceptualisations – Formal and Informal Group Culture

Group cultures can be defined as either being formal or informal. As described by Atherton (2005), formal group cultures are typically manifested in situations where a single person has power over other persons. It relates to cases where the group leader generally defines, directs, and controls the work of group members (in Cecez-Kecmanovic & Busuttil, 1999). It requires some form of organisational system, made up of various job roles, for which individuals are recruited. Members of these groups typically request meeting with the team leader to discuss proposals, issues, and concerns. Such behaviour reveals that groups with a formal culture have rigid hierarchical structure and authority of power, and direct and control the work of members (subordinates). In addition, subordination and obedience are demanded to the leader and the members are dependent of their leader. There is also controlled access to the information (Pun, 1991). Informal groups work the other way round. Roles are informally allocated to individuals within the group, depending on the individual preferences, and occasionally on talents (Atherton, 2005). In this type of culture, the preference of the individuals is paramount. If one does not get anything out of the group membership, one might drop away.

Work groups working in GSD are often involved in Computer supported cooperative work. Through the use of technology supporting this form of work, the task group outcomes is leveraged as there is increased participation, more egalitarian participation, more ideas offered and less centralised leadership (Hiltz, Johnson, & Turoff, 1986, Kiesler, Siegal, & McGuire, 1984, Rice, 1987, Adrianson & Hjelmquist, 1991). Limited social presence may also encourage people to communicate more freely and creatively than they do in person (Kiesler et al., 1984).



2.6.4. Individual Culture Concepts

More recently, the notion homogeneity, as being asserted by national culture is being considered as less appropriate for the study of some areas of Information Systems, where the individual behaviour needs to be integrated with IS model (Davis, 1989). Researchers have acknowledged that individuals might simultaneously embrace several cultural groups (Howard, 2000; Karahanna, Evaristo, & Srite, 2005). Furthermore, the extent to which they embrace these cultural values varies. This further impacts on the overall prevalence level of the national culture (Srite & Karahanna, 2006). This gave rise to cultural studies that focused instead on “collecting contemporary cultural data from individual subjects” (Mccoy, Galleta, & King, 2005). While Mccoy, Galleta and King (2005) acknowledge that national culture still exist, an instrument reflecting the individual level of analysis should be employed (e.g. Dorfman & Howell, 1989). For instance, value orientation can be used to reflect the characteristics of individuals (Betancourt & Lopez, 1993; Triandis, 1995), which is a more sensitive analysis of the possible effects of cultural values on the behaviour of people (Srite & Karahanna, 2006).

Individual culture can be measured through the “The Big Five”, which are five broad factors of personality traits. *Extraversion*, encompasses specific traits as talkative, energetic, and assertive and the *Agreeableness* dimension includes traits like sympathetic, kind, and affectionate. The third dimension, *Conscientiousness* is said to characterise highly organised people, thorough, and planful. *Neuroticism*, is characterised by traits like tense, moody, and anxious. The last dimension, *Openness to Experience* includes having wide interest, and being imaginative (in Shaver & Brennan, 1992). The Big Five structure is derived from statistical analyses of which traits tend to co-occur in the population, the underlying correlations are probabilistic and thus exceptions are possible. For instance, even if talkativeness and assertiveness are associated with Extraversion, they do not go together by logical necessity.

2.6.5. Culture and Communication

Culture has a profound impact on how individuals perceive information, act upon it, and relate to other individuals (Hofstede, 2001). As previously mentioned, cultural differences have a negative impact on communication (van Ryssen & Hayes Godar, 2000, Kayworth & Leidner, 2000) causing to people to decipher communication through their own cultural perspective. Studies have also demonstrated that an awareness and understanding of these differences, through previous cultural exposure, helps to alleviate them (Kayworth & Leidner,



2000; Sarker & Sahay, 2002; Jarvenpaa & Leidner, 1999). Interestingly however, two identified studies contradicted these findings (Krutchen, 2004; Kiel, 2003), whereby despite being aware of their cultural disparities, team members still felt frustrated and communication was not very effective.

2.7. Identified Gaps

Despite having uncovered interesting and useful results, gaps or limitations pertaining to some of these studies are worth mentioning. For instance, none of the studies have so far focused on South Africa and Mauritius as offshore destinations for GSD. Instead, emphasis has been placed on the US, Singapore, and European countries. Also, most studies are experimental, and focus on students working in distributed environments as opposed to organisations. Student teams do not reflect the real complex relationship between team members in a GSD organisation due to the difference between a controlled setting and field based research. A more complete understanding of the intricate bond existing between developers is thus required, especially when they have been working together, in a global environment, for a long time.

No past research has also been performed to support the fact that software development methods can be used to mediate cultural disparities. None has also been undertaken to demonstrate that various forms of software methods fit specific cultural traits. As Mauritius and South Africa form rich cultural settings, they are ideal contexts to perform this kind of study.

As far as culture is concerned, most studies focused mostly on National and Organisational cultures. These are however not the sole form of cultural representations encountered during GSD. Group culture or individual culture might also prevail. Further probing on group or individual culture is also required and will be performed in this study.

The various GSD issues and their respective coping strategies have been identified in this section. Results from this review demonstrate that GSD calls for proper sets of practices to overcome, communication, cultural, geographical and requirements engineering issues, among others. The review also shows that existing software methods have differing efficiency levels when employed in GSD. Their corresponding fit for various forms of cultures has also been proposed. The different forms of communications that might prevail in a dispersed setting as well as the different forms of cultural affiliations have then been described in conjunction to GSD. Finally, Media Capacity Theories have been presented.

They posit that all the tools available for communication convey different forms of messages, which renders them adequate for very specific tasks in specific contexts.



RESEARCH METHODOLOGY

This section describes the methodology followed for this research study. Given the research objectives presented in the introduction, and the facts and thoughts revealed from the literature review, the underlying research model is first outlined. This is followed by a discussion on the chosen research approach, research paradigm, research method, and research strategy. The proposed data collection and data analysis techniques are also explained and justified. Some methodological concerns are expressed, along with the expected contributions that this study might bring to the field of Information Systems.

3.1. Research Model

The literature review reveals that the use of popular software development methods in differing cultures is a valid research area for investigation in the field of GSD. It has been proposed that under such circumstances, specific cultures are more inclined to favour specific forms of communication, the choice of which might not satisfy all the parties involved. As a result, various communication challenges are formed, specific to the GSD environment. Attempts to overcome these unreliable communication processes include the use of widely available communication technologies. However, as asserted by media capacity theories, some technologies are better at some forms of communication than others. The effectiveness of such tools in attaining this goal will thus be investigated too.

The model shown in Figure 8 depicts the constructs which form the basis of this study and the specified relationships will be investigated during the course of the research. The model illustrates that differing cultural influences affect the choice of GSD practices. This results in the adoption of communication preferences during the GSD project. Furthermore, communication preferences embody the software development methods employed, while the communication technologies have differing perceptions of fit for the task at hand. References from the various studies have been added to the diagram as a means to justify the different links

The need for a clean theoretical slate when claiming the use of the Grounded Theory method is a common belief shared by many researchers (Uquhard, 2001; Dey, 1999). The statement implies that the Grounded Theory method does not usually prescribe the use of an initial research model. However, for the purpose of this study, it was necessary to propose an initial framework so as to completely understand the influences shaping a GSD project from various literature sources. However, in doing so, the researcher did not attempt

to prove or disprove the proposed initial framework. Instead, the aim was to increase the researcher's theoretical sensitivity to the domain of global software development. This goes in line with Hunter (2004) who mentions that "the point made in Grounded Theory literature is *not* that a clean slate is necessary or even desirable; the critical point here is that research does not start with a theory to prove or disprove".

Analysis was not guided by the theoretical model. This implies that the researcher did not strive to inscribe preconceived beliefs to the text being analysed (Glaser & Strauss, 1967). However, as acknowledged by Strauss (1987), it is difficult to ignore the existing knowledge present in a researcher's mind before commencing the research process. Thus, starting from scratch with an absolutely clean theoretical slate is neither practical nor preferred (Perry, & Jensen, 2001; Richards, 1993). The process of induction and deduction are therefore simultaneously enacted during the research process (Richards, 1993) and all data are theory-loaded (Popper, 1972).

A similar approach to Grounded Theory has been applied by some past researchers (Jensen, 1998; Alvesson & Skjoelberg, 1994; Brytting, 1990; Skytte, 1992; Rowland, 2005). It involves the development of *pre*-categories, derived from past literature, before attempting the sampling and coding processes. According to Jensen (1998), "this development helps the researcher to be initially aware of a number of dimensions of the phenomenon that is to be studied. It additionally gives the researcher a flying start to the study". It is important to note that these dimensions are not meant to be subsequently tested and verified at the end of the study. Instead, they are "put on trial within a real empirical context for contextual re-specification, refinement and elimination" (Jensen, 1998).

In the following stages, in line with Jensen (1998) the normal processes prescribed by the Grounded Theory techniques were followed. Pre-categories were developed, meta-categories were created, non-working concepts and dimensions were excluded and new dimensions were discovered. The researcher nevertheless remained open to new categories and dimensions that emerged during the coding process.

According to Perry and Jensen (2001), one of the advantages of this modified version of Grounded Theory is that it combines links to existing theories with the specified guiding principles of data sampling and analysis from Grounded Theory. In addition, by comparing the dense core categories derived from the data to past theories uncovered in literature after the analysis process, the robustness of the study is increased through external confrontation (Perry & Jensen, 2001).



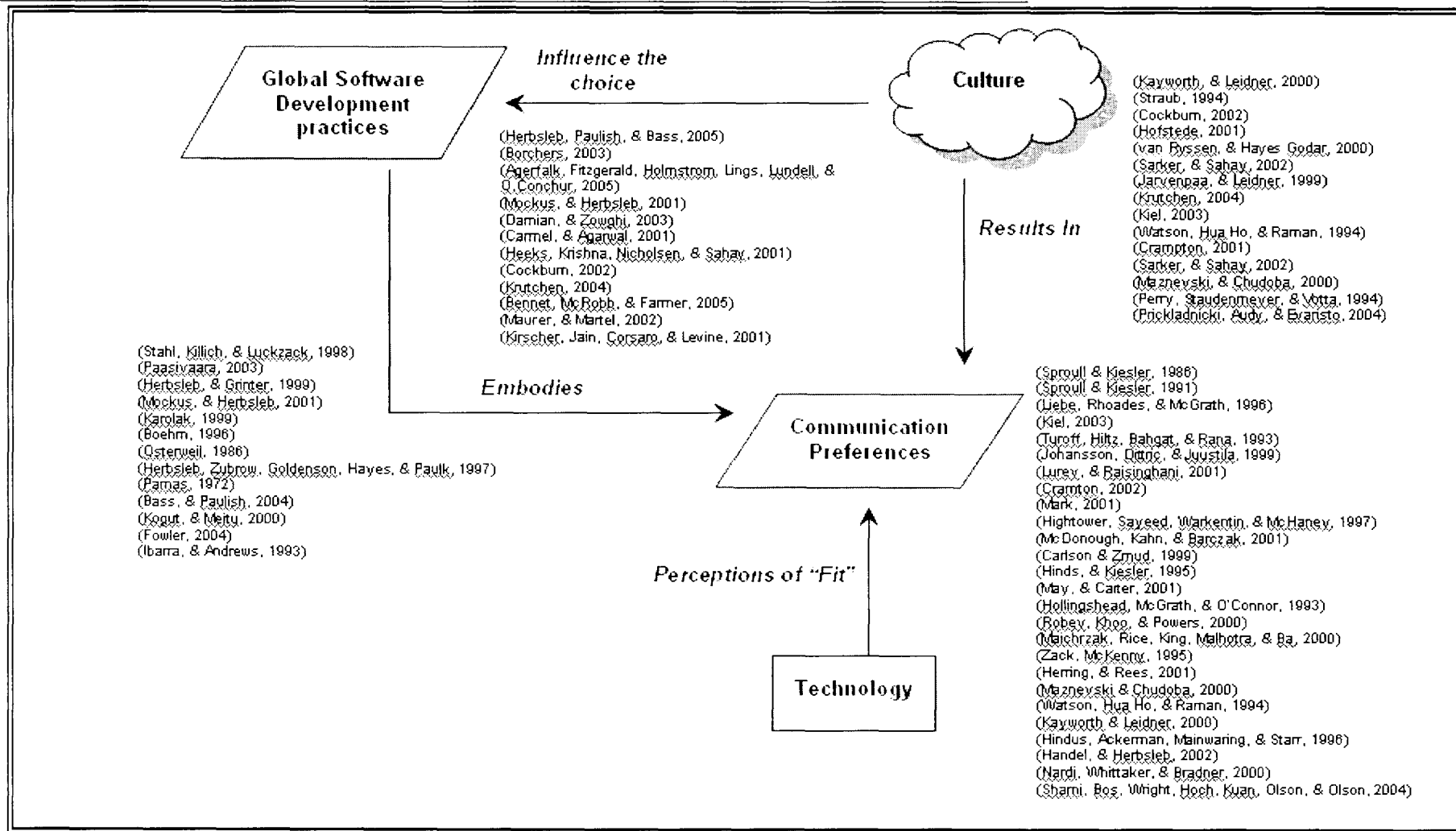


Figure 8 – Preliminary Research Model

3.2. Research Approach

Research methods can be organised into different levels be it quantitative or qualitative, positivist, critical or interpretive, and empirical or non-empirical. Information Systems research methods may fall under any of the broad categories available for each level but there is significant debate about the most appropriate ones (Kaplan & Duchon, 1988). For the purpose of this study, an interpretive, empirical, and qualitative approach has been chosen. Multiple exploratory case studies have been undertaken and data has been collected through interviews. Data collection and analysis is guided by the Grounded Theory techniques, which are concerned with the discovery of theory directly from field data. The Grounded theory techniques have thus been used as part of an iterative research process and as a final product of the work. Inductive coding as explained by Thomas (2003) has also been followed. It allows the “research findings to emerge from frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies” (Thomas, 2003). The choice of these schemes is justified in the following sections.

3.3. Research Paradigm

Philosophical Perspective

As suggested by Chua (1986), there exist three broad epistemological categories: positivist, interpretive, and critical. These three different research paradigms exist as, just like the beliefs and values of people generally differ, the ways to understand what research is also differ. All studies are thus based on some underlying assumptions about what constitutes valid research and appropriate research methods (Myers, 1997).

Positivist research assumes that reality is objectively given and can be described by measurable properties, independent of the observer and his or her instruments (Myers, & Avison, 2002). On the other hand critical research assumes that social reality is historically constituted while being produced and reproduced by people. Although people can consciously act to change their social and economic circumstances, critical researchers recognise that their ability to do so is constrained by various forms of social, cultural and political domination (Myers, & Avison, 2002).

For the purpose of this research, an interpretive perspective has been chosen. As such, by shifting the lens from a positivist paradigm, new insights can be considered (Greenhill, 2004; Pozzebon, 2004; Hirschheim & Klein, 1989). Interpretive methods of research in IS are “aimed at producing an understanding of the context of the information



system, and the process whereby the information system influences and is influenced by the context" (Walsham, 2002). The researcher thus assumes that access to reality (given or socially constructed) is only through constructions such as language, consciousness and shared meaning (Myers & Avison, 2002). As is the case in all interpretive studies, this research understands the phenomena under study through the meanings that people assign to them.

Qualitative vs. Quantitative Approach

Quantitative Research methods have been devised to study natural phenomena through survey methods, laboratory experiments, formal methods (e.g. econometrics), and numerical methods such as mathematical modelling (Myers & Avison, 2002). However, as argued by various authors (Cook & Campbell, 1979; Manicas & Secord, 1983; Maxwell, Bashook & Sandlow, 1986), the study of social sciences in a natural setting involves several uncontrolled variables, of which the imprecise measurement or omission might result in misleading, or unusable results (Myers & Avison, 2002).

Qualitative research methods have thus been chosen for this study as they are said to yield a better understanding of the real world setting (Kaplan & Duchon, 1988). Such methods refer to the kind of research that produces findings not obtained through statistics or other means of quantification. It is thus suited to study organisations, groups, and individuals (Strauss & Corbin, 1998). Qualitative research comprises three major components, namely the data, the analytic or interpretive procedures, and the written and verbal report. The major characteristics of qualitative research involve a focus on interpretation rather than quantification. It emphasises on subjectivity rather than objectivity, flexibility in the process of conducting research, an orientation towards process rather than outcome, a concern with context, and an explicit recognition of the impact of the research process on the research situation (Cassell & Symon, 1997). These characteristics might be considered as advantages, and justify the choice of qualitative methods for the purpose of this study. Furthermore, due to an existing number of uncontrolled variables involved in social systems, (Cook & Campbell, 1979; Manicas & Secord, 1983; Maxwell, Bashook & Sandlow, 1986) the methods for studying closed systems are not applicable in natural settings as is the case in controlled ones.

Empirical vs. non-Empirical research

Empirical research involves observation (Schwandt, 1997) or direct fact-finding about issues (Kling, 1991). On the other hand, non-empirical methods focus on ideas, frameworks,



and speculations rather than observations (Alavi, Brooke, & Carlson, 1990). Empirical research can be further subdivided into theory-testing and theory-creating research (Järvinen, 2004). Theory-testing studies involve laboratory experiments, surveys, field studies, or field experiments. The respective theories, models, or frameworks are either taken from literature, or developed, or refined for purpose of the specific studies. The opposite applies for theory-creating studies, which make use of case-studies, ethnographic methods, grounded theory, contextualism, discourse analysis, longitudinal studies, phenomenological studies, and hermeneutics among others (Järvinen, 2004).

3.4. Research Method

Case study research chosen for this study, figures among those qualitative methods that gained acceptance in the IS field during the past decade (Benbasat, Goldstein, & Mead, 1987; Benbasat & Weber, 1996; Klein & Myers, 1999; Orlikowski & Baroudi, 1991). Empirical in nature, it is used to investigate contemporary phenomenon within real-life contexts, especially when the boundaries between the phenomenon and the context are not clearly evident (Yin, 1994). It consists of a detailed investigation of one or more organisations, or groups within organisations, as a means to provide an analysis of the processes and context involved in the phenomenon under study. Case research is useful when the phenomenon under study is broad and complex, and cannot be studied outside the context in which it occurs (Benbasat, Goldstein, & Mead, 1987; Bonoma, 1985; Feagin, Orum, & Sjoberg, 1991; Yin, 1994). Furthermore, being holistic in nature, it suits the need to understand the complex and ubiquitous interactions among organisations, technologies, and people (Dubé & Paré, 2003) through in-depth investigation. This perfectly describes the current GSD research context, and justifies why case research is deemed appropriate.

The case study is more of a research strategy than a method and can either be exploratory, explanatory or descriptive. Each strategy depends on the type of research question being asked. For instance, exploratory case studies are mainly used to focus on 'what' questions, the goal being to develop hypotheses and propositions for further inquiry (Yin, 2003). 'Who' and 'where' questions are generally not answered by case studies but 'how' and 'why' questions, being more explanatory in nature, are often the focus of explanatory case studies (Yin, 1994). The aim of this study is to understand, through qualitative case studies, how Global Software Development practices are being used to mediate differing cultural influences communication issues and general GSD issues in the GSD context. The role served by communication technologies in improving the



communication process during GSD is also investigated. As the research questions are in 'what' form, an exploratory case study will be employed.

Multiple Case Studies

Multiple cases have been selected as they allow for comparison across sites and might help in demonstrating the influence of variability of contexts (Pettigrew, 1989). In some fields, multiple-case studies are considered as a different methodology but Yin (1994), suggests otherwise. He states that the choice between single and multiple case studies remains within the same methodological framework and no broad difference is made between the two. The advantage of using multiple case studies is that the results are often considered as more compelling and the overall study more robust (Herriott & Firestone, 1983)

Grounded Theory

Data collection and analysis have been guided by the Grounded Theory techniques (Glaser & Strauss, 1967; Martin & Turner, 1986; Turner, 1983). The aim was to generate a descriptive and explanatory theory on the use of software development methods to mediate cultural differences in GSD. This approach has been adopted for two primary reasons. Firstly, grounded theory "is an inductive theory discovery methodology that allows the researcher to develop a theoretical account of the general features of a topic while simultaneously grounding the account in empirical observations or data" (Martin & Turner, 1986). Such a technique has been particularly useful as no existing theory on the use of software development methods to mediate cultural differences has been established to date. Secondly, grounded theory focuses on incorporating the complexities of the organisational context into an understanding of the phenomenon. This will thus produce accurate and useful results.

3.5. Research Strategy

This section presents the research strategy or action plan that is meant to logically link the collected data to the research questions (Yin, 1994). Details of how the study has been initiated, the process followed, the role of the researcher, and the units of analysis are thus presented. As proposed by Yin (2003), the approach shown in Figure 9 will be followed.

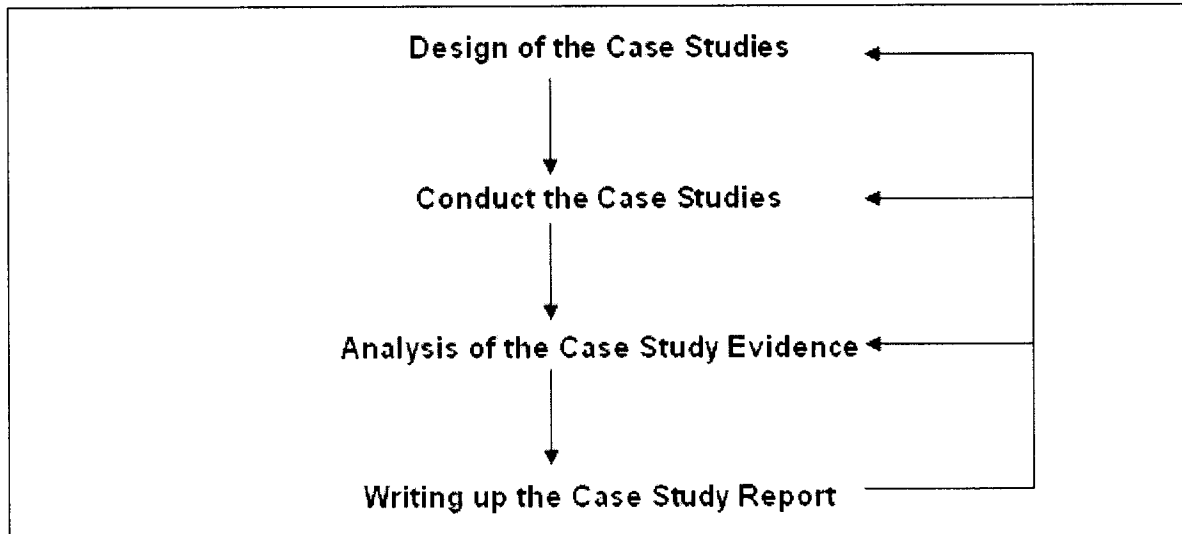


Figure 9 - Case Study Approach

3.5.1. Case Study Design

The different steps involved in the research design process are explained below. They comprise of the initial definition of research questions, followed by the *a priori* specification of constructs or theory, the definition of the unit of analysis, and the selection and number of cases.

Research Questions

The definition of the research questions is one of the most important steps to be undertaken in any empirical study (Benbasat, Goldstein, & Mead, 1987; Eisenhardt, 1989; Miles & Huberman, 1994; Yin, 2003). As such, primary and secondary research questions been devised in a clear, simple, obvious, timely, and scientifically relevant way. The primary question is:

- ❖ In what ways should GSD programs be designed to counteract the issues/problems/situations of concern being experienced within GSD in South Africa and Mauritius?

The secondary research questions include:

- ❖ How can differing cultural and communication affiliations that prevail among the countries involved be mediated?
- ❖ To what extent are the communication tools available for GSD collaboration effective in the Mauritian and South African context?

Each research question has further been linked to the research objectives set forth in the introduction. This is shown in Appendix H.

Prior Theorising

Two different approaches might be employed in guiding theory-building research (Anderson & Aydin, 1994). In the first one the researcher is expected to work in an explicit conceptual framework, “*grouped so as to enable its users to easily see the major concepts simultaneously in their relations to one another*” (Kochen, 1985). The second one requires the researcher to be unconstrained by prior theory. Instead it sees the development of relevant theory, hypotheses, and concepts as a purpose of the project (Paré, 2004).

The first option has been chosen. As can be seen in a statement made by Eisenhardt (1989), it is quite impossible to achieve the ideal of a clean theoretical slate. In the current situation, related previous studies provide proper grounding for the proposed model (see Figure 1). The early identification of these constructs allow them to be explicitly analysed in subsequent interviews (Eisenhardt, 1989). However, the possibility of uncovering new factors during the data collection process is not eluded, thus reducing potential biases which result from the sole focus on the framework.

Role of the Researcher

In attempting to access other people’s interpretations, interpretive researchers can play two distinct roles namely that of the outside observer and that of the involved researcher. The latter can be carried out through participant observation or action research (Walsham, 2002). For the purpose of this study, the researcher played the role of the *outside observer*, investigating the cultural and communication issues in GSD. Such a role has been chosen as it best preserves distance between the researcher and the personnel in the field organisation. As a result, the researcher is not seen as having a direct personal stake in various interpretations and outcomes, which further encourages personnel to frankly express their views (Walsham, 2002).

Unit of Analysis

A case, defined as an “integrated system” bounded by time and place (Stake, 1995), is also referred to as the *Unit of Analysis* (Miles & Huberman, 1994). A single case might involve several units of analysis (Yin, 2003), the specification of which helps in defining boundaries and limitations of the theory being built (Markus, 1989). The different units of analysis for this study involved the organisations, the GSD Team and the GSD Project.



Two case studies have been conducted in Mauritius and South Africa respectively. For each case, the situation in specific dispersed teams has been investigated, in relation to the GSD issues being experienced. The software development methods employed have been uncovered and cultural affiliations and communication requirements have been studied. Furthermore, the communication issues encountered in each dispersed team have been investigated and the effectiveness of the communication tools utilised has been evaluated.

Sampling

The selection of cases represents an important but difficult aspect of case study research (Yin, 2003; Lee, 1989; Benbasat, Goldstein, & Mead, 1987; Eisenhardt, 1989). In line with Glaser and Strauss (1967), the theoretical sampling method has been chosen for that purpose. It requires the researcher to pay attention to theoretical relevance and purpose while choosing organisations. As such, site selection has been carefully thought out rather than being opportunistic. Research on GSD as organisation-level phenomena require site selection based on geographic coverage, software methods and communication technologies employed. As the purpose of the research is to generate theory applicable to various organisational contexts, differences in organisational conditions have also been sought. These differences relate to the nature and scope of the software development activity, the countries involved in the dispersed teams, the team size and structure, and the communication tools employed. This allowed for logical generalisation and maximum application of information to other cases (Patton, 2002). The differences in the different case studies chosen are outlined in Table 4.

Case Number	Team Number	Offshore Country	Country	Software Development method	Main communication tool	Other Technologies
Case 1	Team 1	South Africa	Denmark UK	RUP	Conference call	Email Phone Chat
	Team 2	South Africa	Belgium	RUP	Conference call	Email Phone Chat
Case 2	Team 1	Mauritius	UK	RUP	Email	Conference calls Phone Project management Tool
	Team 2	Mauritius	US	RUP	Email	Conference calls Phone Project management Tool



	Team 3	Mauritius	Canada	Prototyping Waterfall	Phone / Email	Conference calls Project management Tool Chat
Case 3	Team 1/2/3/4	Mauritius	France	Adapted Waterfall /Prototyping	Video conference	Email Phone Remote Desktop sharing Project management tool

Table 4 - Case Studies Differentiation

3.6. Data Collection

Data collection focused on the general issues encountered by the team members during the day-to-day practice of global software development. The software development methods employed, culture, communication, and communication technologies have also been investigated. Furthermore, general information about the respective teams' sizes and structure has been sought. Table 5 details the respective strengths and weaknesses of the Interview data collection method.

Sources of Evidence	Strengths	Weaknesses
Interviews	Targeted – Focuses directly on case study topic Insightful – provides perceived causal inferences	Bias – due to poorly constructed questions Response bias Inaccuracies – due to poor recall Reflexivity – interviewee gives what interviewer wants to hear

Table 5 - Data Collection Methods

With respect to interpretive case-studies, semi-structured interviews have been the primary source of information for this study. It allowed the researcher to access the participants' interpretation regarding the actions and events which have or are taking place (Walsham, 2002). The Interviews remained open-ended and assumed a conversational manner (Appendix H). The interview questions have been linked to the research questions and the research objectives. Each respondent has been interviewed for 1 hour and care has been taken to retain the balance between excessive passivity and over-direction. By avoiding over-direction, the data obtained retained much of the richness of interpretation, which is the raw material for interpretive case studies. Furthermore, by not being excessively passive, the researcher demonstrated an interest in the respondent's answers (Walsham, 2002). This allowed for facts that might have already been established to be corroborated. Special care



has been taken to elicit the respondent's views and experiences in his or her own terms, rather than to collect data that are simply a choice among pre-established response categories (Kaplan & Maxwell, 1994). A total of 17 interviews have been conducted during the course of this study. The number of interviewees by job functions for reliability purposes has been provided in the case description chapter. The interview questions were also pilot-tested before being used for the actual cases. As the information obtained during this pilot interview provided a deep insight on the topic at hand, the transcript has been coded and the results included in the study.

A *Maximum Variation Sampling* strategy has been chosen in accordance to the units of analysis and the overall purpose of the case study project. Such a strategy requires the investigator to obtain the broadest range of information and perspectives on the subject of study, and is the preferred strategy for qualitative inquiry (Guba & Lincoln, 1989). Furthermore, by looking at this broad range of perspectives, preconceived (and developing) understanding of the phenomenon under study is purposefully challenged (Paré, 2004). As a means to capture everything that will be said and to spot salient points at a later stage while transcribing, a tape recorder has been used. However, prior permission has been requested from the interviewee and was by no means taken as a substitute for "listening" closely throughout the course of the interview (Yin, 2003).

3.7. Research Instrument

A copy of the questionnaire is given in Appendix H. The interview schedule has been divided into five main sections. Such a format allowed for the structuring of the information gathered according to the research model and research questions. Descriptions of the research instruments, interview agenda, and glossary of terms were provided to each respondent. This helped in preparing the latter for the interview and thus prevented the researcher from wasting time in explaining the research objectives and main concepts during the limited time allocated for the interview. Section 1 of the questionnaire deals with some general information about the dispersed team currently under investigation. The section then proceeds to enquire about the general global software development issues encountered by the respondent. Section 2 investigates on the software development methods employed for different projects and the efficiency of these methods in GSD. General GSD issues including cultural and communication problems are investigated in Section 3 while the ways in which GSD is being practiced to overcome these issues are handled in Section 4. Section 5 finally



gathers information on the technologies being used in the Mauritian and South African GSD context.

3.8. Data Analysis

The Grounded theory techniques have been used for analysis purposes during the course of this study. Strauss and Corbin (1998) define the Grounded Theory analysis techniques as “a set of well-developed concepts, related through statements of relationships, which together constitute an integrated framework that can be used to explain or predict phenomena.” As such, according to Locke (2001), a well defined theory is composed of a set of well-developed concepts, the statements of the relationships between the concepts, the integrated framework, and the explanation of phenomena embodied in the theory.

Concepts are the building blocks of a theory (Strauss & Corbin, 1998), and can either be relational or descriptive. Descriptive concepts describe the constituent parts of the theory and relational concepts describe the relationships (Locke, 2001). In turn, categories represent a grouping together of similar or related concepts and have a much broader scope than these lower order concepts (Strauss & Corbin, 1998). Sub-categories are those that relate to the main category and answer questions such as who, where, why, when, and how about that category (Strauss & Corbin, 1998).

Other important terms in relation to the Grounded theory techniques and which call for further explanation include core categories, phenomenon, properties and dimensions. The phenomenon is defined as the central idea in the data related to a substantive area of study (Strauss & Corbin, 1998). Similar to the term core category, these are often used interchangeably (Pandit, 1996). Categories may possess characteristics, which are known as properties and each of these properties vary along a range, known as the dimension of the property (Strauss & Corbin, 1998). Given that a category is derived from aggregating several lower order concepts together, it is possible that these lower order conceptual elements may ultimately constitute the properties of a category by also considering the dimensions along which they may range (Strauss & Corbin, 1998; Locke, 2001). Relationships between categories are identified in order to build up a theory. Categories relate at the level of properties and dimensions. Depending on the evidence in the data, there can be a large number of relationships between any two categories (Strauss & Corbin, 1998).

As required by the Grounded Theory techniques, there should be continuous interplay between data collection and analysis (Myers & Avison, 2002). Through this iterative approach, data analysis (in the form of Open Coding and Axial Coding) occurred during data



collection, and the results of the analysis informed and directed the data collection process. Data collected in this study has been analysed using Open Coding, Axial Coding and Selective Coding (Strauss & Corbin, 1998).

Open Coding

The general idea behind open coding is to generate a list of concepts which are then grouped into categories. As concepts are the basic building blocks of a theory, the first task in developing them is to open the data and reveal the name of these concepts (Strauss & Corbin, 1998) in (Brown, 2005). This is achieved through constant comparative analysis by comparing similarities and differences between data incidents. Discrete concepts are then produced and labelled (Strauss & Corbin, 1998). Comparison can also be used as a means to develop a common name for multiple observations of data incidents. This further leads to more general rather than specific conceptual categories (Locke, 2001).

Properties of the categories also have to be identified. In addition, each property has a dimensional range (Strauss & Corbin, 1998). For example, "Communication Practices" is a Category under which "Communication among team members" and "communication channel description" is grouped. "Communication Need" might be a property of the "Communication among team members" and by default becomes a property of "Communication Practices" also. The range of this property might vary from "Random phases" to "Specific phases". As previously mentioned, discrete concepts can become properties or characteristics of a category. Such a process is undertaken because of the rationale put forward by Strauss and Corbin (1998), which states that categories are easier to remember, think about, and develop in terms of properties and dimensions, and can be further be differentiated by breaking them down into sub-categories if necessary.

However, precautions have been taken to corroborate the interpretations made (Miles & Huberman, 1984; Yin, 1994). Emerging concepts have to be checked for representativeness by examining them across participants. This is achieved via *data triangulation* (Patton, 1988) and *constant comparative coding* (Du Poy & Gitlin, 1998; Glaser & Strauss, 1967; Glaser, 1992). Data Triangulation aims at corroborating the same fact or evidence from multiple sources. In turn, constant comparative coding is the validation process whereby observations and behaviours are compared/contrasted with core categories and properties, then coded into categories. The developing conceptual model is modified as new data is explored and new concepts are integrated into the emerging theory, reviewing and expanding where necessary.



Axial Coding

Axial coding is defined as “the process of relating categories to their sub-categories, termed “axial” because coding occurs around the axis of a category, linking categories at the level of properties and dimensions” (Strauss & Corbin, 1998). The axial coding process can be performed using two major activities. Firstly, the categories are more clearly defined in terms of their properties and their dimensions. Then, the axial links between categories are identified from statements in the data during the open coding process (Locke, 2001). These statements are sometimes straightforward, but are most of the times recognised within the broader context of the rest of the interview. As prescribed by Locke (2001) and seen in Brown (2005), “during the axial coding process, less time is spent comparing data incidents with data incidents. Instead, the focus is placed on the comparison of the data incidents with the conceptual categories that have emerged”. This yields a richer description of the properties and their dimensions in relation to the core categories.

As suggested by Strauss and Corbin (1998), a paradigm model is also used to determine how a category relates to its sub categories. A paradigm model is defined as “a pattern or scheme for understanding and showing how categories could be related to each other around a particular phenomenon” (Le Roux, 2001).. It posits that any one main category or strategic actions/interactions gives rise to certain consequences. Causal conditions are said to have an influence on the main category and thus on the actions/interactions of subjects. Intervening conditions on the other hand limit the impact of causal conditions on the main category. Finally, contextual condition is “a condition of overriding scope, under which a set of related categories and properties occur” (Glaser, 1992). However, as the categories emerged, they are not labeled as causal, intervening, consequence etc. This is because each category can “serve as one or more of a causal condition, intervening condition, action/interaction or consequence, depending on the phenomenon being investigated” (Brown, 2005).

Selective Coding

Selective coding is the process of “integrating and refining the theory” (Strauss & Corbin, 1998). As part of the selective coding process, a central category is identified, whereby all other categories relate to it. Selective coding mainly takes the form of “Trimming the Theory” (Strauss & Corbin, 1998), in order to reduce the amount of data. In line with Strauss and Corbin (1998), the conceptual schema is reviewed for internal validity and logic;



poorly developed categories are filled in; excess categories are trimmed; the schema is validated through a high level comparative analysis of the data.

3.9. Theoretical Saturation

In conjunction to Eisenhardt (1989), the iteration between data and concepts ended upon reaching theoretical saturation. Theoretical saturation is the point at which incremental learning is minimal and previously observed phenomena are encountered or seen (Glaser & Strauss, 1967). At this point, enough categories and associated concepts were defined to explain what is being observed at all the sites. Furthermore, no additional data were added to the set of categories. Theoretical saturation has been sought at interview level as opposed to case level.

3.10. Research Validation

For validation purposes, the research findings have been reviewed by the research supervisor. This is important because Grounded Theory analysis being an abstract process, different interview statements might be coded differently. The review process ensured that the findings retained some level of consistency, even when being interpreted by someone else.

3.11. Summary of Research Design

A summary of the proposed research design is given in Table 6:

Research Context	Global Virtual teams and Offshore teams involved in Global Software Development in Mauritius and South Africa
Philosophical Perspective	Interpretive
Research Methodology	Grounded Theory Techniques
Research Approach	Exploratory
Research Strategy	Multiple Case Studies
Data Collection Method	- Semi-structured Interviews
Data Analysis (Analytic strategy)	- Open Coding - Axial Coding - Selective Coding - Constant Comparative Coding

Table 6 - Research Design Summary

3.12. Access, Privacy, Confidentiality and Ethics

An issue that is of utmost importance to the researcher, The Department of Information systems, The Faculty of Commerce and The University of Cape Town at large is the research ethics. Consequently, the researcher has taken every possible measure to ensure that the information gathered for the purpose of this study strictly remains for the purpose of this study alone. The participants, their companies, and the information and opinions expressed by them, remained completely anonymous. The researcher made every effort to comply with the requirements set forth by the research institution in question. An ethics form was submitted to an "*Ethics in Research*" committee which was appointed by the department for the purposes of approving or denying research proposals. Furthermore, an interview consent form and an interview agenda which were presented to all participants of this study for them to read, understand, agree to and sign. These documents aimed at assuring the participants who sign it, of the importance and significance of this practice. The report is not confidential and statements made during the interviews may be used unless requested otherwise. Information obtained within the documentation analysis has been presented in such a way so as not to divulge any confidential details pertaining to the organisation. The respondent's participation is non-compulsory.

Before proceeding to the Data analysis chapter, a description of the cases is being provided in the next chapter. It relates to a brief description of the organisation, the team being investigated and the roles of the respondents.



CASE DESCRIPTION

This chapter provides a description of the different cases selected for the purpose of the study. Four companies, from distinctive backgrounds and countries, and sharing different organisational goals and practices have been chosen. Contextual information pertaining to each of them is being provided below as a means to set the scene for the forthcoming research findings. Teams from these organisations, forming the various units of analysis, are also expressed. Two cases have been analysed from South Africa, and two cases have been chosen from Mauritius.

4.1. CASE 1 (C1) – South Africa

C1 is a global company implemented in South Africa for the past 25 years, and is involved in the shipping business. It has different branches located in Durban, Port Elizabeth, and Cape Town and the main business contacts are from UK (London), Denmark (Copenhagen) and Belgium. The case study focused on the Cape Town branch which is composed of several teams, each dedicated to one customer. Two major teams T1 and T2 were investigated, each dealing with Denmark (Copenhagen) and UK (London), and Belgium respectively, as described in Table 7.

Interview No	Respondent No	Position
1	R1	Divisional Director
2	R2	Program Manager
3	R3	Business Analyst
4	R4	Program Manager

Table 7 - Case Study 1 Overview

The development work is performed using the Java programming language and the staffs are organised according to their proficiency areas. The resulting work setup is known as competency centre. The Cape Town branch is composed of the Testing Competency centre (TCC), the Analyst Competency Centre (ACC), the Java Competency Centre Web Logic (JCCWL), the Project Support (PSO), the Business Intelligence Competency Centre (BICC), and the E-Learning Competency Centre (ECC). Resources are borrowed from the required competency centres for any new projects. T1 is involved in the development of Web based applications and Business Intelligence Solutions for Businesses. The actual team located in Cape Town is commonly known as the CBP Team and the London people, which belong to an organisation known as ML, are known as the clients.



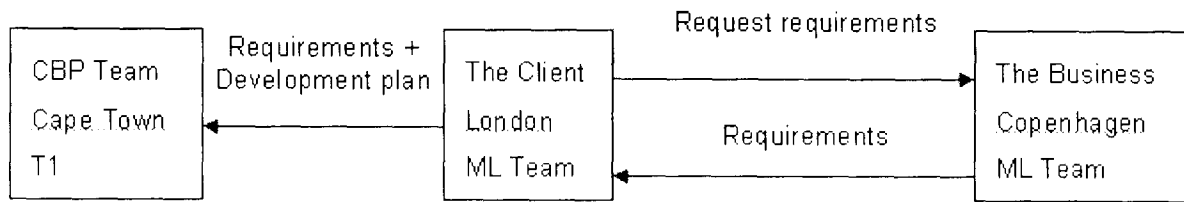


Figure 10 - C1 Work Process

The London ML team is responsible for the development planning and gathers initial requirements from the Denmark team, commonly known as the Business. Such requirements are further transferred to the CBP team in Cape Town, who develops and delivers the system. The whole process is depicted Figure 10.

T2 is also involved with a C1 branch located in Belgium. Similarly to T1, T2 is involved with application development. In addition, they are also responsible for the maintenance of all bespoke applications, which comprise a portfolio of about 100 applications. T2 is involved in smaller work deliverables with 3000 hour projects, as compared to T1 which is involved in 10000 hour projects work.

4.2. CASE 2 (C2) – Mauritius

C2 is a multinational company, implemented in Mauritius since 2000. They started off with 20 employees, who were mainly involved in software development with the main branch located in UK. The number of employees gradually increased during the past few years, from 20 to 250 and the business also expanded to include US and Canadian branches. They currently have only one office in Mauritius but are projecting at having another site in the northern part of the island. They also have the ambition of hiring at least 1500 to 2000 employees in the next three years.

C2 is primarily involved in two main activities, the first one being the delivery of HR and Payroll solutions to UK, US and Canadian customers. As a means to provide this service, the company also has a software development department, responsible for the development and maintenance of the required HR and Payroll applications. In addition, Crystal Reports are also produced to customers, for the manipulation and presentation of the HR and Payroll customer data. The case study has been conducted in each of the three major departments, namely US, UK and Canada.

The UK department is composed of five distinct teams, as described in Table 8. The first one is known as the bespoke team, working directly with the customers whenever issues are reported. The second one is known as the SSM, dealing with a web based application.

The third and fourth ones are the Source team and the ISS team respectively. The fifth team is the Business Application team, involved in software development for the internal systems.

Interview No	Respondent No	Position
1	R1	Team leader (US)
2	R2	Team Leader (UK)
3	R3	System Tester (UK)
4	R4	Team Leader (CPS)

Table 8 - Case Study 2 Description

The case study for the UK department has been centred on the Business Application team (BAT). The team is mainly involved with development on the Oracle platform and liaises only with C1 internal customers (employees). Requirements are gathered internally and products are delivered internally.

In C2, the concept of competency centre has only been implemented for the testing team (TCC). TCC, reports directly to the testing manager in the UK, who is in turn responsible for the assignment of testers to their respective project teams. As such, testers no longer work with the developers and report directly to the UK, where work is defined and allocated.

The US department team analysed during this study is known as the DR team. They are involved on development work in the core product and customise applications. Therefore, they provide support on the core products and develop additional modules whenever required. Customised reports for customers and quality assurance on HR Payroll Web are also produced. The team members report to the business application manager located in the US.

The Canadian department consists of three big teams, namely the Project team, the Siebel team, and the Canadian Professional Services (CPS), which has been the focus of the case study. The CPS team is further subdivided into two groups, including Crystal Reports (CR) and Professional Services (PS). The Professional Services are involved in VB6 development. They build custom modules on an already existing application while the work is allocated to them through a coordinator located in Canada. The coordinator ensures that an analyst and a developer are assigned to every project. For the Crystal Report team, the coordinator is located in Mauritius but an analyst and a developer are also assigned to every project.



4.3. CASE 3 (C3) – Mauritius

C3 is a French company, having branches in Toulouse, Paris and Nancy. It provides logistics and solutions for the retail sector, which controls a chain of supermarket and hypermarket in Europe. C3 is a software and hardware provider for about 400 hypermarkets throughout France and Southern Europe. Its main business is to develop “point of sales” software while a smaller department is concerned with hardware and IT support, and marketing.

In September 2005, after having researched the cultural differences between the Mauritian and the French people, and having uncovered good affinity between the two countries, a branch was implemented in Mauritius. This choice was also supported by the tax incentives provided by the Mauritian ministry.

The Mauritian branch is involved in two major activities, one of them being software development. It also involves a small call centre, responsible for the management of complaints from customers located in France. The IT department is responsible for the development of software for both internal use within the company and for customers. The work is subcontracted by the mother company in France. The development work is composed of two sections, the first one being the migration of the legacy software from VB6 to VB 2005. The need for such migration work was the main reason for the opening of the Mauritian branch. It thus allowed the branches located in France to focus on other important tasks like the addition of new functionalities to the systems while remaining competitive in the market. The Mauritian branch also provides support and development work on the Customer Relationship Management system of C2, the data warehousing software, the project management application, the time keeping application, as well as on their main applications deployed on the hypermarkets point of sales.

The Mauritian branch is composed of 4 to 5 software development teams and 3 to 4 migration teams, which deal mainly with the Paris and the Toulouse departments (see Table 9). Interviews were conducted on team members from both migration and software development teams. Composed of 3 members, the first team (T1) handles the internal products of the company. Interview 1 was conducted on a software developer from T1. The second team (T2) is composed of 4 members and is responsible for some migration work from VB6.0 to VB2005. Interview 3 was conducted on a software developer from T2. The third team (T3) is composed of 4 members and collaborates with both the Paris and the Toulouse team. They are responsible for both migration and development work on the main



software application of C3. Interview 5 was conducted on the team leader of C3 and interview 2 was conducted on one of the software developers. The fourth and last team analysed during the case study (T4) is composed of 3 team members. They are responsible for development work on the CRM application, the project management and the time keeping software utilised by the organisation. Interview 4 was conducted on the team leader of T4.

Interview No	Respondent No	Position
1	R1	Software Developer
2	R2	Software Developer
3	R3	Software Developer
4	R4	Team Leader
5	R5	Team Leader

Table 9 - Case Study 3 Description

4.4. CASE 4 (C4) – South Africa

C4 has been conducted in one of the teams from the IT department of a South African Insurance company. The IT department is involved in the development and maintenance of call centre applications, commission maintenance applications, and online share trading applications among others. Similar to other insurance companies worldwide, C4 heavily invested in COBOL and assembly legacy applications in the past. In spite of their past effectiveness, these applications are 30 to 40 years old and are now considered as legacy applications. The department is now involved in the migration of these applications towards service oriented architecture. The project investigated during the case study is the commission maintenance system. Originally written in Cobol 35 years ago, it calculates the amount of commission to be paid to the brokers. This new application is developed in Java.

South Africa however has a shortage of resources for object oriented languages like Java. The people are more versatile in Dotnet while resources for Java are very scarce. Development has therefore been outsourced to an outside vender called TCS. This vendor was chosen due to its high expertise level in this development area.

TCS is an Indian company, ranked at number 3, from an outside vendor perspective, along with WebPro, Infosys and Satim. The company is part of a group having experience in various sectors, ranging from building of planes to the manufacture of clothes. This specific Indian company was selected due to its past experience in the development of a similar application for an Australian insurance company. The two companies have been working together on an offshore/onshore model. Such a model implies that TCS gathered



requirements for the system through frequent visit to Cape Town, and went back to India, where most of the work was performed. This resulted in a very cost effective solution, with savings of about R85, 000 per resources.

The team consists of 2 systems analysts, 1 business analyst, 5 developers, and 2 testers. 2 of the 5 developers are from C4 and the rest are from TCS. The business analyst is from C4 while each systems analyst belong C4 and TCS respectively. The same applies for the two testers. This has been summarised in Table 10. The major differences among the C4 and the TCS resources lie in their respective basic qualifications and the number years of work experience. The TCS resources are mostly engineers, while those from C4 only have Matric certificates. TCS resources have on average, 2 to 3 years of experience, and are 24 years old, while the C4 resources have about 20 years of experience and are around 38 years old.

Interview No	Team Member	Position
1	R1	Project Manager
2	R2	Software Developer
3	R3	Tester
4	R4	Tester
5	R5	Business Analyst

Table 10 - Case Study 4 Description

The cases chosen for this study comprise four different cultural settings, with different history, work processes and level of experience in GSD. Each team employs various forms of work processes, software development methods and communication practices. This therefore lays ground for rich responses from each of the participants of the study. The next chapter details the analysis process and the results of the open coding, axial coding and selective coding processes. The analysis process evolution is detailed and the final model is then presented and described.

RESULTS AND THEIR ANALYSIS

This chapter provides a detailed account of how the Grounded Theory techniques were applied during the analysis process. Section 5.1 provides a high level overview and discussion of the data analysis process. Section 5.2 describes the results from the open coding process, by particularly focusing on the description of the high level categories selected for inclusion. The process followed during the selection of these categories is also explained. Section 5.3 introduces and describes the properties belonging to each category while the results from axial coding are presented in Section 5.4. Finally, Section 5.5 explains the selective coding process. In particular, an explanation is provided on the gradual evolution of the relationship diagram throughout the whole analysis process, until the final stable version is reached.

5.1. Data Analysis: High-Level Process Explanation

A high level description of the open coding, axial coding and selective coding is first provided, along with an account of the researcher's experience in going through each of these processes. Rather than being straight forward, the overall process was iterative, requiring the researcher to switch from one process to another. This was further compounded by the learning curve through which the researcher had to go through to master the Grounded Theory analysis techniques.

5.1.1. Open Coding

The first step in the data analysis process is to perform open coding. Strauss and Corbin (1998) define Open Coding as: "the analytic process through which concepts are identified and their properties and dimensions are discovered in data". Strauss and Corbin (1998) prescribe that the Open Coding process should be conducted by breaking down the data into discrete parts, closely examining them, comparing them for similarities and differences, and by asking questions about the phenomena as reflected in the data. Numerous techniques have been proposed by Strauss and Corbin (1998) to support the coding process. In the first attempts at open coding, the researcher was too eager to follow these set of procedures in a strict and rigid manner. The process lasted 6 weeks and resulted in five to six levels of concepts categorisation, which had little relevance to the research questions. Due to lack of experience in using the Grounded Theory techniques, each interview statements were initially analysed without any relation to each other. In addition, the coding processes were performed separately. However, further experience

acquired during the course of the analysis process revealed that most of these coding procedures often overlapped and were performed iteratively. As such, following more detailed reading on the grounded theory research techniques, it was concluded that the whole process had to be started over again.

Further insight on how to properly apply the method was gathered by studying practical example of past research that applied Grounded Theory (Coetsee, 2006). In doing so, the researcher was given the opportunity to see the concepts and categories as they emerged from real data, thus providing an understanding of what was really expected at the end of the research project. Inductive coding as explained by Thomas (2003) was followed. It allowed the "research findings to emerge from frequent, dominant or significant themes inherent in raw data, without the restraints imposed by structured methodologies".

In the second attempt at Open Coding, care was taken to label the concepts so as to answer the research questions at the end of the study. A copy of those research questions were always kept at hand during the coding process. Statements from the interview transcripts, which were previously ignored due to lack of experience, were carefully analysed, uncovering relationships among the concepts.

Going through the interview transcripts during the second open coding process also proved to be very useful. It allowed the researcher to more fully immerse herself into the data and to understand the statements in more details. Care was taken to understand and to visualise the data differently from the first time. Statements that were initially considered as irrelevant or unimportant instead brought a new dimension to the analysis results. The statements were viewed and analysed through a different angle. Through constant comparative analysis of data, open coding was carried out by constantly making comparisons and asking of questions (Glaser & Strauss, 1967).

Instances of the concepts were created in an Excel spreadsheet as described in the previous chapter. Each concept was individually linked to the case and interview number, the interview question, the interview statement and its corresponding paragraph and line number from the transcript, the property dimensions, the category, and the associated relationship, if any. A sample open coding sheet is given in Appendix I. Low level concepts were gradually regrouped into higher-level, more abstract concepts or categories. The hierarchy were kept at a maximum of two levels, as suggested by Strauss and Corbin (1998). Appendix J contains full listings of the concepts hierarchy resulting from this exercise.



5.1.2. Axial Coding

Axial coding was also done concurrently with open coding. Each relationship was given a specific code name which was recorded in a spreadsheet, e.g. [C3.I4.A1]. This code implies that the interview statement belongs to interview 4 from case 3. A1 is a unique code name given to each statement. Initially, during the coding process, each relationship identified from each statement were individually drawn and labelled on paper. All related concepts and their corresponding relationships were then regrouped on a very big mind map at the end of one case study analysis. This mind map proved to be a very useful research instrument, allowing the researcher to visualise how the concepts were related to each other. It also helped in forming preliminary research outcomes and to answer the research questions. Relationship codes written on the paper helped to trace back the interview statements in the Excel spreadsheet whenever required. The mind map was carefully organised to provide some light in the apparent chaos. Each concept was regrouped into categories and the main categories were colour coded and were easily identifiable on the paper. After the creation of the first mind map, the researcher proceeded to the analysis of the next case studies. These allowed for new concepts and relationships to be uncovered, and the validation of both the existing categories and relationships.

5.1.3. Selective Coding

The first attempt at selective coding following the analysis of the second case study produced the following 15 high level concepts, regrouped in 7 categories, as shown in Table 11 below:

Category	Concept
GSD Practice	Work Process
	Software Development Method
Culture	Culture
Communication Preferences	Communication
Technology	Task-technology-structure fit
	Communication Technology
GSD Project	GSD Project
	GSD Project success
GSD Issue	GSD Issue
	Coordination Issues
	Communication Inhibitors
	Communication Issues

GSD Team	Team members characteristics
	Team structure
	GSD Team Relationship promotion

Table 11 - Selective Coding Attempt 1

However, as the analysis process continued, these categories and concepts gradually evolved and produced the final set of categories described in Table 12 below.

Category	Concept
Communication Practices	Communication among team members
	Communication channel description
	Communication facilitators
	Communication strategy
	Cues transmission communication
Culture	Individual culture
	National culture
	Cultural Issues
	Organisational culture
GSD Governance	Collaboration process
	Competency Centre
	Documentation management
	GSD Work
	International meetings
	Issue Management
	Management
	Meetings
	Planning
	Project management process
	Requirements management
	Resource Management
	Testing Management
	Training
	Work process
GSD Process Issues	Work site
	Communication inhibitors
	Communication issues
	Coordination issues



	GSD Software development issues
GSD Project	GSD Project
	GSD Project success
GSD Team	GSD Team relationship promotion
	Team member experience
	Team members characteristics
	Team structure
GSD Value issues	GSD Trust Issues
	Missing visual cues
	Uncertainty issues
	Work interaction issues
Software Development Practices	Adapted waterfall
	Prototyping
	RUP
	Software development methods
	Waterfall
Technology	Chat
	Email
	Infrastructure
	Lotus Document manager
	Net meeting
	Phone
	Conference calls
	video conference

Table 12 - Selective Coding Final Attempt

In this study, the categories and their relationships were refined in two stages, namely at the *concept level* and at the *relationship level*. Refinement at the concept level was undertaken throughout the whole analysis process. Based on evidence in the data, some categories gradually evolved into more abstract ones, which better described the phenomenon under study. Eventually, once the concept hierarchy reached a fairly stable state, the core category was selected. All the high-level categories surrounding that core concept were then organised around the core category, so as to represent the essence of the phenomenon under study. Refinement at the relationship level was done according to Strauss and Corbin (1998) statement; "... findings *should* be presented as a set of interrelated concepts, not just a list of themes." Therefore, all categories that did not



participate in a relationship were trimmed, and those that did not contribute to the theory, in spite of being linked together were discarded. Lastly, the properties were categorised based on the number of relationships they participated in and the number of times the properties occurred in the data. Those with high occurrences and that participated in relevant relationships were isolated and used to create the story line (Strauss & Corbin, 1998).

5.1.4. Theoretical Saturation

In line with Coetsee (2006), theoretical saturation is demonstrated through the use of Figure 11, which shows the number of concepts coded per interview, and also the number of relationships revealed per interview coded. As can be seen in the graph, the number of concepts identified, did not increase as analysis progressed. The number even slightly decreased. This is because more effort was eventually placed towards creating and identifying properties and relationship (i.e. axial coding) as opposed to identifying new concepts. For instance, upon reaching interviews 12 and 13, both the number of concepts and the number of relationships dropped, indicating that saturation point was reached. Saturation point was also confirmed as, while reading the interview transcripts from case 4, the researcher repeatedly came across similar ideas and statements uncovered through the previous cases. It was therefore deemed unnecessary to code the final interviews from case 4. Some interview statements from the final case were nevertheless quoted during the discussion, because of the rich set of information provided by them. These statements also corroborated what was being said by respondents from the previous cases.

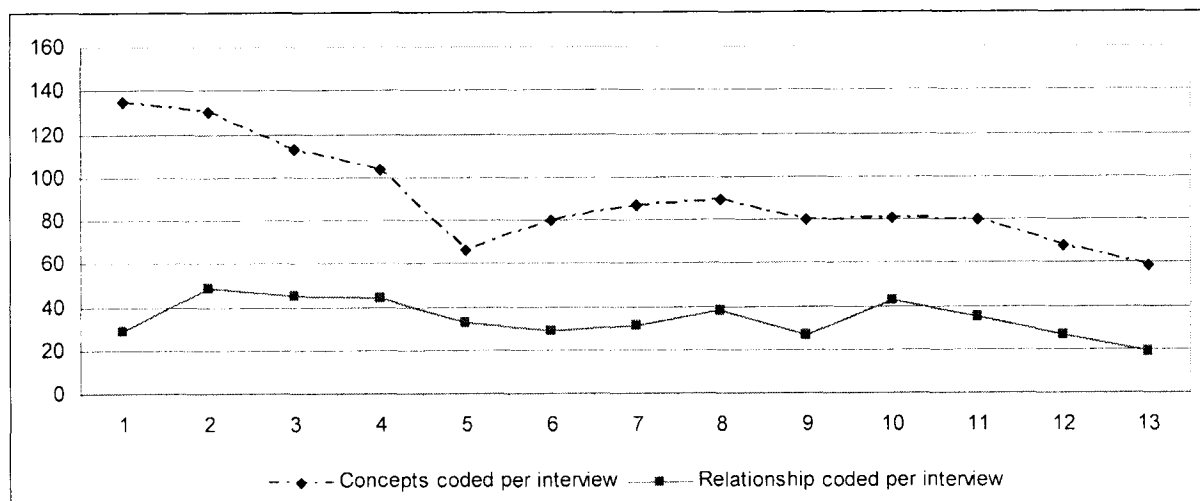


Figure 11 - Concepts and Relationships Uncovered during Coding Process

5.2. Results from Open Coding: High Level Categories

During the whole open coding process, data represented by interview transcripts, were examined, so as to identify as many concepts as possible. Related concepts were regrouped into categories, thus achieving a proper level of abstraction and limiting the number of concepts the researcher has to work with (Strauss & Corbin, 1998). The names chosen for the concepts and categories were chosen in such a way that the researcher was quickly reminded of its referent (Strauss & Corbin, 1998). Where the names were sourced directly from the data, they are referred as “in vivo” codes (Strauss & Corbin, 1998).

A number of 238 concepts were identified in the study 177 were considered as being relevant. The most theoretically relevant ones were regrouped in a concept hierarchy as shown in Appendix J. So as to limit the amount of information being dealt with and to maintain some level of focus on the research questions, these concepts were organised into higher-level categories. The final hierarchy list consists of 9 meta-categories and 54 categories. Categories were developed by identifying “properties” that defined them. Categories with many properties were considered as being theoretically rich and apt to describe the phenomenon under study. In line with Coetsee (2006), Figure 12 shows the number of properties identified for each high-level category. “GSD Governance” emerges as the category having the highest number of properties.

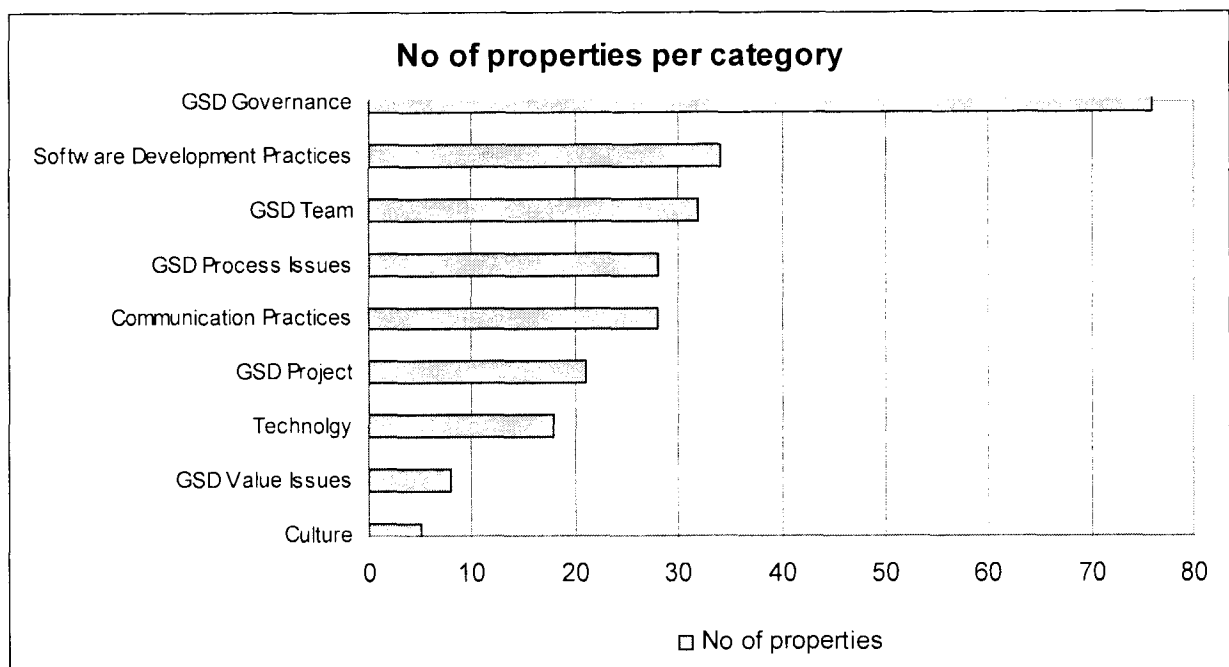


Figure 12 – No. of Property Identified per Category

The following subsections provide a detailed description of the meta-categories selected for the final theory. These categories described are in their final state but undertook several transformations beforehand. However, at this stage, only the final meta-categories are explained.

5.2.1. GSD Governance

During the early stages of the analysis process, the GSD Governance category was initially labelled as GSD Practices, but further evidence in the data led to the evolution of that category. GSD Governance can be described as the set of rules governing the way in which GSD is practiced throughout the dispersed sites. It ensures that people have priorities in the way they behave and perform their work in GSD. GSD Governance is composed of 17 sub categories (Appendix J), namely collaboration processes, competency centre, GSD work, strategies to overcome cultural issues, training, work processes, work site, international meetings, meetings, issue management, project management process, requirements management, testing management, and document management.

5.2.2. GSD Team

For GSD to be a success, the GSD team should be composed of individuals with key characteristics. The GSD Team category describes the characteristics of a typical GSD team based on the team members' experience level, their expertise, their specific characteristics, the team recruitment management process and the ideal team structure. All the organisations studied provided some specific insight on what should be the ideal GSD team, and the combination of these offers some valuable information on the subject.

5.2.3. GSD Project

The GSD Project category describes a typical GSD project in terms of the project size, the project importance, the number of hours attributed to it, and the work type, among others. It also encompasses information about what contributes to GSD project success. These refer to the productivity level, the project delivery speed, the quality, and the software development precision achieved.

5.2.4. GSD Process Issues

The GSD Process Issue category refers to all issues encountered within GSD, with respect to communication, coordination, and software development. According to the results, communication inhibitors introduce communication issues. These issues commonly occur within the GSD project context, while the project work is being undertaken.



5.2.5. GSD Value Issues

GSD Value Issues are issues that occur on a more individual and emotional level within GSD. The category encompasses GSD trust issues, missing visual cues, uncertainty issues and work interaction issues. GSD Value issues also occur within the GSD Project context, but rather arise due to the emotional differences among the individuals.

5.2.6. Communication Practices

Communication practices describe how the communication process is usually undertaken within GSD. It encompasses details about the communication process, the communication channel description, communication facilitators, communication strategies in place within the organisation, and the level of cues being transmitted during the communication process.

5.2.7. Culture

Based on the results, culture can be seen as an external factor which impacts on the overall GSD Project, GSD Governance, Communication Practices, and Software Development practices in place within the organisation. It encompasses the national culture, organisational culture, the team culture, and the individual culture or the personality. Each of those different aspects of culture prevails at different levels, under different circumstances. For instance, for some particular teams, the team culture is said to prevail while for others, the organisational culture might prevail. The culture meta-category also represents the level of cultural differences among people, which in turn impacts on the whole GSD process.

5.2.8. Software Development Practices

According to the case studies, various software development methods are in use during GSD in Mauritius and South Africa. They range from the waterfall model, prototyping, and RUP. In spite of being conceptually different from each other, these methods are said to be adequate for each organisations in which they are being used. The effectiveness of the method is mostly in line with the cultural expectations (national and organisational culture) of those organisations. In addition, instead of being used exactly as prescribed by textbooks, the GSD practitioners have devised ways to adapt these methods to suit their particular cultural and project needs. These adaptations occurred gradually, through an inductive learning process, cumulating to an effective method now in place and yielding GSD project success.

5.2.9. Technology

According to results from the case studies, technology is the cement that holds all the other GSD variables together. Without an appropriate infrastructure and good communication technologies, none of the GSD Governance, Communication Practices and Software Development Practices can be put in place. A wide range of technologies are available for used within GSD, and they include chat, email, document management systems, net meeting applications, phone, conference calls and video conference. Each of these tools is effective when used for the right tasks and in the right context. Some can be used to overcome the disadvantages introduced by others. Furthermore, each of the organisations seemed to have some level of preferences for one particular technology, based their particular communication and cultural needs.

5.3. Results from Open Coding: Properties

This section provides a listing of the properties identified during open coding. As a means to keep the account parsimonious and relevant to the phenomenon being studied, only those properties having axial links to other properties or having more than one occurrence in the data, have been presented. Properties without any axial links and having only one occurrence have been excluded. For each meta-category a Table was provided, which describes the number of axial links and the number of times the property was referred to within the interviews. The first column refers to the property name and the second column provides the concept count (No. of Concept). The last two columns provide the number of axial links arising from (No. of links From Property) and towards (No. of links Towards Property) the properties respectively.

The properties are listed in descending order *No. of links From Property* column. These Figure counts provide a good indication of the relative importance of the property in terms of the overall theory. A relationship with many links and high occurrence within the data increases the density and descriptiveness of the theory relative to the phenomenon under study (Goulding, 1999). The more theoretically “important” properties are clustered near the top of their respective Table. A description of each of those properties is given in the Appendices O to V1. Each description is accompanied by a sample quote from the interviews.

5.3.1. Communication Practices

The Communication Practices category has a total of 19 properties (Appendix J), with 14 links coming from the property and 11 links going towards it. Appendix K provides a



detailed description of the properties listed in Table 13. Illustrative quotes from the interview data are also provided.

Property	No. of Concept	No. of links FROM property	No. of links TOWARDS property
Team-customer-communication strategy	13	11	10
Foreign worker establishment	4	6	0
Communication style	8	6	2
Physical encounters importance	3	4	0
Physical encounters among teams	8	3	1
Communication planning	2	3	0
Reassurance level	3	3	0
Communication level	8	2	8
Employees physical proximity	5	2	0
News type	1	1	0
Flexi time implementation level	9	1	2
Email response time	3	1	1
Common language	3	1	0
Perception of efforts	2	1	1
Communication need	10	0	11
Ease of contact initiation	7	0	5
Number of communicants	1	0	1
Communication channel	3	0	4
Information filter through	3	0	0

Table 13 - Communication Practices Properties

5.3.2. Culture

The Culture category has a total of 6 properties (Appendix J) with 6 links coming from the property and 2 links going towards it. Appendix L provides a detailed description of the properties listed in Table 14. Illustrative quotes from the interview data are also provided.

Property	No. of Concept	No. of links FROM property	No. of links TOWARDS property
Cultural difference impact	16	13	12
Individual culture description	1	8	1
Organisational culture prevalence level	7	2	0
Individual culture prevalence	1	1	0
National culture prevalence level	3	1	0
Organisational values	2	1	0

Table 14 - Culture Properties**5.3.3. GSD Governance**

The GSD Governance category has a total of 48 properties (Appendix J) with 25 links coming from the property and 22 links going towards it. Appendix M provides a detailed description of the properties listed in Table 15. Illustrative quotes from the interview data are also provided.

Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
International meeting purpose	10	13	0
Uncertainty minimization	36	10	23
Documentation	17	7	1
Documentation quality	5	4	2
Standard processes	15	4	0
Project planning	8	3	4
Project management	3	3	2
Procedure oriented	1	3	0
Additional resources	1	2	0
Best Practice oriented	4	2	6
Customer site	2	2	0
Design site	13	2	0
Agreement seeking procedure	28	2	9
Procedure across dispersed sites	8	2	0
international meeting frequency	7	1	1
Documentation sharing	2	1	3
Documentation versioning	2	1	0
Work format	1	1	0



Meeting minutes	2	1	0
Project meetings	1	1	0
International meeting stage	16	1	0
Work re-allocation	1	1	0
Testing procedures	7	1	1
Use of a mentor	1	1	0
Similar requirement standards followed by foreign team	3	1	0
Work hours	3	0	1
Foreign team delegate selection	4	0	0
Foreign team delegates visit frequency	5	0	0
International meeting duration	6	0	0
international meeting site	5	0	1
Number of Foreign team delegates	4	0	0
Issue fixing	2	0	2
Issue prevention	4	0	2
Management level	9	0	0
Management style	2	0	0
Meeting planning	2	0	0
Collaboration across site	18	0	18
Project deadline management	4	0	3
Requirements details	3	0	4
Project task allocation	3	0	0
Project task allocation site	3	0	5
Error recording efficiency	1	0	1
Analysis site	15	0	7
Development site	7	0	1
Requirements elicitation location	3	0	0
Specification writing site	4	0	2
Testing site	8	0	0

Table 15 - GSD Governance Properties

5.3.4. GSD Process Issues

The GSD Process Issues category has a total of 24 properties (Appendix J) with 11 links coming from the property and 21 links going towards it. Appendix N provides a detailed



description of the properties listed in Table 16. Illustrative quotes from the interview data are also provided.

Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
Geographical distance	2	15	2
Time difference	12	11	9
Requirements issues	18	6	1
Foreign language difference	5	5	0
Spoken language	2	3	0
Language interpretation issues	14	3	6
Coordination issues	7	2	16
Language Accent	9	1	4
Mother tongue influence	2	1	2
Information loss	2	1	5
Feedback time	3	1	2
Concepts misunderstanding within documentation	2	0	3
Foreign language issues	4	0	9
Assumptions	1	0	1
Communication delays	5	0	11
Communication Issues type	8	0	11
Meeting planning effectiveness	3	0	3
Planning issues	2	0	0
Priority issues	1	0	2
Work interruptions	2	0	1
Backlogs	1	0	1
Deadline issues	3	0	1
Development issues	4	0	8
GSD Project delays	5	0	17

Table 16 - GSD Process Issues Properties

5.3.5. GSD Project

The GSD Project category has a total of 17 properties (Appendix J) with 15 links coming from the property and 5 links going towards it. Appendix O provides a detailed



description of the properties listed in Table 17. Illustrative quotes from the interview data are also provided.

Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
Work type	11	16	2
Project Type	3	13	0
Project urgency	3	9	0
Project size	6	6	0
Productivity	5	4	2
GSD Project phases	1	5	0
Project importance	4	3	0
Project task	2	3	0
Project visibility	2	2	11
Time frame delivery	4	2	1
People involved	1	1	0
Project complexity	1	1	0
Project delivery speed	3	1	3
Dependency of delivery	5	1	0
Project structure	1	1	0
Project hours attributed	2	0	0
Quality	3	0	6

Table 17 - GSD Project Properties

5.3.6. GSD Team

The GSD Team category has a total of 27 properties (Appendix J) with 19 links coming from the property and 9 links going towards it. Appendix P provides a detailed description of the properties listed in Table 18. Illustrative quotes from the interview data are also provided.

Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
Job title	1	11	1
Adaptability of offshore team members	11	5	2
Employees skills in using methods	5	4	0
Personal experience	1	4	0

Level of expertise	5	4	0
Understanding of foreign language	4	4	0
Project experience	2	3	0
Product knowledge	3	3	3
Employee confidence	2	3	1
Affiliation level	8	2	8
Customer facing team	2	2	0
Team age	2	2	0
Team size	1	2	0
Employee well-being promotion techniques	2	1	0
Team building exercise	1	1	0
Development tool knowledge	1	1	0
Employee motivation level	3	1	2
Team member independence level	9	1	2
Work dedication	1	1	0
Trust improvement	3	0	0
Accent familiarity	3	0	1
Real time interaction preference	3	0	0
Rule abiding	2	0	0
Team member uncertainty acceptance	2	0	1
Recruitment method	2	0	0
Competency centers	12	0	0
Multicultural team	10	0	0

Table 18 - GSD Team Properties

5.3.7. GSD Value Issues

The GSD Value Issues category has a total of 7 properties (Appendix J) with 3 links coming from the property and 6 links going towards it. Appendix Q provides a detailed description of the properties listed in Table 19. Illustrative quotes from the interview data are also provided.



Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
Cues transmission	8	4	9
Work redundancy	2	2	0
Uncertainty level	3	1	3
Trust level	7	0	9
Feelings and emotions filter through	3	0	1
Collaboration issues	1	0	2
Cooperation issues	6	0	4

Table 19 - GSD Value Issues Properties

5.3.8. Software Development Practices

The Software Development Practices category has a total of 15 properties (Appendix J) with 11 links coming from the property and 12 links going towards it. Appendix R provides a detailed description of the properties listed in Table 20. Illustrative quotes from the interview data are also provided.

Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
Method effectiveness level for GSD	14	6	3
Software development approach	9	6	1
Software development choice	1	6	1
Software development method disadvantage	7	2	4
Uncertainty minimization	2	2	0
Phases	3	2	1
Iteration length	2	1	1
Best Practice oriented	1	1	0
Project delivery speed	2	1	3
Method standard	4	1	1
Methodology learning curve	2	1	0
Percentage of use of components	10	0	3
Ease of adaptability	2	0	1
Software development process acceptance	3	0	3
Modeling level	1	0	1

Table 20 - Software Development Practices



5.3.9. Technology

The Technology category has a total of 14 properties (Appendix J) with 9 links coming from the property and 6 links going towards it. Appendix S provides a detailed description of the properties listed in Table 21. Illustrative quotes from the interview data are also provided.

Concept/Property	No. of Concepts	No. of links FROM property	No. of links TOWARDS property
Task-technology structure fit	101	32	1
Connection speed	16	9	0
Cues transmission	13	4	9
Tool disadvantage	25	3	6
Feedback time	11	1	2
Tool efficiency	14	1	0
Infrastructure setup	1	1	0
Demonstration ability	1	1	0
Ease of explaining	2	1	0
Formality level	2	0	0
Frequency of use	20	0	4
Effectiveness level	8	0	0
Infrastructure difference	3	0	0
Number of communicants	5	0	1

Table 21 - Technology Properties

5.4. Results from Axial Coding: Relationships

This section introduces the axial links between the categories. The relationship between these categories are described and discussed, thus tying them together, as a means to provide a more animated description of each phenomenon. Each category may serve as one or more of either causal condition, intervening condition, action/interaction, or a consequence (Strauss & Corbin, 1998).

Each relationship is described on a per category basis. Each category has its own subsection, within which all the links emanating from that category are described and discussed. The links are grouped into target categories. The features of each of those individual links are explained, in terms of their properties and respective dimensional range, as obtained through the interview statements. As previously mentioned, each axial link is



labelled with a relationship code. The complete set of supporting interview statements and their corresponding relationship codes are provided in the separate document labelled *Coding Evidence Booklet*. The corresponding Table from which the relationship descriptions can be obtained in the booklet is provided at the end of each storyline.

This section also includes a sample table, which provides an example of one interview statement supporting one of the relationships. Links emanating from properties of the source category and terminating at properties of the target category are also described. Each table is composed of six columns, the first one being the *Link emanating From the Property*. This field contains properties of the category from which the link is emanating. The *Link towards the Property* field in turn contains properties for the target category. An explanation of the actual relationship is given in the *Description* column, while the *Direction* column indicates whether the association between the two properties is in direct proportion or inverse proportion. For inverse proportions, as one property increases along its scale, the other decreases (DOWN). A link with a direct proportion would in turn imply that when the source property increases along its scale, the target one increases as well (UP) (Strauss & Corbin, 1998). The sample *Interview Statement* supporting such a link is given in the next column. The final column provides the *Interview Question*, as in some cases, cues about the relationship are driven from both the interview statement and the interview question.

However, the quote and the interview question only provide a simplistic view of the raw data on which the study is based. These relationships instead emerged through the analysis of many different contextual elements. Paragraphs from the body of data were carefully studied, in an attempt to abstract and make sense of the different concepts and categories and their respective relationships. As such, the sample quotes provided in the tables might not provide complete justifications for the suggested links, thus inducing the reader into perhaps disagreeing with the manner in which some of the quotes may have been coded. In this case, the latter should bear in mind that there is no right way of coding the data when applying the Grounded Theory techniques, and that the coding is based on several paragraphs of text.

5.4.1. Communication Practices

This section describes all the links emanating from the Communication Practices category. These links are grouped into categories that are the targets of the axial links, thus forming category pairs. For each category pair, a mini story line is provided, which describes and justifies the link from the source to the target category. The second part presents the



table described in Section 5.5. This table only provides one key interview statement as an example. The complete set of interview statement is provided in the *Coding Evidence Booklet*. As the same applies for each sub-section, the above explanation will not be repeated for each category. Each story line makes reference to properties that are further described and elaborated in Appendix K to V1.

5.4.1.1. From Communication Practices to Communication Practices

It is hard for team members to have a proper perception of efforts due to the lack of physical proximity during GSD [C1.I2.B16].

Previous physical encounters (meetings where dispersed team members physically meet) facilitate the contact initiation [C1.I4.C48] and help to bridge physical distance among the team members [C2.I1.C46]. Proper planning prior to any meeting also facilitates the contact initiation among the team members [C1.I4.C32] and is crucial for successful communication when three or more people are involved in the interaction process [C1.I4.C33].

The team-customer communication strategy can be used overcome communication issues among dispersed team members. For instance, by limiting the communication to only a certain level of management (e.g. team leaders and project managers), communication issues can be avoided [C3.I2.G28].

Language interpretation issues can be bridged by posting a professional liaison (foreign worker from the onshore site) at the offshore site. The offshore teams could learn to speak and practice the foreign language [C3.I2.G30] [C3.I3.H33], thus facilitating the communication process [C3.I2.G47].

A good communication level can be maintained through the implementation of flexi-time [C2.I2.E18]. If the communication style is too franc and direct, it introduces communication issues among the team members. People may start shouting at each other, thus causing tension within the teams [C3.I3.I1].

(Refer to Table 1 in Coding Evidence Booklet for code description and sample interview statement)



Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Employees physical proximity	Perception of effort	Due to the lack of physical proximity among the team members, perception of effort is hard to capture	UP	And its something that's really difficult for them to judge, really how much effort are you putting in, are you sitting around doing nothing, or are you actually working very hard	Discuss about the main problems that you encounter while working in GSD

Table 22 - Axial links from Communication Practices to Communication Practices

5.4.1.2. From Communication Practices to GSD Process Issues

Communication issues can be avoided through the adoption of a formal and professional communication style [C1.I2.B26]. Such is the case because a communication style involving a high amount of jargon introduces foreign language issues [C3.I4.I23].

An appropriate level of communication provided at the right time, can be used to handle and manage GSD Project delays. It allows every stakeholder to be aware of any existing or potential delays, thus leaving room for necessary actions to be undertaken to handle the problem [C2.I2.E13]. Constant level of communication between the developers and the team leaders is also crucial to avoid deadline issues [C3.I2.G32].

Requirements issues are introduced when the technical team members do not understand the terms employed by the client to describe the requirements [C2.I3.E45].

A team-customer communication strategy, whereby only team leaders offshore are allowed to contact people at other sites, can be used to minimise the negative impact of time difference across the sites. In the absence of direct interaction, developers are only concerned with their work and are thus not affected by the time difference while communicating [C3.I2.G35]. Such a strategy overcomes major communication issues as the number of resources allowed to communicate is limited [C3.I3.H28][C2.I2.E9]. By only allowing the team leaders to contact the project managers, coordination issues can be avoided as more control can be put in place [C3.I3.H29]. In particular, coordination issues are introduced in the organisation applying such a scheme, whenever the team leaders are not available to act as communication liaison between the dispersed sites [C3.I3.H26] [C3.I4.H24].

(Refer to Table 2 in Coding Evidence Booklet for code description and sample interview statement)



Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Communication style	Foreign language issues	By having a formal communication style, communication issues can be reduced	UP	Hmmm... good question... I think probably not too much in kind of formal business communications . Certainly you'll have the guys out here talking about the things like robot and [...]	Do you think that you use some expressions that are typically from South Africa?

Table 23 - Axial links from Communication Practices to GSD Process Issues

5.4.1.3. From Communication Practices to GSD Project

If the team members have little or no perception of effort produced by their fellow foreign team members, the project visibility is reduced [C1.I2.B13]. In addition, by only allowing a certain category of team members (e.g. team leaders and project managers) to communicate with the clients or fellow dispersed workers, project visibility is also reduced [C1.I2.B14].

Such project visibility can however be enhanced through a high level of reassurance concerning the work progress [C1.I2.B15], proper planning prior to any communication (e.g. conference calls) [C1.I3.C35], and emails sent and responded to in due time [C1.I3.C34].

Having a specialist who is permanently established offshore helps to improve product quality and promote GSD Project success [C3.I2.G29].

(Refer to Table 3 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Communication with client	Project visibility	If only a certain category of team members (e.g. team leaders & managers) are allowed to communicate with clients, project visibility is reduced	UP	I think that the issue that we have is that quite often they ... if there's a critical issue on the project, because they don't have a visibility on the project , they can't see the team all running around and freaking about something. Really what they have is the project manager talking to them.	Discuss about the main problems that you encounter while working in GSD

Table 24 - Axial links from Communication Practices to GSD Project

5.4.1.4. From Communication Practices to GSD Team

Resources are chosen for international meetings according to their job titles. For instance, developers rarely meet with foreign project managers or customers [C1.I4.C44]. Such physical encounters help to promote the level of affiliation among the team members [C2.I1.C47].

By having a foreign worker (from the onshore site) established offshore, the adaptability level of the resources can be promoted [C3.I3.H34]. It encourages people to communicate by adapting to the culture of the foreign worker.

(Refer to Table 4 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Physical encounters among teams	Job title	Physical encounters with the customer depends on the job title	UP	But mostly, the developers on the floor and the project managers actually never have met, physically met the customer	Have the team members ever met?

Table 25 - Axial links from Communication Practices to GSD Team

5.4.1.5. From Communication Practices to GSD Value Issues

In the absence of frequent physical encounters between the dispersed team members, the amount of visual cues conveyed during subsequent conversations, is reduced [C3.I5.H6]. The negative impact of having limited visual cues conveyed during a conversation can be compounded by the type of news being conveyed. As such bad news should be communicated with as much visual cues as possible [C3.I4.I46].

When team members mutually reassure themselves about work progress during the course of a project, trust level can be promoted [C1.I2.B24]. This can be accomplished through regular phone calls to provide feedback about the whole project evolution [C3.I1.G7].

(Refer to Table 5 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Employees physical proximity	Cultural difference impact	When employees do not sit in the same office, cultural differences can be reduced as they don't interact much with each other	UPDOWN	Because we're not sitting together working so we don't see the cultural differences.	And anything else?

Table 26 - Axial links from Communication Practices to GSD Value Issues

5.4.1.6. From Communication Practices to Technology

Physical meeting among the team members can be used to bridge geographical distance and overcome the disadvantages of phone conversations [C1.I4.C45]. The establishment of a foreign worker at offshore can be used to overcome the disadvantages conveyed by communication technologies which express limited level of visual cues (E.g. Phone). It thus facilitates and enhances communication [C3.I2.G46].

(Refer to Table 7 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Physical encounters importance	Tool disadvantage	Physical encounters can be used to bridge distance and overcome the disadvantages of phone conversations	DOWN	So we sent him to Denmark for 2 weeks. Sometimes it's easier to send the person physically there than to handle things over the phone . But we don't do it that often.	And do they come over here?

Table 27 - Axial links from Communication Practices to Technology

5.4.1.7. From Communication Practices to Culture

When employees do not sit in the same office, the amount of physical encounters between them is limited. This further mitigates the cultural difference impact [C1.I1.A22][C3.I1.G18]. Employees having no contact with foreign team members are unable to describe the foreign culture, thus implying that they do not feel any cultural difference [C3.I5.H20]. A formal and professional business style can be used to overcome negative cultural influences. By maintaining such a professional tone of voice, work can be more efficiently performed [C3.I3.F10][C1.I2.B45].

(Refer to Table 6 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Physical encounters among teams	Cultural difference impact	With minimal physical encounters with the foreign team, the cultural difference impact can be minimised	DOWN	The fact that we don't meet them, we don't feel the difference	Is there a cultural difference between France and Mauritius?

Table 28 - Axial links from Communication Practices to Culture

5.4.1.8. Relationships High-Level Discussion

The case studies revealed two forms of communication processes currently in place within South African and Mauritian GSD companies. The first one calls for constant and unlimited communication among all job titles (C1 and C2), as prescribed by previous GSD studies (Staudenmayer & Votta, 1994; Robillard & Robillard, 2000; Seaman, 1996) (even though some job titles tend to communicate more among each other). The second one instead limits the communication flow to team leaders from offshore site and project managers from onshore sites (C3 and C4).

For communication type 2, in spite of having no communication between the developers offshore and project managers onshore, GSD work is still being successfully performed, as can be seen in C3. Communication process is said to be at the basis of GSD but evidence from the data suggests that by limiting the level of communication across the dispersed sites, numerous issues like cultural disparities and communication issues can be avoided (see C3). Therefore, communication can only be restricted to certain job titles, like between team leaders offshore and project managers onshore. This leaves room for the GSD work to be performed more successfully, especially since the developers are less interrupted in their work (see C3).

However, for communication type 2 to be effective, the need for constant and unlimited communication is shifted to the offshore site and occurs between the developers and the team leaders. Having constant interactions between those two roles is the only way to limit misunderstandings or lack of project of visibility, which is bound to happen when the communication process is limited across the sites. However, the burden of providing project visibility to the onshore sites is left to the team leaders (see C3).

In spite of being successful, this form of communication set forth by the mother company onshore is not always appreciated by the offshore team members. In some cases, it does not allow for the maximised use of the resources capabilities. For instance, some developers might be very fluent in the foreign language, but are still not given the opportunity to express themselves. A higher level flexibility in that form of communication could thus be more advantageous to both the communication process and the resources (as is performed in C4). For instance, C4 reveals that even if only the team leaders are officially allowed to contact the managers onshore, developers can sometimes be allowed to do so, whenever specific issues need to be addressed pertaining to their work. By doing so, the communication process is improved as people got used to each others accent and way of speaking. Consequently, there is a need for some form of balance. Only allowing the team leaders to communicate introduces coordination issues if the latter is not available. Furthermore, there is a need for the team leader to know every tiny detail for every project, which increases the workload. The relationships emanating from the “Communication Practices” category are summarised in Figure 13.

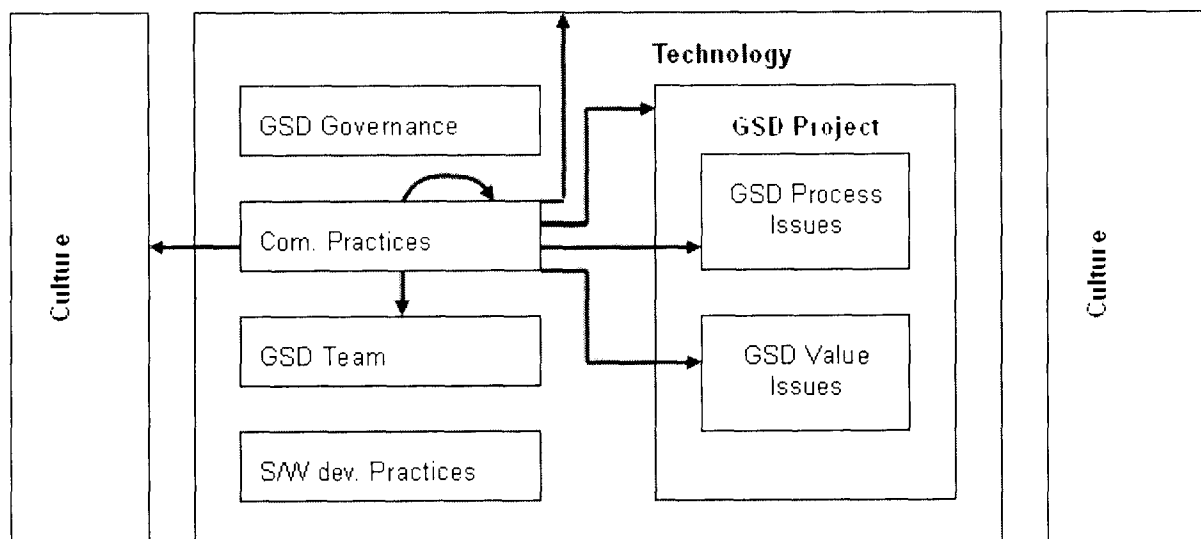


Figure 13 - Communication Practices Relationships

5.4.2. Culture

5.4.2.1. From Culture to Communication Practices

The team culture will determine whether employees are allowed to contact external customers or not [C1.I4.A2]. For instance, in teams having an informal arrangement with the customers (which describes their flat hierarchical structure), team members are allowed to contact external customers.

The national culture (E.g. franc, direct) governs the communication style employed among the team members. This communication style might be diplomatic, straight forward and even untactful [C3.I3.H50][C3.I4.I19]. It also impacts on the level of collaboration across the sites as based on their culture, some cultures are more willing to help than others [C3.I3.I11].

National culture also impacts on the communication need. People from different countries need to be approached differently, some with a professional tone of voice while others in a more relaxed manner [C1.I3.C28].

National culture drives the team-customer communication strategy. Some cultures with a tall hierarchical structure do not allow the developers to communicate with the project managers [C3.I3.I12][C3.I4.I37]. Cultures highly oriented towards hierarchy expect the team members to respect this hierarchy even during the communication process.

An organisational culture highly focused on achieving customer satisfaction is likely to have a short email response time allowed [C1.I1.A16].

The warmth of the communication channel depends on the personality (individual culture) of the communicants. It is easier to communicate with some people as opposed to others [C3.I4.I16]. The personality of the resources also impacts on the communication need. Different people need to be approached differently [C1.I3.C27].

Team members might refuse to work for late hours or on a flexi-time basis if such an attitude is not within their culture. This further hinders the communication process among team members [C2.I4.F43].

(Refer to Table 8 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Team culture prevalence level	Team-customer-communication strategy	Based on the customer's preferences, employees are allowed to contact the external customers or not.	UP	Yes, because the customer preferences are different. In terms of technology, in terms of environment, in terms of maturity, [the approach there is], communication strategy etc. are completely different. People are different.	You have one specific team for one specific customer?

Table 29 - Axial links from Culture to Communication Practices

5.4.2.2. From Culture to Culture

The organisational values influence the organisational culture [C1.I1.A37].

The organisational culture sometimes prevails to such an extent that it influences and changes the individual culture [C1.I1.A38]. It can also influence and take precedence over the national culture [C1.I1.A39] [C3.I4.I49].

(Refer to Table 9 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Organisational values	Organisational culture description	The organisational values influences the organisational culture	UP	It's multinational, very much influenced by the organizational values.	But how would you describe your organisational culture?

Table 30 - Axial links from Culture to Culture

5.4.2.3. From Culture to GSD Governance

Culture influences the style of management [C1.I1.A23].

The national culture (low/high uncertainty tolerance) traits may govern the level of uncertainty minimisation processes in place within the dispersed team [C1.I1.B11] [C3.I2.G43] [C3.I4.I45]. Some cultures are so prone towards minimising uncertainty that they might stop a project altogether during unclear situations [C3.I4.I43]. National culture also defines whether the work standards will be easily accepted or not [C3.I4.I38]. For instance national cultures which drive people towards the acceptance of rules might lead team members into more easily following the set of standards in place within the organisation.



Based on the national culture, the team members will be expected to work for a certain number of work hours [C1.I2.B25]. For instance, South Africans have the reputation of working late while the Danes do not.

Personality (or Individual culture) of the project manager influences the project deadline management as some people are more deadline oriented than others [C3.I1.G19]. It also impacts on the level of requirements details being provided by the project manager [C3.I4.I33]. Individuals allowing information to be extracted from the shared context provides minimal requirement details while some more precise people do otherwise.

The national culture also impacts on how the project deadline will be managed. Depending on their national culture description, some people are more inclined to accept delays [C3.I4.I26].

The organisational culture impacts on the extent to which uncertainty minimisation techniques are in place within the dispersed teams. For instance, in some organisations, resources are not expected to struggle eternally on a problem. Help should be sought out immediately [C3.I2.G44]. It inspires the work attitude and entices the team to follow sets of best practices [C3.I2.G49] [C3.I2.H1]. The organisational culture governs the set of standard processes in place within the organisation [C3.I3.H41]. Rule oriented cultures will define a higher amount of processes within the organisation.

(Refer to Table 10 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
National culture description	Project management	Culture influences the style of management	UP	I can also say that the culture influences the style of management...	And in terms of explaining, describing?

Table 31 - Axial links from Culture to GSD Governance

5.4.2.4. From Culture to GSD Process Issues

By allowing developers to talk to external customers, communication delays introduced by cultural differences can be alleviated. [C1.I4.A1]. Based on their personality, some team members might insist on having their point of view accepted. This further introduces communication delays [C1.I3.A8]. Such delays are further compounded due to their incapacity to understand certain concepts [C1.I1.A36].

Individual culture and national culture both introduce communication issues when too franc and direct [C3.I3.I3] [C3.I4.I47]. For instance, when franc and direct people interact with more diplomatic individuals, the communication process might break down and the message is not properly conveyed due to the cultural difference impact.

Some national cultural traits induce people into not respecting schedule, thus causing meetings to overrun. This can be mediated if team members find a way to adapt to the situation by finding alternative solutions, like overestimating the time required for the meeting [C1.I4.A9].

Differences in culture introduce work interaction issues due to lack of or differing levels of cooperation [C2.I3.E31]. The cultural difference can introduce collaboration issues since the expectations of one culture (e.g. extreme precision) might not match the other culture traits (e.g. more laid back). In these cases, collaboration issues occur [C3.I3.H27]

People from different races and cultures express themselves in different ways which further introduces language interpretation issues [C1.I4.A19]. In addition, people belonging to some specific cultural group have a stronger accent than others [C2.I4.F35] [C2.I4.F36]. Cultural differences might cause people to be offended during the communication process. This might introduce communication issues [C2.I4.F42] during meetings [C1.I4.D24].

(Refer to Table 11 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Individual culture description	Communication delays	Specific forms of individual culture introduces communication delays as team members will keep on insisting to have their point of views accepted	UP	Rigidity of character, people that are inflexible, who are not prepared to be opened to change. Also where people feel threatened and they fear they're not making a mark strongly enough. They'll insist and insist and insist and having their point of view manifested. I think that this prevents proper communication	What prevents proper communication flow?

Table 32 - Axial links from Culture to GSD Process Issues

5.4.2.5. From Culture to GSD Project

The organisational culture entices the team members to focus on quality, thus contributing to GSD Project success [C3.I2.G50]. National culture can promote software development precision [C3.I4.I50].

Cultural differences and specific cultural traits reduce the project delivery speed due to frequent rework [C1.I3.A32]. The cultural difference can also introduce project delays. In particular, if team members are absent due to a cultural festivity while other team members from different cultures are not willing to work late to cover up, projects are delayed [C2.I4.F40]

(Refer to Table 12 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Organisational culture description	Quality	The organisational culture entices the team members to focus on quality and thus contributes to GSD Project success	UP	I think that they are adopting the Infomil culture. That is work work work work ☺ Everything has to be done very precisely to complete your work. Then you must ensure that the quality of your work is there. They focus a lot on quality and you have to do it their way, you can't do it your way.	In terms of the attitude towards the work here, how is the culture?

Table 33 - Axial links from Culture to GSD Project

5.4.2.6. From Culture to Software Development Practices

When properly chosen, the software development method can be used to support and satisfy the organisational culture [C1.I2.A25]. In turn, if the method satisfies the organisational and national culture needs [C3.I3.I9], team members may be more inclined to embrace the method, no matter how tedious it is [C1.I3.C22]. It promotes the acceptance of any disadvantage obtained through that software development method. For instance, a desire for perfection coupled with a precise culture entices team members into accepting the numerous iterations introduced by the waterfall model [C3.I1.G13] [C3.I3.I9]. Specific forms of organisational culture, which require people to stay abreast of technology, can influence a team in choosing the most recent software development method available [C1.I3.C25].

A methodology which includes several strict phases of development might be in contradiction with a relaxed national culture, where people are less inclined in achieving precision. However, when the organisational culture entices people to take pride in their work, that methodology can nevertheless be enthusiastically embraced by the team members [C1.I3.C24].

The modelling level can be chosen based on the project leader personal preferences [C3.I3.H47].

(Refer to Table 13 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Organisational culture description	Method standard	The right choice of software development method can be used to support the organisational culture requirements	UP	And also in terms of the client, they are very process driven. And the fact that RUP is a very recognized methodology is fairly advantageous	What specific features of RUP would you say are advantageous to you?

Table 34 - Axial links from Culture to Software Development Practices

5.4.2.7. Relationships High-Level Discussion

Evidence from the study reveals that national culture, organisational culture, team culture or individual culture each prevails under different circumstances. However, in spite of the prevalence of one specific form of culture, the effect of the less dominant ones should not be neglected. For instance, even if national culture prevails, organisational culture still impacts on the overall GSD process, as can be seen in C1.

Evidence from the case studies suggests that culture influences the form of work processes, be it through uncertainty minimisation processes, management style, project deadline management, work attitude or best practices (C1, C2, and C3). A flagrant example of how the national/organisational culture influences the work process can be seen in case 3. The French being quite hierarchical in their form of management would not allow developers to contact higher levels of management. This form of work process, in spite of being in contradiction to the usual GSD prescribed practices, seems to be effective as the cultural preferences prevail over anything else.

The organisational culture also impacts on the software development method selection. For instance, case 3 employed the Waterfall model, thus satisfying their

organisational culture which reveals a strong opposition to change as well as the need to decide on everything upfront before proceeding with the project. The waterfall model supports them in that process. The method was even adapted to limit its disadvantages, thus better fitting it to their work structure. The organisation from C1 chose RUP because of their organisational culture which calls for the desire to be upfront with technology, to show precision, quality and diligence in the work, and minimal uncertainty. RUP provides such framework, mostly due to the methods' elaborate documentation and the level of iterations required until reaching perfection. This organisational culture even drives them in accepting this heavy load of documentation, generally seen as a burden by other users belonging to different cultures. Therefore, a software development method might still be accepted due to the prevalence of some form of organisational culture, even when the method does not fit the national or individual culture requirements. The relationships emanating from the "Culture" category are summarised in Figure 14.

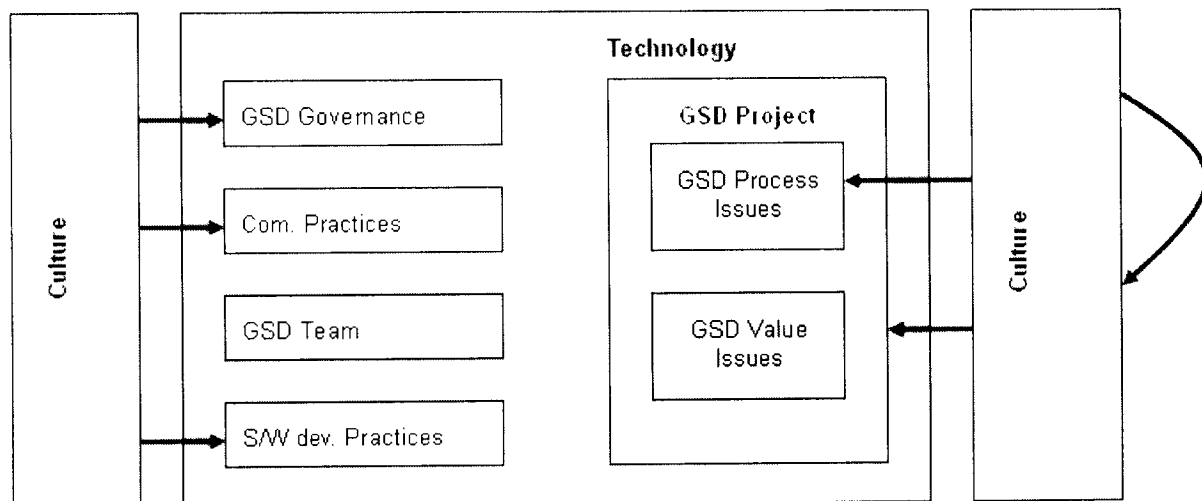


Figure 14 - Culture Relationships

5.4.3. GSD Governance

5.4.3.1. From GSD Governance to Communication Practices

Prior international meetings enhance the communication process among the team members [C1.I3.A7]. In the absence of such previous physical encounters, the communication channel is dry and impersonal [C2.I3.F9].

Proper documentation sharing mechanisms across the sites help to promote a good communication level [C1.I3.B1] with the customers [C2.I4.F25] as information about the project is freely available across the dispersed sites.

(Refer to Table 14 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Documentation sharing	Communication level	Having proper documentation sharing mechanisms across the sites help to promote the communication level	UP	That is what was agreed initially, we enclose that again during each workshop. Any documentation filled by any party will immediately be shared and be CCed. And we do that and it works wonderfully.	Is there a problem as you guys are far away and you don't know what the other team is doing?

Table 35 - Axial links from GSD Governance to Communication Practices

5.4.3.2. From GSD Governance to GSD Governance

The implementation of competency centres helps in the promotion of best practices within each of the respective work areas (analysis competency centre, testing competency centre, etc.). This in turn helps in the promotion of best practices in the day to day work [C1.I2.A14].

International meetings help to reach agreement pertaining to requirements elicitation [C1.I3.C30], reduce the risk of having disagreements at a later stage [C1.I3.A17], and may be used for training purposes [C2.I3.E32]. The international meeting site is chosen based on the purpose of the meetings [C2.I2.E6].

Up-to-date documentations reduce uncertainty within the project team [C1.I3.C14]. When made accessible to all, documentation informs stakeholders about the project status [C1.I2.B6]. Documentation management promotes collaboration across sites as it forces stakeholders to interact with each other [C1.I3.C15].

Documentation sign-off promotes agreement seeking [C1.I3.C16] while documentation versioning might be used to overcome uncertainty issues [C2.I3.F6]. Different versions of the documents are accessible and can be used to clear out any uncertainty.

When having proper procedures in place, collaboration can be promoted across the sites [C2.I4.F23]. But these procedures are of no use if they are not respected and followed by all the sites [C2.I4.F24].

With proper uncertainty minimisation techniques, issues can be prevented and properly managed [C1.I1.B10]. For instance, by recording meeting minutes issues can be prevented [C1.I4.D26].

Analysis and design can be handled at offshore sites [C3.I1.F50] [C3.I1.G1] [C3.I1.G2]. But generally, analysis and design are performed at the customer site [C3.I3.H45]. This is due to the need for informal communication, which is crucial to facilitate communication [C2.I2.E17]. The design site is dependent on the analysis site. Most of the time, both work are performed simultaneously [C2.I4.F26].

(Refer to Table 15 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Project type	Analysis site	For internal projects, analysis can be performed offshore	UP	In both places. Sometimes we do the analysis here and the design here. Sometimes they've already done the analysis and we just have to design and implement.	So let's talk about the internal. Do you do analysis here or in France?

Table 36 - Axial links from GSD Governance to GSD Governance

5.4.3.3. From GSD Governance to GSD Process Issues

When placing additional resources on a project, GSD project delays can be overcome [C2.I2.E14]. When such additional resources are not available, project delays are introduced [C1.I2.B28].

Work re-allocation (re-distribution) can be used to overcome priority issues [C2.I4.F17]. This can also be achieved by having the customer redefining the task priorities, which also helps in the overcoming of coordination issues [C1.I4.B29].

Requirements engineering can be managed by having proper procedures in place [C1.I2.B33].

Communication issues can be overcome by following a similar set of procedures across the dispersed sites [C1.I3.C13]. When the foreign teams do not follow similar standards, requirements issues cannot be avoided [C1.I4.D19].

By having proper agreement seeking [C2.I2.E15] and uncertainty minimisation procedures through constant probing and asking of questions, requirement issues can be overcome and reduced [C2.I4.F21] [C2.I4.F22] [C2.I1.D39].

Uncertainty minimisation techniques can be used to reduce information loss when they entice team leaders into being fully aware of the all aspects of the project [C3.I5.H7].

Good standards in place within the organisation can overcome geographical distance [C1.I4.D18]. Standardised activities across the sites and throughout the development process (documentation standard, code standard etc) also reduce GSD issues [C3.I5.H17] and development issues [C3.I3.H42].

Proper testing procedures overcome development issues [C3.I3.H49] while project planning overcomes coordination issues [C3.I4.I29].

Regular project meeting [C1.I4.D8] and careful project planning [C2.I3.F5] can be used to overcome coordination issues.

When documents are of high quality and contain all the required information, requirements issues [C1.I4.D20] [C3.I1.G17] and development issues are avoided [C3.I3.H48]. On the other hand, when these are not up to date, communication issues are introduced [C2.I3.E35].

When design site and development site are different, development issues can be introduced as the team members might have trouble understanding the program logic [C3.I1.G10].

Project management techniques including tight project monitoring and control can be used to overcome information loss due to relay of communication. For instance, the team leader has to be 100% informed of what is happening in the project [C3.I2.G33] [C3.I2.G34].

Cultural understanding can be used to minimise language interpretation issues [C3.I5.H11] and overcome language accent problem [C2.I1.D33]. Cultural understanding implies that all parties involved are willing make the required efforts to promote the communication process.

The impact of time difference is enhanced when there is a high cultural difference impact. For instance, in cultures where overtime work is not common, team members usually make



little or no effort to work extra hours and increase the communication window across the sites. Time difference is thus more felt [C2.I4.F20].

(Refer to Table 16 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Additional resources	GSD Project delays	The unavailability of additional resources whenever required introduces project delays	UP	But we also have project delays because we don't have the resources to do something that took longer that we thought . Then we have to communicate to them that we're not gonna be able to make it	Do you have any work coordination issues?

Table 37 - Axial links from GSD Governance to GSD Process Issues

5.4.3.4. From GSD Governance to GSD Project

Proper team structures (e.g. competency centres) help to promote best practices and increase the level of expertise available for a project [C1.I2.A10]. Tight procedures are crucial to the success of the GSD Project [C1.I3.C4] and standard processes help to increase project delivery speed [C3.I5.H18].

Proper project management and planning leverage project visibility [C3.I4.I28] [C3.I4.I30].

The lack of cues transmission reduces the project visibility [C1.I2.B22].

(Refer to Table 17 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Expertise	Expertise level	The proper team structure, like competency centres introduces some best practices and increases the level of expertise for a project	UP	But basically, people who are experts in business intelligence work there (BICC), ... and then for any one project, you have resources from [each CC], hmm, you have an analyst, a project manager and all of them come together on a project	Can you please explain the concept of competency centres?

Table 38 - Axial links from GSD Governance to GSD Project

5.4.3.5. From GSD Governance to GSD Team

A mentor can be useful if a new team member has no prior experience in using the methodology being employed throughout the dispersed team [C1.I1.A30]. The mentor can thus help the new employee to acquire the necessary skills.

International meetings (for training) can be used to improve the product knowledge of the team members [C2.I1.B34] [C2.I2.E3]. They also promote the affiliation level between the team members [C2.I2.E4] [C3.I3.H26]. For instance, when a new manager is being appointed for the GSD team, international meetings promote the bonding process between the latter and the team [C2.I3.E33].

When clear documentation is available to everyone, it contributes to leverage the product knowledge of the team members [C3.I2.G37].

The design site is chosen based on the age of the team located at that site [C2.I1.B30]. For instance, older teams with high level of experience might be allowed to perform design work.

(Refer to Table 18 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Team age	Design site	The design site is chosen based on the age of the team located at that site		Since this is a new department, my department has started in February, we have not had the chance to do that much design. But it might be in the future	But for the big projects, is analysis / design done over there?

Table 39 - Axial links from GSD Governance to GSD Team

5.4.3.6. From GSD Governance to GSD Value Issues

By having formal review cycles, agreement is reached among the stakeholders and uncertainty is reduced [C1.I2.A48].

Uncertainty minimisation techniques, like constant probing for clarification, can be used to overcome the lack of cues during communication [C2.I3.E39]. Having a contract which clearly states everything can also help to reduce uncertainty [C1.I2.B37].

When international meetings are held regularly and at the right stage, the trust level among the team members can be promoted. [C1.I3.B18] [C1.I4.D6]. After having physically met, team members are no longer affected by lack of visual cues [C2.I3.F8].

When the documentation being shared is of high quality, the negative impact of the lack of cues during communication is mediated as enough details are available in the documents. The resulting communication process is improved [C2.I3.E38].

(Refer to Table 19 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
International meeting purpose	Trust level	International meetings held at the right stage helps to promote the trust level among the team members	UP	A feel that after this workshop, things were actually voiced by London. So Denmark now has complete trust in the capability of the team and is now relaxed. It perhaps enabled the trust component	Was there some sort of lack of trust from the parties from Denmark and London?

Table 40 - Axial links from GSD Governance to GSD Value Issues

5.4.3.7. From GSD Governance to Culture

Uncertainty minimisation techniques overcome cultural differences among people with high tolerance to uncertainty and others [C1.I3.C21]. When team members are aware of such differences, cultural issues can be mediated [C2.I4.F44] [C2.I1.D32].

(Refer to Table 20 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Uncertainty minimisation	Cultural difference impact	Uncertainty minimisation procedures can be used to overcome cultural differences for culture with high tolerance to uncertainty.	DOWN	We have to contact them again. Rephrase the question, ask again. I know that sometimes they feel that it is a bit much. But I'm not aware of that. What is important for me is having complete clarity, and understanding and agreement on the requirements.	How do you overcome the fact that the brits are very tolerant for uncertainty and u guys are not?

Table 41 - Axial links from GSD Governance to Culture

5.4.3.8. From GSD Governance to Technology

Each technology is appropriate when used in the right work context [C2.I1.D45].

Proper follow up of emails can be used to minimise uncertainty and overcome emails overlaps [C2.I3.E40].

(Refer to Table 21 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Work format	Task-technology-structure fit	Each technology is appropriate when used for the particular work type or context	UP	Till now I haven't had any problems with those communication tools. Each one has its purpose. As long as you use each one of these tools in the proper context its fine.	Are there any limitations from these tools?

Table 42 - Axial links from GSD Governance to Technology

5.4.3.9. Relationships High-Level Discussion

The study reveals that GSD Governance plays a central role in GSD. It impacts on communication practices, GSD Process issues, GSD Project, GSD team, GSD Value Issues, and Technology. Through various GSD Governance practices, communication flow across the sites is guaranteed. For that purpose, management employs a wide range of communication technologies to communicate (C1, C2, C3, and C4). They might also physically fly people across the sites as often as required (C1). However, it all comes down to one common goal; the transmission of a high amount of cues and the bridging communication issues through the use of a clear communication channel. The risk of having misunderstanding, uncertainties or disagreement should be minimised and this goal is being achieved, whatever the method employed.

South African and Mauritian GSD organisations seem to have devised personal ways to effectively perform their work, based on their respective standards. This is particular visible in C2 and C3. The French organisation studied in C3 devised their own documentation standard which does not include any modeling and which is quite different from the usual industrial prescribed standards. In turn, C2 gradually improved their testing procedures, by shifting from the use of a dedicated tester for the GSD team, to the use of testing competency centres. They reported that their testing procedures were greatly improved after

having made that step. The relationships emanating from the “GSD Governance” category are summarised in Figure 15.

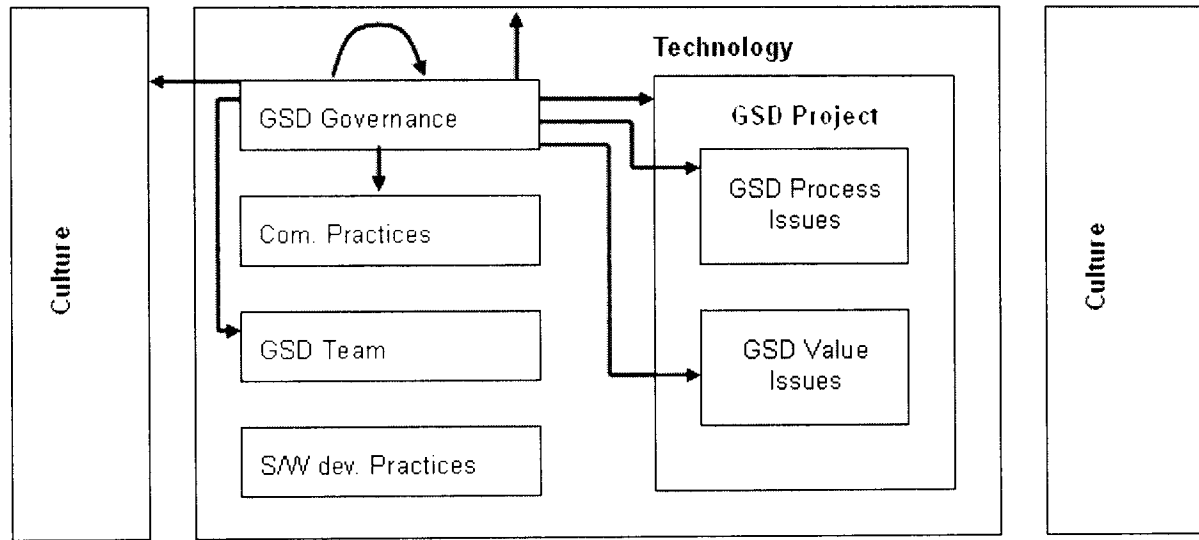


Figure 15 - GSD Governance Relationships

5.4.4. GSD Process Issues

5.4.4.1. From GSD Process Issues to GSD Governance

When minimal, time difference can be considered as an advantage as it helps to promote best practices across the dispersed teams [C1.I2.A41]. In particular, it improves the work collaboration ability as team members come to work while their fellow team members are already available for communication at the other sites. However, this is not applicable for teams that are ahead in the time zones [C1.I1.A43].

Geographical distance decreases the ease of collaboration across the sites. This can only be mediated through the use of tight procedures [C1.I3.C5]. Due to geographical distance, project planning has to be carefully managed [C1.I3.C8] as more variables have to be taken into consideration [C1.I4.D2].

(Refer to Table 22 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Time difference	Best Practice Oriented	Time difference can be considered as being advantageous when minimal and helps to promote best practice within the dispersed teams	UP	I'm quite happy so that we can come to the office before they do and you get a chance to refine email and refine some stuff before they come and say "what happened??"	Do you have trouble with the time zone difference?

Table 43 - Axial links from GSD Process Issues to GSD Governance

5.4.4.2. From GSD Process Issues to GSD Process Issues

Geographical distance introduces communication issues, which can be reduced by having constant communication throughout the dispersed team [C1.I3.A6]. It reduces the meeting planning effectiveness [C1.I2.B21], enhances priority issues [C2.I4.F15], and increases feedback time [C2.I4.F32]. Geographical distance introduces coordination issues which can be reduced by having international meetings at proper stages [C1.I3.C6], good documentation, correctly managed meeting minutes [C1.I3.C7], and suitable work allocation procedures [C2.I1.C10].

Geographical distance also introduces issues during the requirements elicitation stage. This can be alleviated by having international meetings held at this specific stage [C1.I3.A4]. Such international meetings can also help during the design work [C1.I3.A5].

Geographical distance can be advantageous as it minimises work interruptions [C1.I4.D3].

Time difference introduces coordination issues during the scheduling of meetings [C1.I2.A42]. If the time difference is too large, feedback time increases, which further introduces coordination issues [C1.I3.C12] and communication issues as the people have limited time to talk to each other [C2.I4.F47] [C3.I1.G12]. This causes communication delays [C3.I5.H8] when the time overlap is minimal [C3.I4.I31].

In the presence of blocking issues, time difference also further introduces GSD project delays [C3.I5.H9]. In such situations, team members have to wait for people from the dispersed site to come to work and fix the issues [C3.I3.H30].

With minimal time difference between the dispersed sites, geographical distance is not felt and coordination issues are minimised [C1.I1.A40].

Language difference might lead to the misinterpretation of concepts within the documentation and during the daily business communication. This further causes delays [C1.I1.A21] especially when the requirements are wrongly understood [C1.I1.A18 [C3.I1.G26].

The difference in spoken language throughout the dispersed sites introduces foreign language issues [C3.I3.I15]. Furthermore, the mother tongue has a negative influence on communication and introduces communication issues [C2.I1.D43]. For instance, words might not be used in the right context, which further causes confusion. This can be mediated through the use of email communication [C2.I4.F13] [C2.I4.F14]. Even when employing technical terms, the language accent introduces communication issues, as resources sometimes do not understand the pronunciation of the words [C3.I3.H31]. The lack of fluency in the common language being used introduces communication issues [C3.I2.G31].

When a common language is not maintained during the communication process, information might be lost when team members attempt to translate the terms on their own [C1.I4.C43], [C1.I4.C41]. Delays are also introduced as the same things have to be repeated several times for all parties to understand [C1.I4.C42].

When information is lost during the communication process, team members tend to make assumptions [C1.I2.B49].



When employees have some basic notions of the native language spoken by the other team members, communication issues can be bridged and a certain level of understanding can be maintained [C1.I4.C40].

Incomplete requirements introduce project delays [C1.I2.B32]. A rigid documentation process helps to overcome these project delays [C1.I4.D15]. Project delays are also reduced by having proper agreement seeking procedures [C1.I4.D16] and proper standard processes in place [C1.I4.D17].

Evidence suggests that coordination issues introduce development issues, but a recognised and process driven methodology like RUP can help [C1.I2.A26] [C1.I2.A29].

(Refer to Table 23 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Geographical distance	Requirements issues	International meetings help in the design work, and requirements issues introduced by geographical distance are solved	INT	But agreement was reached on the issues that were not clarified before. Work could actually start on the on the training. All the parts collaborating, we designed the framework, or the layout that the rest of the training course was gonna be based on.	So you told me that you went to UK recently? Can you please tell me about it? Under what circumstances was that?

Table 44 - Axial links from GSD Process Issues to GSD Process Issues

5.4.4.3. From GSD Process Issues to GSD Project

Geographical distance decreases the project delivery speed [C1.I4.D1].

(Refer to Table 24 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Geographical distance	Project delivery speed	Geographical distance decreases the project delivery speed	DOWN	And also development done remotely can become time consuming. Because everything has to be sent to somebody and then you have to wait for the response to come back. Whereas if	What are the main problems that you encounter while working in global software development?

they're local, you can stand up and walk to the person. So it takes longer and you have to work that in your plans and delivery.

Table 45 - Axial links from GSD Process Issues to GSD Project

5.4.4.4. From GSD Process Issues to GSD Value Issues

Due to the geographical distance, visual cues like body language cannot be transmitted. This has a negative impact on the communication process [C2.I3.E34].

(Refer to Table 25 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Geographical distance	Cues transmission	Due to the geographical distance, visual cues like body language cannot be transmitted, which causes communication process to be more difficult	DOWN	Well in terms of communication, especially when the documentation are not that up to date and not that detailed, we have some issues. Then we need to phone them, or email them. And the distance makes a difference. It sometimes gets difficult. It's easier for me if we are talking face to face. Just hearing the voice on the phone does not make it easy to explain things sometimes. You don't see the body language.	I would like to know about the communication issues that you encounter while working with people who are far away.

Table 46 - Axial links from GSD Process Issues to GSD Value Issues

5.4.4.5. Relationships High-Level Discussion

Time difference is a big part of GSD process issues in the Mauritian and South African contexts. It can however be considered as both an advantage and a disadvantage. For instance, when minimal, no impact is felt (C1 and C3), but when larger, it introduces communication and coordination issues (C2 and C4). In addition, only employees having direct contact with the customers are affected by this time difference. It can however provide some advantages for those who are ahead in the time zone. By being ahead, they have a few hours everyday to complete or prepare the work before the arrival of other resources from other sites. They nevertheless face communication issues, especially when required to communicate with people at other site who are not yet available in the office.

Geographical distance is known to introduce communication issues and coordination issues (C2). It reduces meeting planning effectiveness and causes issues at the requirements elicitation phase (C1 and C2). But the distance can also be considered as an advantage. For instance, it allows developers to perform their work in a smoother way, without having constant visits from project managers or project sponsors (C3). The relationships emanating from the "GSD Process Issues" category are summarised in Figure 16.

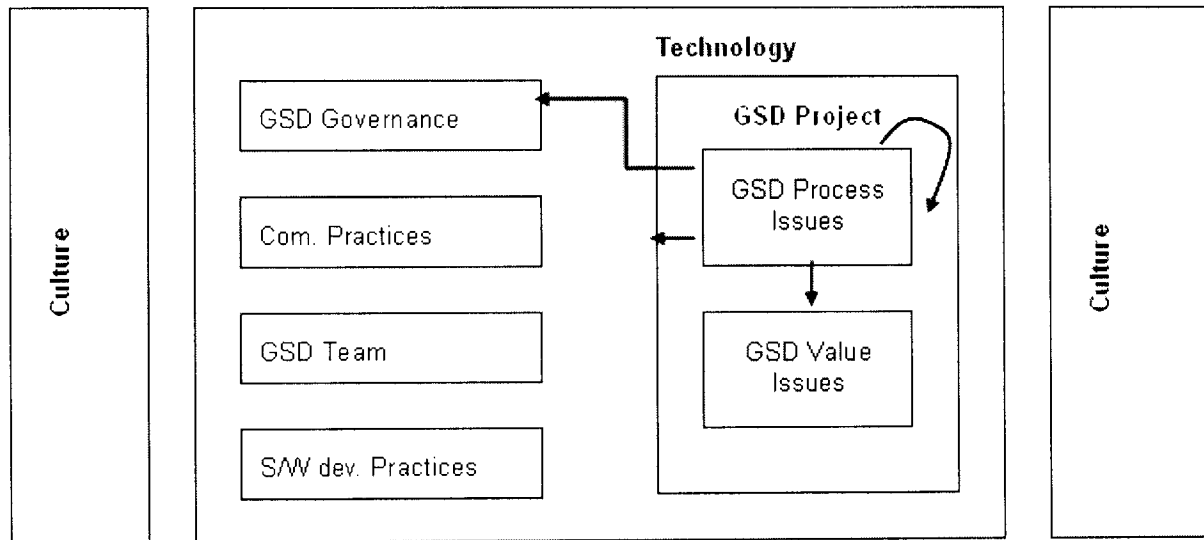


Figure 16 - GSD Process Issues Relationships

5.4.5. GSD Project

5.4.5.1. From GSD Project to Communication Practices

There are different communication needs at different project phases [C1.I2.B47] [C1.I2.B48] [C1.I3.C26] [C2.I1.D37] [C3.I4.I32]. The communication level depends on the job nature. Developers have higher communication requirements than testers [C2.I2.E20]. The communication level also depends on the project type [C2.I2.E22].

The level of collaboration across the sites is dependent on the work type [C3.I3.H25].

(Refer to Table 26 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
GSD Project Phase	Communication need	There are different communication needs at different project phases	UP	Yes, definitely. I think that at the beginning and the end of a project , there's the biggest communication needs. I think that in the main construction time, you can tell the client, "Its going OK, Its going OK" . Then when you're getting closer to the end, you're chasing things or you need to start deploying , or you're missing those deadlines, I think that when they start getting concerned	Do you have different communication needs at different project phases?

Table 47 - Axial links from GSD Project to Communication Practices

5.4.5.2. From GSD Project to GSD Governance

The project type determines the level of expertise required from the resources to perform the work [C1.I2.A11] [C1.I2.A13]. It further defines how resources are organised throughout the project [C1.I2.A12], the amount of collaboration required across the sites [C1.I3.C20], and the amount and type of documentation being used within the project [C3.I3.H43].

The tasks involved in the project will impact on the amount of collaboration required among the team members. For instance, simple tasks which can be performed by one person requires minimal or no collaboration [C1.I3.C38].

Due to the interdependency among certain deliverables, project planning has to be carefully managed both for documentation and development work [C1.I3.C9].

The documentation quality depends on the project importance. For more important projects, documentation tends to be more precise [C3.I4.I40] [C3.I5.H22].

The level of uncertainty minimisation in place depends on the work type [C2.I4.F34] and on the project type. For internal projects, teams tend to be more tolerant on uncertainty [C3.I1.G16].

Project deadline is dependent on the project type. For internal projects (development work performed for the organisation itself), some teams are more inclined to accept delays. On the other hand, external projects are more tightly managed [C3.I1.G21]. When the timeframe for delivery is limited, it calls for tight collaboration across the sites so as to complete the work on time [C1.I3.C11].

The design site is sometimes chosen based on the project size. For instance, design work for small projects can be performed offshore [C2.I2.E16].

The analysis site is chosen based on the project type. For some projects, like migration work where not much analysis is required, analysis can be handled offshore [C3.I2.G36]. For highly technical projects without much customer requirements, analysis can also be performed offshore, even if the customer is onshore [C3.I4.I39].

The development site is chosen based on the project urgency. Urgent projects are developed offshore because of the expertise level of the people there [C3.I5.H23].

(Refer to Table 27 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Time frame delivery	Collaboration across sites	Having a limited timeframe for delivery calls for tight collaboration across the sites	UP	Yes. I would imagine that if there was not the time constraint, if one had a load time to complete the project , in only the cape town component, it wouldn't call for collaboration [...]	The same procedures are followed for every project?

Table 48 - Axial links from GSD Project to GSD Governance

5.4.5.3. From GSD Project to GSD Process Issues

When the project or the task at hand is urgent, the negative time difference impact is enhanced [C2.I1.D9] [C2.I3.E44]. The time difference impact also depends on the job nature. For instance it mostly affects support work as opposed to development work [C2.I3.E41]. Support work enhances the time difference impact because it has a shorter delivery time frame as opposed to development work [C2.I3.E43].

A highly technical work type reduces the amount of communication issues encountered during GSD [C2.I4.F37]. The work type being very technical, language interpretation issues are minimised. Technical jargon are understood by everyone [C1.I4.D23].

Programming work reduces any foreign language issues as the syntax is in a language which is commonly understood by all parties [C3.I1.G9].

By breaking the project into small independent tasks, it contributes to minimising coordination and integration issues across the sites [C3.I3.I7].

(Refer to Table 28 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Project urgency	Time difference	Time difference impact is enhanced when the project or the task at hand is urgent	UP	It might happen when we have something urgent . But otherwise, we have to plan everything before hand and see that we have all the required information in our hands. I think that it comes with proper planning.	But it's a small overlap... does it create any problems?

Table 49 - Axial links from GSD Project to GSD Process Issues

5.4.5.4. From GSD Project to GSD Team

Team members should be able to work both independently and in group. Some job type requires people to work in group while others do not [C2.I4.F38]. Bigger projects require team members to work in group [C3.I2.G48].

The level of uncertainty tolerated by the team members is dependent on the task at hand [C2.I4.F39].

(Refer to Table 29 in Coding Evidence Booklet for code description and sample interview statement)



Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Work type	Team member independence level	Team members should be able to work both independently and in group. Some job type requires people to work in group while others do not	DOWN	I would say that it depends on what type of work I'm doing. If it's a team work, let's say that I have to build something; I would prefer to work in a group, where I can ask questions. Individually, it depends on what I'm doing. Let's say that I'm doing performance review, I'll prefer to work individually.	Do you prefer to work as a team or individually?

Table 50 - Axial links from GSD Project to GSD Team

5.4.5.5. From GSD Project to GSD Value Issues

A high productivity level leverages the amount of trust among the team members and reduces trust issues [C2.I1.B17] [C1.I2.B44] [C1.I4.D7] [C3.I3.I2].

The more complex the project, the higher the negative impact of the lack of visual cues [C2.I3.E42]. But the lack of visual cues might be overcome by having proper mechanisms in place to enhance project visibility [C1.I4.D5].

The higher the GSD project importance, the higher the chances of having collaboration issues, due to the high level of stress present during these projects [C3.I4.I22].

(Refer to Table 30 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Productivity	Trust level	Having a high productivity level increases the level of trust among the team members and reduces trust issues	DOWN	Because until now, we have delivered everything on time and as accurate as possible , I think that we've established the required trust . I think that we are delivering OK.	Is there any trust issues between you people working together?

Table 51 - Axial links from GSD Project to GSD Value Issues



5.4.5.6. From GSD Project to Software Development Practice

The percentage of components used from the methodology depends on the project size. Smaller projects require fewer components and larger projects more components [C1.I4.D22].

The ease of adaptability of the software development method depends on the project size. For smaller projects, it is harder to apply UML [C2.I1.D36] [C2.I3.F4].

The choice of software development method is dependent on the work type [C2.I4.F27]. The method effectiveness level also depends on the work type. For instance, prototyping is more efficient for report development [C2.I4.F28] or when prototypes have to be produced before deciding on the final version [C3.I3.I4].

The method iteration length depends on the work type or the simplicity of the task at hand [C2.I4.F29].

The disadvantage of the waterfall model arises due to its iterative nature, which causes development task to repeatedly go back to the analysis. The extent to which this disadvantage is felt is however dependent on the job title. For instance, it is more felt by analysts [C3.I3.I5]. The effect is not felt by developers as they are only involved in programming work. Analysts, on the other hand, have to perform the analysis work over and over again [C3.I5.H19].

(Refer to Table 31 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Project size	Percentage use of components	The project size impacts on the percentage use of components of the methodology. For smaller projects, smaller components are used	UP	When we first implemented that methodology in the UK, we did have problems about how to fill in the documents. And also the number of documents that we need to fill in is quite enormous. That's why we have got that light version. For the small projects we use the light version and for the bigger ones, we use the full version.	for the problems that you encounter with CUSP, is it only the quality?

Table 52 - Axial links from GSD Project to Software Development Practices

5.4.5.7. From GSD Project to Technology

Each technology is appropriate when used for the particular work type or context. Phone and conference calls are appropriate when GSD Project task is urgent [C2.I1.D46] [C2.I1.D47]. Chat is appropriate during troubleshooting of issues [C2.I1.D48]. Project management tool is appropriate for message and issue tracking [C2.I1.D49].

The frequency of use of the conference call depends on the project type. Bigger projects require more frequent meetings [C2.I2.E28].

Communication technology is chosen based on the project urgency [C2.I4.F33].

(Refer to Table 32 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Project type	Frequency of use	The frequency of use of the conference call depends on the project type. Bigger projects require more frequent meetings	UP	Depending on the project, at least one teleconferencing per week	Can you please tell me how often do you use each of these tools?

Table 53 - Axial links from GSD Project to Technology

5.4.5.8. Relationships High-Level Discussion

In the Mauritian and South African contexts, communication needs differ according to the project phases and the project type. Communication is said to be crucial mostly during the beginning and the end of the project while less communication occurs during the development phase (C1, C2, and C3). Beginning phases include requirements elicitation and analysis where the liaisons have to be established between the analysts at different sites, the project sponsors and the customers. End of project phases refer mostly to testing phase and implementation phase. Different technologies are also being used at different project phases. The relationships emanating from the “GSD Project” category are summarised in Figure 17.

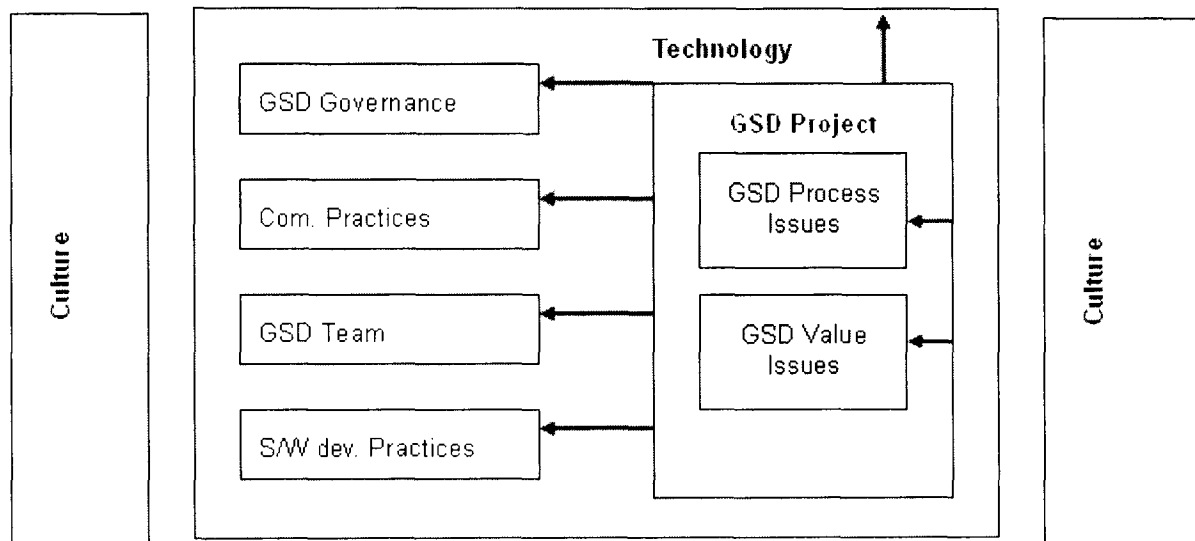


Figure 17 - GSD Project Relationships

5.4.6. GSD Team

5.4.6.1. From GSD Team to Communication Practices

The level of flexi-time being implemented depends on whether the team member is customer facing or not [C1.I4.A15] [C1.I4.D13]. Customer facing resources are expected to work on a flexi-time basis.

The team age and the amount of product knowledge detained by the team member determine the amount of communication required. Resources with minimal knowledge tend to ask more questions [C2.I1.D40] [C2.I1.D41] [C2.I1.D42]. The bigger the team, the higher the communication level required [C2.I2.E23].

The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers [C3.I1.G4] [C3.I2.G27] [C3.I5.H4] [C3.I5.H5].

Personal experience in working together eases the contact initiation [C3.I2.G40].

The adaptability of offshore team members can be used to enhance the communication process. Highly adaptable team members can force themselves to communicate in spite of some initial apprehension [C3.I2.G42]. Team members with low level of adaptability have trouble communicating and decrease the warmth of the communication channel [C3.I4.I18].

In the presence of a good affiliation level, communication level among the team members is good [C3.I3.H32].

The warmth of the communication channel depends on the level of expertise of the project managers in dealing with offshore projects [C3.I4.I17].

(Refer to Table 33 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Team age	Communication level	The team age and the amount of knowledge about the product detained by the resource will determine the amount of communication required. Resources with minimal knowledge will ask more question	DOWN	This will depend on the product knowledge. If you are a new team, you might ask a lot of questions to find	But is the message passed correctly?

Table 54 - Axial links from GSD Team to Communication Practices

5.4.6.2. From GSD Team to GSD Governance

When a good team structure is in place, best practices are promoted and the level of expertise is maximised [C1.I2.B12]. For instance, by having a proper structure for the testing team, error recording efficiency is improved via good error tracking mechanisms [C2.I2.E1] and the testing procedures are enhanced and better followed [C2.I2.E2].

The level of collaboration across the sites depends on specific job titles. Some resources with specific job titles tend to collaborate more among each other (e.g. there is a very close collaboration between the developers and the analyst but less collaboration between the developers and the project managers) [C1.I2.B38] [C1.I2.B39] [C1.I2.B40] [C1.I4.D25] [C2.I4.F31].

Employees with a high motivation level have a better attitude towards work, which further increases the productivity [C1.I3.C23].

The frequency at which international meetings are held depends on the job titles. For instance, developers tend to have more international meetings than testers [C2.I2.E5].

The employees' skills in using the method impact on the documentation quality. Employees with poor skills write poor documentation, irrespective of the method effectiveness level [C2.I3.E50].

In some cases, the project experience determines the level of requirement details. Developers with higher level of project experience are given less requirements details as opposed to more novice ones [C3.I5.H12] [C3.I4.I34].

The specification writing site is chosen based on the amount of knowledge detained by the team members in using the development tool. Sites with higher level of knowledge are chosen to write the specifications [C3.I3.H24]. The specification writing site [C3.I3.H44] and



the design site [C3.I3.H46] are chosen based on the level of expertise of the resources at that site. Sites with higher level of expertise are chosen.

Prior experience in offshore software development [C3.I4.I20] and some level of understanding in the foreign language [C3.I4.I21] help to promote cultural understanding.

(Refer to Table 34 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Job title	International meeting frequency	The international meetings frequency depends on the job titles. For instance, developers tend to have more international meetings than testers	UP	I think that there have been 2 or 3 during the past 2 years . But there are not so many as the developers. The developers they tend to go more often to the UK than the testers.	And has anyone from the testing team ever been to the UK?

Table 55 - Axial links from GSD Team to GSD Governance

5.4.6.3. From GSD Team to GSD Process Issues

The lack of confidence while speaking a foreign language introduces communication issues [C2.I1.B46] [C2.I4.F45]. It might introduce project delays when the team members are unwilling to communicate and find a solution to the issue [C2.I4.F46].

Poor understanding of the foreign language can cause requirements misunderstanding [C3.I4.I35] [C3.I4.I36]. When all team members have some notion of the foreign language spoken by their fellow co-workers, fewer issues due to misunderstandings are encountered. The communication process is therefore sustained [C3.I1.G8].

Requirement issues are introduced when the business people have poor level of skills in using the method [C1.I4.D21]. The lack of knowledge on the system or product being maintained or developed can also cause requirements misunderstanding [C2.I3.E47].

The amount of communication issues felt depends on the job title. Testers are less inclined to feel communication issues [C2.I2.E7].

(Refer to Table 35 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Employees skills in using method	Requirements issues	The lack of skills of the business people in using the method to set out the requirements completely, introduces requirements issues	UP	But I don't think necessarily they've got the skills in the business to be able to do it. They've got this idea in their head: 'I've got this problem, find a solution for me'. And then you find that the problem was only about 1% of the real problem and we have to figure out about the other 99%	Do they use the template?

Table 56 - Axial links from GSD Team to GSD Process Issues

5.4.6.4. From GSD Team to GSD Project

When provided with a high level of independence, team members are more productive [C1.I4.B43]

(Refer to Table 36 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Team member independence level	Productivity	Team members with who are given a high level of independence are more productive	UP	And the group of people on this floor are probably more productive and they operate a lot better when being allowed to do their own things. With much less structure. And that's the C1 way of doing things.	Do you in SA tolerate uncertainty? Or do you like things to be clear and precise?

Table 57 - Axial links from GSD Team to GSD Project

5.4.6.5. From GSD Team to GSD Team

Having well-being promotion techniques in place within the organisation, is crucial to maintain the employees motivation level in a dispersed environment [C2.I2.E24].

The employees' affiliation level can be improved through the team members experience in working together [C2.I3.E37] [C3.I2.G39].

The high adaptability of some team members can be used as an example for the others, thus enticing them to in turn increase their adaptability level [C3.I2.G41]. With experience, resources get accustomed to each others language accent [C3.I5.H10].



(Refer to Table 37 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Personal experience	Affiliation level	Personal experience in working together helps to improve affiliation level among the team members	UP	In the beginning, there was some hesitation. He's not the same as a Mauritian guy where we could just ask him. Actually, he did our formation and in those two months time, we got used to him and we started speaking. So in the beginning, there was some hesitation. Later on, we....	In terms of dealing with him, in the beginning, was it a problem?

Table 58 - Axial links from GSD Team to GSD Team

5.4.6.6. From GSD Team to GSD Value issues

When team building exercises are practiced, each individual feels part of the team. This further reduces frustration [C2.I1.D34]. Work dedication eventually overcomes cooperation issues introduced by work redundancy [C2.I2.E26].

The adaptability of the offshore team members can be used to reduce the negative impact of the cultural difference [C3.I2.G38]. Team members adopt some cultural attitudes which bridge the gap [C3.I4.I48].

(Refer to Table 38 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Team building exercise	Team frustration level	Having proper team building exercises and making the team members feel part of the team helps to reduce frustration	DOWN	Normally what is important is to make these people have a sense of belonging to Ceridian. I try to make them as happy as possible in their workplace. Whenever we have birthdays, organise something. We do a lot of jokes in the team. I talk to them on an individual basis, I try to keep them up to date with technology as well. I try to avoid frustration in the team	Have you adopted these values in your team too?

Table 59 - Axial links from GSD Team to GSD Value Issues



5.4.6.7. From GSD Team to Software Development Practices

Older generation take longer and are more resistant in embracing new methodologies [C1.I3.C36]. Newer generations are more likely to accept change and embrace new software development methods [C1.I3.C37].

Employees with high skills in using the method help to promote the method effectiveness level for GSD. For instance, employees with low skills encounter issues when requested to fill in the huge amount of documentation for RUP [C2.I3.F3]. Resources with the proper skills at using the method also help in the customisation of the methodology [C1.I1.A27]. Analyst with high level of expertise will mitigate the disadvantages of the waterfall model by rapidly completing any rework task [C3.I3.I6].

(Refer to Table 39 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Employees skills in using method	Percentage use of components	Resources with the proper skills at using the method can make the different components of the methodology relevant	UP	You need to have experienced and skilful people to take components of the methodology and make it relevant	You don't encounter any problems using it?

Table 60 - Axial links from GSD Team to Software Development Practices

5.4.6.8. From GSD Team to Technology

The frequency of use of the chat tool sometimes depends on the affiliation level among the team members [C1.I2.B50]. When employees have a high level of affiliation among each other, they tend to use the chat more frequently. Bigger teams tend to have more frequent conference calls meetings [C2.I2.E21].

(Refer to Table 40 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Affiliation level	Frequency of use	The frequency of use of the chat tool sometimes depends on the affiliation level that the team members have with each other	UP	Yes, sometimes, only with the ones we like :) Yes, there are some people with which we use Google talk.	Even Google talk with the people in Denmark too?

Table 61 - Axial links from GSD Team to Technology



5.4.6.9. Relationships High-Level Discussion

Results from the study reveals GSD requires a high amount of team work, in spite of the geographical distance. As was mentioned in C1, it is a team work and as a team work, procedures have to be put in place to facilitate work process. The GSD Team has to hold some specific features like a good adaptability level to various difficult situations, including language accent, cultural traits differences, and work habits among others. The relationships emanating from the “GSD Team” category are summarised in Figure 18.

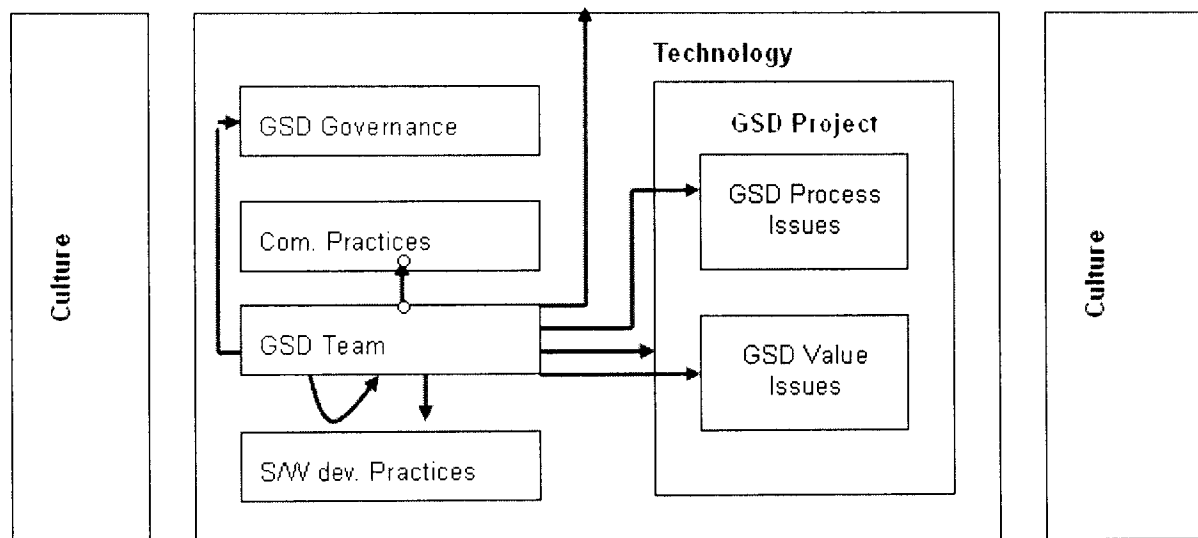


Figure 18 - GSD Team Relationships

5.4.7. GSD Value Issues

5.4.7.1. From GSD Value Issues to GSD Process Issues

GSD Project delays are more likely to occur when the level of uncertainty is high [C2.I1.D31].

(Refer to Table 41 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Uncertainty level	GSD Project delays	A high level of uncertainty increases GSD Project delays but having proper uncertainty minimisation mechanisms in place helps	INT	There must be a reason for that, there might be some specifications that was not cleared. That's why its important to clear everything before hand and make them aware that there is an issue.	But what happens if the product is not delivered on time?

Table 62 - Axial links from GSD Value Issues to GSD Process Issues

5.4.7.2. From GSD Value Issues to GSD Project

Project visibility is reduced by the lack of cues transmission during the communication process [C1.I2.B22].

(Refer to Table 42 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Cues transmission	Project visibility	The lack of cues transmission reduces the project visibility	DOWN	Because people believe in the visual thing that if you are sitting around and typing furiously, or if you're sitting relaxed and munching... so because they don't see us , they don't have a feeling of are we working that hard or if we're sitting ...	Can you please tell me again about the trust issue?

Table 63 - Axial links from GSD Value Issues to GSD Project

5.4.7.3. From GSD Value Issues to GSD Team

The minimal level of cues being transmitted through emails or other forms of communication reduces the affiliation level among the team members [C2.I3.E36]. Instead, when high level of cues is being transmitted the team's affiliation level is promoted [C3.I3.I14].

(Refer to Table 43 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Cues transmission	Affiliation level	Having a high level of cues being transmitted helps to promote the team's affiliation level	UP	The visio is something that is very important now. Before the visio, we were doing meetings on the phone. Now the message is passed much better. We are talking to a person, you see his reactions. And the fact that the person sees you, it has become more friendly. That helped a lot. It is a crucial tool in our work. And even sometimes we fight to have free time to do a visio. Because this room is not only taken for visio but for interviews.	How effective are each of these tools?

Table 64 - Axial links from GSD Value Issues to GSD Team

5.4.7.4. From GSD Value Issues to GSD Value Issues

The lack of cues transmission reduces the trust level among the team members [C1.I2.B23]. Work redundancy at the local site introduces some cooperation issues. Employees are thus unwilling to fully cooperate with offshore team members [C2.I2.E25] [C2.I2.E27].

(Refer to Table 44 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Cues transmission	Trust level	The lack of cues transmission reduces the trust level	DOWN	Because people believe in the visual thing that if you are sitting around and typing furiously, or if you're sitting relaxed and munching... so because they don't see us, they don't have a feeling of are we working that hard or if we're sitting ...	Can you please tell me again about the trust issue?

Table 65 - Axial links from GSD Value Issues to GSD Value Issues

5.4.7.5. Relationships High-Level Discussion

The study reveals that GSD value issues mostly impact only on the GSD Team while mutually reinforcing itself (C1, C2 and C3). Consequences of having GSD value issues are further revealed in the GSD project where it reduces project visibility and introduce GSD project delays. This can be explained by the fact that value issues pertain mostly on the inner feelings and emotions felt by the team members. The biggest impact of that category is therefore primarily on the GSD team members themselves. Lack of trust, missing visual cues, and uncertainty entail that GSD team members might not be at ease in working with each other. This is further reflected in their work. When the work interaction ability is reduced, GSD delays are introduced, and visibility is decreased. The relationships emanating from the “GSD Value Issues” category are summarised in Figure 19.

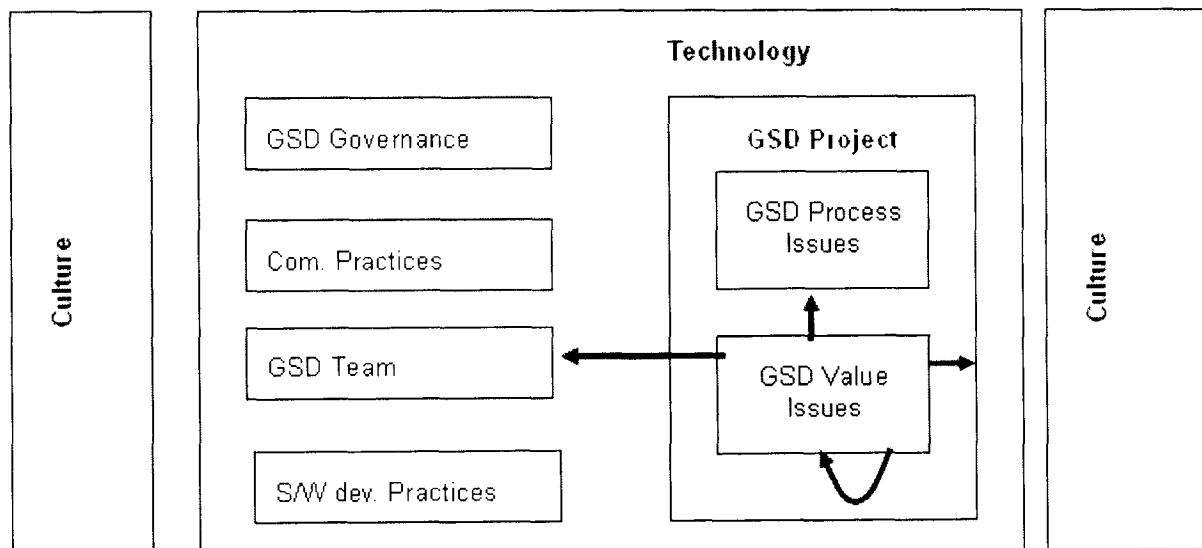


Figure 19 - GSD Value Issues Relationships

5.4.8. Software Development Practices

5.4.8.1. From Software Development Practices to Culture

The adapted waterfall model fits cultures trying to minimise uncertainty [C3.I4.I44].

(Refer to Table 45 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question
Method effectiveness level for GSD	National culture description	The adapted waterfall model fits some cultural traits that try to minimise uncertainty as much as possible	UP	Yes, in the sense that with the waterfall model, you get to plan in the beginning. They like to know where they're stepping. They won't take any risks. So they like to know all the limitations of something before using it. They can spend hours in meetings discussing about something.	Does the waterfall model fits the French cultural traits needs?

Table 66 - Axial links from Software Development Practices to Culture

5.4.8.2. From Software Development Practices to GSD Governance

RUP forces collaboration across the dispersed sites [C1.I3.A24] [C1.I3.C19] [C1.I2.B41], promotes uncertainty minimisation [C1.I3.C17], and best practice throughout the dispersed team [C1.I3.C18].

The adapted waterfall model is said to minimise uncertainty early in the project [C3.I4.I41].

A method, highly effective for GSD, should ease the resource deployment throughout the sites [C1.I1.A34]. Furthermore, a method which provides a high level of visibility can improve the project management effectiveness [C1.I1.A35].

A software development approach calling for the early involvement of the business component (business department setting the requirements) helps to reduce uncertainty throughout the project [C1.I2.B7].

Uncertainty is reduced when the software development approach requires an analyst to be present throughout the whole project evolution [C1.I2.B8].

By including an analysis review stage in the software development process, project planning and project estimate can be better managed [C1.I2.B31]. Any changes requirement changes can thus be captured early on, and the project plan is updated.

(Refer to Table 46 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Method effectiveness level for GSD	Collaboration across sites	The Rational Unified Process forces collaboration across the dispersed sites	UP	They work! They really do! They allow for tight control, they allow for traceability, and they obviously allow for constant interaction. What needs to be reviewed, to be signed off, agreed upon... Collaboration across business areas is forced by that.	How advantageous is this method for you?

Table 67 - Axial links from Software Development Practices to GSD Governance

5.4.8.3. From Software Development Practices to GSD Process Issues

When the correct software development approach is employed, it can be used to minimise development issues. For instance, a method that minimises uncertainty at an early stage can be used to enhance software quality and prevent subsequent GSD project failures [C3.I2.G45].

The software development approach, which only allows the team leader to handle all the verification and the testing procedures, introduces backlogs [C3.I3.H35]. Some software development approaches may introduce coordination issues, especially when one small project is dependent on other smaller ones which have not yet been completed [C3.I3.I8].

(Refer to Table 47 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Software development approach	Development issues	The correct software development approach can be used to minimise development issues. For instance, a method that minimises uncertainty	DOWN	No, it's not like that. What happens is that when you are developing a software, if you don't see a problem at the start, you'll get it in the end, when the project is	Is it different here? Does it interrupt you in your work?

right at the beginning
can be used to
enhance software
quality

completed. So, every
time you have to go
back and change the
code. Here it's different.
You don't have to wait
till the end to see the
problems. It's better if
you deal with the
problems in the
beginning, you don't
leave any bugs in your
code, so it's better.

Table 68 - Axial links from Software Development Practices to GSD Process Issues

5.4.8.4. From Software Development Practices to GSD Project

RUP can contribute to GSD Project success as it enhances the delivery speed [C1.I1.A31].

The proper choice of software development method (for instance RUP) increases project quality by identifying issues at an early stage, thus reducing uncertainty [C1.I1.A33]. For instance, a software development method like the waterfall which introduces a lot of iterations can nevertheless promote software quality [C3.I1.G15] [C3.I4.I42].

The number of stages involved in a project depends on the project size [C1.I2.B35] and on the number of people involved in the project [C1.I2.B36]. Bigger projects with larger number of resources often have more phases. Project task allocation is further facilitated by breaking down the software development process into an appropriate number of phases [C2.I1.D35].

The iteration length impacts on the time frame delivery of the project [C2.I4.F30].

(Refer to Table 48 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Project delivery speed	Speed of delivery	RUP can contribute to GSD Project success as it provides speed of delivery	UP	The benefit is speed, speed of delivery.	What benefit do you get from RUP?

Table 69 - Axial links from Software Development Practices to GSD Project

5.4.8.5. From Software Development Practices to GSD Team

Software development methodology learning curve depends on the team culture. Team cultures that have some notion of the method learn more easily [C1.I3.A28].

A software development method like waterfall, which introduces lots of iterations and reworks, has a negative effect on the employees motivation level [C3.I1.G14].

(Refer to Table 49 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Methodology learning curve	Team culture description	Software development methodology learning curve depends on the team culture. Team cultures that have some notion about the method learn more easily	UP	In the organisation I was before, it was a very big learning curve to introduce this methodology in the IT environment , cause they were not used to it	Does RUP meet your cultural requirements here? How are the South Africans?

Table 70 - Axial links from Software Development Practices to GSD Team

5.4.8.6. Relationships High-Level Discussion

The study reveals that several forms of software development method can be used during software development. The Mauritian and South African companies under study employed methods ranging from the Waterfall model, prototyping, and RUP, each of which are adapted or customised to some extent to fit specific cultural or GSD project needs. This implies that practitioners are aware of what is required to drive their project towards success. They are also able to take the necessary measures to achieve that success. Customisation and adaptation of the methods is achieved through experience and past project failures or issues. For instance, it was revealed through past projects that the use of the waterfall model for one big project is bound to accentuate the disadvantages introduced by that method. Frequent requirements issues are encountered, which lead to frequent rework and GSD project delays C3 and C4. GSD practitioners thus decided to break the project into smaller project parts, which would each be treated as separate projects, which eventually lead to GSD success (C3 and C4). The relationships emanating from the "Software Development Practices" category are summarised in Figure 20.



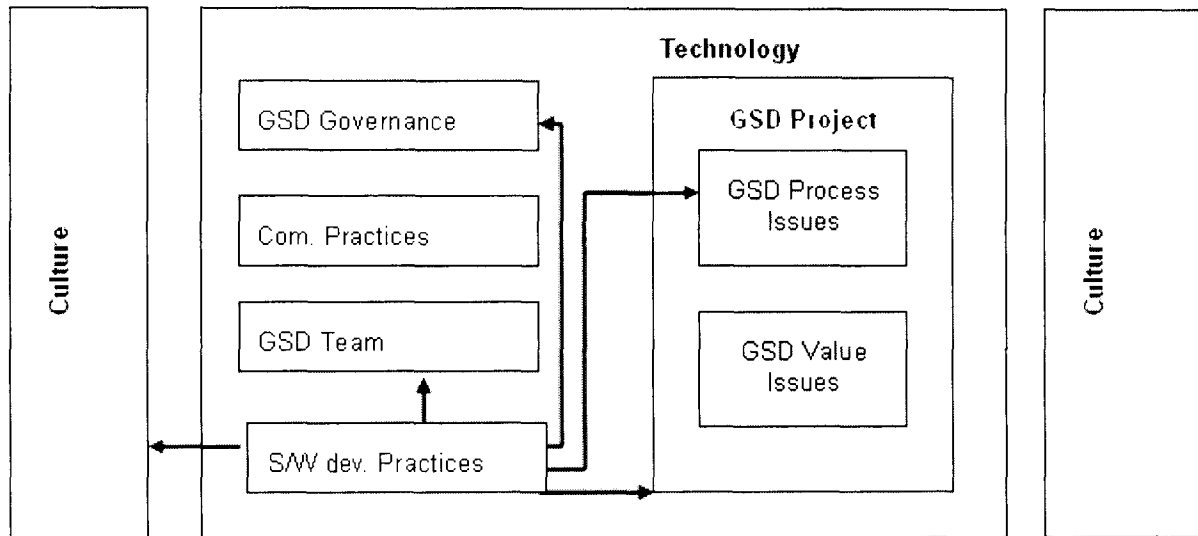


Figure 20 - Software Development Practices Relationships

5.4.9. Technology

5.4.9.1. From Technology to Communication Practices

A good infrastructure setup for communication, in terms of phone lines, communal mail boxes etc, can help to bridge geographical distance and facilitate the communication process [C1.I3.C31].

There are different communication needs at different project phases, and different communication technologies are used to cater for these needs. For instance, the video conference is used during analysis [C3.I1.G23]. The phone is used in the second phase to inform about the problems being encountered [C3.I1.G24]. The mail is used in the third phase to communicate with the project managers [C3.I1.G25].

(Refer to Table 50 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question
Infrastructure setup	Bridging distance	Having a good infrastructure setup for communication, in terms of phone lines, communal mail boxes etc, geographical distance can be bridged and communication process facilitated	UP	I think that our infrastructure really supports our communication. We have a communal mail boxes in both London and Copenhagen. So email happens basically uninterrupted in our network. Then teleconferences are allowed at anytime or for any length of time, as well as one-on-one phone call. They'll even promote travel in order to reach agreement and optimum communication.	How about the infrastructure? Does it facilitate communication or prevent communication?

Table 71 - Axial links from Technology to Communication Practices

5.4.9.2. From Technology to GSD Governance

A communication technology like email can be used to support the work process and promote agreement seeking mechanisms by sending documentation [C1.I1.A47] [C1.I1.A49] [C1.I3.A50], meeting agendas [C1.I1.A45], and meeting minutes across all dispersed sites [C1.I1.A46]. It can also be used for sign off purposes [C1.I1.B2], confirmations [C1.I1.B3], and clarifications to promote the uncertainty minimisation process [C2.I1.D29] [C2.I2.E12].

Conference calls are used to promote uncertainty minimisation [C1.I1.B4] [C1.I1.B5] and are of great assistance for agreement seeking procedures during analysis [C2.I3.E48] [C2.I3.E49].

The ability to save chat conversations can be used as evidence to reduce uncertainty at a later stage in the project [C1.I4.B9].

Project management tools can promote the collaboration process between internal customers and project teams by automatically firing emails under all necessary circumstances [C2.I1.D38]. It also leverages project visibility. Details like time allocated for project, delivery date, testing schedule etc. can all be made available to everyone [C2.I2.E10] [C2.I2.E19] [C3.I4.I27]. The tools can also be used for documentation sharing management [C2.I2.E11] [C2.I3.F1] and help in the work allocation process [C2.I4.F19] and issue notification for developers [C3.I1.F49].

The demonstration ability of the net meeting tool helps in fast issue resolution [C2.I2.E29].

Procedures might be in place to promote best practices (E.g. remote desktop sharing), but if the connection speed is slow, the work process is hindered [C2.I4.F16]. Remote desktop sharing tool are useful for issue fixing procedures [C3.I1.G5] [C3.I1.G20].

Technologies like video conferences, emails or phones support the requirements elicitation process across the dispersed sites [C3.I5.H13] [C3.I5.H14] [C3.I5.H15].

Video conference is used to overcome requirements misunderstanding [C3.I5.H16] and to minimise uncertainty [C3.I3.H38] [C3.I3.H39]. The phone is also used to minimise uncertainty [C3.I3.H40].

(Refer to Table 51 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Task-technology structure fit	Agreement seeking procedure	A communication technology like email can be used to support the work process and promote agreement seeking by sending documentation and agenda prior to any meeting	UP	Agenda is sent, documentation are sent before the meeting, before we go to get agreement	Let's talk about for instance the conference call. How effective is that?

Table 72 - Axial links from Technology to GSD Governance

5.4.9.3. From Technology to GSD Process Issues

A wide range of communication technologies can be used to support the communication process and reduce communication issues [C2.I2.E8]. These range from email, chat, video conference, conference calls, phone, among others.

Bandwidth limitation introduces communication delays as it reduces the usage efficiency of the communication tool [C1.I4.D27]. For instance, inefficient phone lines introduce communication issues [C1.I2.B19] and communication delays as the phone calls take longer than necessary [C1.I2.B20]. Slow connection speed also introduces GSD Project delays as the work process is slowed down and tasks are not completed on time [C1.I2.B27], especially in urgent situations [C3.I1.G6]. Email disadvantages (jumbled up emails) introduce coordination issues [C1.I2.C2] and delays during communication because of low cue transmission level [C1.I4.C49] [C2.I4.F48].

Phone disadvantages (line out unavailable, un-ability to explain things easily) introduce communication delays [C1.I2.C3] [C1.I4.C50].

Conference calls being expensive, team members tend to respect the meeting planning schedule and stick to the point [C1.I4.D4].

When requirement are unclear or when the terms used to describe the requirements are not clear, email [C2.I3.E46] and video conference [C3.I3.H37] can be used to probe for further clarifications.

Email can be used to request confirmation when the language accent is too strong and prevents the message from being understood [C2.I3.F7]. It reduces the negative influence of the mother tongue on communication process [C2.I4.F11]. Email can also assist in the scheduling of meetings in the proper time zones [C1.I2.A42].

Technologies like chat, having a high feedback time without requiring the team members to verbally communicate can be used to overcome the mother tongue influence and provide quick response [C2.I4.F12].

Project management tools are used handle the work allocation and overcome the coordination issues [C2.I4.F18].

Remote desktop sharing tools are useful during issue fixing tasks [C3.I1.G11].

(Refer to Table 52 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the Property	Link TOWARDS the Property	Description	Direction	Interview Statement	Interview Question
Efficiency level	Information loss	Having really inefficient phone lines causes communication issues	UP	Really bad phone lines!!	What are the barriers that hinder proper communication?

Table 73 - Axial links from Technology to GSD Process Issues

5.4.9.4. From Technology to GSD Project

Conference calls can be used to support general GSD work type [C2.I1.D30].

Project management tool helps to provide project visibility [C2.I3.F2].

Connection speed causes some tools like remote desktop sharing to be inappropriate and ineffective in conducting GSD Project work [C3.I2.H3]. Requirements issues and unclear requirements introduce project delays. But technologies like emails can be used to obtain quick clarifications [C2.I1.D28].

(Refer to Table 53 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Task-technology-structure fit	Work type	Conference calls can be used to support the general GSD work type	UP	Yeah, coding issues, clarifications, project updates	The conference calls are only used for clarifications of issues?

Table 74 - Axial links from Technology to GSD Project

5.4.9.5. From Technology to GSD Team

Email can be an efficient tool to overcome the lack of confidence while talking in a foreign language [C2.I1.D44].

(Refer to Table 54 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Tool efficiency	Employee confidence	Email can be used as an efficient tool to overcome the lack of confidence of the resources in talking in a foreign language	UP	I think that the mail is a very important tool. It's better to type than to talk to someone else in another language.	How effective are each of these tools?

Table 75 - Axial links from Technology to GSD Team

5.4.9.6. From Technology to GSD Value Issues

Video conference [C3.I3.I13] and email allow for cues to be transmitted about feelings and emotions [C1.I2.B42].

(Refer to Table 55 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Cues transmission level	Feeling and emotions filter though	Email allows for cues to be transmitted about the feelings and emotions of the team members	UP	I think that what's important is that when you don't feel anything, you can interpret cues from their email . You start to see their email style when somebody's short and abrupt ; they're either very busy or kind of upset with what you've said. And if they kind of waffle on , it usually mean that they're not really decided so you can probably sway them your way . So you can pick up cues like that from their emails especially when you get to know them.	Do you think that before making a decision about a project, visual cues are important

Table 76 - Axial links from Technology to GSD Value Issues

5.4.9.7. From Technology to Technology

The communication tools are selected based on the extent to which they suit the dispersed teams' communication requirements [C1.I1.A44]. The connection speed impacts on the choice of using video conference or not [C1.I2.C1] and enhances the disadvantages of the communication tools like remote desktop sharing [C3.I2.H2] and emails [C1.I3.C39]. One technology can be used to overcome the disadvantages conveyed by others. For instance, when the message is not properly expressed by email, the phone is used [C2.I1.D50].

(Refer to Table 56 in Coding Evidence Booklet for code description and sample interview statement)

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question
Task-technology structure fit	Task-technology structure fit	The communication tools are selected based on how well they suit the dispersed teams communication requirements	UP	Video conference is not very effective for us , so we rather use conference calls. It is more effective than video conferencing	So you have the mail, you have the phone, you have the video conf. too?

Table 77 - Axial links from Technology to Technology

5.4.9.8. Relationships High-Level Discussion

The study reveals that numerous communication tools are currently employed within the South African and Mauritian GSD context. Different communication needs are encountered at different project phases. At each phase different communication tools are used, according to the communication level requirements (C1). Each tool conveys specific form of advantages, and is designed to suit specific forms of communication needs. GSD practitioners are aware of this fact and are thus employing each tool in the right context (C1, C2, and C3). For instance, emails are used for formal forms of communication and when documentary evidence is required. Conference call is a cheap way (as compared to physical meetings) to perform meetings involving team members from several dispersed sites, and video conference is useful when visual aids are needed. When the tools are used in the right context, communication is said to be successful and the issues felt due to poor infrastructure is reduced.

GSD practitioners are also utilising some communication tools to counteract the disadvantage felt through the use of other tools. For instance, chat can be used instead of email where the feedback time is slow and the video conference might be used as a means to replace international meetings (C1). The relationships emanating from the "Technology" category are summarised in Figure 21.

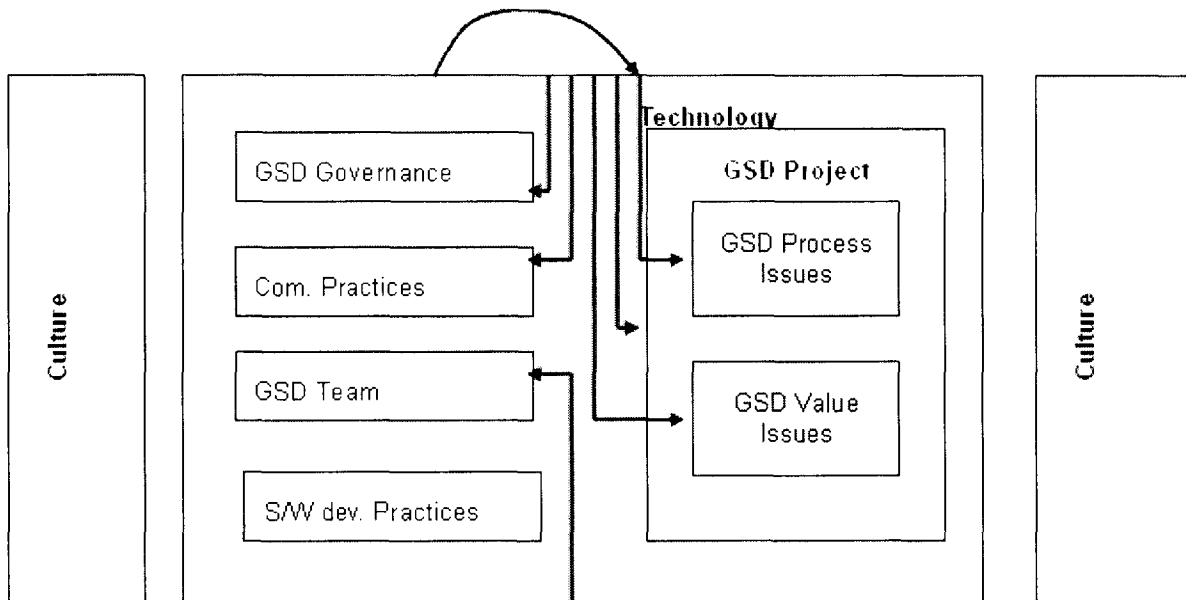


Figure 21 - Technology Relationships

5.5. Results from Selective Coding: Theoretical Summary

The selective coding process was the final stage of the analysis process. It was however not conducted in isolation, but rather in parallel with open and axial coding. As mentioned in Section 5.1.3, selective coding was conducted at both the *concept level* and at the *relationship level*. Gradually, the set of categories to be included in the theory were uncovered and those properties having no relationships to other properties were discarded.

The axial coding stage in the previous section was concluded with the generation of propositions, in the form of relationships between the categories. However the final list of categories and relationships presented in the previous sections were derived after several iterations, aimed at refining the theory and at solely revealing the most pertinent ones. Two main methods were employed to identify the properties having greater theoretical relevance as opposed to the rest.

In the first one, the number of links to and from a specific property was counted. The number of occurrences in the interview was also counted. Those properties with highest figures for those two parameters were considered as being more theoretically relevant or as being of high concern to the respondents. Properties with no links or little amount of occurrences were discarded. Properties can however have a high amount of occurrences but without any links (Strauss & Corbin, 1998). However, those having several axial were generally interdependent. This implies that properties with high amount of links generally had high amount of occurrences.

Relationship Diagram Evolution

After several iterations through open coding, axial coding and selective coding, the final model outlined in Figure 22 was eventually uncovered. However, selective coding was the key step which led to the emergence of the model. Through the integration of the categories that were developed, a theoretical framework was formed (Pandit, 1996). The core category (Technology) was uncovered, and the subsidiary categories were related to it, so as to systematically think about the data and to relate them in complex ways. Linkages were proposed and the data constantly revisited to allow for validation (Pandit, 1996). The resulting relationship diagram is described in the following section.

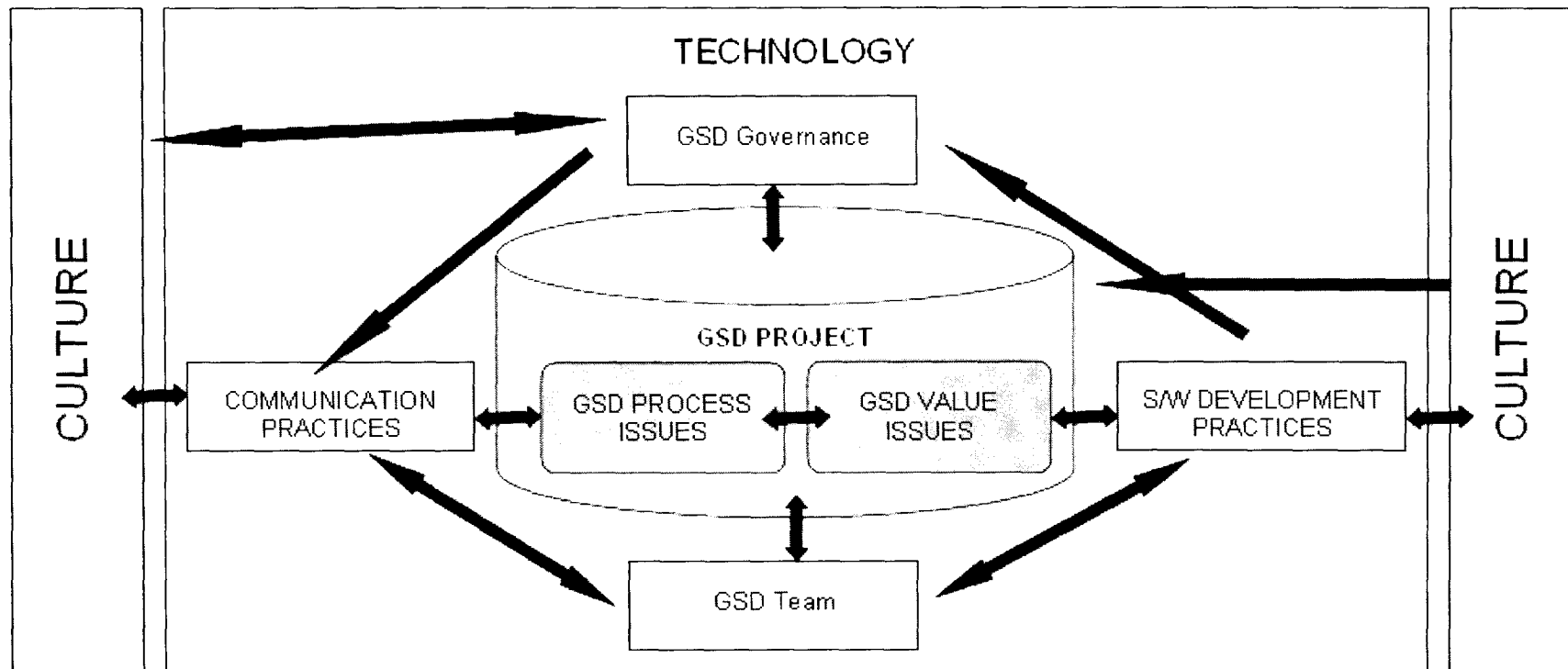


Figure 22 - Final Research Model

Relationship Description

The final relationship diagram outlined in Figure 22 is grounded in data and primarily reveals that Technology is the cement that supports the whole GSD process. With the exception of culture, it ties all the categories together, by supporting the whole Communication Process, GSD Governance, GSD Team, Software Development Practices and GSD Project. It supports the communication practices if the infrastructure and the connection speed are adequate. It also promotes GSD Governance practices when the right tool is utilised in the right context to support GSD project work. However, it also introduces GSD Process issues due to the limitations of some of the tools. The only way to overcome these issues is to select the right tool, according to the message that needs to be conveyed and the urgency of the situation. For instance, communication practices like foreign worker establishment and physical meetings overcome communication issues when technology is failing.

The data also suggests that culture is an external factor that impacts on GSD Governance, Communication Practices, Software development practices, GSD Process issues and GSD Project. It impacts on the GSD Governance by driving the core practices of the organisation. The prevailing culture, be it national, organisational, team or individual culture, shapes the manner in which uncertainty is handled, agreement is reached, and late projects are handled, among others. Culture also governs the communication practices by defining the communication style, the communication need and the warmth of the communication channel. Most importantly, it drives the team-customer communication strategy by defining the amount of communication allowed and practiced among job titles. Finally, culture has some level of impact on the GSD Project, by framing the tasks undertaken to achieve success, including the level of focus placed on quality and the need for precision.

Culture however introduces GSD process issues due to the cultural disparities among individuals. The difference is mostly perceived in the way they GSD team members express themselves. For instance, some diplomatic individuals have to interact with more franc and direct individuals. In such situations, the risk of people being offended during communication increases, which might result in the breakdown of the communication process. Cultural issues can be overcome through GSD Governance practices (e.g. cultural awareness programs) and Communication Practices (e.g. by limiting interaction across the sites so that cultural difference is not felt).

It is very important to note that culture has a big impact on the choice of software development method, as well as on the readiness to accept the method being used within the organisation. The choice is based on whether the method matches the cultural requirements or not and can even be used to overcome cultural issues. For instance, the waterfall model is readily accepted by cultures with a deep desire for perfection, along with a high level of strictness and precision.

The data also reveals that GSD Process Issues and GSD Value Issues occur within the GSD project life cycle. This implies that these two forms of issues are encountered during the course of GSD Projects and have to be mediated and avoided. GSD practitioners have devised ways to overcome these issues, be it through the use of GSD Governance (e.g. uncertainty avoidance, agreement seeking), communication practices (e.g. face to face meetings, team-customer communication strategy), the software development method, and even through the hiring of team members matching specific personality traits. Team building exercises are also performed.

The GSD Governance promotes the Communication Practices through the use of good documentation sharing mechanisms and through prior international meetings to facilitate future communication process. Finally, GSD Team is supported by GSD Governance (physical encounters to promote team relationship), Communication Practices and Software Development Practices. Culture however has no direct impact on the GSD team. Instead it drives the Communication Practices which in turn impacts on the GSD team.

The whole experience in using the Grounded Theory techniques proved to be an iterative and evolutionary process. Experience at using the method has been acquired through time, thus leading the researcher into mastering the process to eventually reveal the research outcome theory. The next chapter aims at answering the research questions by interpreting and discussing the relationships among the categories. Implications for the practitioners and the existing body of research are also exposed.

5.6. Theoretical framework evaluation

According to Lewin (1945), nothing is more practical as a good theory. It leverages knowledge in a scientific discipline, and guides research towards critical questions (Van de Ven, 1989). In order to establish the validity of the proposed theoretical model in making a contribution to GSD research, it has been evaluated in accordance with criteria for good theory as proposed by Whetton (1989). In essence, Whetton (1989) posits that a good theory should be composed of four essential elements, namely.

1. **What:** The essential elements of a behavioural phenomena (Constructs or variables)
2. **How:** The relationship between the constructs (Sequential, logical, causal, etc)
3. **Why:** The underlying assumptions about human behaviour (Necessary conditions)
4. **When, Where, and Who:** The boundaries of generalisability (Limiting conditions)

The checklist proposed by Whetton (1989) to evaluate the theoretical framework against those essential elements is provided in table 78 below.

Essential elements	Element Criteria	Criteria Match	Match explanation
1(a). All the "Whats" pertaining to the theoretical question are listed	Causes and effects are included and correlated	Yes	All concepts are linked to each other in a logical manner, based on the results of the data analysis. All relationships are explained in the <i>Relationship Description</i> section (pg. 139)
	Only one construct per "box" is used	Yes	Each box contains only one Variable
	Variables (e.g. height) are used, not variable "levels" (e.g. tall)	Yes	Variables are labelled correctly
1(b). Evaluate Construct set	A consistent level of abstraction (behaviour vs. trait) is maintained	Yes	The variables have been named in such a way that they encapsulate lower level concepts uncovered during the analysis process. They can therefore be termed as meta-categories

	Consistent level of analysis (individual vs. organization) is maintained	Yes	
	"Necessary" and "sufficient" questions (Complete set, yet?) are being asked	Yes	The interview questions have been linked to both the research objectives and to the preliminary research model proposed at the beginning of the study
2a. Identify relationships ("Hows") by arranging constructs in a logical order	Left being earlier, or former; right being later, or after	Yes	Each links have been created based on interview statements. They have also been ordered adequately within the diagram
	Place related variables (moderators, mediators) above or below	Yes	The variables have been organised in a logical and clear manner, facilitating the reader's overall understanding of the overall research outcome
2b. Specify the nature of the key relationships	Logical, sequential, causal, etc	Yes	Any variables impacting on other variables are clearly shown through the use of arrows. The logical, sequential, and causal flows are also shown, as detailed in the relationship description section
3&4. Explicate underlying assumptions, and other circumscribing conditions	List necessary and limiting conditions	Yes	- Individual culture might prevail, and differ from the national or organisational culture. - Communication technology availability is limited

List "why" assumptions: What we must agree on for the model to "work"		- Poor infrastructure is available in the country
	Yes	- National culture of organisational culture prevails within the dispersed setting, i.e. individuals do not behave in completely different ways from each other with respect to uncertainty acceptance or the level of information being extracted from the context. Otherwise, communication patterns or software development method adequacy cannot be predicted

Table 78 - Theoretical Framework Evaluation Checklist

DISCUSSION & IMPLICATIONS

The aim of this chapter is to interpret the findings obtained through the application of the Grounded Theory techniques, in light of the research questions. GSD will be described as practiced in the South African and Mauritian context, with particular focus being placed on cultural and communication coping strategies. In the first section, GSD issues uncovered during the study are compared to those reported in past literature. Insights are next provided on how software development methods are employed in these contexts to support cultural differences and communication preferences. Specific ways of overcoming situations of concerns in the form of communication challenges, cultural disparities and requirements elicitation issues, are also revealed. People play a crucial role in GSD and can help to limit communication and cultural disparities if they possess the right characteristics. This is further elaborated in the Section 6. Lastly, an evaluation is provided, on the effectiveness of the technologies employed within the Mauritian and South African GSD context.

In light with the different processes, team structures, and tools employed during GSD, it can be proposed that effective GSD projects are conducted in both a flexible and rigorous manner. The discussion is therefore centred on the need for flexibility and rigour within GSD to achieve an optimum level of stability and success.

6.1. Issues Comparison

The study reveals that numerous issues are encountered while orchestrating GSD within the Mauritian and the South African context. Some of these issues are similar to those reported in previous GSD studies, while others differ. Table 79 compares the issues reported in literature to those uncovered during the study. The issues have been categorised as *GSD Process Issues* and *GSD Value Issues*, in line with the high level categories proposed in the final research model. *GSD Process Issues* have been further subcategorised as *Communication Process Issues*, *GSD Orchestration Issues* which pertains to issues arising while GSD is being orchestrated, *Environment and Tools Issues*, and *Requirements Elicitation Issues*. The *GSD Value issues* have further been subcategorised as *Emotional Issues*, *Cultural Issues* and *Skills and Experience Issues*.

The issue descriptions being self-explanatory, no additional discussion will be provided, except for one general remark, pertaining to some issues occurring during the communication process. The communication issues encountered within GSD can further be

related to the argument of parsing patterns put forward by Cockburn (2002). In essence, geographical distance and dissimilar cultural settings cause differing parsing patterns. These are not amongst GSD issues, but are a confirming evidence of Cockburn's theory.

Past literatures mention GSD issues pertaining to the lack of common software development processes, code standards, documentation standards (Prikladnicki, Audy, & Evaristo, 2004), and the lack of control on task assignments (Herbsleb, Paulish, & Bass, 2005). However, results from the case studies do not corroborate these findings. Instead, GSD practitioners interviewed during the case studies follow tight processes, having recognised the benefits obtained from them. According to the respondents, these issues have been dealt with in the past but by learning from past mistakes, coping strategies have been devised to improve the situations of concerns. Further details about these coping strategies are provided in the following sections.

GSD Issue Description	Research GSD Issue Findings	Literature Review Findings	
GSD PROCESS ISSUES			
Communication Process Issues			
The language accent can be very bad and hinders the communication process	Y	N	
Written English vocabulary misinterpretation as some team members are not at ease with the language	Y	N	
The mother tongue influences the way in which the language is spoken and introduces issues during the communication process	Y	N	
Lack of fluency in the foreign language	Y	N	
Language interpretation issues	Y	N	
Lack of understanding of the terminology being used by all parties during conversation	Y	N	
When the use of a common language is not respected, people start talking in their own language and some parties do not understand and information is lost	Y	N	
When high amount of jargon is used during communication, issues are introduced	Y	N	
The lack of confidence in speaking the foreign language introduces communication issues	Y	N	
Communication issues occur during deployment when third party vendors are at a different site	Y	N	
Assumptions are often made during the communication process	Y	N	
Information is often lost during translation attempts when a common language is not maintained	Y	Y	Herbsleb & Grinter, 1999
Cost of initial contact	Y	Y	Herbsleb & Grinter, 1999
Time difference introduce communication delays	Y	Y	Herbsleb & Grinter, 1999
Time zone difference makes it difficult to schedule meetings and prevent rapid interactions	Y	Y	Herbsleb, Paulish, &



			Bass, 2005
Geographical distance has a negative impact on communication and cooperation	Y	Y	Cassey & Richardson, 2006
The amount of communication issues felt depends on the job title	Y	N	
It is difficult to communicate urgency in one's second language	N	Y	Herbsleb & Grinter, 1999
When emails and voice mails are not promptly answered, issues are escalated	N	Y	Herbsleb & Grinter, 1999
GSD Orchestration Issues			
Email delays and poor infrastructure introduce coordination issues	Y	N	
Temporal & geographical distance have a negative impact on performance	Y	N	
Geographical distance and time zone difference enhance priority issues	Y	N	
Geographical distance has a negative impact on project estimate	Y	N	
Geographical distance introduces issues during project deployment	Y	N	
Geographical distance between analyst and developers introduces coordination issues	Y	Y	Herbsleb & Mockus, 2003; Damian, 2002
Geographical distance introduces communication issues, decreases meeting planning effectiveness, and increases feedback time.	Y	Y	Agerfalk et al., 2005
Geographical distance decreases project delivery speed	Y	N	
Documentations that are not kept up to date introduce communication issues	Y	Y	Prikladnicki, Audy, & Evaristo, 2004
Interdependencies among work items cause difficulties while dividing the work into modules to be assigned to different locations	Y	Y	Mockus & Herbsleb, 2001
The software development approach introduces coordination issues, especially when one small project is dependent on other smaller ones which have not yet been completed	Y	Y	Mockus & Herbsleb, 2001
Little or no communication of deadline to the developers introduce planning issues	Y	Y	Herbsleb & Grinter, 1999
Late task approval due to time zone difference	Y	N	
Non existing or little overlap in time zones introduces communication issues	Y	N	
Time zone difference increases the feedback time	Y	Y	Herbsleb, Paulish, & Bass, 2005
Time zone difference is an issue when fast pace interactions is required	Y	N	
Time zone difference introduce GSD Project delays	Y	Y	Herbsleb, Paulish, & Bass, 2005
When design site and development site are different, development issues are introduced as developers might have trouble understanding the logic behind the codes	Y	N	
Incomplete requirements introduces project delays	Y	N	
Support work enhances the time difference because it has a shorter delivery time frame as opposed to development work	Y	N	
Urgent projects are more affected by time difference	Y	N	
The higher the GSD importance, the higher the chances of having collaboration issues, due to a higher stress level within people	Y	N	



It is hard to determining someone's availability	N	Y	Herbsleb & Grinter, 1999
Due to geographical distance, delays in issue resolution are introduced	N	Y	Herbsleb, Paulish, & Bass, 2005
Project managers have no control on who gets assigned jobs at the remote sites	N	Y	Herbsleb, Paulish, & Bass, 2005
Lack of well defined and common software development processes	N	Y	Prikladnicki, Audy, & Evaristo, 2004
Lack of code standards	N	Y	Prikladnicki, Audy, & Evaristo, 2004
Lack of documentation standards	N	Y	Prikladnicki, Audy, & Evaristo, 2004
Environment and Tools Issues			
Bad infrastructure introduces communication delays	Y	Y	Mockus & Herbsleb, 2001
Slow connection speed introduces GSD Project delays, especially in urgent situation	Y	Y	Mockus & Herbsleb, 2001
Communication tools do not always fit the communication requirements	Y	N	
Disadvantages of some communication tools introduce communication issues	Y	Y	Mockus & Herbsleb, 2001
Requirements Elicitation Issues			
Conceptual misunderstandings within documentation introduce requirements issues	Y	N	
Poor requirements introduces project delays	Y	Y	Damian & Zowghi, 2003
Requirements misunderstanding between developers and testers introduce issues during testing.	Y	N	
Requirements are both unclear and missing due to geographical distance between the communicants	Y	Y	Damian & Zowghi, 2003
Poor level of understanding of the common language used across the sites introduce requirements issues	Y	Y	Damian & Zowghi, 2003
Requirements disagreements occur due to the prevalence of high uncertainty level	Y	N	
Requirements issues are introduced when the technical teams do not understand the terms used by the foreign client to describe the requirements	Y	N	
When similar standards are not followed across the sites, requirements issues cannot be avoided	Y	Y	Prikladnicki, Audy, & Evaristo, 2004
Requirements issues are introduced due to geographical distance and time difference	Y	Y	Prikladnicki, Audy, & Evaristo, 2004
When the project or the task at hand is urgent, time difference impact is enhanced	Y	N	
Requirements issues are introduced due to the inability to maintain a full awareness of working context at remote sites	N	Y	Damian & Zowghi, 2003
GSD VALUE ISSUES			
Emotional Issues			
Lack of visual cues introduces communication delays	Y	Y	Herbsleb & Grinter, 1999



Lack of visual cues introduces trust issues	Y	N	
Frustration and stress introduce communication issues as a form of slang language is often employed in those situations	Y	N	
Geographical distance accentuates the negative effect of the lack of visual cues during communication	Y	Y	Kayworth & Leidner, 2000
Cultural disparities still prevail, in spite of having aligned processes and standards across the sites	Y	N	
Lack of trust in the project estimate by the project sponsors from foreign sites	Y	N	
Fear of losing one's job introduce collaboration issues	Y	Y	Herbsleb & Grinter, 1999
The more complex the project, the higher the negative impact of the lack of visual cues	Y	N	
Cultural Issues			
Rigid personalities who insist on having their point of view maintained introduce communication delays	Y	Y	Perry, Staudenmayer, & Votta, 1994
People from different countries have different ways of interpreting verbal expressions. This might introduce communication issues	Y	Y	Herbsleb, Paulish, & Bass 2005
Schedule oriented cultures might cause issues during meetings. For instance, meetings can be cut short before everything has been discussed.	Y	Y	Perry, Staudenmayer, & Votta, 1994
Cultural disparities negatively affect the work collaboration. People from differing cultures might be unwilling to collaborate with each other	Y	Y	Agerfaik et al., 2005
Organisational culture difference introduces cultural issues	Y	N	
Skills and Experience issues			
Lack of common project experience hinders project success	N	Y	Mockus & Herbsleb, 2001
The lack of skills in using the software development standards introduces requirements issues	Y	N	

Table 79 - GSD Issue Comparison

6.2. GSD Design Coping Strategies

The software development methods employed within the SA and Mauritian GSD contexts range from the monolithic to the unified process. Strikingly, these methods are however not rigorously applied. Instead the study reveals that, through the experience gathered from various projects, GSD practitioners from the Mauritian and South African contexts have adapted these methods to fit particular GSD needs and cultural requirements. These adaptations expose some level flexibility, which might be the key to GSD success. The final research model (Figure 22) outlines that software development methods may be employed to overcome GSD Process Issues and GSD Value Issues during GSD Projects. This is further exposed in Appendix T and the concepts are further explored in the following sections.



Waterfall Model

Results from C3 and C4 reveal that the Waterfall model can and should be flexibly adapted during the GSD process. In both cases, this is achieved through the breaking down of project tasks into smaller independent modules, which are further executed in parallel. This goes in line with the need for software modularity as prescribed by Parnas (1972) and the reveals some form of agility due to the method's similarity to the CORD methodology (Repenning et al., 2001). As mentioned by R4 from C3, these independent tasks are then allocated to different teams, thus allowing for multitasking. This form of adaptation provides a solution to several GSD issues. For instance, in line with past literature findings (Mockus & Herbsleb, 2001), it can be deduced from the findings that coordination issues can be avoided by employing the waterfall model with parallel and independent tasks in a flexible manner. This is induced by the fact that the said independent tasks can be completed without much interference with each other (C4, R3).

According to R4 from C3, the adapted waterfall model also promotes stability by minimising the amount of issues being uncovered at the end of the GSD project. The requirement engineering process is thus better handled, which would otherwise introduce budget and schedule overruns, as mentioned by Damian and Zowghi (2003). In C3 and C4, issues are instead uncovered right at the beginning, during the development of the small independent tasks. This further minimises uncertainty, by solely focusing on parts of the project which are currently being developed (C3, R4).

Based on the results from C4, it can be proposed that the adapted waterfall model also allows for optimised usage of the available resources. Instead of having people sitting idle and waiting for work, independent tasks are undertaken in parallel (C4, R4). Independent tasks may take the form of small independent projects which are simultaneously allocated to different teams. For instance, upon completion of the analysis work, system specifications documents are produced. These system specification documents may be delivered in parallel to both the design team for the use case development and to the testing teams test scripts development. Such optimisation of the GSD work process allows for faster and optimised project delivery and overcomes two major disadvantages of the conventional waterfall model, namely a high level of iterations (Curtis et al., 1987) and the lack of guidance on how to handle products and activities (Pfleeger & Atlee, 2006).

C3 flexibly adapted the waterfall model to overcome its long turnaround time (Curtis et al., 1987) by creating small prototypes for each independent project task. These



prototypes are then delivered to project sponsors. In doing so, the project visibility and the trust level are improved among the stakeholders, as all parties are aware of the work progress (C3, R3). R3 from C3 also mentioned that the adapted method further overcomes the issues generally introduced by the waterfall model by allowing for fast modifications of requirements at an early stage. When the customers and the project sponsors have access to early versions of the product, and suggestions and new requirements can be captured early on. Requirements issues and assumptions are thus reduced (C3, R3).

It can also be deduced from the study that, when employed in the proper cultural context, the rigorous aspect of the waterfall model can be used to match the cultural requirements of the dispersed sites. For instance, according to C2, the waterfall model suits cultures with low tolerance to uncertainty by allowing for proper planning right from the beginning of the projects. No risk is thus taken. The method also entices people to be more responsible and accountable for their work. In turn, rigor is perceived in the tight project management required when using the method. For instance, as many teams are busy working on various projects or projects tasks simultaneously, it calls for seamless and intensive planning to avoid project failures (C2, R2).

RUP

According to RUP users from C1, the methodology is perceived as being a very rigorous and standardised method which fits international standards like the CMMI and ISO 9001/2000 (C1, R1). Rigorous in nature, the method calls for the establishment of proper international standards across the sites. It provides tight control, enhances project quality, promotes resource management and deployment, traceability, and allows for effective and efficient project management (C1, R1). In line with Simons (2002), the study also reveals that RUP allows for continuous integration and build verification tests to help resolve integration problems at the end of the project (C1, R3).

Both C1 and C2 reveal that the rigorous amount of documentation and the tight approval mechanism provided by the method suit a GSD context having remotely located clients. For instance, when the stakeholders are regularly presented with sets of documentation, project visibility is enhanced, uncertainty is minimised and disagreements are avoided. In addition, through the exchange of documents across the sites, interaction is promoted and communication is enhanced (C1, R2;R3). However, in line with Simons (2002), R2 from C3 also acknowledges the importance of ensuring that all stakeholders are aware of those procedures. Only then can documentation management and project visibility



be effectively enhanced and uncertainty issues reduced. This has also been mentioned in past studies (Bass & Paulish, 2004; Kayworth & Leidner, 2000; Suchan & Hayzak, 2001).

Both C1 and C2 have, to some extent, adapted RUP in a flexible manner. For instance, it has been tailored to fit any GSD project, irrespective of the size (large or small) (C2, R3). Should the method have been employed in its original state, it would not be suitable for smaller projects due to the cumbersome amount of documentation being produced. The deep level of details expected within these documents would not be applicable for smaller projects. Consequently, being aware of this limitation, GSD practitioners from C2 and C1 have flexibly adapted the method to fit their needs by devising two different RUP versions which are used accordingly in both situations. A lighter version of RUP is thus used for smaller projects and the complete version is used for larger ones (C2, R3; C1, R2). Furthermore, being an iterative method, project delivery success is enhanced as some versions can still be delivered even when they have not yet been completed (C1, R2).

R1 from C2 also reported that RUP allows for easy work allocation to the correct job title, as each document is known to convey a specific type of information (analysis package, design package etc). This reveals another flexible aspect of RUP, and proves that the method fits the requirements set forth by past researchers about features of a good software development method. In essence, RUP provides visible and explicit mechanisms for coordination (feature specified by Boehm (1996) and Osterweil (1986)). By having the project broken down into small independent parts, it also contributes to minimising coordination and integration issues across the sites (feature prescribed by Parnas(1972)).

Prototyping

According to results from C3, the flexible aspect of the Prototyping method is revealed through its ability to gradually deliver several versions of the project application until finally reaching stability. Software engineers from C3 thus have the opportunity to research the optimal solution before committing to any version. This contributes to increased delivery speed for GSD projects. For instance, project owners or customers from the Mauritian case study (C3) are regularly provided with some insight on the end product at each delivery stage. In line with what was prescribed by Oberg, Probasco and Ericson (2000), this further allows for provide quick feedback to be provided on any required modifications or changes to requirements. The project is then completed at a faster pace (C3, R3). The method is



however best applicable to only some forms of projects (e.g. report development or projects involving high amount of research work).

6.3. Communication Coping Strategies

Communication is a major challenge faced by GSD companies (Herbsleb & Grinter, 1999) and South African and Mauritian offshore companies are no exceptions. The study reveals that effective communication practices have been devised to overcome communication issues in these particular contexts. According to the findings, some of these practices are in line with what have already been prescribed by previous researchers (e.g. Paasivaara & Lessenius, 2004; Maznevski & Chudoba, 2000; Herbsleb & Grinter, 1999). Others however, specifically seek to fulfil the particular communication and cultural needs of the people involved in the business. The range of communication practices employed is both flexible and rigorous, as shown in Appendix U.

Flexibility in the communication practices in place is first exhibited in the set up of the physical encounters or international meetings, which are held as early as possible in the project lifecycle, as reported by R2 from C3. These international meetings are useful as they increase the shared context and shared experiences among the team members. It therefore corroborates the theory of Cockburn (2002) and Kogut and Meito (2000). Such physical encounters may be undertaken quite early during the requirements elicitation phase, if stakeholders are unable to reach to an agreement (C1, R3). These meetings are also organised on ad-hoc basis whenever the need arises. They ease contact initiation among the team members and bridge the physical distance among them. This goes in line with the prescribed set of practices uncovered by previous studies, to promote the communication process during GSD (Paasivaara & Lessenius, 2004; Maznevski & Chudoba, 2000; Herbsleb & Grinter, 1999). In line with what was prescribed by Paasivaara & Lessenius (2004), results from the study also show that meetings may be held through video conferences or conference calls. Such forms of encounters also reduce misunderstandings and bridge geographical distance (C1, R2).

Another common communication practice within the South African and Mauritian GSD context is the establishment of foreign workers from the onshore site, to act as communication liaisons. Indeed, all the Mauritian and South African companies studied (C1, C2, C3 and C4), reported having used a communication liaison at some point. The role of the foreign worker is to improve the communication process by reducing language problems and minimising communication issues due to geographical distance and time difference (C1, R1;



C3, R2). Evidence from past literature also reveals the need for communication liaisons in order to achieve effective communication during GSD (Paasivaara, 2003).

Flexitime implementation is a well known practice to overcome the time difference and enhance the communication process among the dispersed team members of South Africa and Mauritius. The results however suggest that flexitime can only be implemented for customer facing team members, or when there is little or no time overlap across the sites (C2, R1; C1, R4). The nature of the job also impacts on the need for flexitime. For instance, it would be advisable for people involved in support or issue fixing to work on a flexitime basis, support work being more urgent than usual development work (C2, R3). However, none of the organisations reported using flexitime in such situation. Such a work format would have improved the feedback time between the developers and the customer as all parties would have been available for information exchange.

In the absence of flexitime implementation, the GSD teams studied seem to rely on proper planning to address the situation of concern (C2, R1). When communication is planned in advanced, it further facilitates the contact initiation, especially when two or more people from different locations are involved (C1, R4). South African and Mauritian GSD companies have thus learnt through past experiences and results from previous studies (Paasivaara & Lassenius, 2004; Herbsleb, Zubrow, Goldenson, Hayes, & Paulk, 2003) that planning needs to be carefully handled for the communication process to be successful.

It has also been uncovered during the study that the use of a formal communication style, professional and diplomatic tone of voice, and simple words understandable by all parties, help to avoid misunderstandings during the communication process (C2, R1). This entails that it is important for GSD practitioners to devise common set of practices, involving all of the above, to enhance the communication process. In addition, all stakeholders should be informed about this common communication scheme. This adds on to what has been prescribed by Mockus and Herbsleb (2001), which refers to the need for a common set of practice on how to answer the phone and respond to emails.

The study finally reveals a new way of flexibly maintaining the communication process, which has not yet been mentioned in past literatures. It relates to the communication strategy in place within one of the Mauritian organisations. As opposed to the body of knowledge which states that a high communication level has to be maintained at all costs (Robillard & Robillard 2000; Seaman, 1996), results from the study suggest that the minimisation of the communication level also proves to be successful. A communication



strategy only allowing team leaders at one site to communicate with project managers at other sites has proved to limit the risks of having communication issues and coordination issues. It is also a way of controlling the projects. It overcomes the time difference as only a limited number of people are allowed to communicate while the others do their work without much interruption. Developers are only allowed to contact dispersed team members in the absence of the team leader or during common video conference sessions. Such a scheme calls for tight work coordination as team leaders have to be fully aware of all the GSD issues and project issues being faced by the team members so as to communicate with the project managers at the dispersed sites (C3, R3).

6.4. Coping Strategies to Handle the Cultural Impact

The study reveals that culture is an external factor having a major impact on the GSD context. This goes in line with previous GSD studies which state that based on their culture, individuals have different attitude towards hierarchy, sense of time, communication style and structural needs (Perry, Staudenmayer, & Votta, 1994; Prickladnicki, Audy, & Evaristo, 2004). South African and Mauritian companies mostly employ cultural coping strategies relating to GSD Governance, Communication Practices, and Software Development practices.

The direct impact of GSD Governance on culture (see Figure 22) implies that through rigorous GSD Governance practices like uncertainty minimisation techniques (e.g. constant probing for information, documentation reviews, asking of precise questions), cultural differences among groups with high tolerance to uncertainty and others can be mediated. None of the previous GSD studies reviewed mentioned such a cultural coping strategy (C1, R1). This requires GSD practitioners to be well versed on their dispersed teams' cultural features in order to tune their GSD Governance practices towards meeting those needs.

Communication practices may also be used to overcome cultural disparities, as revealed by the direct link between the two variables (see Figure 22). For instance, a formal business style and a professional tone of voice can be used to mitigate cultural disparities arising from opposing communication style (e.g. franc and direct as opposed to diplomatic), (C1, R2). Results from C3 also reveal that another way of limiting negative cultural influences is to reduce the amount of communication among the team members. Mauritian GSD practitioners founded this strategy on the basis that if employees have no contact among each other, they should not perceive any cultural differences (C3, R1). Should such a strategy be employed, it must be supported by some other form of communication

mechanism to ensure that information flows freely across the sites and promote project visibility. This is achieved in C3 by having a strong communication link between one key person at the offshore site and the other dispersed team members onshore. None of the literature reviewed reported the use of such a method. The link between culture and communication practices implies that, if properly devised, communication can be used to reduce cultural differences.

As previously mentioned, the use of an appropriate software development method can also be used for that purpose. This entails that prior investigation on the dispersed sites' culture should be performed at some point. Results of this investigation could then be used to select the best software development method for that particular GSD context. Appendix G describes how specific software development methods may be effective for some specific forms of culture. This table was constructed based on the logical interpretation and comparison of the cultural description of the organisation studied (national, organisational, team and individual culture), and their respective software development method employed (C1, C2, C3).

Other methods employed by the Mauritian and the South African organisations include the use of cultural liaisons. These delegates, through previous cultural exposure, are aware of the cultural differences prevailing across the sites. Such practices have also been revealed in previous GSD studies (Kayworth & Leidner, 2000; Sarker & Sahay, 2002; Jarvenpaa & Leidner, 1999; Carmel & Agarwal, 2001). The above is summarised in Appendix V.

6.5. Coping Strategies to Overcome Elicitation and Communicating Requirements

In line with literature which defines the requirement engineering phase as being one of the main challenges for GSD projects (Prickladnicki, Audy, & Evaristo, 2004), South African and Mauritian companies came to the same conclusion. The study thus reveals that flexible and rigorous strategies have been devised to manage this requirement engineering process. These relate mostly to GSD Governance practices which have a direct positive impact on the GSD process issues (see Figure 22). In line with Karamouzis (2003), the study reveals that flexible approaches to resolve requirement issues are crucial. For instance, as was prescribed by Ramesh and Dennis (2002), regular international meetings aimed at improving the project's definition should be undertaken (C1, R3). This imparts that GSD practitioners should be ready to schedule international meetings on ad-hoc basis, whenever agreements cannot be reached or when confusion arises. Such meetings help in alleviating



requirement issues as the communication process is better handled face-to-face (C1, R3). The resulting communication channel is warmer, thus leading to richer and more productive encounters (C1, R4).

Rigorous forms of GSD Governance are also employed, as can be seen in all the cases studied. This is achieved through proper planning and regular status meetings, similar to what is prescribed by Herbsleb et al. (2003) and Prickladnicki, et al. (2004). Tight procedures including clearly delineated documentation format adopted across the sites, documentation sign-offs, formal review cycles, agreement seeking mechanisms and uncertainty minimisation procedures, are also employed (C1, C2, C3, and C4).

6.6. The People in GSD

Another major outcome of this study is that GSD Teams have a direct impact on the effective use of Software Development Practices. This link is revealed by the level of skills held by the GSD team members in using the software development method. According to R3 from C2, employees with poor skills reduce the effectiveness of the method and introduce unnecessary overheads in the whole process. For instance, the time taken to write some documentation might be unnecessarily increased and the quality of that documentation reduced, due to the lack of skills. Such a situation further increases the probability of having GSD failures or delays, as mentioned by R1 from C1. This implies that techniques have to be devised and put in place to constantly leverage the knowledge of GSD Team members. This corroborates the results from the study of Bass and Paulish (2004). Newly acquired skills compounded by the experience gathered through various projects are bound to promote GSD success in the long run. It would further maximise the benefits offered by the method.

The GSD team also has a direct impact on the use of the communication practices put in place across the dispersed sites. South African and Mauritian GSD team members demonstrate flexibility through the adaptation of their communication pattern to eventually enhance the communication process. For instance, fear or apprehension in communicating in a foreign language can be overcome, so as to improve the communication process and complete the task at hand (C3, R2). Without such an ability to adapt, whole process would have failed. This implies that to achieve success, it is important to hire GSD team members who are willing and able to constantly surpass their inner fears to promote GSD success.

The GSD team variable also impacts on the GSD Project, the GSD Process Issues and the GSD Value Issues (see Figure 22). For instance, GSD Process issues are introduced due to the lack of confidence while speaking and the poor understanding of the

chosen common language across the dispersed sites (C3, R4). It is therefore important to provide adequate language training and accent management courses to limit the likelihood of having GSD Process Issues. Another solution would be to hire employees already possessing these skills. Else, GSD project success would be hindered. The results suggest that team building exercises should also be put in place to promote the affiliation level among the dispersed team members. As can be seen from C4, these exercises leverage the bond between the team members and, depending of their willingness to cooperate with each other, promote GSD collaboration and success. In line with what was mentioned by Maznevski and Chudoba (2000), results from the study (C1, C2) also suggest that regular encounters among team members foster socialisation, trust and respect among team members. Travel must therefore be promoted for a working harmonious environment to be maintained.

6.7. Technologies for GSD

The study reveals that numerous technologies are currently being employed in the Mauritian and South African GSD context. This goes in line with what was prescribed by previous GSD studies that called for the use a wide range of tools across the dispersed sites (Carmel, 1999; Herring & Rees, 2001; Karolak, 1999). However, it appears that each organisation favours some specific tool, based on their infrastructure or communication needs (C3, R1). For instance, C3 mostly employed the video conference tool as opposed to the others who did not because of the costs that it entails. C1 mostly relied on conference calls while C2 on emails. However, a wide range of tools are still in use, each matching some specific form of communication requirements at some specific project phase, as shown in Appendix X.

The results therefore suggest that, the communication tool is chosen based on the tasks requirements. For instance, according to R3 from C3, the mail is used when some formal form of communication is required and when a record of the discussion thread has to be kept. It helps to promote agreement seeking across the sites by sending documentation, meeting agendas and minutes, among others (C1, R1). The phone and conference calls, which provide high level of interactivity, are appropriate for urgent project tasks (C1, R3; C2, R1) while the chat is used to have some quick response (C1, R2), without being bothered by the language accent. Project management tools improve collaboration process across the sites (C2, R2), as information can be conveyed through various means as stated by the Symbol Variety Theory. Finally, the remote desktop sharing is employed during issue fixing procedures (C3, R1) and the video conference when some form of documentation is required



(C3, R5). This implies that GSD practitioners are aware of their different communication needs, pertaining to the project type and the different project phases. Previous studies which informed on the level of richness, social presence, interactivity, symbol variety, rehearsability, and reprocessability of each of the tools (Daft, Lengel & Trevino, 1987; Massey, Hung, & Ramesh, 2001; Rogers, 1986; Dennis & Valacich, 1999) helped them in choosing the most appropriate one for each task. Having been involved in GSD for quite some time, past experiences probably lead them to rigorously employ each of these tools in the right context to enhance the communication process.

According to the results, it seems that communication technologies can also be flexibly employed to counteract the limitations of other tools. For instance, past studies state that email is an asynchronous tool which is not appropriate when there is a big time difference (Kiel, 2003). It sometimes increases the level of difficulty in properly conveying the message (Kayworth & Leidner, 2000). In this case, GSD team members resolve to the phone to urgently obtain the required information, as the tool provides high level of interactivity. (C2, R1). This implies that, as prescribed by previous studies (Carmel, 1999; Herring & Rees, 2001; Karolak, 1999), a wide range of tools should always be available, each conveying the right amount of richness, social presence and interactivity. The above is summarised in Appendix X.

From this discussion, it can be concluded that, in spite of facing numerous challenges, GSD practitioners have devised several ways to overcome communication and cultural issues. Software development methods have been adapted to fit specific cultural contexts and mediate negative influences of differing cultural affiliations. Numerous communication coping strategies have been set up, ranging from unlimited communication to restricted communication channel, as well as the use of cultural coping strategies like the use of cultural liaisons. Restricted communication channel can also mediate cultural challenges. It has also been demonstrated that the people play a crucial role in GSD and have to be carefully selected, with the right set of characteristics and expertise level. Finally, a wide palette of tools is being employed during the GSD work process, because of the different levels and forms of cues conveyed them. Each organisation favours one particular tool over the other, as they all have differing communication needs, work processes, and infrastructures. The final chapter concludes this paper and provides an overview of the research outcome in relation to the research questions. Implications for future research are also mentioned.



CONCLUSION

GSD is now a well established practice in the Mauritian and South African contexts. As demonstrated in the study, countries like Denmark, Belgium, UK, the US, Canada, France, and India, have invested there and are successfully undertaking global software projects. Constantly surrounded by numerous challenges, these organisations follow well-devised set practices to drive the GSD projects towards success. High diligence level and commitment are also perceived from the GSD team members.

The primary objective of this study was to uncover how GSD is being practiced in the Mauritian and South African contexts, through the use of communication and cultural coping strategies. The study achieves this objective by generating a theory through the application of the Grounded Theory techniques for analysis (Stauss & Corbin, 1998). Grounded Theory is however highly iterative in nature, and comes with cumbersome guidelines. Therefore, in addition to developing a new theory on GSD, the study also contributes to the Grounded Theory method by successfully merging it with a more inductive approach, explained by Thomas (2003). The resulting approach proved to be valuable especially since the researcher had no prior experience in the use of the Grounded Theory techniques. Being more lightweight and easier to follow, the inductive approach greatly facilitated the researcher's learning curve.

7.1. Research Outcome

The following research questions were posed at the beginning of this thesis:

Primary research questions

- 1 In what ways should GSD programs be designed to counteract the issues/problems/situations of concern being experienced within GSD in South Africa and Mauritius?

Secondary research questions

- 1 How can differing cultural and communication affiliations that prevail among the countries involved be mediated?
- 2 To what extent are the communication tools available for GSD collaboration effective in the Mauritian and South African context?



The outcome of this research is the emergence of a framework of categories and the relationship between them, as a set of propositions. The theory aims at supporting and enriching the existing body of knowledge on GSD, more particularly for the Mauritian and South African context. It also aims at providing guidelines to practitioners on how to best conduct GSD by enhancing their current mode of operation and achieve success faster. Such guidelines mostly relate to cultural and communication coping strategies.

The primary research question is first answered through the direct link emanating from the “Software Development Practices” category towards the “GSD Project” category and the “Culture” category respectively, as outlined in the final research framework (see Figure 22). These links demonstrate that software development methods, when adequately chosen, may be used to mediate cultural differences. In particular, the resulting theory suggests that different methods seem to be best suited to fit specific cultural traits. For instance, the waterfall model serves best for cultures with low tolerance to uncertainty while the prototype model fits cultures with high inclinations towards work precisions. RUP might be used to drive cultures with high tolerance to uncertainty into paying more attention to details.

The theory further suggests that in the GSD context, the two main characteristics of a good software development method is its adaptability level, and its potential to allow for quick project delivery. The adaptability level implies that the method should allow the developers to only utilise relevant aspects of the methodology, which are best fitted to the GSD context. Quick delivery can either be achieved through quick feedback from stakeholders or through the creation of prototypes through iterative software development. In doing so, project visibility is enhanced, and project success is promoted.

Secondary research question 1 is first answered through the links emanating from the “Communication Practices” category towards the “GSD Governance” category (see Figure 22). This indicates that GSD practitioners have devised various communication practices to overcome both cultural and communication disparities. These range from having a maximum amount of communication across all organisational levels, to restricting the communication process between only team leaders and project managers across dispersed sites. The second form of communication overcomes both cultural and communication issues on the basis that if there is no interactions between individuals, issues cannot occur. However, such a method calls for tight control to ensure that information still flows throughout the dispersed sites, in spite of being through a restricted communication channel.



GSD Governance covers a wide range of practices aimed at overcoming several GSD Value and GSD Process issues. These practices have been devised from past GSD experiences, be it past successes or past failures. The major GSD Governance practice aimed at overcoming cultural and communication disparities involve precise uncertainty minimisation techniques, documentation reviews, constant probing for details, among others.

A major area in which South African and Mauritian GSD practitioners spend a lot of effort and money is the requirements elicitation stage. All cases strive to minimise requirements issues through various practices including international meetings, tight project planning, constant reviews, as summarized in Appendix W.

In addition to methods and practices put in place to promote GSD, the proposed theory state that, competent staff/people should be available to professionally perform the work. Based on what has been reported in the case studies, the study uncovers characteristics of the ideal GSD team member. For instance, irrespective of the job title, it is required of a GSD staff to be able to work both individually and in group, and to have the ability to adapt to various situations. Furthermore, a high expertise level is determinant. Such level of expertise should be constantly promoted through training, to leverage the benefits obtained from the methods and practices in place within the organisation. Otherwise, unnecessary overheads could be introduced as the staff would not be competent enough to efficiently employ these methods.

Answers to the secondary question 2 are revealed in the manner in which the “Technology” category holds all the other categories together in the final framework (see Figure 22). According to the results, in the absence of adequate technologies, the whole GSD process would not be feasible. In essence, GSD case studies employ a wide range of tools, each suited for one specific form of communication or task. As such, provided that the infrastructure (communication lines) is satisfactory and provided that the right tool is employed, the communication process should not fail and minimal issues should be encountered.

7.2. Implications for Future Research

The study also uncovered two other findings not directly related to the research questions. They relate to testing management and issue management. Issue management takes the form of issue escalation, issue prevention, and issue fixing. All cases report the use of some form of issue prevention mechanism throughout the project. It is therefore important for future GSD research to investigate on the optimal ways to handle the issue fixing



mechanisms during GSD. For instance, how should one select the best site for issue fixing? Should it be performed at the development site, the implementation site, or both? Issues sometimes arise on ad-hoc basis during support work and employees may not be available for work because of the time difference. What would be the best coping strategy in that case? These unanswered questions suggest that strategies have to be devised to support GSD issue fixing work in the smoothest and most efficient manner.

Support work goes in line with testing work. Similarly to the requirement engineering phase, the testing phase is a rich area that could be further explored in the GSD context. Future studies could focus on how to best implement testing mechanisms within that context. The study already reveals some practices that are in place for that purpose. These include the use of testing competency centres, testing performed solely by the team leaders, or the establishment of testing experts at the implementation or customer site. Each of these methods conveys specific advantages and disadvantages which need further investigation.

Many issues are being encountered during GSD but the mechanisms in place to overcome those issues seem to be very effective. Mauritian and South African GSD organisations have learnt, through previous years, to adapt to their environment. They are constantly devising new means to improve their work conditions and promote GSD success. They learnt from their mistakes, and past failures and are now using some good standards which are effectively promoting GSD success. However, many issues still prevail and cannot be avoided in spite of the rigid set of practices in place within the organisations. Organisations wishing to embark on GSD should therefore ensure that they are aware of: what tool should be used and under what circumstances, the most adequate software development method to be employed based on their cultural requirements, the different communication coping strategies available, the best set of standards and practices, and what kind of people to employ for their projects. Answers to these questions are found in this study, and might hopefully be useful to GSD practitioners in the Mauritian and South African context.



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APPENDICES

Appendix A: Distance, Communication, and Control Opportunities

		Distance Dimension		
		Temporal Distance	Geographical Distance	Socio-cultural distance
Impact on GSD process	Communication	+ Improved record of communications	+Potential for closer proximity to market and utilisation of remote skilled workforces	+ Potential for stimulating innovation and sharing best practice
		- Reduced Opportunities for synchronous communication	- Increased cost and logistics of holding face-to-face meetings	- Risk for misunderstanding
	Coordination	+ Decreased coordination needs due to division of labour	+ Increase in size and skills of labour pool can offer more flexible coordination planning	+ Access to rich skill set and various practices
		- Increased coordination costs	- Reduced informal contact can lead to lack of task awareness	- Inconsistency in work practices can impinge on effective coordination, as can reduced cooperation through misunderstanding
	Control	+ Opportunities for round the clock development	+ Communication channels often leave an audit trail	+ Access to rich skill set and authority
		- Management of project artefacts may be subject to delays	- Difficult to convey vision and strategy	- Different perceptions of authority/hierarchy can undermine morale

Table 80 - Distance, Communication, and Control Opportunities

Note: +(plus sign) indicates an opportunity; - (minus sign) indicates a challenge

(Agerfalk et al., 2005).



Appendix B: Actions and Support for Communication

Structure	Actions	Support for Communication
Organisational structure with communicating roles	- Create roles - Link communicating roles between organisations - Make organisation chart with roles and contact info easily available	- Roles include communication requirements and identify which roles need to communicate with each other between companies - Roles and organisation chart makes it easier to know whom to contact
Inter-organisational process	- Synchronise the main process milestones between organisations - Use iteration cycles of similar lengths and frequent builds.	- Milestones synchronise communication - Several iteration cycles and builds create transparency, and facilitate follow-up and communication
Project level coordination	- Create a project level steering group with members from all organisations and sites - Arrange inter-organisational groups with weekly (teleconference) meetings	- Meetings (face-to-face / video- / teleconference) facilitate problem solving and decision making, they provide transparency and facilitate later electronic communication.

Table 81 - Actions and support for communication

(Paasivaa, 2003)



Appendix C: Communication Tools

Tool	General details
Email	Email being an asynchronous mode of communication is not an appropriate tool when there is big time difference among (Kiel, 2003) Relying solely on email increases the level of difficulty encountered during communication (Kayworth & Leidner, 2000).
Video Conference	When linguistic and cultural differences are present, the following issues are amplified (Kiel, 2003): ❖ Awkward form of dialogue ❖ Difficult to control speaking order resulting in people frequently talking over one another ❖ Equipment problem in one location can makes it hard to understand individuals at the other site
Chat	❖ Higher levels of frustrations, perhaps due to greater mental demands and the necessity to exert significantly more effort due to the nature of computer-mediated communication (Graetz, Boyle, Kimble, Thompson, & Garloch 1998)
Groupware	❖ More than just electronic messaging systems ❖ It integrates electronic messaging with screen sharing, group scheduling, meeting support, group writing, and other applications ❖ Dissolve distance and time so that people from diverse cultures can work together profitably. ❖ Features support team leadership, facilitate group processing, and extends the team's technical and managerial competence. E.g. IBM Lotus Notes ❖ Facilitates efficient and accurate sharing of ideas, streamlines processes, and makes parallel task execution possible ❖ Help group members to learn from each others experience and expertise (Boudreau, Loch, Robey, & Straub, 1998)

Table 82 - Communication tools

Appendix D: Individualist and Collectivist Cultures Characteristics

Individualist Cultures

The needs, values and goals of the individual take precedence over the needs, values and goals of the group

Less concerned with self-categorisation

Less influenced by group membership

Engage in more open and precise communication

Higher willingness to respond to ambiguous messages

Ties between people are loose and self-understanding is based on individuals' own actions, which are usually taken independently of what others think.

Collectivist Cultures

The needs, values and goals of the group take precedence over the needs, values and goals of the individual

More concerned with self-categorisation

More influenced by group membership

Engage in less precise and open communication

Less willingness to respond to ambiguous messages

People are integrated into strong cohesive groups and individuals base their understanding on the reaction of others around them.

Table 83 - Individualist and Collectivist cultures characteristics

(Hofstede, 1980; Gudykunst & Matsumoto, 1996)

Appendix E: Uncertainty Avoidance Cultures Characteristics

Low UAI

Scepticism to technological solution

Tolerance in ambiguity in structures and procedures

Precision and punctuality have to be learned and managed

Relationship orientated

Flexible working hours not appealing

High UAI

Strong appeal to technological solution

Highly formalised conception of management

Precision and punctuality come naturally

Task orientated

Flexible working hours popular

Table 84 - Uncertainty Avoidance cultures characteristics

(Hofstede, 2001).



Appendix F: Communication Contextuality Cultures Characteristics

High CC Cultures

Communication is implicit

Information is more conveyed by the context than by the verbal expression

Low CC Cultures

Communication is explicit and overt, stating facts exactly and in details

Facts are stated exactly and in details

Table 85 - Communication Contextuality cultures characteristics

(Hall, 1976; Levine, 1985; Gudykunst et al., 1996)

Appendix G: Culture and Software Development Methods

Monolithic Processes	Cultural dimension	Features	Cultural Dimension Features	Case Cultural description
Waterfall	High IDV	Modularity can be achieved and not much communication is thus required	<i>Ties between people are loose and self understanding</i> <i>Engage in more open and precise communication</i>	<u>C3 - National culture (France)</u> - Friendly <u>C3 - National culture (Mauritius)</u> - Diplomatic - Laid back <u>C3 - National culture (France)</u> - Franc and Direct - Always ask questions whenever required <u>C3 – National culture (Mauritius)</u> - Not very direct (contradicting)
Prototyping	Low IDV	Ensure that that the customer, user and developer have a common understanding of the problem.	<i>People are integrated into strong cohesive groups and base their understanding on the reaction of others around them</i>	<u>C3 – National culture (France)</u> - Team work oriented <u>C3 – National culture (Mauritius)</u> - Diplomatic



Waterfall	High UAI	Documentation needs to be produced at the end of each phase	<i>Precision and punctuality comes naturally</i>	<u>C3 - National culture (France)</u> - Everything has to be perfect - Precise (no approximation) - Do not tolerate uncertainty and ambiguity - Quality Oriented <u>C3 – National Culture (Mauritius)</u> - Not very precise (contradicting)
Prototyping		Primary goal is to reduce uncertainty in development Part of the system is implemented quickly to clarify issues	<i>Highly formalised conception of management</i> <i>Task oriented</i>	<u>C3 - National Culture (France)</u> - Strong hierarchical structure - Methodical - Strict <u>C3 - National Culture (France)</u> - Everything has to be perfect
Waterfall Prototyping	Low CC	Little consideration about the shared context with the end-user Requires documentation	<i>Facts are stated exactly and in details</i>	<u>C3 - National Culture (France)</u> - Have a lot of rules in place - Precise
Waterfall Prototype	Job-Oriented	Ensure that that the customer, user and developer have a common understanding of the problem.	<i>Focus is on getting the job done</i>	<u>C3 Organisational culture</u> - work schedule oriented - No time wasting
Waterfall	Process Oriented	Documentation needs to be produced at the end of each phase	<i>Risk avoiding individuals</i>	<u>C3 Organisational culture</u> - Do not tolerate uncertainty and



				ambiguity
				- Standard oriented
Prototyping	Risk avoiding	Primary goal is to reduce uncertainty in development	<i>Risk avoiding individuals</i>	<u>C3 Organisational culture</u> - Minimise bugs - Security Oriented
Waterfall Prototyping	Pragmatic	Emphasis is on satisfying customers requirements	<i>Major emphasis is on customers needs</i>	<u>C3 Organisational culture</u> - Satisfy the customers - Proud of product - Proud of their work
Iterative and Incremental	Cultural dimension	Feature	Cultural Dimension Feature	
UP	Low IDV	Ensure that that the customer, user and developer have a common understanding of the problem Promote close collaboration across job titles (E.g. architects and engineers) Provides history of what has been agreed upon Provides structure and people cannot fold things their own way due to evidence. Involves several iterations involving analysis, design, coding, which requires high level of team involvement Reliability	<i>Needs values of the group takes precedence over needs values of the individual</i>	<u>C1 – National Culture (SA)</u> - Able to adapt - Loyal team members - Trust among the individuals - High team spirit - Familiar and comfortable with each other <u>C1 – National culture (Denmark)</u> - Over assertive (contradicting) - Come with force (contradicting) - Dictatorial (contradicting) - Forceful (contradicting) <u>C2 – National Culture (UK)</u> - Eager to help - Promote people



Efficiency			values
			<u>C2 – National culture (US)</u>
			- Not eager to help (contradicting)
UP	High UAI	Primary goal is to reduce uncertainty in development Part of the system is implemented quickly to clarify issue Speed of delivery Tight control Traceability Constant interaction Facilitates review, sign-off Promotes collaboration across sites Formalises things Project visibility	<i>Task oriented</i> <i>Precision and punctuality comes naturally</i> <u>C1 – National Culture (Denmark)</u> - Strict - Meticulous <u>C1 – National Culture (Belgium)</u> - Work Oriented <u>C1 – National Culture (US)</u> - Result oriented <u>C1 – National Culture (Canada)</u> - Task Oriented - Work dedicated <u>C1 – National Culture (Denmark)</u> - Schedule Oriented - No tolerance to uncertainty - Meticulous - Rigid - Precise <u>C1 – National Culture (UK)</u> - Allow uncertainty (contradicting) - Strict <u>C1 – National Culture (Belgium)</u> - Strict



C1 – National Culture (US)

- Clearly understood

C1 – National Culture (Mauritius)

- Not very precise (contradicting)

C1 – T2 team culture

- Striving for excellence (TC)

Highly formalised conception of management

C1 – National culture (Denmark)

- Formal office environment

C1 – National culture (SA)

- Hierarchical management style
- Follow processes and methodologies

C1 – National culture (UK)

- Abide to principles

C1 – National culture (Belgium)

- Formal

UP	Low CC	Little consideration about the shared context with the end-user	<i>Facts are stated exactly and in details</i> <i>Communication needs to be explicit and overt</i>	<u>C1 – National culture (Denmark)</u> - Meticulous, Precise <u>C1 – National culture (UK)</u> - To the point
UP	Employee Oriented	Ensure that that the customer, user and developer have a common understanding of the problem Involves several	- Favours concerns for people	<u>C1 organisational culture</u> - Harmonious - Demonstrate constant caring - Trust among



	iterations involving analysis, design, coding, which requires high level of team involvement		individuals - Individual empowerment <u>C2 organisational culture</u> - Promote people values - Promote employees happiness
Process oriented	Primary goal is to reduce uncertainty in development Part of the system is implemented quickly to clarify issues	- Perceive themselves as being risk avoiding	<u>C1 Organisational culture</u> - Restrictive
Pragmatic	Emphasis is on satisfying customers requirements	- Major emphasis is on customers needs	<u>C1 Organisational culture</u> - Customer focused - Professional but relaxed - Delivery focused - Quality focused <u>C2 Organisational culture</u> - Customer focused

Table 86 - National culture and software development methods

Appendix H: Interview Questions

Primary RESEARCH QUESTION	<i>In what ways should GSD programs be designed to counteract the issues/problems/situations of concern being experienced within GSD in South Africa and Mauritius?</i>
Objective 1	The ways in which GSD programs should be designed to counteract the issues/problems/situations of concern being experienced within GSD in South Africa and Mauritius?
Interview Questions	SECTION 2: Software Development Methods ❖ What documentation do you have? ❖ Can you please describe the purpose of these documentations?



- ❖ How is the development work organised throughout the dispersed sites (analysis, design, coding, testing, etc.)?
- ❖ What software development methods do you use?
- ❖ How effective are these methods and how do you benefit from using them?
- ❖ What specific features of the method would you qualify as being advantageous to GSD? How is that so?
- ❖ What specific problems do you encounter with these methods?
- ❖ Do you use several methods?
- ❖ If yes, which methods do you prefer?
- ❖ Do you follow the same work process management than in the foreign teams?
- ❖ Does the method require the team members to work in close collaboration, as opposed to individually? Does this suit your needs?
- ❖ To what extent does the method tolerate uncertainty and ambiguity? Does it suit you?
- ❖ Does the method allow you to specify the facts clearly and precisely or does it leaves room for information to be extracted from the shared context?

Objective 2

- ❖ How is GSD being practiced within South African and Mauritian offshore companies and what specific coping strategies have been devised within these context to overcome and prevent GSD issues.
- ❖ The possible benefits drawn from some form of communication and practices within the GSD context might also be revealed. Furthermore, the resulting possibility of improving the situations of concern will then be exposed

Interview Questions**SECTION 4: GSD PRACTICE**

- ❖ Have the team members ever met? Under what circumstances?
- ❖ Do you have different communication needs at different project phases? If yes, what are they and to what phases do they refer to and how do you meet those needs?
- ❖ How do you overcome the work coordination issues?
- ❖ How do you overcome the time difference?
- ❖ How do you overcome the requirement engineering issues?
- ❖ Have all your team members participated in the same projects?

Secondary Research Questions 1

What are the consequences of differing cultural and communication affiliations that prevail among the countries involved, including Mauritius and South Africa?

Objective 3

- ❖ Issues identified in the South African and Mauritian context will be



reported. These will then be singularly or in combination, compared to the global issues being experienced

Interview Questions

SECTION 3: GSD Issues

- ❖ Discuss about the main problems that you personally encounter when working in Global Software Development?

Communication

What are the barriers that according to you hinder proper communication?

Coordination

Do you encounter any work coordination issues? What are they?

Distance

Are you affected by the time difference in your team? Why / How?

Requirements Engineering

Would you say the requirements engineering is an issue in your offshore environment?

Standards and well-defined software processes

Do you encounter any difficulties due to lack of proper standards?

Secondary Research Question 2

To what extent are the communication tools available for GSD collaboration effective in the Mauritian and South African context?

Objective 4

To determine the effectiveness of the technologies employed within the Mauritian and South African GSD context.

Interview Questions

SECTION 5: Technology

- ❖ What communication technologies do you usually use for distributed communication?
- ❖ Do you enjoy real-time interactions?
- ❖ How often and under what circumstances do you use each of the tools?
- ❖ Are the tools efficient in meeting your communication requirements?
- ❖ Are the tools efficient in meeting the communication requirements while using different software development methods?
- ❖ If not, what specific problems do you encounter with each tool?
- ❖ According to you, why are the tools efficient / not efficient in providing effective communication?
- ❖ Explain the use of each tool?

General Case Description

SECTION 1: Company / Team information

- ❖ What do you do? What services do you provide?
- ❖ How many branches do you have in Cape Town / South Africa?
- ❖ Since when have you been implemented in Cape Town? (Give the year or



a brief history)

- ❖ With how many countries do you work with in total? (I.e. where are your clients located? What are those countries?)
- ❖ Why is GSD being pursued?
- ❖ Can you please tell me about your team? What are you involved in? (Name, purpose etc.)
- ❖ How many members are there in your team?
- ❖ What is the nationality of your team members? (foreign and local)
- ❖ What is your job title?

Table 87 - Interview Questions



Appendix I: Sample of Open Coding sheet

Case	Interviewee	Question Name	Interview Statement	Paragraph	line	Concept/Property	Dimensions	Category
1	1	You've already told me that you've got more than two teams	I have more than two teams because I have more than 2 customers.	1	1	Team-Customer-culture Dedication	little Complete	Strategies to overcome cultural issues
1	1	But its two different styles of management, how do you cope with that? (culturally speaking)	That is why we have different teams	14	1	Team-Customer-culture Dedication	little Complete	Strategies to overcome cultural issues
1	1	You have one specific team for one specific customer?	Yes, because the customer preferences are different . In terms of technology, in terms of environment, in terms of maturity, [the approach there is], communication strategy etc. are completely different. People are different.	3	1	Team-customer-preference dedication	little Complete	Strategies to overcome cultural issues

Table 88 - Sample Open Coding sheet



Appendix J: Full Category Hierarchy Listing

Meta-Category	Category	Concept / Property	
Communication Practices	Communication among team members	Communication need [<i>Random Phases – Specific Phases</i>]	
		Ease of contact initiation [<i>Easy – Difficult</i>]	
		Employees physical proximity [<i>Different countries – Same Room</i>]	
		Number of communicants [2 – <i>Unlimited</i>]	
		Physical encounters among teams [<i>Never – Frequent</i>]	
	Communication channel description	Communication channel [<i>Dry – Warm</i>]	
		Communication level [<i>Minimal – Constant</i>]	
		Communication style [<i>Informal – High Business Style</i>]	
		Information filter through [<i>Completely wrong Information filtered through – Correct information filtered through</i>]	
		News type [<i>Good – Bad</i>]	
	Communication facilitators	Flexi-time implementation level [<i>Minimal flexi-time – Maximum flexi-time</i>]	
		Foreign worker establishment [<i>Permanently – Temporarily</i>]	
		Physical encounters importance [<i>Not important – Really important</i>]	
	Communication strategy	Common language [<i>Different language used – Common language used</i>]	
		Communication planning [<i>No planned communication – Planned communication</i>]	
		Email response time [<i>1 hour – 5 days</i>]	
		Team-customer-communication strategy [<i>Contact with external customer allowed – contact with external customer not allowed</i>]	
Culture	Cues transmission communication	Perception of efforts [<i>No perception of efforts – Complete perception of efforts</i>] Reassurance level [<i>Little – High amount</i>]	
	Individual culture	Individual culture description [<i>Minimal characteristics – Strong characteristics</i>] Individual culture prevalence level [<i>Minimal – Maximal</i>]	
		National culture	National cultural prevalence level [<i>No prevalence – High level of prevalence</i>]
	Organisational culture	Organisational culture prevalence level [<i>No prevalence – High level of prevalence</i>] Organisational values [<i>Not influenced by – Highly influenced by</i>]	
		Cultural issues	Cultural difference impact [<i>Little amount of cultural issues – High amount of cultural issues</i>]
	Collaboration process	Collaboration across site [<i>Minimal collaboration – Close collaboration</i>]	
	Competency Centre	Best Practice oriented [<i>Minimal best practice – Complete</i>] Procedure oriented [<i>Minimal procedure in place – Complete procedure in place</i>]	
		Documentation management	Documentation [<i>Little – Complete</i>] Documentation quality [<i>Low quality – Very well written</i>] Documentation sharing [<i>Little – Complete</i>] Documentation versioning [<i>No versioning – 100% versioning</i>]
	GSD Work		Work format [<i>Contract based - Unofficial</i>] Work hours [<i>7h – 7.5h</i>]



International meetings	Foreign team delegate selection [<i>Randomly – Key persons</i>]
	Foreign team delegates visit frequency [<i>Very seldom – Frequently</i>]
	International meeting duration [<i>1 day – As long as required</i>]
	International meeting frequency [<i>Once – Unlimited</i>]
	International meeting purpose [<i>Random meeting – Specific purpose</i>]
	International meeting site [<i>Onshore – Offshore</i>]
	International meeting stage [<i>Rarely – At each project stage</i>]
	Number of Foreign team delegates [<i>One – Two many</i>]
Issue Management	Issue fixing [<i>Easy – Difficult</i>]
	Issue prevention [<i>Little – Complete</i>]
Management	Management level [<i>Onshore – Offshore</i>]
	Management style [<i>Collaborative – Dictatorial</i>]
Meetings	Meeting minutes [<i>Rarely taken – Regularly taken</i>]
	Project meetings [<i>Rarely – Frequently</i>]
Planning	Meeting planning [<i>Unplanned – Planned</i>]
	Project planning [<i>Minimal – High level of planning</i>]
Project management process	Project deadline management [<i>Local team – Foreign team</i>]
	Project management [<i>Minimal – Tightly</i>]
Requirements management	Requirements details [<i>Poor – High quality</i>]
Resource Management	Additional resources [<i>Not available – Available</i>]
	Project task allocation [<i>Undefined – Well-defined</i>]
	Project task allocation site [<i>Onshore – Offshore</i>]
	Work re-allocation [<i>Never – Often</i>]
Testing Management	Error recording efficiency [<i>Low – High</i>]
	Testing procedures [<i>Poor – Excellent</i>]
Training	Use of a mentor [<i>Little – Level of use</i>]
Work process	Agreement seeking procedure [<i>Little – Complete</i>]
	Procedure across dispersed sites [<i>Same procedure – Different procedure</i>]
	Similar standards followed by foreign team [<i>Completely different standards followed – Similar standards followed</i>]
	Standard processes [<i>No standards in place – 100% standards in place</i>]
	Uncertainty minimisation [<i>Little – Complete</i>]
Work site	Analysis site [<i>Onshore – Offshore</i>]
	Customer site [<i>Onshore – Offshore</i>]
	Design site [<i>Onshore – Offshore</i>]
	Development site [<i>Onshore – Offshore</i>]
	Requirements elicitation location [<i>Onshore – Offshore</i>]
	Specification writing site [<i>Onshore – Offshore</i>]
	Testing site [<i>Onshore – Offshore</i>]



GSD Process Issues	Communication inhibitors	Concepts misunderstanding within documentation [<i>Low level of misinterpretation – High level of misinterpretation</i>] Foreign language difference [<i>Minimal – Frequent</i>] Foreign language issues [<i>Minimal – Frequent</i>] Language Accent [<i>Lousy – Easily understood</i>] Mother tongue influence [<i>Minimal influence – High level of influence</i>] Spoken language [<i>Easy – Hard</i>]
	Communication issues	Assumptions [<i>Minimal – 100%</i>] Communication delays [<i>Little delays – High amount of delays</i>] Communication Issues type [<i>Minimal – Maximal</i>] Information loss [<i>Minimal – 100%</i>] Language interpretation issues [<i>High level of misinterpretation – Low level of misinterpretation</i>]
	Coordination issues	Coordination issues [<i>Minimal – Maximum</i>] Feedback time [<i>Slow - Fast</i>] Geographical distance [<i>Small – Big</i>] Meeting planning effectiveness [<i>Easy – Highly difficult</i>] Planning issues [<i>Minimal – Maximum</i>] Priority issues [<i>No priority issues – Frequent priority issues</i>] Time difference [<i>No time difference – 24 hours</i>] Work interruptions [<i>Minimal – Frequent</i>]
	GSD Software development issues	Backlogs [<i>Minimal – High amount of</i>] Deadline issues [<i>No issues – High amount of issues</i>] Development issues [<i>Minimal – High amount of issues</i>] GSD Project delays [<i>Minimum – Maximum</i>] Requirements issues [<i>No issues – High amount of issues</i>]
GSD Project	GSD Project	Dependency of delivery [<i>Minimal dependency – High amount of dependency</i>] GSD Project phases [<i>Single phase – Multiple phase</i>] People involved [<i>Little amount of people involved – High number of people involved</i>] Project complexity [<i>Simple – Very complex</i>] Project hours attributed [<i>Predefined and fixed – Not defined and varied</i>] Project importance [<i>Minor – High</i>] Project size [<i>Small – Very large</i>] Project structure [<i>Refined – One big project</i>] Project task [<i>Random – Specific</i>] Project type [<i>Internal – External</i>] Project urgency [<i>Urgent – Very Urgent</i>] Project visibility [<i>No visibility – Complete visibility</i>] Time frame delivery [<i>Limited – Unlimited</i>] Work type [<i>Communication tasks – Technical tasks</i>]



GSD Team	GSD Project success	Productivity [<i>Low – High</i>] Project delivery speed [<i>Low – High</i>] Quality [<i>Low quality – High quality</i>]
	GSD Team relationship promotion	Employee well-being promotion techniques [<i>No techniques in place – Maximum technique in place</i>] Team building exercise [<i>Minimal – Highly emphasised</i>]
	Team member experience	Accent familiarity [<i>Low – Familiar</i>] Personal experience [<i>Little – High amount</i>] Project experience [<i>Little – High</i>] Trust improvement [<i>Minimal improvement – Complete improvement</i>] Development tool knowledge [<i>Poor – Excellent</i>] Employees skills in using methods [<i>Little – Very skilful</i>] Level of expertise [<i>No expertise – Experts</i>] Product knowledge [<i>No product knowledge – Complete product knowledge</i>]
	Team members characteristics	Adaptability of offshore team members [<i>Low adaptability – High adaptability</i>] Employee confidence [<i>Low – High</i>] Employee motivation level [<i>Low – High</i>] Job title [<i>Analyst – Developer</i>] Real time interaction preference [<i>No real time interactions – Real time interactions</i>] Rule abiding [<i>Enjoys – Not enjoy</i>] Team member independence level [<i>Highly independent – High level of team work</i>] Team member uncertainty acceptance [<i>No acceptance – 100% acceptance</i>] Understanding of foreign language [<i>No understanding – High level of understanding</i>] Work dedication [<i>Minimal – Maximum</i>] Recruitment method [<i>Random – Profile-oriented</i>]
	Team structure	Affiliation level [<i>High level of affiliation – Low level of affiliation</i>] Competency Centres [<i>Minimal – Complete</i>] Customer facing team [<i>Non customer facing – Customer facing</i>] Multicultural team [<i>Single culture – Multiple culture</i>] Team age [<i>New – Old</i>] Team size [<i>Small – Big</i>]
	GSD Trust Issues	Trust level [<i>Low level of trust – High level of trust</i>] Work redundancy [<i>Minimal – High level</i>]
	Missing visual cues	Cues transmission [<i>Little – Complete</i>] Feelings and emotions filter through [<i>Missing – Filters through</i>]
	Uncertainty issues	Uncertainty level [<i>Low level of uncertainty – High level of uncertainty</i>]
	Work interaction issues	Collaboration issues [<i>Minimal collaboration issues – High amount of collaboration issues</i>] Cooperation issues [<i>Minimal – High amount</i>]
	GSD Value issues	



Software Development Practices	Adapted waterfall	Method effectiveness level for GSD [<i>Ineffective – 100% Effective</i>]
		Software development method disadvantage [<i>Minimal – Maximal</i>]
	Prototyping	Iteration length [<i>1 – Unlimited</i>]
		Method effectiveness level for GSD [<i>Ineffective – 100% Effective</i>]
	RUP	Best Practice oriented [<i>Minimal best practice – Complete</i>]
		Ease of adaptability [<i>Hard – Easily adapted</i>]
		Method effectiveness level for GSD [<i>Ineffective – 100% Effective</i>]
		Method standard [<i>No standards met – Very up to standard</i>]
		Methodology learning curve [<i>Low – High</i>]
		Percentage of use of components [<i>Little – 100%</i>]
Technology		Project delivery speed [<i>Low – High</i>]
		Uncertainty minimisation [<i>Low – High</i>]
	Software development methods	Phases [<i>Single – Multiple</i>]
		Software development approach [<i>No task breakdown – phased</i>]
		Software development choice [<i>Random – Targeted</i>]
		Software development process acceptance [<i>Little – 100%</i>]
	Waterfall	Percentage of use of components [<i>Little – 100%</i>]
		Software development method disadvantages [<i>Minimal – Maximal</i>]
	Chat	Feedback time [<i>Very slow – Very fast</i>]
		Formality level [<i>Informal - Formal</i>]
		Frequency of use [<i>Very rarely – Very often</i>]
		Task-technology structure fit [<i>Low fit – High level of fit</i>]
		Tool efficiency [<i>Low - Excellent</i>]
	Email	Cues transmission [<i>Little – High amount</i>]
		Effectiveness level [<i>Low - High</i>]
		Tool efficiency [<i>Low - Excellent</i>]
		Feedback time [<i>Very slow – Very fast</i>]
		Formality level [<i>Informal - Formal</i>]
		Frequency of use [<i>Very rarely – Very often</i>]
		Task-technology structure fit [<i>Low fit – High level of fit</i>]
		Tool disadvantage [<i>Minimal - Maximal</i>]
	Infrastructure	Infrastructure setup [<i>Minimal setup – Excellent setup</i>]
		Connection speed [<i>Very bad – Very good</i>]
		Infrastructure difference [<i>Similar infrastructure – Different infrastructure</i>]
	Lotus Document manager	Task-technology structure fit [<i>Low fit – High level of fit</i>]
	Net meeting	Demonstration ability [<i>Inability to demonstrate – High ability to demonstrate</i>]
		Frequency of use [<i>Very rarely – Very often</i>]
		Task-technology structure fit [<i>Low fit – High level of fit</i>]



Phone	Ease of explaining [<i>Easy - Difficult</i>]
	Effectiveness level [<i>Low - High</i>]
	Tool efficiency [<i>Low - Excellent</i>]
	Frequency of use [<i>Very rarely – Very often</i>]
	Task-technology structure fit [<i>Low fit – High level of fit</i>]
	Tool disadvantage [<i>Minimal - Maximal</i>]
Project management tool	Effectiveness level [<i>Low - High</i>]
	Task-technology structure fit [<i>Low fit – High level of fit</i>]
Remote desktop sharing	Task-technology structure fit [<i>Low fit – High level of fit</i>]
	Tool disadvantage [<i>Minimal - Maximal</i>]
Conference calls	Effectiveness level [<i>Low - High</i>]
	Tool efficiency [<i>Low - Excellent</i>]
	Frequency of use [<i>Very rarely – Very often</i>]
	Number of communicants [<i>2 - unlimited</i>]
	Task-technology structure fit [<i>Low fit – High level of fit</i>]
	Tool disadvantage [<i>Minimal - Maximal</i>]
Video conference	Demonstration ability [<i>Inability to demonstrate – High ability to demonstrate</i>]
	Effectiveness level [<i>Low - High</i>]
	Frequency of use [<i>Very rarely – Very often</i>]
	Task-technology structure fit [<i>Low fit – High level of fit</i>]
	Tool disadvantage [<i>Minimal - Maximal</i>]
	Tool efficiency [<i>Low - Excellent</i>]

Table 89 - Full Category Hierarchy listing



Appendix K: Communication Practices Property Description

Communication Need

Communication need arises at different phases during the Global Software Development process. The “communication need” property describes each of these phases and ranges from *Random phases* to *Specific phases*. Random phases relates to any situation that might occur unexpectedly during the communication process, for instance, in situations with blocking issues. The specific phases might refer to key project phases where communication is bound and known to happen.

“If I am not here and if there is a problem and they are blocked, they can contact. If they need it, they call.”

“Yes because sometimes we do need clarifications for example from the analyst, and he has to go back to the customer himself. This is sometimes during analysis and sometimes during development.”

Team-Customer Communication Strategy

This property describes the extent to which the developers are allowed to communicate with external customers. It ranges from *contact with external customer allowed* to *contact with external customer not allowed*. No communication implies that the developer is not allowed to communicate with the customer while 100% communication implies that the developer is given the green light to follow any form of communication.

“Say that a client has a problem with software A. I should handle it but I don’t have direct contact with the client. So, the person who is handling the customer will put me as the one who will handle that particular problem”

Ease of Contact Initiation

The ease of contact initiation property describes how easily the GSD communicants are able to initiate communication among each other. Contact initiation can happen before, prior or without any previous face-to-face encounters and the ease of which it occurs varies accordingly. The property ranges from *easy* to *difficult*.

“It was not difficult, to initiate contact, the communication channel was open. But it was dry and impersonal.”

Employees Physical Proximity

The employees physical proximity property describes the extent to which GSD participants are close to each other. The property varies from *Different countries* to *Same room*.



".. because we're not sitting together working so we don't see the cultural differences."

Number of Communicants

The number of communicants provides an indication of the number of people that might participate in a communication event during GSD. The communication event might relate to conference call meetings, video conference meetings, or face-to-face encounters. The property ranges from 2 to *unlimited*. Unlimited implies that any number of people can take part in the communication event.

"Yes, because you've got 4-5 people from here in Mauritius and 4-5 people from England, the communication is clear."

Physical Encounters Among the Teams

The Physical encounters among the teams property describes the frequency with which team member physically meet during the GSD process. Some dispersed team members are never physically introduced to each other, as represented by the minimal range of the property; *Never*. In contrast, physical encounters can occur frequently as described by the highest range *Frequent*.

"The problem that I personally have is that I wish to see the project managers for once. I never saw them. I just spoke to them on the phone, once or twice"

Communication Channel

The communication channel property describes the warmth of the communication channel during the communication process. When GSD participants communicate with each other, the communication channel can either be dry and impersonal if the individuals have little affiliation among each other, or it can be warm, allowing people to feel close to each other. The property ranges from *dry* to *warm*

"But it was dry and impersonal."

*"The first one, it was very easy to relate to him, even on the phone or the video conference. We were pretty close I would say. I managed to **communicate** very easily"*

Communication Level

The communication level property describes the amount of communication occurring between different job titles during GSD. Communication level can be *minimal* or *constant* depending on the roles of the communicants, the task at hand, the levels of details required, and even the organisational culture.

"Communication between a developer and an analyst is totally different from a project manager and me for instance. Because the level of details differs."

"Not really with the people in the team. We deal mainly with the project manager. But it happens that sometimes.... See the project manager has several team leaders under him. He gave a development work to us, but there is some other team leader who is very familiar with the problem. So we have to deal with the other team leader there. It happens very rarely and most of the time we deal with the project manager directly"

Communication Style

The communication style describes the degree to which the communication process can be formal or informal. The property ranges from *informal* to *high business style*. An informal communication style might mix jokes within the conversation and even includes some level of jargon. Conversely, a high business style focuses on having professional interaction among the communicants, even while using simple words.

"But since we are communicating with British people, there's no joke. But the work is getting done as long as we are keeping the professional thing."

"It is a mixture of both. Sometimes we do mix a joke in the conversation"

Information Filter Through

When information has to be escalated through different management levels or job title during the communication process, details might get lost and the wrong information is filtered through. This property describes the extent to which information is lost during the communication process. It varies from *completely wrong information filtered through* to *correct information filtered through*.

"We've seen cases where the person at the top has pretty much a lot to do and they want the shortest summary and quite often, there'll be an issue and I'll know what the issue is and I'll understand it and I'll explain to my manager, this is the issue. And the guy on that side would explain to his manager "this is the issue". And his manager would talk to my manager "this is the issue" And I'll be like "It's NOT the issue". They'll understand the wrong thing!! I find sometimes that things get filtered out in the organization, and its not an active picture of what's going on."

News Type

The news type property defines whether *good* or *bad* news are being communicated

"It depends on what kind of news you are communicating. If you are communicating bad news and there is silence at the end of the line, you're clearly wondering what is happening"

Flexi-time Implementation Level

The flexi-time implementation level describes the extent to which GSD participants have adjusted their working hours to reduce the time zone difference across the dispersed sites. The flexi-time implementation might be as small as one hour, when the time zone difference is small or can include night shifts when little or no overlap is available across the sites. Furthermore, even when flexi-time is being implemented, the overlap can be as small as two hours. The property varies from *minimal flexi-time* to *maximum flexi-time*.

"We are working on a shift system here. We start work at 12h30 and we stop work at 20h30. So we have an overlap. Now we are in winter time, we have an overlap of 2h30 mins, whereas in summer we have an overlap of 2 hours"

Foreign Worker Establishment

The foreign worker establishment property describes situations when experts from the onshore site are established offshore to help and coordinate the work. The foreign worker can be *permanently* established at offshore or can be *temporarily* posted there.

"Yes. Actually the guy from France was the IT process Engineer. He checked the quality of the software and the codes quality."

"He's here for 2 years. That's already one and a half year."

Physical Encounters Importance

This property describes the importance of having physical encounters within the GSD context. Physical encounters might be important when the communication tools are failing or when the lack of visual cues hinders the communication process. The property varies from *not important* to *really important*

"I think that it's important that we meet them personally. It kind of close the existing gap between us here and them. We became friendlier and we got to know them."

Common Language

The common language property describes whether a similar language is being used for communication throughout the dispersed sites. The property varies from *different language used* to *common language used*.

"Lets say language; we make a big effort to speak English. Even here, we make a big effort to communicate in English"

Communication Planning

The communication planning property describes the level of planning undertaken prior to any form of communication, be it conference calls, video conference, or international meetings. The property varies from *no planned communication* to *planned communication*.

"No its not difficult, its got to be planned. If we need to discuss something, whether there's an issue with a project or something needs to be resolved, obviously we've got to schedule. If something needs to be done on an ad hoc basis, some requirements have to be refined, you have to plan that. Whether we want to start a discussion or they want to start a discussion, we can't just pickup the phone. Because its mostly 2 people, 3 people, 4 people that needs to get into a room"

Email Response Time

The email response time property describes the maximum time allocated for emails to be replied to. The property varies from *1 hour* to *5 days*

"It is not a time issue. In the contract that we sign with the clients, we ask for [3-5 working day to respond to email]"

Perception of Efforts

The perception of efforts property describes the extent to which GSD team members perceives the level of effort made by their fellow colleagues during a project. Teams being geographically dispersed, the perception of *efforts* is often quite low and at times inexistent and has to be promoted. The property varies from *no perception of efforts* to *complete perception of efforts*.

"And its something that's really difficult for them to judge, really how much effort are you putting in, are you sitting around doing nothing, or are you actually working very hard "

Reassurance Level

Due to the lack of perception of effort during the GSD Process, stakeholders have to be constantly reassured that the work is actually being done and that much effort is in place to achieve GSD Success. The reassurance level property describes the mechanisms in place across the sites to reassure everyone. The property ranges from *little* to *high amount*.

"So, quite often, you have to reassure them a lot that yes, we are taking this seriously and we're working late and lots of people are working very hard on this."

Appendix L: Culture Property Description

Cultural Difference Impact

This property describes impact of the cultural difference on the overall GSD work and team. Cultural difference might be minimal and almost not felt by the team members. On the other hand, it might introduce issues like reduced collaboration or unwillingness to share information. The impact of cultural difference varies from team to team and is found to be related to the amount of interaction among the team members. For instance, when team members rarely interact with each other, cultural difference is not felt. The property varies from *little amount of cultural issues* to *high amount of cultural issues*.

"The Belgium side, you can feel the difference in culture, they're much more formal than us South African."

"There's no real clash of culture no."

Individual Culture Description

The individual culture description property describes key features of the personality of some individuals working in GSD. The property ranges from *minimal characteristics* to *strong characteristics*.

"Rigidity of character, people that are inflexible, who are not prepared to be opened to change. Also where people feel threatened and they fear they're not making a mark strongly enough."

Individual Culture Prevalence Level

The Individual culture prevalence level indicates the degree to which the individual culture or personality of a GSD team member prevails over the other forms of culture present within the organisation. The other form of culture relate to national culture, organisational culture or team culture. The property ranges from *minimal*, which indicates the lowest prevalence level, to *maximal*, which represents the highest prevalence level.

"That depends on the project manager there. Some are very strict with the codes and they want things to be perfect."

National Culture Prevalence Level

The National culture prevalence level indicates the degree to which the national culture of a GSD team member prevails over the other forms of culture present within the organisation. The other form of culture relate to individual culture, organisational culture or team culture. The property ranges from *no prevalence*, which represents the lowest prevalence level, to *high level of prevalence*, which indicates the highest prevalence level.

"The thing is that in France, the national culture impacts on all the sub... how do I say that... the national culture for them is the president, or the god father of Infomil. In the organization, they will model it. So the top person is like the president and they will respond to him. It's that kind of culture and it is the same thing as in Mauritius."

Organisational Culture Prevalence Level

The Organisational culture prevalence level indicates the degree to which the organisational culture of a GSD team member prevails over the other forms of culture present within the organisation. The other form of culture relate to individual culture, national culture or team culture. The property ranges from *no prevalence*, which represents the lowest prevalence level, to *high level of prevalence*, which indicates the highest prevalence level.

"Top management often filters through to the lower level. If top management trusts individuals and give them free way, it naturally filters through the lower levels. The organizational culture is exactly what I feel in the team."

Organisational Values

The organisational values property represents the degree to which these values influences or governs the organisational culture. The property ranges from *not influenced by* to *highly influenced by*.

"These are the core values of the organization, which eventually creates the culture. I would say that our culture is informed by our values."

Appendix M: GSD Governance Property Description

Collaboration Across Sites

This property reflects the degree to which team members collaborate with each other across the dispersed sites. Collaboration can occur across business areas or job titles. The property ranges from *minimal collaboration* to *close collaboration*.

"The problem that I'm working on now requires constant interactions with the guys overseas. So there's continuous collaboration with them"

"So the developer has to deal with the analyst. So there is a close collaboration in that way. But between the developers, not that much because each and everyone of them has their own projects."

Best Practice Oriented

The best practice oriented property describes the set of best practices put in place throughout the GSD dispersed sites. It refers to the use of competency centers, the organising of GSD activities (analysis, testing, etc), the rules that are followed within the organisation for code documentation, documentation format etc. The property ranges from *minimal best practice* to *complete*. "Minimal best practice" indicates that very little or no best practices are in place within the organisation, while "complete" implies that tight practices are in place to promote GSD.

"But here you have to follow all the rules. You cannot escape those rules, you have to follow them. One thing that I've noticed is that everything has to be perfect with them. One small mistake and they will tell you!!"

Work re-allocation

Work re-allocation describes frequency with which project tasks are redistributed among team members in case of GSD project delays and coordination issues. The property ranges from *Never* to *Often*.

"Sometimes, we have to do reallocation. For example it might happen that somebody has so many priorities work to do, then we have to break it down and assign it to other developers. So that's the main way I'm dealing with that right now."

Procedure Oriented

The procedure oriented property describes the set of procedures that are in place within GSD to promote the work organisation and achieve success. The procedures mostly relate to

the work process and are said to be vital for GSD success. Furthermore, it is important for everyone to be aware of such procedures for them to be effectively used. The variable ranges from *minimal procedure in place* to *complete procedure in place*.

"We do have a work process in place because otherwise, it would be very difficult to organise ourselves. Also there are some templates and code reuse."

"Everybody is aware of what the procedures are. And if there is something you just go there and look for the right documentation."

Documentation

The documentation property describes the whole range of documentation employed during the GSD Project. These generally range from the requirements specification documents, the use of various templates, to test scripts. Documentation usually varied across the case studies. The property ranges from *little* to *complete*. "Little" implies that little or no documentation are currently used during the GSD process while "complete" implies that the whole range of documentation prescribed in theory are actually being used.

"For example, if you are doing a form, you have a document for that. A module, a class, a crystal report, a user control, and we have the list of projects, the list of classes, the list of reports, for both VB6 and VB dotnet. Except for the report, report we have only one"

Documentation Quality

This property describes the quality of the documentation produced during the software development process. The documentation quality ranges from *low quality* to *very well written*, and generally depends on the expertise of the person writing it, the time available for writing it, and even on the GSD project itself.

"Although the document has got some templates, the quality of the writing that we put in that is not very guaranteed. It depends on the individual who wrote it."

Documentation Sharing

The documentation sharing property describes the extent to which documentation is shared among the GSD team members. The property ranges from *little* to *complete*. "Little" implies that documentation is rarely exchanged across the site and "complete" implies that there are excellent mechanisms in place to allow for documentation sharing.

"That is what was agreed initially, we enclose that again during each workshop. Any documentation filled by any party will immediately be shared and be CCed. And we do that and it works wonderfully."

Documentation Versioning

This property describes the extent to which a documentation versioning scheme is applied within the GSD organisation. The documentation versioning property varies from *no versioning* to *100% versioning*.

"We have Lotus Document Manager. That is our documentation safe keeping tool. And yes if you want to edit document in that, you have to check them out and check them in, and versioning"

Work Format

The work format property describes the type of work actually being performed during GSD. It can either be *contract based* or *unofficial*.

"In the contract that we sign with the clients, we ask for [3-5 working day to respond to email]"

Work Hours

The work hours property describes the official work hours at each dispersed sites. The work hours can differ across the sites and can range from *7h* to *7.5h*.

"Work habits are also different. We tend to work 7 hours here in Mauritius but in Canada it's 7.5."

Foreign Team Delegate Selection

The foreign team delegate selection describes how key persons are selected to act as foreign delegates at the offshore sites. These persons can either be selected *randomly* or because of their specific key characteristics or roles within the organisation (*key persons*).

"In fact, the directors of the company came back in November and all the staff members had a small meeting. The president, the future president and the managing director"

Foreign Team Delegate Visit Frequency

This property describes the frequency with which key persons are sent at the dispersed sites to meet with the teams. These meetings might be *very seldom* or can be held *frequently*.

"Yes we do, once or twice in a year, they come down or we go there"

"Very seldom. We actually once sent this creation guy to Denmark. Because we had to do some development work which involved some back-end systems in Denmark. So we sent him to Denmark for 2 weeks. Sometimes its easier to send the person physically there than to handle things over the phone. But we don't do it that often."

International Meeting Duration

The international meeting duration property describes length the international meetings. The meetings can last for *1 day* or for *as long as required* until the task at hand is completed.

"And they stay there for about 5 days to work with them, do all the documentation and then they come back"

International Meeting Frequency

The international meeting frequency property describes how often international meetings are held during Global Software Development. It can be held only *once* at some point, or an *unlimited* number of times, whenever required.

"Yes, the testing manager was here this year, we've got also the project manager. They do come... every three months we've got some visitors."

International Meeting Purpose

This property describes the purpose for which the international meeting is usually held. These can refer to the need to promote communication to reach optimum agreement, training purposes, business purposes, introduction of new managers or directors, among others. The property ranges from *random meeting* to *specific purpose*.

"We went there for business and training. 2000 and 2001 we went there. And then recently, last month, in October, we were there for one week. Just to meet the team. We've got a new manager now. And also take over some of the new systems that we are supporting."

International Meeting Site

The international meeting site property specifies where the meeting is actually being held, whether *onshore* or *offshore*.

If there's any training required, we've got someone coming from England and they deliver the training to the testers.

International Meeting Stage

The international meeting stage property describes the stage at which the international meeting is being held during the course of the GSD project lifecycle. The meetings can be held, at the beginning of the project, at each project milestone, or on an ad-hoc basis whenever the need arises. The property ranges from *rarely* to *at each project stage*.

"Or they come down, like last week, we had three people coming down from Britain and they were there for a week to do what we call preliminary user acceptance test. They were looking at it in terms of the technical perspective, in terms of acceptability of the application"

"...depending on the milestone, or where you are on the project. If it is analysis stage, ..."

Number of Foreign Team Delegates

The variable indicates the number of foreign team delegates chosen during international meetings. The property ranges from *one to two* to *many*.

"If it is analysis stage, we send one or two key persons over there to meet the business people from London, Denmark or Belgium"

Issue Fixing

The issue fixing property describes the ease with which issues are fixed during GSD work. The property ranges from *easy* to *difficult*. When issue fixing is easily performed, tools and mechanisms are in place across the sites to support the whole process. This can include remote desktop sharing facilities.

"So he will enter our computer and have a look at the parts that are causing the problem. If he can solve it he just type it there and we will see the changes and so on"

Issue Prevention

The issue prevention property describes the mechanisms and practices in place within the GSD organisation to overcome GSD issues. Issues can be prevented through collaborative software development, and careful prevention of any uncertainties. The property ranges from *little* to *complete*. "Little" implies that there are minimal practices in place to prevent GSD issues while "complete" entails that a wide range of mechanisms are in place for that matter.

"We don't give it to them to create their own interpretation. This would create a lot of problem. That's why I call it collaborative software development."

Management Level

The management level property defines whether the GSD team is managed at the offshore site, onshore, or both. It also provides information on the project management level. The property varies from *onshore* to *offshore*.

"They just manage us. This is the customer sitting in Belgium and this is the customer sitting in Denmark. What happens is that they've got a delivery team which is made up of the development manager, testing manager, and some more, and then they manage us"

Management Style

The management style can either be *collaborative* or *dictatorial*. Collaborative management styles take into consideration the opinion of all the stakeholders while dictatorial ones tend to impose decisions on others.

"The Danes are very arrogant, over assertive, and they come with force... hmmm... they come across with force. Very much dictatorial.... Whereas you find the British and some of the Flemish people from Belgium, coming across more collaborative, more willing and prepared to engage. Collaborative is the best word to say, they like the collaborative approach."

Meeting Minutes

This property describes the frequency with which minutes are taken during any forms of meetings. It varies from *rarely taken* to *regularly taken*.

"They then take my minutes and draw up their official minutes and yesterday eventually I received that."

Project Meetings

The project meetings property describes the frequency with which project meetings are held during the GSD work process. It varies from *rarely* to *frequently*.

"But at the same time, we've got monthly project board meetings with the customers, and those kinds of issues get discussed."

Meeting Planning

The meeting planning property describes the extent to which meetings are planned in the GSD organisations. Some teams have very extensive planning mechanisms including shared agendas, while others have poor planning structures in place. The property ranges from *unplanned* to *planned*.

"Agenda is sent, documentation are sent before the meeting, before we go to get agreement"

Project Planning

The project planning property describes the level of planning prior to the beginning of any GSD project. Project planning should allow for good task duration estimate, tight control of the interdependent deliverables, and communication of the project plan to all stakeholders, among others. The property varies from *minimal* to *high level of planning*.

"Also our project plan, in all three places, London, Denmark and Cape Town, needs to be managed very very tightly. Apart from the fact that this project has a very tight timeline, if we

didn't stick to the dates determined initially, the others have dependency on deliverables and documentation and impacts to us. It is managed really tightly."

Project Deadline Management

The project deadline management property describes how deadline issues are managed in the GSD companies. Deadline management can either be handled by the *local team* (onshore) or by the *foreign team* (offshore), and depends on the urgency with which the task at hand needs to be completed.

"That depends on the project. You see, for the internal team it's not very critical. Sometimes they need something by the end of January and we have to do everything to deliver it by then. But most of the time they are OK with the delay. If we say that we will not be able to deliver it on that date, is that other date OK? They say yes, agreed. That depends on the project"

Project Management

This property describes how tightly the project management process is handled. The property ranges from *minimal* to *tightly*.

"No because as I said, the team leader has to validate the work and the work has to be done completely right. So the team leader will validate it and he must understand what is going on"

Requirement Details

The requirement details property describes the quality of the requirements being provided at the beginning of a GSD project. In some cases, the requirements are complete and precise while in others, they are poorly elicited. Some organisations have even devised their own ways of describing the requirements, and this is handled in a very creative way. The property ranges from *poor* to *high quality*.

"So if they're going to write something, it's gonna be very complex. Even in their requirements specifications, it will be something which is alive. It won't be something like "point 1 do that, point 2 do that". It will be a whole paragraph, they will explain it, "you need to do it for this reason,". They will take all factors into consideration. "Maybe if you do that, it will cause some problems," they will also include all the references. If they are going to give you a specification it will be with all the details. So if you are not at ease with French, you will have problems. You can completely misunderstand the point of the project."

Additional Resources

This property describes whether additional resources are available to do the work whenever the need arises. It varies from *not available* to *available*.

"But we also have project delays because we don't have the resources to do something that took longer than we thought."

Project Task Allocation

The project task allocation describes how well the project tasks are broken down to facilitate allocation to the GSD team members. The project task allocation process can be *undefined* and poorly structured, thus resulting in high interdependencies among the different work items. On the other hand, it can be very *well-defined*, and eases the work allocation process. The project task allocation is also dependent on the software development method employed.

"It's more broken down. The analyst will do the analysis package and the software engineer or the designer will do the design package. Someone else will do the build of materials. It's kind of broken down. And I think that different people with different roles will fit into this methodology. You have the project manager doing meetings, the analyst will do the analysis package, the QA will do the test cases."

Project Task Allocation Site

This property specifies the site at which the project task allocation is decided upon. This can be done either *onshore* or *offshore*.

"It's the project manager who distributes the work. There is a project plan and everything."

Error Recording Efficiency

This property describes the efficiency with which errors or issues are recorded throughout the GSD project. It ranges from *low* to *high*.

"So maybe, given that we are very close together, if there are 2 or 3 errors, they just correct it and give it back to you. So there is no proper recording of errors at the very start. So what we ended up doing, is not a system testing but a unit testing for the developer. So we are doing his work in the first place."

Testing Procedures

The testing procedures property describes the different testing mechanisms which are in place within the GSD organisations. Several forms of test might be performed, including unit testing, user acceptance testing among others. The testing process can also be organised differently across the sites. The property ranges from *poor* to *excellent*. "Poor" implies that little or no testing procedures are in place while *excellent* entails that the testing procedures are quite effective.

"When the developer has completed the coding, he does the unit testing, and leaves the work to the team leader. The team leader now has to do the integration testing, read the code, see whether we have respected the coding standards, do the integration testing and test results and the documentation. And if he thinks that it is OK, then he delivers to the project manager. Now the project manager has to do his testing and if he finds something that is not good, he will send an email, describing what is not good to the team leader. The team leader will forward to the developer, correct and test again."

Use of a Mentor

This property describes the extent to which a mentor is used to train new comers in the GSD team. The property ranges from *little* to *high level of use*.

"Everyone new in the team has got a mentor. And a mentor will have to show you how to do things. Technically it is good, experience-wise it is OK, Knowledgeable he's got a qualification. So when you come on board, you've got to be guided by somebody who's been in the process already because we don't want anybody to come in and start using their own methodology."

Agreement Seeking Procedure

The agreement seeking procedure property describes all the set of mechanisms which are in place for allowing GSD stakeholders to reach an optimum level of agreement. Examples of agreement seeking procedures include documentation walkthrough, conference calls meetings, requirements agreement, documents sign-offs, among others. All GSD companies studied strived to achieve some form of mutual agreement before undertaking any new project. The property varies from *little* to *complete*.

"That is prior to starting the work, the developer has to understand what needs to be done completely. If there's something which is not clear, they have to ask. So the developer doesn't touch the code if something is not clear. That's for PS."

"After getting the approval of the management for the design package, then I start development. And then I do my test plan and test cases"

Procedure Across Dispersed Sites

The procedure across dispersed sites property describes the extent to which the prescribed set of procedures is followed across all the GSD sites. The procedures might relate to the work environment, and the methodology employed, among others. By having similar procedures across the sites, control and traceability can be achieved. The property varies from *same procedure* to *different procedure*.

"This is an example of [...]. This makes it so much easier to communicate is that both SCS and Meask are both used to following these processes. We know that first we need to fetch the requirements, and then it has to be reviewed, then it needs to be signed off. Both organisations are used to working this way, and it's for control, traceability"

Similar Requirement Standard Followed by Foreign Team

This property describes the extent to which similar standards for requirement descriptions are followed by the foreign team. Standards might be put in place for the expected format of the requirement specification, but are of no use if they are not followed across all the sites. The property ranges from *completely different standards followed* to *similar standards followed*.

"...they don't follow the same standard.... So the requirements that comes from them, because they haven't got the same standards to put those requirements together, (business requirements), it can be... depending on who is doing this in the business before they reach our analysis."

Standard Processes

This property describes the list of standard processes put in place throughout the dispersed sites to support GSD. Standards relate to documentation, testing mechanisms, coding, software development process, requirements elicitation format, among others. Companies which are more rule-oriented have more precise sets of standards while the others are more relaxed. This property ranges from *no standards in place* to *100% in place*.

"Yes we do. We have code standards for both Crystal and VB developers. Documentation as well and work processes of course. We do have a work process in place because otherwise, it would be very difficult to organise ourselves. Also there are some templates and code reuse."

Uncertainty Minimisation

This property relates to the set of techniques devised by GSD organisations to minimise uncertainty. In doing so, it prevents stakeholders from creating their own interpretation on requirements. The property ranges from *little* to *complete*.

"Normally we don't want uncertainty and ambiguity because since we work with money, payroll and salaries of people, we don't really want to make mistakes. So we really have to be very careful. So the word of advice here was, any uncertainty that the developer has needs to be raised"

Analysis Site

This property describes the site at which the analysis is undertaken. It can either be *onshore* at the customer's site or *offshore*.

"Normally here we don't do that much design. Mostly we do the coding and implementation. It might happen that in some cases we do the analysis and design."

Customer Site

This property describes the site at which the customer is located. The latter can either be located *onshore* or *offshore*.

"I think that it's not an issue and its not a problem, because all the main customers are found in England"

Design Site

This property describes the site at which the design work is undertaken. It can either be *onshore* at the customer's site or *offshore*.

"I think that you can have some small projects which the system analyst or the analyst programmer here can take charge. But mainly 95% is done in the UK."

Development Site

This property describes the site at which the development work is undertaken. It can either be *onshore* at the customer's site or *offshore*.

"Not all the coding is done here. There is a very big team there also doing the coding."

Requirement Elicitation Location

This property describes the site at which the requirement elicitation work is undertaken. It can either be *onshore* at the customer's site or *offshore*.

"The team members, they're the CBP Team and they're here in Safmarine. But the London people from Meask, we call them our clients. Because they're the one who say "we need some development plan, you guys will do it".

Specification Writing Site

This property describes the site at which the specifications are actually written. It can either be *onshore* at the customer's site or *offshore*.

"Sometimes we do the specs, sometimes they give us a preliminary investigation and then we do the specs based on that."

Testing Site

This property describes the site at which the testing is undertaken. It can either be *onshore* at the customer's site or *offshore*.

"We do our own testing here. The first phase is that I, as a developer I test. After the project I test. And then I deliver to the team leader who integrates the testing for the whole project. And after that we send it to France. There they will test it again."

Appendix N: GSD Process Issues Property description

Concepts Misunderstanding Within Documentation

This property describes the extent to which concepts are misunderstood within documentation. These concepts might relate to the idea being formulated. They might be misunderstood due to the way in which the language is being used in the business world, where one concept might not have the same meaning to everyone. The property ranges from *low level of misinterpretation* to *high level of misinterpretation*.

"The documentation, I think that it's fine too, because we have everything there. But the main drawback is if someone misinterprets something or if the person writing the documentation forgets to specify some important part, it becomes very difficult?"

Foreign Language Difference

This property describes the cases where a difference in foreign language employed, is felt among the GSD dispersed teams. An example of such situation might be when the use of a common language is not maintained during a discussion thread. The property ranges from *minimal* to *frequent*. "Minimal" implies that the foreign language difference is rarely felt whereas "frequent" implies the opposite.

"But what might also happen is that they might have email communication which happens in Flemish and they must forward that mail to us! And then suddenly you have to start following some Flemish discussions."

Foreign Language Issues

This property describes the issues arising due to the foreign language difference impact. Such issues might relate to communication delays or the inability to follow the conversation when the GSD team members have no notion of the foreign language. The property ranges from *minimal* to *frequent*.

"And mostly you have to write in French and the keyboard is in English. So Accent grave and accent aigue J we have to put them because they are very strict on the writings. I once used the work exemplifier and I got a message saying "this word is not a French word".

Language Accent

This property describes the extent to which the language accent is felt within the conversation. Some individuals have a stronger accent than others and this impacts on the

communication process. However, evidence suggests that with time, GSD team members adapt and learn to understand each other, irrespective of the accent. The property ranges from *lousy* to *easily understood*.

"... you know, we learn in English, and when they say a word in French, sometimes we don't understand, because we know the word in English and the way that it is said in French might be different. Especially technical terms. For example, when Fabrice (the French representative) did our training, the SELECT statement count, he said SELECT "cooont" (the pronunciation is different, as if with a French accent). And in the beginning, you know, you don't talk much, you only say the minimum, and you wonder what the other person might say."

Mother Tongue Influence

This property describes the extent to which the mother tongue or the national language impacts on the use of the common language used throughout the GSD team. For instance, some words might be used in the wrong context or individuals might have trouble understanding some verbal expressions during the conversation. The property ranges from *minimal influence* to *high level of influence*.

"There is also the mother tongue influence in Mauritius. Our mother tongue language is closer to French. It will never be eradicated this mother tongue influence! And that's why I said that we must talk in such a way that all parties can understand"

Spoken Language

The spoken language property describes the ease with which the common language chosen is utilised across the teams. While some individuals might have no trouble in expressing themselves in the common languages, others do. The property ranges from *easy* to *hard*.

"Sometimes we have to switch around French and English depending on the customer. Because some customers in Quebec only speak French. So we have to speak French. Even the emails sometimes need to be written in French."

Assumptions

This property describes the degree to which assumptions are made or ideas are preformed during the communication process. Individuals already biased by some degree of assumptions tend to pay less attention to details during the discussion, which eventually leads to communication issues. The property ranges from *minimal* to *100%*.

"I think... assumptions. I think that if they (or us) hear kind of half of the story, ... if we hear half of the business requirements or they hear half of what the issue is... then you make



assumptions about what the real issue is. And then when you're talking to somebody trying to understand the issue, you may not really be listening because you've already preformed your ideas. And you can be more likely to perform those ideas in an offshore environment where the information is not that easily available. So you grab whatever you can, you perform your ideas of what's happening and you start chasing the idea and actually you're completely wrong cause you missed a whole piece of information."

Communication Delays

This property describes the amount of delays that might occur during the communication process. Delays relate to the time taken for the correct message to be delivered to the right recipient and might be introduced by the culture, bad communication lines, foreign language difference, lack of visual cues, and time zone difference. The property ranges from *little delays* to *high amount of delays*.

"Yeah, we had this situation where we had really bad phone lines and we had to ask them to phone them because the connection was really terrible. So if you can't quite hear the other person, telephone calls take a lot longer than they need to"

Communication Issues Type

This property describes the different forms of issues that might arise during the communication process. Examples of communication issues include fights that occur during the communication process due to misunderstanding, or awkward moments of silence where the communicants do not know what to say. The property ranges from *minimal* to *maximal*.

"You get these long moments of silence on the phone when you ask them something that they haven't understood and finally they say "I don't understand what you're saying".

Information Loss

The Information loss property describes the extent to which information is lost during the communication process. For instance, information might get lost while being transferred through several layers of management, or when the requirements details were not properly understood in the first place. The property ranges from *minimal* to *100%*.

"That's the problem. We sometimes happen to have a note like that and one of the developers might say! Hey I don't understand what's going on! We then normally send it back and ask "please repeat this in English". Because in translating it ourselves, we might lose some information"

Language Interpretation Issues

This property describes the issues that might arise when GSD team members have to interpret and understand a language other than their own. Language interpretation issues might occur both in verbal and written communications. The property ranges from *High level of misinterpretation* to *Low level of misinterpretation*.

"You say something and he takes in from a different angle or interprets it in a different way... you do get that... but its not all of them."

"If you look at emails, you'll find that a guy is writing in English to you, but the way that he is writing and interpreting the principles of concepts differs from how you understand it. And you might say "wait a minute this is not right"! That's not what I meant! This is what I mean" and he comes back and say "Oh Sorry! I thought you meant this!" And this is a day gone!"

Coordination Issues

This property relates to the issues that occur due to the need to coordinate the work across several geographically dispersed sites during GSD. Coordination issues property might occur at the level of email communication, during deployment, during sign-offs or approval processes, when the key coordinator is absent, etc. The property ranges from *minimal* to *maximum*.

Coordination issues, I would say yes, but not much. The main issue is sometimes for the mainframe, we've got so much changes, two or more of these changes impacts on the same problem. So what I tend to do is, if I get a request first, I do it. Then I get another request coming after that which impacts the same problem. Then what I do, I take those second changes and put it on my first one. Even though the first one hasn't gone live yet. And sometimes what happens is that the second one goes live before the first one! Because it's difficult for me to maintain one changes for that, one changes for that , and after that I need to integrate. Because everything that goes live needs to be tested before. And how can I ask them to do a second testing because of integration. That is the main problem

Feedback Time

This property relates to the speed with which feedback is obtained during the work process. Feedback, in this context, relates to approvals or sign-offs, or information on the task that has just been completed. The feedback time depends the time zone difference and on the speed at which the work is being done across the sites. The property ranges from *slow* to *fast*.



"And then you need to include the tests for this module in the documentation... they test the software very well. It's one thing that has impressed me here. You can work on a project for 15 days, you send it to them in the morning and in the afternoon, they send you 2 pages of corrections. Very quickly!"

Geographical Distance

This property describes the size of the geographical distance between the GSD dispersed teams. It ranges from *small* to *big*.

Then we need to phone them, or email them. And the distance makes a difference.

Meeting Planning Effectiveness

The meeting planning effectiveness property describes the effectiveness with which the meetings are planned in the GSD context. Examples of meetings include international meetings, conference calls, or video conference sessions, and they all need to be carefully planned as the communicants might be located in different time zones. The property ranges from *easy* to *highly difficult*.

Also the need to... hmm... we've got project going on at the moment with people sitting in Copenhagen, London and South Africa and to get those three people together at an agreed time for a teleconf is actually sometimes difficult. We have to phone around and... OK now I'm on the call, now you phone them, oohh now wait it is busy now....

Planning Issues

This property describes the issues that occur due to improper planning of the GSD work. It ranges from *minimal* to *maximum*.

"Another one is that with mainframe, I never get the deadline. So I just do my schedule and just say that I'll deliver it by that date. And they come and say, " Oh we need it before for testing because it needs to go live". Then I need to rush."

Priority Issues

The priority issues describe the frequency with which work priority conflicts occur during GSD projects. The property ranges from *no priority issues* to *frequent priority issues*.

Because it could happen that one project is priority, but for some other analyst, there's another project which is top priority, but in both cases, the same developer is being used, then the developer has two important priorities. So, sometimes this is a problem, where there are so many people involved in the process, there might be some conflicts like priority issues, or some conflicting goals as well. These are the main coordination problems I think.



Time Difference

The time difference property provides an indication of the number of hours by which the time zones differ across the sites. In some cases, no difference is experienced. In others, the difference is so small that it does not affect the work. In the worst case scenario, there is no time overlap. The property thus ranges from *no time difference* to *24 hours*.

"I think that its not too bad because its one hour to Copenhagen and its two hours to London at the moment. And when its winter it's the same hour at Copenhagen and with London it's two hour behind."

"I would say yes, a bit. Because the thing is, there's quite a big time difference between Canada, about 8 hours. And that's the eastern coast. So now, if we consider the western coast, it might be 12 hours. So, the problem with that is, whenever they start working, it's night time"

Work Interruptions

The work interruptions property describes the frequency with which the GSD team members are interrupted in their work during the GSD project. Generally, the team being geographically dispersed, work interruptions tend to occur less frequently as the communication is a burden that needs to be planned and cannot occur on an ad-hoc basis. The property ranges from *minimal* to *frequent*.

"... there's the pros also, where since the customer is so far remote, you don't find them knocking at your door. So you're free to do your job. You don't get interrupted; you can carry on whatever you need to do."

Backlogs

The backlog property describes the frequency with which task backlogs occur during the GSD work. The property ranges from *minimal* to *high amount of*.

"I had three persons working with me. When I came back, I had 15 days of work (1 X 5) that I had to validate. And then they had already completed their work and so I had to find new projects for them.... So you see the problems that I have here. Before you finish the verification, they are already over with their work."

Deadline Issues

The deadline issues property relates to any situations where any GSD tasks are not completed on time due to various external reasons like poor requirements details or poor

product knowledge. Deadline issues are very common in the GSD context. The property varies from *no issues* to *high amount of issues*.

"Sometimes it happens that there is some problems, we can't finish on time."

"Late projects all the time. All of our projects are late. They are trying to improve on that."

Development Issues

The Development issues relate to any forms of problems that arise during the software development process. Development issues might occur during the deployment phase, or during coding when the developer has poor knowledge about the product. The property ranges from *minimal* to *high amount of issues*.

"Also, where we do development here, but everything in production is found in Belgium. So we're not even close to the production environment so that can become cumbersome sometimes when we move something in production."

GSD Project Delays

The GSD Project delays property relates to the extent to which GSD project tasks are delayed during the project life cycle. Project delays generally occur during the requirements elicitation phase where misunderstandings frequently occur. Clarifications are thus required, but are often obtained quite late due to the geographical distance and the time zone difference. GSD project delays are thus introduced. The property ranges from *minimum* to *maximum*.

"But where we've agreed to the project but the business hadn't actually given us decent requirements and we committed to a six month contract and when we actually looked for the requirements, they didn't have all the details in them."

Requirements Issues

The requirements issues property describes the whole set of issues that occur during the requirements elicitation phase in a GSD project. This phenomenon is known to occur very frequently during GSD. It can occur between the customers and the analyst, between the analyst and the developers and even between the testers and the developers. The property ranges from *no issues* to *high amount of issues*.

"Yes, especially for us testers. Perhaps for some there are the documents, we can have a look at them and understand it differently. Let's say a developer is working on a system and has developed it as required. Us testers, we come and take the document, perhaps we might say,

OK, you understood it this way, and we think that this should be developed in some other way, having further details."



Appendix O: GSD Project Property Description

Dependency on Delivery

The dependency on delivery describes the extent to which one GSD project task is dependent on the others. Ideally, in the GSD context, project tasks should be independent on each other, so as to facilitate project coordination across the dispersed sites. But complete independence is hard to achieve, which thus calls for tight project management. The property ranges from *minimal dependency* to *high amount of dependency*.

"Also our project plan, in all three places, London, Denmark and Cape Town, needs to be managed very very tightly. Apart from the fact that this project has a very tight timeline, if we didn't stick to the dates determined initially, the others have dependency on deliverables and documentation and impacts to us. It is managed really tightly"

GSD Project Phases

This property provides an indication on the various phases involved within a GSD project. Examples of phases include requirements elicitation phase, analysis, design etc. The property ranges from *single phase* and *multiple phase*.

"I think that at the beginning, when we have everything being setup, there is a lot of communication. But when we are implementing the solution, it will decrease. It might also happen when we encounter an issue during the software development. And also during support in terms of issue fixes."

People Involved

This property describes the number of people that can be involved in a GSD project. The "people involved" property ranges from *little amount of people involved* to *high number of people involved*.

"They would vary depending on the size of the project and how many people are involved etc."

Project Complexity

This property describes the level of complexity of the GSD project work. Some works are considered as *simple* while others are regarded as *very complex*. The work might relate to project tasks, or development issues that need to be fixed.

"Well it depends on the work. If it is a simple work, then we just phone them or email them. If it is a complex issue then... It is more difficult to talk to people on the phone."

Project Hours Attributed

This property describes the number of hours attributed to each project. The property ranges from *predefined and fixed* to *not defined and varied*. The number of hours attributed is usually decided upon during the project planning phase and can remain fixed.

"... but every project is a fixed amount of hours and everything goes around relationship"

Project Importance

This property describes the level of importance accorded to the project as compared to other GSD projects. Some internal projects are considered as being relatively *minor* as compared to other ones which involve some major external customers. The project importance determines the level of details expected in the documentation as well as the handling of GSD project delays. The property ranges from *minor* to *high*.

"Yes, part of it is due to the fact that I am working with him for that statutory product (Evolutel) and the company earns a lot of money from that. So if there is something going wrong he has more pressure. It also depends on the kind of pressure being placed on the person"

Project Size

This property determines the size of the GSD project. It ranges from *small* to *very large*. Small projects involve only minor tasks and only have little project hours attributed. The opposite applies for large projects.

"Like right now, we've got a project which is very small. So sometimes, we say, it's not needed for a project because the project is small, we only need this little piece out of it. So it is important because the work that we deliver is really smaller type of delivery work than Meask. Meask might have 10000 hour project or 5000 hour project, whereas our project might be anything up to 3000 hours. Most of our projects are a couple of hundred hours"

Project Structure

The project structure property describes whether the project is broken down into different small phases or not. The more broken down, the better. The property ranges from *refined* to *one big project*.

"I think that the chef de project found a way to make good... because throughout a project, like a gift card, they will break it into very small parts. Very very small so that they are independent, and then finally there, they will integrate everything together. So, I don't find problems in getting the specs, asking questions and then they don't take time to answer back. I think that the fact they have broken every projects into so small parts, like printing reports will

be a project, the interface for taking inputs from users will be a project, the service behind it, that will answer your request will be a project, it's clearly broken. ."

Project Task

The project task property describes all the different tasks that have to be completed during a GSD project. The tasks might have been scheduled during the planning phase (e.g. gathering requirements), or might occur randomly (e.g. unexpected question about an issue that popped up). The property ranges from *random* to *specific*.

"For example I might have a question over an issue. I will post that message there."

Project Type

The project type property implies that a project can either be *internal* or *external*. An internal project is undertaken for the organisation itself (e.g. an application to be developed for another department within the company). External projects are developed for external customers.

"For the internal projects, we are free. We get a project and we have to design it here. But for the clients, France is mainly designing and the analysis is done there."

Project Urgency

This property describes the urgency of the GSD project. The project urgency property ranges from *not urgent* to *very urgent*

"What creates concerns is when we have to leave at 16h30 and then we need to either send it to one of the colleagues there and if it's not urgent, then we can do it on the next day"

Project Visibility

The project visibility property describes the extent to which GSD team members are aware of the effort being made by their fellow team members during the GSD project. It also relates to whether the stakeholders are aware of what is happening throughout the dispersed sites. For instance, high visibility is achieved when they are aware of any backlogs, changes to the requirements, new deadlines etc. The property ranges from *no visibility* to *complete visibility*.

"I think that the issue that we have is that quite often they ... if there's a critical issue on the project, because they don't have a visibility on the project, they can't see the team all running around and freaking about something. Really what they have is the project manager talking to them."

Time Frame Delivery

The time frame delivery property describes the amount of time allocated for a project to be completed. It varies from *limited* to *unlimited*.

"Because the development work is more on a larger timeframe while the help desk is more on the helpdesk, we need to be working together with the end-user."

Work Type

The work type property defines whether the GSD project task is mostly related to *communication tasks* to *technical tasks*. Communication related work refers to situations where negotiations are required. This mostly happens during the requirements elicitation phase. Technical tasks are mostly during the actual coding phase or the testing phase.

"Let's say for a developer, if they want to have some further details about how they should develop the system, what they should include in their coding, they also communicate with the people concerned over there."

Productivity

This property describes the productivity level of the GSD team. The more projects are delivered on time and successfully, the higher the productivity level. Project failures or numerous issues decrease the productivity level. The property ranges from *low* to *high*.

"Because until now, we have delivered everything on time and as accurate as possible, I think that we've established the required trust. I think that we are delivering OK."

Project Delivery Speed

This property describes the speed at which the GSD project can be completed with the help of the software development method employed. Some methods promote project delivery speed (e.g. RUP) while others do not (e.g. waterfall). The property ranges from *low* to *high*.

"The benefit is speed, speed of delivery."

Quality

This property describes the quality of the GSD project being delivered. Projects can either be of *low* quality or of *high* quality.

"Quality – you are able to identify problems. So, you're on top of your quality."

Appendix P: GSD Team Property Description

Employee Well-Being Promotion Techniques

The employee well-being promotion techniques property describes the different set of practices that are in place to promote the happiness of the GSD team member. The property ranges from *no techniques in place* to *maximum technique in place*.

"... they want to be a world wide company which is a good place to work.. I think that there's a big effort from the directors to make you feel happy, happy in your work. And they give you the tools that you need."

Team Building Exercise

The team building exercise property describes the different set of practices that are in place to promote the GSD team relationship. The property ranges from *minimal* to *highly emphasised*.

"Normally what is important is to make these people have a sense of belonging to Ceridian. I try to make them as happy as possible in their workplace. Whenever we have birthdays, organise something. We do a lot of jokes in the team. I talk to them on an individual basis, I try to keep them up to date with technology as well. I try to avoid frustration in the team"

Accent Familiarity

The accent familiarity property describes the extent to which the team members get accustomed to each others language accent, with time and experience. Upon reaching some good level of familiarity with the accent, the negative impact of this issue is reduced. The property ranges from *low* to *familiar*.

"In the beginning maybe... but not really because we are used to the language. It's just that at the beginning, to get their accent it's a bit difficult."

Personal Experience

The personal experience property relates to the level of experience gathered by the team members while working together in GSD. The property ranges from *little* to *high amount*.

"But actually, it is her way of replying mails. Even now, when I tell her "I would like to tell you about changes about system testing", she will reply " OK, just put it there, as long as it doesn't mess up everything!". But now I know that it's the way she is. But now it's getting better."

Project Experience

The project experience property relates to the level of experience gathered by the team members while working together on GSD projects. The property ranges from *little* to *high*.

"It also depends on the experience exposure of the person. He might be someone from France, but I know that the other person has traveled a lot and has a lot of international exposure. In fact the first project manager was working for an English company so he was at ease with English speaking people. Even in the code, if there is something in English, he doesn't mind"

Trust Improvement

The trust improvement property describes the extent to which trust is improved with time in the GSD process. The property ranges from *minimal improvement* to *complete improvement*.

"Yeah, I think there is a good level of trust. At least, there might not have been the same level of trust lets say 3 months ago, but that changed a lot."

Development Tool Knowledge

The development tool knowledge property describes the level of knowledge and experience the GSD team member in using specific software development tool. The property varies from *poor* to *excellent*.

"There is a lot of communication going. And then we develop. Because if we had started working on dotnet and some of the chef de projet there didn't have a training on dotnet, so they prefer to let us write the specs to show them what we are planning and then they give their experience here and there."

Employees' Skills in Using Method

This property describes the amount of skills acquired by the GSD team member in using the software development method employed in the organisation. The property varies from *little* to *very skillful*.

"You need to have experienced and skillful people to take components of the methodology and make it relevant"

Level of Expertise

This property describes the level of expertise of the GSD team member to perform GSD work. The expertise may reside in doing coding in a particular language, design work, among others. The property ranges from *no expertise* to *experts*.

"In some teams, it depends on the level of expertise of the developers also. Like my team, I have experienced developers. So we can even work with preliminary investigation"

Product Knowledge

This property describes the level of expertise held by the GSD team member in working with the products being developed or maintained. The product knowledge property ranges from *no product knowledge* to *complete product knowledge*.

"Of course!. We didn't know anything about these products before. They had to come here to provide us with the training."

Adaptability of Offshore Team Members

The adaptability of offshore team members property relates to the extent to which GSD team members are able to adapt to many difficult situations occurring in GSD. Employees with high level of adaptability are able to change their attitude and work habits to overcome GSD process issues and GSD value issues. The property ranges from *low adaptability* to *high adaptability*.

"The South Africans are very amazing people. They are able to adapt. [...] . I wouldn't say that they all adapt, but most of my people do adapt And this is based on the fact that I have a specific way of recruiting people. I want people who are capable of adapting. I don't want people who are stereotyped, fixed in their ways of thinking, never thinking out of the box. I don't want people like that. I have a particular profile for all my positions here. Every job must match the people. And I use this as a guide. It cannot be the same, but very close"

Employee Confidence

This property relates to the level of confidence of the GSD team member in working and expressing themselves in a GSD environment. For instance, the level of confidence might be low due to the difficulty in expressing themselves in a foreign language. The property ranges from *low* to *high*.

"I think that the main issue for mauritians is the lack of confidence in talking with people in the UK or in the US. And I think that to communicate, we don't need to use big English words to communicate. We can use simple English words that both parties can understand. I think that the most important issue is confidence. Mauritian can speak English well, but its just the confidence which is sometimes lacking"

Employee Motivation Level

This property describes how motivated GSD team members are in working together to perform GSD work. Motivation level has to be maintained within GSD as the general working conditions are often bad and frustrating. For instance, the communication flow is hard to maintain as visual cues are missing and team members are dispersed. All these contribute to reducing the motivation level. The property ranges from *low* to *high*.

"Employees are generally more positive. And like I've said earlier, the inspiration is such that one wants to get things done."

Job Title

This property defines the job title of the GSD team member. It ranges from *analyst* to *developer*.

"Technical person no, because we haven't been there."

Real time Interaction Preference

The real time interaction preference property indicates whether team members prefer real time interactions or not. In most cases, team members favour prompt feedback and real time interactions. The property ranges from *no real time interactions* to *real time interactions*.

"Very much! I prefer it by far, be it face to face or teleconference."

Rule Abiding

This property defines whether team members enjoy sticking to rules or not. The property ranges from *enjoys* to *not enjoy*.

"No, because I really enjoy abiding to the rules"

Team Member Independence Level

The team member independence level property describes the extent to which the team members enjoy working on their own or not. For a GSD team to be successful, team members should be able to work both in teams and individually due to the different task types involved in that context. The property ranges from *highly independent* to *high level of team work*.

"I think that I enjoy both. I really really get a lot out of working as a team, being with a lot of people and deliver something. But I'm also very efficient by working by myself. I work at home one day a week and then take the time to put together the things that I need to do. I think that you can work in a team if you can't accomplish something by yourself."

Team Member Uncertainty Acceptation

This property defines the GSD team member's level of tolerance for uncertainty during the GSD work process. This property varies according to the national culture, organisational culture, or team culture description. It ranges from *no acceptance* to *100% acceptance*.

"If it's something which is important, no I will not tolerate uncertainty, but if it's something which is less that can be amended, then I don't have any problems."

Understanding of Foreign Language

This property defines how well the GSD team members understand each others native foreign language. For instance, the common language might be English, but the native foreign language at one site might be Flemish. This property describes how well the people at some other site understand Flemish. It varies from *no understanding* to *high level of understanding*.

"Luckily for us, or for me, Flemish is very close to Afrikaans, so if I ask them to talk a little bit slower, I can understand"

Work Dedication

This property defines how dedicated are GSD team members while performing their work. It ranges from *minimal* to *maximum*.

"It can affect the work temporarily. [...] are gone, and those working they feel that you are here to work, they cooperate. It doesn't affect the work really."

Recruitment Method

This property describes the manner in which GSD resources are recruited. Usually, employees are expected to fit a particular profile. It ranges from *random* to *profile-oriented*.

"Yeah, and also we particularly build the team and try to recruit people who are... who fit then with the process. There are people who like to work in a more free form of instructions, but we really try to recruit people into the team who enjoy that so there won't be a clash like that."

Affiliation Level

The affiliation level property describes how close GSD team members are to each other. It varies from *high level of affiliation* to *low level of affiliation*.

"When you have talked to a chef de project, your relationship afterwards is much better. You know to what kind of person you are talking, how to present him a problem,"

Competency Centers

The competency centers property describes the extent to which the GSD teams are organised in competency centers. A competency center is the grouping of employees with similar job titles. As such, for each new project, resources are taken from these competency centers to work together in collaboration. Instead of belonging to a team, resources are said to belong to their respective competency center. This property ranges from *minimal* to *complete*. “Minimal” implies that the team is not organised into competency centers, while “complete” implies otherwise. In some situations, competency centers are only applied to one job title, e.g. testing competency center.

“I’ve got testing competency, I’ve got analysis competency. If I were to build an application from you, I would look at what constitute an application and then draw from the competency centres to provide resources from competency centers.”

Customer Facing Team

This property provides an indication of the extent to which a GSD team has direct contact with the customer or not. The property ranges from *non customer facing* to *customer facing*.

“No, not necessarily because most of the people are not customer facing so they’re not affected. Most of the developers are just internal. But some of the project managers might do it because suddenly at 4 o’clock, a meeting for the customer becomes a 5Oçlock meeting for us. My job is customer facing, so I adjusted to fit with the customer.”

Multicultural Team

This property indicates whether the GSD team is composed of people from different cultures or not. It ranges from *single culture* to *multiple culture*.

“From India, I mean from Indian origin. They have probably got the British nationality for having lived for so long in England. But I know they come from India because of the accent”

Team Age

The team age property gives an indication of the time during which the GSD team has been in activity. It varies from *new* to *old*. The team age impacts on the level of clarifications required during the requirements elicitation stage.

“This will depend on the product knowledge. If you are a new team, you might ask a lot of questions to find”

Team Size

This property gives an indication of the size of the team. The team size property varies from *small* to *big*.

"They do at least one per week because it's a big team. But its not the case for me. Everything is done by phone or by email. But it depends on the project. If you're a big team, you must communicate effectively between yourself here in Mauritius and in the UK"



Appendix Q: GSD Value Issues Property description

Trust Level

This property defines the level of trust prevailing among the GSD team members. It ranges from *low level of trust* to *high level of trust*.

"Because until now, we have delivered everything on time and as accurate as possible, I think that we've established the required trust. I think that we are delivering OK."

Work Redundancy

This property refers to the frequency with which GSD team members are spotted for redundancy across the dispersed sites. Redundancy occurs when the team members' job is being redistributed to other dispersed sites with lower costs. The property ranges from *minimal* to *high level*.

"Because "here in Mauritius you are taking all of our jobs, you are making people redundant here, and you are growing here in Mauritius. You were 20 people four years backwards, and now you are 250 and there has been some redundancy here."

Cues Transmission

This property describes the extent to which cues are being transmitted during the communication process in GSD. Different levels of cues are transmitted during different forms of conversations. For instance, face to face conversations provide the highest level of cues, as opposed to phone conversations. Cues transmission becomes an issue when minimal. The property ranges from *little* to *complete*.

"It's easier for me if we are talking face to face. Just hearing the voice on the phone does not make it easy to explain things sometimes. You don't see the body language."

Feelings and Emotions Filter Through

This property describes the extent to which feelings and emotions filter through during the communication process. The property ranges from *missing* to *filters through*.

"I think that they are very friendly when they speak to you. But I don't know what they think interiorly. What don't know what are their feelings..."

Uncertainty Level

This property describes the level of uncertainty prevailing throughout the whole GSD process. Uncertainty might occur during communication and during the development work

process. The uncertainty level property ranges from *low level of uncertainty* to *high level of uncertainty*.

"Well, you can never get rid of uncertainty 100%. There's always that small percentage that goes along."

Collaboration Issues

This property describes the amount of issues experienced by GSD team members while collaborating with each other. It ranges from *minimal collaboration issues* to *high amount of collaboration issues*.

"So someone explained to me but I missed something. I should have pressed one button. For him this was a big trouble. He called that guy.... For him this is something that should not happen. Approximation is something that should not happen at Infomil. They are very strict as you can see internally. But this is a different culture. They are very strict and here in Mauritius we are a bit laid back"

Cooperation Issues

This property describes the amount of issues experienced by GSD team members while cooperating with each other. It ranges from *minimal* to *high* amount.

"...lets say that you can have the feeling that they are not cooperating with you."

Appendix R: Software Development Practices Property Description

Method Effectiveness Level for GSD

The method effectiveness level for GSD property describes how effective is the software development method when used in a GSD context. The effectiveness level depends of the method's ability to promote collaboration across the sites and overcome major GSD issues. For instance the method might allow for tight control, might promote agreement seeking, provide project visibility etc. All these contribute to the method's effectiveness level for GSD. The property ranges from *ineffective* to *100% effective*.

"CUSP is effective in the sense that everything that we do has to be documented and approved."

Software Development Method Disadvantage

Each software development method carries some form disadvantages which may be enhanced in GSD because of some particular contextual requirements (process-wise, communication-wise, and cultural). Examples of methods disadvantage include, the enormous amount of documentation that needs to be filled, the heavy workload due to iterations and reworks, lack of modularity, among others. The property ranges from *minimal* to *maximal*.

"One of the problems that we currently get is modifications and reworks. I don't know if it's just in my team but we do tend to get a lot of rework. So I think that what actually needs to be done is to locate these areas where and why these modifications are coming."

Iteration Length

The iteration length property provides an indication on the average number of iterations performed when iterative software development methods like RUP and Prototyping are employed. The dimension varies from *1* to *unlimited*.

Hmm RUP. We tried to use RUP which is an iterative method where we do 3 or 4 week iterations [...] Trying to do more iterative development

Best-Practice Oriented

This property describes the extent to which the software development method promotes best-practices throughout the whole GSD process. Best practice can be achieved by helping in the organisations of tasks and by providing structure and responsibility. The property ranges from *minimal best practice* to *complete*.

"It certainly them, and help us to have a history of whatever's been agreed upon to call upon, where they might want to fold things up in their own way. I would say RUP really helps us to do that. RUP provides a little bit of structure and responsibility where it's needed."

Ease of Adaptability

The set of rules prescribed by a software development method can be cumbersome and inappropriate when fully applied to the GSD context. As such, some level of adaptation is thus required for the full potential of the method to be utilised. For instance, RUP could be adapted so that only a small portion of the documentation set is used for smaller projects. This property thus describes the ease with which the method is adapted to the GSD context requirements. It ranges from *hard* to *easily adapted*.

"Yeah, you have problems in terms of adaptations. You do have problems when you need to adapt. You need to have experienced and skillful people to take components of the methodology and make it relevant"

Method Standard

The method standard property describes the extent to which the software development method meets some level of standard (CMM, ISO 9001/2000). The more recognised is the method, the more standardised it becomes and promotes work collaboration. The property ranges from *no standards met* to *very up to standard*.

Rational Unified Process is the most effective software engineering methodology that conforms to the CMMI and ISO 9001/2000

Methodology Learning Curve

This property describes the ease with which the methodology is learnt by the GSD team members. It ranges from *low* to *high*. Low indicates that the method is hard to learn as opposed to *high*. The learning curve often depends on the age group of the team member, whereby older team members have more trouble and are less willing to acquire new skills.

In the organisation I was before, it was a very big learning curve to introduce this methodology in the IT environment, cause they were not used to it

Percentage Use of Components

This property describes what percentage of the methodology's components are utilised in the GSD context. Components on the methodology relates to key steps in the methodology or the prescribed set of documentation. This property is relevant to RUP, UML and to a smaller extent, the waterfall model. It ranges from *little* to *100%*.



"We might not be using it with everything; we take out what's necessary for our projects. Like right now, we've got a project which is very small. So sometimes, we say, it's not needed for a project because the project is small, we only need this little piece out of it.e a couple of hundred hours"

Project Delivery Speed

This property describes the extent to which the software development method promotes GSD project delivery speed. It ranges from *low* to *high*. Low implies that the GSD project is not delivered rapidly when the method is being used, as opposed to high.

"What is quite nice with the iterative development is that if you're running out of time, you can still deliver something and totally still make it to the delivery date."

Uncertainty Minimisation

The uncertainty minimisation property describes the extent to which the method allows for uncertainty to be minimised during the GSD process. Uncertainty can be minimised through rigid set of procedures (clear documentation history, quick problem identification) which need to be respected throughout the dispersed sites. The property ranges from *low* to *high*.

"It certainly them, and help us to have a history of whatever's been agreed upon to call upon, where they might want to fold things up in their own way. I would say RUP really helps us to do that. RUP provides a little bit of structure and responsibility where it's needed."

Phases

The software development process can be broken down into various phases, as described by this property. The larger the number of phases, the better for GSD as the tasks can be easily allocated. The property ranges from *single* to *multiple*.

"Ironically, RUP, or any methodology or process that needs a lot of attention and has many different phases, is almost in contradiction with a relaxed culture."

Software Development Approach

The software development approach property describes the different steps in which a GSD project is undertaken. It might involve the breaking down of the proposal into different stages, the involvement of the business as early as possible, the feedback mechanism employed, among others. The property ranges from *no task breakdown* to *phased*.

"It's different because let's say that we have a big project, they will separate it into maybe 10 parts. They do maybe small parts first. For example we are developing a big system for managing online [...], there are a lot of parts in this. So, they won't plan the whole project,

document the whole project first, start coding everything and then testing everything. They develop one part of it, code it, test it, make sure that it's stable, then move on to the next phase. There might be several teams working on several parts of it, but in the end it's one product. It's kind of small waterfall like cycles."

Software Development Choice

This property describes the way in which a software development method is chosen for use within GSD. The choice can either be *random* or *targeted* to fit specific cultural needs.

"Yes you could call it the culture. Because they want to stay abreast of the latest technology. They want to stay in line with benchmark, they opted for RUP. Perhaps, an organization where staying abreast of technology was not at first to heart, they might have opted for something different which is not globally recognized."

Software Development Method Acceptance

The software development method acceptance describes the degree to which the method chosen for use is accepted by the GSD team members. It ranges from *little* to *100% acceptance*. The level of acceptance depends mostly on their culture and age.

"Yes, in South Africa. And I find that the South Africans here, specially the older generation, opposed to change. They find it very difficult to change."

Modelling Level

This property describes the extent to which models are used to describe requirements in documentation. It varies from *limited* to *extensive modelling*.

"You have some modelling, but it's not that intense. It's sometimes surprising how they explain things "Leave two pixels to the right"

Appendix S: Technology Property Description

Feedback Time

The feedback time property indicates the speed at which responses can be obtained when using the communication tool. Phone conversations are said to have faster feedback time than the mail. Feedback time is dependent on the geographical distance, on the availability of the respondent but mostly on the efficiency of the communication infrastructure. Bad connection speed hinders feedback time. The property ranges from *very slow* to *very fast*.

"It's just for quick feedback. It's easier than going on the phone"

"So email is not fast enough for that cause the guys don't check their email but chat pop all the time."

Formality Level

This property describes the level of formality conveyed by the communication tool during the communication process. For instance, email is known to be a very formal tool as opposed to the chat system. The property varies from *informal* to *formal*.

"And the formality of email is gone. "

"No one's formal on chat".

Frequency of Use

This property describes the frequency with which the communication tool is used during the communication process in GSD. Depending on the organisation's communication requirements and preferences, and on the urgency of the situation, some tools are used more frequently than others. The property ranges from *very rarely* to *very often*.

"I see that they done the teleconferencing here once or twice a week. If they have any problem, it's dealt with immediately."

Task-Technology Structure Fit

The task-technology structure fit property provides an indication at how suited for a particular task is a technology. Results from the case study demonstrate that some tools are more suited to for some particular situations as compared to others. As such if the right communication tool is used for the right task, communication process is more likely to be successful. For instance, when some form of demonstration is required during a meeting, it is

most advisable to use the video conference as opposed to the conference call. The property varies from *low fit* to *high level of fit*

"When you compare to another level where you're trying to do a demonstration or trying to get a picture, ... to get to know who you're talking to ... and those types of things, then yes video conference is very very effective"

Tool Efficiency

This property provides an indication of how efficient the communication tool is in assisting the communication process. It ranges from *low* to *excellent*.

"Yes. If we didn't have instant messaging, it would have made life so much difficult. I think it's one of the best communicating tool that I've used."

Cues Transmission

The cues transmission property describes the level of visual cues being transmitted by the communication tool. Cues relate to body language, tone of voice, eye contact, ability to explain things with the hands, among others. For instance, video conference conveys a higher level of visual cues than the mail. The property ranges from *little* to *high amount*.

"[Conference call] But it doesn't pick up the body language"

Effectiveness Level

This property describes the level to which the communication tool is perceived by the GSD team members as being effective during the communication process. It varies from *low* to *high*.

"One-on-one call depending on the availability of the person you're calling, its 99%."

"Video conference is not very effective for us, so we rather use conference calls."

Tool Disadvantage

This property describes the disadvantages obtained by using each of the technologies available for GSD. For instance, disadvantages of the phone include the inability to record conversations, and the disadvantage of emails is the occasional "jumbling of emails" during delivery. The sound quality during conference calls is not always good and the image lags behind the voice for the video conference. The property ranges from *minimal* to *maximal disadvantage*.

"Yes, email delays. We get every now an then when we would send an email and the order would get jumbled and they'll get the first email twelve hours later. And this causes quite a

lot of confusion. And "what are you working on? I told you to stop doing it, then I told you to do it. Which one did you get first?" That's the point where you need to pick up the phone... Yes that's quite of the problem with email."

Infrastructure Setup

The infrastructure setup property describes the extent to which the GSD infrastructure supports the communication process. It can either be very well setup (*excellent setup*) and allow the communication process to be performed very well or have a *minimal setup* and often breaks down, thus causing communication failure.

"I think that our infrastructure really supports our communication. We have a communal mail boxes in both London and Copenhagen. So email happens basically uninterrupted in our network"

Connection Speed

This property provides an indication of the connection speed within which the communication takes place while using the communication tool. When too slow, the connection speed hinders proper communication flow. The property ranges from *very bad* to *very good*.

"Yeah, we had this situation where we had really bad phone lines and we had to ask them to phone them because the connection was really terrible. So if you can't quite hear the other person, telephone calls take a lot longer than they need to"

Infrastructure Difference

This property defines the level to which the infrastructure differs from one site to the next. The Infrastructure difference property ranges from *similar infrastructure* to *different infrastructure*.

"They're much smaller than us, and their office is much smaller. We've got a team on this floor, that's looking after Safmarine, of about close to 40/45 people. Whereas there, its about 10 people. Whereas on the other side, while we have no hosting environment, (we don't have any staff here to do hosting), they've got a bigger hosting environment, a bigger operational environment on that side. Their teams are smaller, their working environment is smaller and we're much bigger. But it's not a real issue"

Demonstration Ability

This property describes the degree to which the technology allows for demonstration during communication. For instance remote desktop sharing and video conference have a high level

of demonstration ability, as opposed to the phone. The property ranges from *inability to demonstrate* to *high ability to demonstrate*.

"Oh well, sometimes when it becomes very critical, and when we have to demonstrate, but we use WebX, which is also in the Internet"

Ease of Explaining

This property describes the ease with which the message can be conveyed by using the communication tool. For instance, it is sometimes hard to explain things on the phone. The property ranges from *easy* to *difficult*.

"Phone, maybe if there's something unclear after having communicated by email, we just talk on the phone and perhaps we can explain more easily."

Number of Communicants

This property indicates the number of GSD team members than can be involved in the communication process. The number of communicants property varies from 2 to *unlimited*.

"Yes, because you've got 4-5 people from here in Mauritius and 4-5 people from England, the communication is clear. You can understand everyone because each person speaks in turn,"



Appendix T: Software Development Method and GSD Issues

	GSD Issue	Software Development Practice	Flexibility	Rigour
GSD Process Issues	Coordination issues	Waterfall model	Adapted the model to fit the particular GSD setup. In doing so, traditional issues of the waterfall model (enhanced in GSD) are overcome. The adapted model also fits the cultural requirements.	Each step of the method is rigorously applied until stability is reached.
	GSD Project issues			Project management is rigorously handled
	GSD Project delays			
	Requirements Issues			
GSD Value Issues	Uncertainty Issues			
	Trust issues			
	Project visibility issues			
GSD Value issues	Uncertainty issues			
GSD Process Issues	GSD Project delays	Prototyping	Ability to gradually produce several versions leading to quick project delivery	Applicable to only some forms of projects
	Project visibility			
GSD Process Issues	GSD Project visibility	RUP	Easily adaptable depending on the project. Only the relevant set of documentation can be used	Conforms to CMMI and ISO 9001/2000 standards
	Requirements issues			Tight documentation produced and shared across the sites
	GSD Project delays			
	Collaboration issues			
GSD Value Issues	Uncertainty issues			

Table 90 - Software Development method and GSD Issues



Appendix U: Communication Practices Coping Strategies

	Communication Coping Strategies	Research findings	Literature Findings	
	<i>Physical encounters through international meetings (As early as possible and whenever required)</i>	Y	Y	(Herbsleb & Grinter, 1999)
	Facilitate contact initiation and bridge physical distance among team members			
	Reduces disadvantage of communication tools			
	<i>Minimised communication level</i>	Y	N	
	Limits the risk of having communication issues			
	Limits time difference impact			
	<i>Foreign worker establishment for communication liaison</i>	Y	Y	(Paasivaara, 2003)
	Improve language problems			
	Minimises communication issues			
	<i>Flexi-time implementation</i>	Y	N	
Flexibility	Overcome time zone difference			
	<i>Constant meeting whenever required (planned meetings, weekly video conference, ad-hoc meetings, emergency workshops)</i>	Y	Y	(Paasivaara & Lessenius, 2004)
	Reduces misunderstandings			
	Bridges distance			
	<i>Collaboration through various communication tools (emails, phones, video conferences, conference calls, chat etc)</i>	Y	Y	(Hindus, Ackerman, Mainwaring, & Starr, 1996) (Handel & Herbsleb, 2002) (Nardi, Whittaker, & Bradner, 2000) (Dourish & Bly, 1992) (Obata & Sasaki, 1998) (Majchrak, Rice, King, & Ba, 2000)



				(Maznevski & Chudoba, 2000)
	Bridges distance enhances communication process			
	Informing and Monitoring			
	Picture Sharing	Y	N	
	Reduces negative impact of lack of visual cues for people who haven't physically met			
	Constant communication during GSD Project evolution (Informing of project status, project updates, etc)	Y	Y	(Herbsleb, Paulish, & Bass, 2005)
	Overcome deadline issues			
	Planned communication	Y	N	
	Facilitates contact initiation			
	Formal Communication Style	Y	N	
	Avoid communication misunderstanding			
	Documentation sharing mechanism	Y	N	
	Promote communication level			
	Promote communication with the customer			
	Uncertainty Minimisation	Y	N	
	Improves communication process by reducing risk of disagreements			
	Make use of a common language	Y	Y	(Suchan & Hayzak, 2001)
	Provides shared understanding of the context			
	Minimises communication issues due to loss of information			
	Specified email response time	Y	Y	(Suchan & Hayzak, 2001)
Rigour	Eases communication process			

Table 91 - Communication Practices coping strategies



Appendix V: Coping Strategies for Cultural Differences

	Cultural Coping Strategies	Research findings	Literature Findings	References
Flexibility	Awareness of cultural difference through previous cultural exposure	Y	Y	(Kayworth & Leidner, 2000; Sarker & Sahay, 2002; Jarvenpaa & Leidner, 1999)
	The use of cultural liaisons	Y	Y	(Carmel & Agarwal, 2001)
	Bridgehead teams, technical or managerial liaisons	N	Y	(Heeks, Krishna, NicholSEN, & Sahay, 2001)
	Rotation of management	N	Y	(Ebert & De Neve, 2001)
	Assigning more experienced and culturally aware individuals onshore as they are apt to understand customers requirements in the local context	Y	Y	(Cockburn, 2002)
Rigour	Choosing the right software development method	Y	N	
	Limit the interactions among the team members so that they do not feel the cultural difference	Y	N	
	Adopting a formal business style and tone of voice	Y	N	
	Uncertainty minimisation techniques for cultures with high tolerance to uncertainty	Y	N	

Table 92 - Coping Strategies for cultural differences

Appendix W: Coping Strategies for Requirement Issues

	Requirement issues Coping Strategies	Research findings	Literature Findings	References
Flexibility	Frequent international meetings to reach agreement and minimise future misunderstandings	Y	Y	(Paasivaara, 2003)
	Planning and regular status meetings for progress tracking	Y	Y	(Herbsleb, Zubrow, Goldenson, Hayes, & Paulk, 2003)
Rigour	Tight procedures (documentation format ,sign-offs, formal review cycles) in place, which are followed by all stakeholders	Y	Y	(Boehm, 1996; Osterweil, 1986)
	Agreement seeking and uncertainty minimisation (e.g. constant probing for more details)	Y	N	
	High quality document should be produced	Y	N	

Table 93 - Coping strategies for requirements issues

Appendix X: Technology Purposes

Technology	Purposes	GSD Issues resolved
Email	Formal communication Promote agreement seeking Documentation sharing (agenda, meeting minutes, UML documents) Sign-off purposes Confirmations Clarifications Uncertainty minimisation Process Support requirements elicitation process	Lack of confidence in English language Allow cues about feelings and emotions to be transferred
Phone	Urgent tasks During second phase of GSD project, can be used to inform stakeholders about problems encountered Support the requirement elicitation process Minimise uncertainty	
Chat	Appropriate for message and issue tracking When quick feedback is required Presence awareness	Overcome language issues (Mockus & Herbsleb, 2001)
Conference calls	Frequently used during big projects Used frequently during analysis and requirement elicitation phase Promote uncertainty minimisation Agreement seeking procedures	
Project management tool	Helps collaboration between internal customers and project team Stores and provided project information (delivery date, testing schedule etc.) Documentation management	Improves project visibility Improves task allocation Improves coordination issues (Ramesh & Dennis, 2002)
Remote desktop sharing	Used for issue fixing	
Video conference	Supports the requirement elicitation process	Helps to overcome requirement misunderstanding Minimise uncertainty
Infrastructure	Maintains a good communication level	Helps to overcome communication issues due to communication breakdown (Mockus & Herbsleb, 2001)

Table 94 - Technology Purposes





CULTURE AND COMMUNICATION IN GLOBAL SOFTWARE DEVELOPMENT

Coding Evidence Booklet

By:
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TNNMAU001
November 2007

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INTRODUCTION

This booklet validates and provides evidence on the axial links described in Section 5.3, Chapter 5 of the Dissertation paper entitled ***Culture and Communication in Global Software Development***. Relationships for each of the meta-categories have been explained on a per category basis in different chapters. Chapter 1 describes the Communication Practices relationships, Chapter 2 the Culture relationships, Chapter 3 the GSD Governance relationships, Chapter 4 the GSD Process Issues relationships, Chapter 5 the GSD Project relationships, Chapter 6 the GSD Team relationships, Chapter 7 the GSD Value Relationships, Chapter 8 the Software Development Practices relationships, and Chapter 9 the Technology relationships.

Each category has its own subsection, within which all the links emanating from that category are described. A table is provided with sample interview statements supporting the relationships. Links emanating from properties of the source category and terminating at properties of the target category are also described. Each table is composed of seven columns, the first one being the *Link emanating From the Property* column. This field contains properties of the category from which the link is emanating. The *Link towards the Property* column in turn contains properties for the target category. An explanation of the actual relationship is given in the *Description* column, while the *Direction* column indicates whether the association between the two properties is in direct proportion or inverse proportion. For inverse proportions, as one property increases along its scale, the other decreases (DOWN). A link with a direct proportion would in turn imply that when the source property increases along its scale, the target one increases as well (UP) (Strauss & Corbin, 1998). The sample *Interview Statement* supporting such a link is given in the next column. The final column provides the *Interview Question*, as in some cases, cues about the relationship are driven from both the interview statement and the interview question. Each relationship has been labelled with a unique code, e.g. C3.I4.A1 and is provided in the last column, *Rel. Code*. This code implies that the interview statement belongs to interview 4 from case 3. A1 is a unique code name given to each statement.



COMMUNICATION PRACTICES

1.1. From Communication Practices to Communication Practices

This section provides evidence for the axial links between categories Communication Practices and Communication Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Employees physical proximity	Perception of effort	Due to the lack of physical proximity among the team members, perception of effort is hard to capture	DOWN	And its something that's really difficult for them to judge, really how much effort are you putting in, are you sitting around doing nothing, or are you actually working very hard	Discuss about the main problems that you encounter while working in GSD	C1.12 .B16
Communication planning	Ease of contact initiation	Proper planning prior to any communication meeting eases the contact initiation among the team members	UP	No it is not difficult; it's got to be planned. If we need to discuss something, whether there's an issue with a project or something needs to be resolved, obviously we've got to schedule. If something needs to be done on an ad hoc basis, some requirements have to be refined, you have to plan that. Whether we want to start a discussion or they want to start a discussion, we can't just pickup the phone. Because its mostly 2 people, 3 people, 4 people that needs to get into a room	Is it difficult?	C1.14 .C32
Communication planning	Number of communicants	Proper planning is crucial as more than 2 people often need to be placed in a room	UP			C1.14 .C33
Physical encounters importance	Bridging distance	Physical encounters can help to bridge physical distance among team members	DOWN	I think that it's important that we meet them personally. It kind of closes the existing gap between us here and them. We became more friendly and we get to know them.	And in terms of the work relationship, did it help that you actually met them in person?	C2.11 .C46
Physical encounters importance	Ease of contact initiation	Physical encounters facilitates the contact initiation	UP	The main thing is this communication. Its easier when you do the things face to face	What are the main problems that you encounter while working in global software development?	C1.14 .C48
Flexi-time implementation level	Communication level	Having flexi-time implemented helps to maintain the communication level	UP	We must finish 35 hours per week. It's not strict. Instead of coming at 8h30, we can come at 9h30. But provided that we leave later. And this better perhaps because we would have more time to speak to those	Or is it the Mauritian culture that prevails?	C2.12 .E18



Team-customer-communication strategy	Physical encounters with foreign teams	The team-customer communication strategy can be used as a method to overcome the lack of physical meetings among the foreign team members. By limiting the communication process, to only a certain level of management, communication issues can be avoided	DOWN	people. So I don't think that this is an issue. .And this better perhaps because we would have more time to speak to those people. So I don't think that this is an issue. No, because what happens is that any work that we have to do, our team leader has assigned the work and if there's any problem he will deal with the project leader in France. Actually that's not much of a problem. So as I am now working with Fabrice who is from France, I don't have much of a problem.	Is it a problem for you not to have met them?	C3.I2 .G28
Foreign worker establishment	Language interpretation issues	Having a foreign worker established at offshore can help to overcome language interpretation issues. The people can thus learn how to speak the foreign language	DOWN	And because he is from France, we have to communicate in French and that has helped by French language.	How does it help you to have someone from France to be your team leader?	C3.I2 .G30
Foreign worker establishment	Ease of contact initiation	Having a foreign worker established offshore facilitates communication	UP	No I think that it would have been harder. Because since he is here, you can liaise with him directly. Because you know, the team leader, they speak mainly on the phone and you know, on the phone it's not quite easy to explain everything. But when he is in front of you, he can come and see your problem. He can come to your place and see your problem, so it's a lot easier. Here he has been helping everyone a lot. If there's a problem, he will come, see what the problem is and deal with it.	Is it easier for you to deal with him now that he is in front of you, or would it have been different if he was in France?	C3.I2 .G47
Communication style	Communication issues	The communication style, if too franc and direct introduces communication issues among the team members	UP	If an obvious error has occurred, then they shout, saying that we have not done enough testing, "this should not come with me with this kind of problem". But they say it in a very diplomatic way. They ask you how are you and then, they start shouting ☺ It depends... like [R4] got problems with the chef de project. They guy said things "straight". "This should not happen!"	Do you use UML?	C3.I3 .I1

Table 1 - From Communication Practices to Communication Practices

1.2. From Communication Practices to GSD Process Issues

This section provides evidence for the axial links between categories Communication Practices and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Communication style	Foreign language issues	By adopting a formal communication style, communication issues can be reduced	DOWN	Hmmm... good question... I think probably not too much in kind of formal business communications. Certainly you'll have the guys out here talking about the things like robot and [...]	Do you think that you use some expressions that are typically from South Africa?	C1.I2 .B26
Communication level	GSD Project delays	Proper communication at the right time can be used to handle and manage GSD Project delays. Through communication, everyone can be aware of the situation and more time can be allocated	DOWN	The tester or the developer? Let's say for the developer, if he has to deliver something and he finds that there is some backlog. He just communicates with the manager and asks for some more time. Or they tend to put additional developers to the project, working overtime. If it's a very important customer who requested to deliver the project in time, I think that they put additional resources and tend to honour their agreement. ...	What happens if somebody doesn't meet the deadline? How is it managed?	C2.I2 .E13
Communication style	Requirements issues	Requirements issues are introduced when the technical team member do not understand the terms used by the client to describe the requirements	UP	But the mainframe will be working with the payroll processing and also part of it with the company setup. So sometimes when the customer explains a bit of the payroll processing, for me it's a bit of Chinese. The misunderstanding comes from the terms that they use. The terms are more payroll oriented. But for me, I'm more technical people. But then, I just email the person who wrote the specs and ask for more details.	Do you happen to have misunderstandings pertaining to the requirements before coding?	C2.I3 .E45
Communication level	Deadline issues	Deadline issues and delays are avoided by having a high and constant level of communication between the developers and the team leaders.	DOWN	In this case, I deal directly with my team leader. He will be aware of the problem. If I am also experiencing some technical problem, I just call my team leader and he will come. As he is more experienced, in 5 minutes he will be able to clear it out. Because we communicate a lot. If there's any problem, we don't sit idle, we just ask	In terms of coordination, do you have coordination issues, like projects running late, or poor project details?	C3.I2 .G32



				our team leader. Every time there is communication so that we don't have any delays.		
Team-customer-communication strategy	Time difference	The team-customer communication strategy, which only allows team leaders offshore to contact people at other sites, can be used to limit the negative effect of the time difference. As the other developers do not have such contact, they only do their work and are not affected by the time difference	DOWN	No. But I think that for those who have to contact the people, they have to wait for the French people to come to work. But for me I don't have to contact them directly	Are you affected by the time difference between here and France?	C3.I2 .G35
Team-customer-communication strategy	Communication issues	The team-customer communication strategy can be used to overcome communication issues. By limiting the number of resources allowed to communicate, communication issues are avoided	DOWN	It will become a mess if everyone starts calling	Why is it that only the team leaders deal with the people in France and not the software developers?	C3.I3 .H28
Team-customer-communication strategy	Coordination issues	By only allowing the team leaders to communicate with the project managers, coordination issues can be avoided. More control is in place.	DOWN	If a developer here just calls and agrees on something with the chef de project, and then, I come and I'm not aware of it... It is just for controlling what is going there, what is coming. It is the role of the team leader to ensure..... Normally the developer will ask the team leader, we should find a solution here. But if we are not finding something, then we have to call them. We just don't call like that	How?	C3.I3 .H29
Foreign worker establishment	Language interpretation issues	Having a foreign worker established at offshore can help to overcome language interpretation issues. The people can thus learn how to speak the foreign language	DOWN	Fabrice helped us a lot. If we heard a term that didn't make sense, we just asked Fabrice. And then you get used to it. Then you yourself start using the French words,	How did you overcome the language problem in the beginning?	C3.I3 .H33
Team-customer-communication strategy	Coordination issues	When the team-customer communication strategy of having only the team leaders communicating with the managers is not applied, coordination issues are introduced.	UP	As long as the chef de project is checking everything, it goes smoothly. There are two chef de project there, one in Toulouse and one in Paris. These two were absent for vacation. And then we were dealing directly with the developers there. And the	Do you actually have any issues while coordinating everything?	C3.I3 .H36

				project ran 10 to 12 days late. Because, we sent them a problem, they sent it back to us. But if the chef de project was there, it would have finished up on the first round. The chef de project is the main person for the success of the project		
Communication style	Foreign language issues	Communication style with high level of jargon introduces foreign language issues	UP	It's mainly jargon. Something not related to work. If we're doing something together and he is exasperated he sometimes use some form of slang language. We don't get it	Do they have typical expressions that they use that you don't understand?	C3.I4 .I23
Team-customer-communication strategy	Coordination issues	The team-customer communication strategy which only allows the team leaders to communicate with the project managers introduces coordination issues when the team leaders are not available to do the work	UP	In theory when I started the project, the controls were completed. They had planned the windows control project would be finished before I started, that I could use them and that they would be stable. But there were major problems when I was using them. The team leader for that project is here, but if I have some problems with these applications, I had to get back to the project manager in France because the person here is done with this project.	And coordination issues?	C3.I4 .I24
Team-customer-communication strategy	Coordination issues	The team-customer communication strategy which only allows the team leaders to communicate with the project managers introduces coordination issues when the team leaders are not aware available to do the work	UP	Yes. The communication goes like this. I have to communicate it to the project manager in France, and the project manager in France will communicate it to the person here, and now he can start working. It happened in December and the project manager was not there. Of course I told the person here but he couldn't do it by himself without prior approval. So we get that kind of work coordination issue	Even if there are errors?	C3.I4 .I25
Team-customer-communication strategy	Communication issues	The team customer communication strategy can be used to reduce communication issues. For instance, job titles having limited contact with the team members do not encounter any communication issues	DOWN	As a tester, I've not encountered any great issue of difficulty or any communication problems. Because we've got all the electronic tools, we've got video conference, we've got teleconference, and we've got netmeeting. The department is well organised with a testing manager and some senior testers. And everything question that you might have, you just mail or by	Can you please tell me about the problems that you encounter while working in GSD?	C2.I2 .E9

telephone and ask for the proper details. For the testing team I don't think that there's any communication or even cultural problem. We don't have any direct communication with the customer over there. People from UK deal with the customers. And the customers are mainly Europeans and are based in England.

Table 2 - From Communication Practices to GSD Process Issues

1.3. From Communication Practices to GSD Project

This section provides evidence for the axial links between categories Communication Practices and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Perception of effort	Project visibility	If the team members have little or no perception of the level of effort produced by their fellow foreign team members, the project visibility is reduced	DOWN	I think that the issue that we have is that quite often they ... if there's a critical issue on the project, because they don't have a visibility on the project, they can't see the team all running around and freaking about something. Really what they have is the project manager talking to them.	Discuss about the main problems that you encounter while working in GSD	C1.12. B13
Communication with client	Project visibility	If only a certain category of team members (e.g. team leaders & managers) are allowed to communicate with clients, project visibility is reduced	DOWN	I think that the issue that we have is that quite often they ... if there's a critical issue on the project, because they don't have a visibility on the project, they can't see the team all running around and freaking about something. Really what they have is the project manager talking to them.	Discuss about the main problems that you encounter while working in GSD	C1.12. B14

Reassurance level	Project visibility	A high level of reassurance is required to overcome lack of project visibility	UP	So, quite often, you have to reassure them a lot that yes, we are taking this seriously and we're working late and lots of people are working very hard on this. So it's difficult for them to get a perception of effort. And quite often when we tell them that this is going to take that much effort, and they're like "It can't be that hard"	Discuss about the main problems that you encounter while working in GSD	C1.I2. B15
Email response time	Project visibility	When emails are sent and responded to in due time, project visibility is enhanced	UP	Our emails are sent and answered in due time. Teleconferences are normally setup in advance, so there's never an impact or an intrusion on work in progress.	Does it affect you?	C1.I3. C34
Communication planning	Project visibility	When communication is planned in advanced, for instance planned conference calls, project visibility is enhanced	UP	Our emails are sent and answered in due time. Teleconferences are normally setup in advance, so there's never an impact or an intrusion on work in progress.	Does it affect you?	C1.I3. C35
Foreign worker establishment	Quality	Having a specialist established at offshore permanently or for a long period of time helps to improve the product quality and promote GSD Project success	UP	He knows the software much better. If there's any problem, we just have to deal with him. We will be definitely sure that a project won't go back to France and then come back. Let's say that he is a specialist.	How does it help you to have someone from France to be your team leader?	C3.I2. G29

Table 3 - From Communication Practices to GSD Project

1.4. From Communication Practices and GSD Team

This section provides evidence for the axial links between categories Communication Practices and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Physical encounters among teams	Job title	Physical encounters with the customer depends on the job title	UP	But mostly, the developers on the floor and the project managers actually never have met, physically met the customer	Have the team members ever met?	C1.I4. C44
Physical encounters importance	Affiliation level	Physical encounters helps to promote the level of affiliation among	UP	I think that it's important that we meet them personally. It kind of closes the existing gap	In terms of the work relationship, did it help that you	C2.I1. C47



		the team members		between us here and them. We became more friendly and we got to know them.	actually met them?	
Foreign worker establishment	Adaptability of offshore team members	Having a foreign worker established at offshore helps to promote the adaptability level of the resources	DOWN	Fabrice helped us a lot. If we heard a term that didn't make sense, we just asked Fabrice. And then you get used to it. Then you yourself start using the French words,	How did you overcome the language problem in the beginning?	C3.I3.H 34

Table 4 - From Communication Practices to GSD Team

1.5. From Communication Practices and GSD Value Issues

This section provides evidence for the axial links between categories Communication Practices and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Reassurance level	Trust level	Having proper reassurance level increases the level of trust	UP	So we have to say "we're taking these things seriously, we're working very hard"	Can you please tell me again about the trust issue?	C1.I2. B24
Common language	Cultural difference impact	Having a common language helps to overcome cultural differences	DOWN	Yes and No. In terms of language it's OK. We all speak English so that's not a big issue.	Do you feel any cultural impact?	C2.I3. E30
Reassurance level	Trust level	Having an appropriate level of reassurance level among the team members helps to promote trust. Regular phone calls to reassure people are crucial	UP	No not really, because we call them everyday to give feedback. We talk to each other every day and if there is a problem they will tell us: "the job is not being done well, so we have to do something".	Is there any trust issues between you and them?	C3.I1. G7
Physical encounters among teams	Cues transmission	Limited or no physical encounters with foreign team members limit the visual cues during the conversation	DOWN	The problem that I personally have is that I wish to see the project managers for once. I never saw them. I just spoke to them on the phone, once or twice	What are the problems that you encounter while working in a dispersed team?	C3.I5. H6
Team-customer-communication strategy	Cultural difference impact	Developers are not able to describe the foreign team culture as they have no contact with them. This implies that they do not feel any cultural differences among the team members	DOWN	No, not as such. Because I only deal with our team leaders and friends	So you don't feel any cultural issues?	C3.I5. H21
News type	Cues transmission	The news type impact on the importance on the lack of visual cues during communication. Bad news need to be communicated with a high amount of visual cues	UP	It depends on what kind of news you are communicating. If you are communicating bad news and there is silence at the end of the line, you're clearly wondering what is	Do you feel that when you are communicating with somebody, it is important to see the person and how the person is	C3.I4.1 46

happening.

reacting?

Table 5 - From Communication Practices to GSD Value Issues

1.6. From Communication Practices to Culture

This section provides evidence for the axial links between categories Communication Practices and Culture.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. code
Employees physical proximity	Cultural difference impact	When employees do not sit in the same office, cultural differences can be reduced as they do not interact much with each other	DOWN	...because we're not sitting together working so we don't see the cultural differences.	And anything else?	C1.I1. A22
Physical encounters among teams	Cultural difference impact	With minimal physical encounters with the foreign team, the cultural difference impact can be minimised	DOWN	The fact that we don't meet them, we don't feel the difference	Is there a cultural difference between France and Mauritius?	C3.I1. G18
Team-customer-communication strategy	Cultural difference impact	Developers are not able to describe the foreign team culture as they have no contact with them. This implies that they do not feel any cultural differences among the team members	DOWN	Actually, we as software developers, we don't interact too much with the French people. Only one IT process engineer is a French person, here in Mauritius. I don't know too much about the French people.	In terms of culture, how would you describe the French culture?	C3.I5. H20
Communication style	Cultural difference impact	A formal and professional business style can be used to overcome cultural difference. By maintaining such a professional style, the work is done efficiently	DOWN	Well, we are professional people, and our main focus is our work here. Definitely it is different is two British people are working together or if two Mauritian people are working together. But at least we are meeting our business goal. Of course if it was two Mauritian people or two British people working together, I would make a joke around it. But since we are communicating with British people, there's no joke. But the work is getting done as long as we are keeping the professional thing.	I think that the British culture is different from the Mauritian culture. Does it affect the work?	C2.I3. F10
Communication style	Cultural difference impact	Having a formal business style reduces the cultural difference impact	DOWN	I don't think that they have a different business style you could call it culture. I think that means that it is quite easy for us to do	What specific problems do you encounter while working with a globally dispersed	C1.I2. B45



business with them. team?
Because if we are
reacting in a formal
business style, which we
would be with a client,
there isn't really a
cultural issue.

Table 6 – From Communication Practices to Culture

1.7. From Communication Practices to Technology

This section provides evidence for the axial links between categories Communication Practices and Technology.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. code
Physical encounters importance	Tool disadvantage	Physical encounters can be used to bridge distance and overcome the disadvantages of phone conversations	DOWN	So we sent him to Denmark for 2 weeks. Sometimes it's easier to send the person physically there than to handle things over the phone. But we don't do it that often.	And do they come over here?	C1.14. C45
Foreign worker establishment	Tool disadvantage	Foreign worker establishment can be used to overcome the disadvantage of other communication technologies like phone where visual cues cannot be conveyed. Having a foreign worker facilitates communication	DOWN	No I think that it would have been harder. Because since he is here, you can liaise with him directly. Because you know, the team leader, they speak mainly on the phone and you know, on the phone it's not quite easy to explain everything. But when he is in front of you, he can come and see your problem. He can come to your place and see your problem, so it's a lot easier. Here he has been helping everyone a lot. If there's a problem, he will come, see what the problem is and deal with it.	Is it easier for you to deal with him now that he is in front of you, or would it have been different if he was in France?	C3.12. G46

Table 7 - From Communication Practices to Technology

CULTURE

2.1. From Culture to Communication Practices

This section provides evidence for the axial links between categories Culture and Communication Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Team culture prevalence level	Team-customer-communication strategy	Based on the team culture, employees are allowed to contact the external customers or not.	UP	But in application development, you have to have some form of structure around. So we try to find a middle ground, which is we don't want to [...] we will allow a developer to talk to a customer. On T1 side you won't find that. Karen talks to the customer or an analyst. But the developer doesn't. We're very much closer to the customer. We won't mind if customer picks up the phone to talk to a customer. We don't encourage it but we won't mind. Because we've got that informal arrangement and relationship with the customer. Anybody on this floor, we've got nothing to hide from the customer, can ask anybody what he wants to and talk to him. The customer likes it. That might change from the 1st of December. You know that from the 1st of December we will all become IBM. SO that might change because IBM operates in a totally different way.	Do you in SA tolerate uncertainty? Or do you like things to be clear and precise?	C1.14. A2
Team culture prevalence level	Team-customer-communication strategy	Based on the customer's preferences, employees are allowed to contact the external customers or not.	UP	Yes, because the customer preferences are different. In terms of technology, in terms of environment, in terms of maturity, [the approach there is], communication strategy etc. are completely different. People are different.	You have one specific team for one specific customer?	C1.11. A3



Organisation values	Email response time	An organisational culture highly customer focused is likely to have a short email response time allowed	UP	Customer focused. If the customer drops a mail, you have less than 12 hours to go back to the customer	It takes precedence over the national culture?	C1.11. A16
Individual culture description	Communication need	The national culture description of the resources will impact on the communication need. People from different countries need to be approached differently	UP	I find that with the UK client, professional tone of voice, terminology, are far more appropriate. That's the way they're approached. Whereas in South Africa, we like to relax and relax the terminology. And information flows more freely then.	Do you think that you have different communication needs at different levels of the project?	C1.13. C28
National culture description	Communication style	The national culture traits govern the communication style employed among the team members.	UP	If an obvious error has occurred, then they shout, saying that we have not done enough testing, "this should not come with me with this kind of problem". But they say it in a very diplomatic way. They ask you how are you and then, they start shouting ☺ It depends... like [R3] got problems with the chef de project. They guy said things "straight". "This should not happen!"	Do you use UML?	C3.13. H50
National culture description	Collaboration across sites	National cultures with helpful people help to promote collaboration across sites	UP	Yes it is reflected. If you have a problem now, you call someone there, they will help you. If they can't they will contact someone who can. They are very helpful. You don't have the stress of "I'm having a problem, if I can't solve it, who will solve it?" You just call there and they will help you	This kind of cultural traits, is it reflected in the national culture too?	C3.13.1 11

National culture description	Team-customer-communication strategy	National culture drives the team-customer communication strategy. Some cultures do not allow the developers to communicate with the project managers. Layers have to be respected	UP	Yes, if I want to talk to someone above the chef de project... I can but I have to ask permission... In the meeting, we talk with Danny OK, but outside this, we can't contact him. And even the mail is blocked. You can only send mail to the person that you are allowed to. If you want to send a mail to someone else that you are not working with, you can't. You have to ask permission, get approval of management... you can't send mail outside also. If you're the developer and you want to send a mail to the chef de project there, you can't. You don't have the right. But you can call. In my team, everyone calls now. But surely there is a hierarchy	Someone mentioned the fact that they are very directed towards hierarchy. In the sense that as a developer, you can't contact the project manager directly. Do you feel that this is like that?	C3.I3.1 12
Individual culture description	Communication channel	The communication channel warmth depends on the individual personality of the communicants. It's more easy to communicate with some people as compared to others	UP	I would say that it depends on the person. I work with two project leaders. The first one, it was very easy to relate to him, even on the phone or the video conference. We were pretty close I would say. I managed to communicate very easily	Is it a problem that you've never met with that person before?	C3.I4.1 16
National culture description	Communication style	The national culture determines the communication style	UP	Actually, the first project leader was someone who wasn't exactly from France but from Corsica. It's completely different from the people coming from Southern France. People from Southern France are very direct. They can communicate something very harshly and this is something which is very difficult to accept here.	Why	C3.I4.1 19

National culture description	Team-customer-communication strategy	National culture drives the team-customer communication strategy. Cultures with a tall organisational structure, do not allow the developers to communicate with the project managers. Layers have to be respected	UP	No they don't deal with France. They don't do the mail either. The explanation that we got afterwards is that French people like to have a good hierarchy. They respect all the levels very seriously and you can't bypass someone and go to the manager. It's something which is not acceptable in their culture.	So your team members don't?	C3.14.1 37
Cultural difference impact	Communication with client	Cultural differences might cause people to refuse to work late, as it is not in their culture. As such, communication among team members is hindered	DOWN	Disadvantages, of course, not everybody are the same. There might be some things that offend that people for some particular reason that you won't understand because you are different from them. For example, working late is a cultural thing. I tend to see that people belonging to certain cultural group are less flexible to working late.	What specific cultural elements are advantageous or disadvantageous?	C2.14. F43

Table 8 - From Culture to Communication Practices

2.2. From Culture to Culture

This section provides evidence for the axial links between categories Culture and Culture.

Link emanating FROM the property	Link TOWARDS the property	Description	Direction	Interview Statement	Interview Question	Rel. Code
Organisational values	Organisational culture description	The organisational values influences the organisational culture	UP	Its multinational, very much influenced by the organisational values.	But how would you describe your organisational culture?	C1.11. A37
Organisational culture prevalence	Individual culture description	The organisational culture prevails so much at times that it influences and changes the individual culture	UP	You walk in, you're changing	Everyone now abides to the culture?	C1.11. A38
Organisational culture prevalence	National culture description	The organisational culture prevails so much at times that it influences and takes precedence over the national culture	UP	It takes precedence over everything.	It takes precedence over the national culture?	C1.11. A39

National culture prevalence level	Organisational culture description	The national culture can impact and prevail over the organisational culture	UP	The thing is that in France, the national culture impacts on the entire sub... how do I say that... the national culture for them is the president, or the god father of C3I. In the organisation, they will model it. So the top person is like the president and they will respond to him. It's that kind of culture and it is the same thing as in Mauritius. When we were working in Ceridian, even the software developers could send a mail to the president, even without the manager knowing anything. But here, the national culture impacts on the organizational culture	do you feel that the national culture prevails over the national culture?	C3.I4.I 49

Table 9 - From Culture to Culture

2.3. From Culture to GSD Governance

This section provides evidence for the axial links between categories Culture and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
National culture description	Project management	Culture influences the style of management	UP	I can also say that the culture influences the style of management...	And in terms of explaining, describing?	C1.I1. A23
National culture description	Uncertainty minimisation	The national culture traits at times governs the level of uncertainty minimisation put in place within the dispersed team	DOWN / UP	In the Indian type, you throw the document at them and they do their own interpretations, which could be good, which could be bad, which could be what you want, but could mean something else.	And in terms of explaining, describing?	C1.I1. B11
National culture description	Work hours	Based on the national culture, the team members will be expected to work for a certain number of work hours	UP	Because the south Africans have a reputation of doing whatever they need to do, they've come to expect this. And they've got no problems asking us to work late if something's important to them. And they all go like "do you think that you're going to work the weekend?"	Can you please tell me again about the trust issue?	C1.I2. B25

Individual culture prevalence	Project deadline management	Project deadline management is impacted by the individual culture or the personality of the project manager. Some people are more strict and deadline oriented while others are not	DOWN	That depends on the project manager there. Some are very strict with the codes and they want things to be perfect. But our project manager is OK. It did happen that we had 10 days for a project, and it took 20-30 days. I was learning dotnet, I never did dotnet before. I had to ask my team leader, I don't know this part, how should it be done? I had to check on MSDN how things should be done. And they were OK with that.	And in terms of work habits, are they very strict people who expect things to be done on time?	C3.11. G19
National culture description	Uncertainty minimisation	The national culture traits at times governs the level of uncertainty minimisation put in place within the dispersed team	UP	No actually, he's very strict. That's the difference with the Mauritian where there is a lot of "laissez aller". All the work should be done properly. When you are not sure, you just ask him. And some other thing that he insists on is: don't sit idle with a problem, just ask.	Do you think that he tolerates uncertainty and ambiguity in the work?	C3.12. G43
Organisational culture description	Uncertainty minimisation	The organisational culture traits at times govern the level of uncertainty minimisation put in place within the dispersed teams. Resources are not expected to struggle eternally on a problem. Help should be sought immediately	UP	Yes, I think that it does. Here, what I noticed is that if you've got a problem, you just can't sit and struggle with it. I suppose that you can take one day or two to think about it but not more. But in other Mauritian companies where I've worked, they won't interfere much with your work. They let you work and finally they will see the product and see if it's working.	Do you think that the way that an employee works depends on the organisational culture that surrounds him?	C3.12. G44
Organisational culture description	Best-practice oriented	The organisational culture inspires the work attitude and entices the team to follow a set of best practices	UP	I think that they are adopting the C3 culture. That is work work work work ☺ Everything has to be done very precisely to complete your work. Then you must ensure that the quality of your work is there. They focus a lot on quality and you have to do it their way, you can't do it your way.	In terms of the attitude towards the work here, how is the culture?	C3.12. G49

Organisational culture description	Best-practice oriented	The organisational culture inspires the work attitude and entices the team to follow a set of best practices	UP	I think that it's the right way because you don't actually lose any time. The work is getting done and it is getting done properly so that later on you don't get any problem. With the kind of attitude that they have, I think that it helps a lot. You get a lot of experience, so I think that it's good	In terms of the work attitude that you've described to me, what according to you are the advantages and the disadvantages to the work progress or success?	C3.I2.H1
Organisational culture description	Standard processes	The organisational culture governs the set of standard processes in place within the organisation	UP	Yes. You have to respect the rules ... 200 pages of rules ☺ They specify everything that you are not allowed to do. Like this function you are not allowed to use it...	Have you got any standardised activities like code standards, documentation standards?	C3.I3.H41
National culture description	Uncertainty minimisation	The national culture enhances and promotes the uncertainty minimisation techniques in place	UP	I think that this is the difference between us and them. They are very very very strict. Like in documentation, if you miss a point, this is something... this is an error for them.	And in Mauritius do we tolerate uncertainty?	C3.I3.10
National culture description	Project deadline management	The national culture determines how the project deadline will be managed. Some people are more inclined to accept delays as compared to others depending on the country	UP	And the other thing that we have learnt also is that people from the South of France are different from people from the North. People from the North are more Anglo-Saxon and they don't mind the time. The only thing if some project has been delayed, they want to know the exact reason. If there is a valid explanation, and we can explain exactly why there has been a delay, there is absolutely no problem. So they'd rather delay something to a customer rather than giving something which is not good.	How do they handle the fact that the projects are late?	C3.I4.126
Individual culture description	Requirements details	The amount of details given in the requirements depends on the individual personality of the project manager	UP	It depends on the project manager. Some will take the time to do it very detailed. It's mainly during the first months that you work here that they give you a lot of details. But as we advance in time, they will give you less and less details. They will assume that with some information you can expand yourself. It depends on the project. If it is something which is very specific to a	Is it clear and complete the high level specs?	C3.I4.133

				customer and he needs the button on a screen to be at the top left, this kind of small details that has been specified by the customer, they will give this to you. If this is something that you can expand yourself, they will give fewer details. In this case, you can work on the specs yourself and expand on it.		
National culture description	Standard processes	The national culture description will define whether the amount of standards will be easily accepted or not	UP	I would say that there is an over use of standards. Everything is bound to some rules somewhere. Everything that you do everyday ... [...] and when we deliver a project, anytime that there is an issue and something is not working properly with the project, you get [...] saying that you need to respect the standard of the company	Do you have any difficulties due to lack of standards?	C3.I4.1 38
National culture description	Uncertainty minimisation	Some cultures are so prone towards minimising uncertainty that they can stop a project altogether when things are not clear	UP	For example, if some problems occur in development on the solution that they are trying, as I said they work on critical phases first. So we start with that and if we find a problem like the technology that they decided to use is not working, they can stop everything. We'd rather stop everything. For example, there are cases where there were limitations in Microsoft, and dot net was not allowing us to do certain things. They stop the project altogether and got back to Microsoft and asked them what can be done. And when a solution comes back, they unlock the project. I mean they freeze the project completely if there is a problem.	What specific features of the waterfall model would you say are effective in helping them to achieve their goals of perfection, and stability?	C3.I4.1 43
National culture description	Uncertainty minimisation	The national culture traits define the amount of uncertainty minimisation within the GSD Team	UP	Yes, in the sense that with the waterfall model, you get to plan in the beginning. They like to know where they're stepping. They won't take any risks. So they like to know all the limitations of something before using it. They can spend hours in meetings discussing about something.	Does the waterfall model fits the French cultural traits needs?	C3.I4.1 45

Cultural difference impact	Project task allocation site	Cultural differences can be an advantage and be used to promote the work allocation. Work can be distributed based on cultural festivities so that resources are always available to work on the project	UP	Advantageous in the sense that you have a mix of cultures. Everybody is different. Somebody who is in that cultural mix tends to learn a lot. Because then you what is right and what is wrong with that person. What you can do and what you cannot do. In terms of the work itself, if I have a culturally diverse team, and I have a festivity which is related to let's say Indian people, since my team is culturally diverse, I can get other people to work on that day and have the two or three Indian people take the day off.	What specific cultural elements are advantageous or disadvantageous?	C2.I4.F41

Table 10 - From Culture to GSD Governance

2.4. From Culture to GSD Process Issues

This section provides evidence for the axial links between categories Culture and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Cultural difference impact	Communication delays	By having a Team-customer-communication strategy (allowing developers to talk to external customers), communication delays introduced by cultural differences, can be alleviated.	INT	But in application development, you have to have some form of structure around. So we try to find a middle ground, which is we don't want to [...] we will allow a developer to talk to a customer. On T2 side you won't find that. Karen talks to the customer or an analyst. But the developer doesn't. We're very much closer to the customer. We won't mind if customer picks up the phone to talk to a customer. We don't encourage it but we won't mind. Because we've got that informal arrangement and relationship with the customer. Anybody on this floor, we've got nothing to hide from the customer, can ask anybody what he wants to and talk to him. The customer likes it. That might change from the 1st of December. You know that from the 1st of December we will all become IBM. SO that might change because IBM operates in a totally different way.	Do you in SA tolerate uncertainty? Or do you like things to be clear and precise?	C1.I 4.A 1
Individual culture description	Communication delays	Specific forms of individual culture introduces communication delays as team members will keep on insisting to have their point of view accepted	UP	Rigidity of character, people that are inflexible, who are not prepared to be opened to change. Also where people feel threatened and they fear they're not making a mark strongly enough. They'll insist and insist and insist and having their point of view manifested. I think that this prevents proper communication	What prevents proper communication flow?	C1.I 3.A 8

National culture description	Meeting planning effectiveness	National cultural traits of some people cause them to behave in such a way that meetings are successfully held. This can be alleviated if team members find a way to adapt to the situation to find alternative solutions, like overestimating the time required for the meeting	INT	So, what we generally tend to do, we overestimate the time of our meeting with them. Because we know it can run out. So we overestimate the time. As we don't want things to be cut short.	And does it exceed the hour?	C1.I 4.A 9
National culture description	Language interpretation issues	Culture introduces language interpretation issues	UP	Interpretation and communication, you might have some slight differences because of your race culture. In SA it's sometimes not easy off the background that you come from. Europeans might talk this way and blacks might talk this way, so the pronunciation of your words is different. And understanding of what you mean...	No misinterpretation ?	C1.I 4.A 20
Individual culture description	Communication delays	Personalities of some individuals within the team introduces communication delays due to their incapacity to understand certain concepts	UP	We do sometimes have problems with certain people, certain individuals, more by their nature, they become pedantic with certain issues. We've seen that in Denmark and Belgium, we haven't seen that in English people. You get one out of 10 coming from Belgium or Denmark who's not just getting it, you know..	Let's talk about the work itself now	C1.I 1.A 36
Individual culture description	Communication issues	The personality of the resources might introduce communication issues if the latter is too franc and direct	UP	Yes, and also on the trust that the person has in you. If you have sent 5 good projects and then you sent one not good, you won't get that reaction. They will just say "make sure that this does not happen". But if you are sending and they get issues... because it takes a lot of time for them. They have to reset the environment, do their test...	Does it matter on the personality of the chef de project?	C3.I 3.I3

National culture description	Communication issues	National culture introduces communication issues	UP	But one thing that they have told me is that ... I had a problem with a project manager where he sent a mail where he just ... he was very very severe in that mail. But when I spoke to him one hour later, he was speaking fine. He only told me that for hi, it's just business. There is nothing personal. There is no difference because he's talking to me on the phone but on the mail it's different. He's only saying that on a work related context, he is very direct. But I was offended here. The manager here contacted him; the HR over there contacted him also, because even if there was a problem, there was no point in being that crude. The man, Fabrice [the French guy] he was saying that over there, there can be a problem between two person and there could be "des injures fort dans le bureau". And one hour later the people would be fine. When they have something to say, they will say it. They won't go behind your back and talk. Whether you like it or not they will tell you.	Do you feel that when you are communicating with somebody, it is important to see the person and how the person is reacting?	C3.I 4.14 7
Cultural difference impact	Language interpretation issues	People from different races and cultures talk in different ways and this causes language interpretation issues	UP	Interpretation and communication, you might have some slight differences because of your race culture. In SA it's sometimes not easy off the background that you come from. Europeans might talk this way and blacks might talk this way, so the pronunciation of your words is different. And understanding of what you mean...	No misinterpretation ?	C1.I 4.A 19
Cultural difference impact	Communication issues type	Differences in culture introduces communication issues during meetings	UP	And it sometimes gave us problems which we did resolve. We sit in a customer meeting with somebody from cape town and somebody from Belgium and the customer, and the two SCS people start blaming one another. Which is something	How about the Belgium team culture?	C1.I 4.D 24

Cultural difference impact	Time difference	Time difference is enhanced when there is high cultural difference impact. For instance, in a culture not used to working overtime, little effort will be made to increase the common working time hours. Time difference is thus more felt	UP	obviously that you never do in front of the customer. And I don't think that it is in the Mauritian way of thinking to work at night. I strongly believe that the Mauritian want to end at 5h. At 5h, everybody packs up and they go. They don't really have that thing like: "this is work, I have to work". So it is very very difficult at times to convince people to do overtime. If somebody is working till 8h30 and now she has to do overtime, it can go till very late. So sometimes, it is a small problem.	Are you affected by the time difference?	C2.I 4.F2 0
Cultural difference impact	Language accent	People belonging to some specific cultural group have a stronger accent than others	UP	And one of the big problems is the accent. And I've noticed that sometimes people belonging to one cultural group tends to have a stronger accent than the others!	Do you feel any cultural difference among the team members?	C2.I 4.F3 5
Cultural difference impact	Language accent	People belonging to some specific cultural group have a stronger accent than others	UP	And also in Canada, there are different regions and each regions have their accent. And this is something that also needs to be considered. You have the French which is proper to Quebec.	Do you feel any cultural difference among the team members?	C2.I 4.F3 6
Cultural difference impact	GSD Project delays	The cultural difference can introduce project delays. If team members are absent due to a cultural festivity and the other members, from another culture are not willing to work late to cover up, projects are delayed	UP	Cultures, we have different cultures in Mauritius. Let's say for example, we have a public holiday which is related to a festivity, lets say an Indian festivity. Normally, all the Indian people, they tend not to work. But this can sometimes affect the team because you might need somebody and if all of them are Indian, they are not going to come. So these are some problems that I get. And also like I said, in the Mauritius culture, they don't have the spirit of working after 5PM. They don't like working late. Even if it's till seven hours, it's not in their culture at all.	What problems result from cultural disparities from the team members?	C2.I 4.F4 0

Cultural difference impact	Communication issues	Cultural differences might cause people to be offended during the communication process. This might introduce communication issues	UP	Disadvantages, of course, not everybody are the same. There might be some things that offend that people for some particular reason that you won't understand because you are different from them. For example, working late is a cultural thing. I tend to see that people belonging to certain cultural group are less flexible to working late.	What specific cultural elements are advantageous or disadvantageous ?	C2.I 4.F4 2

Table 11 - From Culture to GSD Process Issues

2.5. From Culture to GSD Project

This section provides evidence for the axial links between categories Culture and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Organisational culture description	Quality	The organisational culture entices the team members to focus on quality and thus contribute to GSD Project success	UP	I think that they are adopting the C3 culture. That is work work work work 😊 Everything has to be done very precisely to complete your work. Then you must ensure that the quality of your work is there. They focus a lot on quality and you have to do it their way, you can't do it your way.	In terms of the attitude towards the work here, how is the culture?	C3.I2. G50
National culture description	Software development precision	National culture can promote software development precision	UP	The fact that they are very methodical, even in software development concepts. If they are developing something, they give a lot of importance to appearance. They invest a lot in that so that visually it's appealing.	What specific cultural traits would you say are advantageous or disadvantageous to software development?	C3.I4.1 50
Cultural difference impact	Project delivery speed	Cultural differences and specific cultural traits reduces the project delivery speed due to frequent rework	DOWN	Delays of progress. Not very largely, but there are definitely things that must be reworked.	How does it impact on the work?	C1.I3. A32

Table 12 - From Culture to GSD Project

2.6. From Culture to Software Development Practices

This section provides evidence for the axial links between categories Culture and Software Development Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Organisational culture description	Method standard	The right choice of software development method can be used to support the organisational culture requirements	UP	And also in terms of the client, they are very process driven. And the fact that RUP is a very recognized methodology is fairly advantageous	What specific features of RUP would you say are advantageous to you?	C1.12. A25
Organisational culture description	Software development method acceptance	Proper organisational culture helps in the acceptance of the software development method, no matter how tedious it is	UP	I'll tell you how it is impacted. Because these methodologies are followed so strongly, the system life cycle happens according to universally accepted processes and methodologies. And documentation is then diligently signed off and reviewed. All these iterations and the different parts of the life cycles are strictly followed here. Its done with inspiration and energy. It's not a chore that needs to be taken care of, because it's the culture.	Do the cultural differences impact on the design?	C1.13. C22
National culture description	Phase	A methodology with a lot of phases could be in contradiction with a relaxed national culture. However, when the organisational culture entices people to take pride in their work, the methodology can be enthusiastically embraced	INT	Ironically, RUP, or any methodology or process that needs a lot of attention and has many different phases, is almost in contradiction with a relaxed culture. But because of its [...] there's a lot of pride in what's being delivered here. The methodology is perfectly aligned with the professionalism of the organization. So, I'd say that they both complement one another in this organization.	What specific features of RUP are beneficial here?	C1.13. C24

Organisational culture description	Software development method choice	Specific forms of organisational culture, which requires people to stay abreast of technology, can influence the choice of software development method	UP	I would say.... Yes you could call it the culture. Because they want to stay abreast of the latest technology. They want to stay in line with benchmark, they opted for RUP. Perhaps, an organization where staying abreast of technology was not at first to heart, they might have opted for something different which is not globally recognized.	Would you say that the culture has influenced the choice of methodology?	C1.I3. C25
Organisational culture description	Software development method disadvantage	The organisational culture helps to accept any disadvantage obtained from the software development method. For instance, their desire for perfection, helps to accept the many iterations created by the waterfall model	DOWN	That happens yes. Let's say that they want a project to be done on function A, function B, function C. During the implementation, they can say, OK, it was not supposed to be function C, function E. So we have to do it again. Not everything, but the function only. And sometimes when we deliver the project, we say, OK, this should not be like this, if you could find some other way to do it like that...It's expected to be like that because I think that they want the software to be perfect.	What I want to understand is... let's say that they did the analysis and the design and you implemented it, and then they want more changes to the design... So they are not really sure in the beginning if the design is what they want?	C3.I1. G13
Individual culture description	Modelling level	The modelling level is chosen based on the project leader personal preferences	UP	It depends on the chef de projet. It's mostly written in French. You have some modelling, but it's not that intense. It's sometimes surprising how they explain things ☺ "Leave two pixels to the right" ☺	Do you use UML?	C3.I3. H47
National culture description	Software development approach	The national culture helps in accepting the software development approach being used within the organisation. Strict and precise cultures find the waterfall model appropriate	UP	Yes I think so. Because the fact that they have different parts, that is analysis, design etc. So when they do analysis, they will concentrate on doing something very strict and very clear, before moving to the next phase. There are a lot of validation phases before moving to the next phase like the design. They work like this, break into small parts. So the waterfall model provides a framework for breaking into these steps	Do you think that the waterfall model suits the cultural traits that the French people have?	C3.I3.1 9

Table 13 - From Culture to Software Development Practices

GSD GOVERNANCE

3.1. From GSD Governance to Communication Practices

This section provides evidence for the axial links between categories GSD Governance and Communication Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
International meeting stage	Ease of interaction	Prior international meetings enhance communication among the team members	UP	There's always a beauty of meeting people face to face. There's stronger communication. And knowing them in person, then brought some colourfulness to the whole thing. And the softness, you know what the person looks like. It is of immense value	Has it changed your perception?	C1.I3. A7
Documentation sharing	Communication level	Having proper documentation sharing mechanisms across the sites help to promote the communication level	UP	That is what was agreed initially, we enclose that again during each workshop. Any documentation filled by any party will immediately be shared and be CCed. And we do that and it works wonderfully.	Is there a problem as you guys are far away and you don't know what the other team is doing?	C1.I3. B1
International meeting purpose	Communication channel	Without prior international meeting, which allows team members to meet physically, the communication channel is dry and impersonal	DOWN	Then there's like minimal interaction. We just go straight to the work conversation. Because we are not doing call centres here and we are working with the colleagues so it's not important that we concentrate on salutations, etc. As long as we are polite, it's fine.	But on the phone?	C2.I3. F9
Documentation	Communication with client	Having proper documentation can help to promote the communication with the client	UP	Basically some of the documentation provides guidelines for us and for the client to know how we work. And what type of service they can expect from us.	Can you please explain the purpose of each documentation?	C2.I4. F25

Table 14 - From GSD Governance to Communication Practices

3.2. From GSD Governance to GSD Governance

This section provides evidence for the axial links between categories GSD Governance and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Best Practice Oriented	Best Practice Oriented	As competency centres helps the resources to promote best practices within each of their respective work areas, this in turn help the organisation to promote best practices within the day to day work	UP	Those are the teams. But the reasons we've broken them into competency centers is that, usually there is a center manager who take care of that and what they usually do is that what are the best practices for that competency and make then sure that across the analyst, regardless of the projects that they are working on, they're applying their best practices.	But those are the teams?	C1.I2. A14
International meeting purpose	Agreement seeking procedure	International meetings can be used to reach agreement and reduce the risk of disagreements at a later stage	UP	That means there's not going to be disagreement. There's certainty reached and this is actually the value that the workshop bought.	So you told me that you went to UK recently? Can you please tell me about it? Under what circumstances was that?	C1.I3. A17
Documentation	Uncertainty minimisation	Documentation can be used to reduce uncertainty among the Project team, as when they are accessible to everyone, all stakeholders are aware of the status	UP	Hmmm there are sometimes but what we do is that we keep a document going that we call the business clarification document where if someone goes "does it means this or that?" then it gets put in the clarification document and we discuss with the business team and they say "Oh I see that's ambiguous and this is what I actually mean" and then next its updated and the source requirement document will actually get updated	Are there sometimes misunderstandings in terms of software requirements?	C1.I2. B6
Uncertainty minimisation	Issue prevention	By having uncertainty minimisation techniques in place, issues can be prevented and properly managed	DOWN	We don't give it to them to create their own interpretation. This would create a lot of problem. That's why I call it collaborative software development.	And in terms of explaining, describing?	C1.I1. B10



Documentation	Uncertainty minimisation	Having a proper set of documentation constantly updated is crucial to reduce uncertainty	DOWN	The whole approach of having every requirement, every specification, every query with its subsequent clarification document is very valuable. Because if anywhere along that system life cycle line, questions pop up, you have always got a solid history, documented to fall back on. The documentation, what one feel as an excess of documentation, has to be produced. The documentation has to be signed off. Every document has to be signed off. That I see as a benefit as well, because it forces the interaction review across stakeholders.	Any specific features of RUP would you say are beneficial to this specific dispersed environment?	C1.I3. C14
Documentation	Collaboration across sites	Documentation management promotes collaboration across sites as it forces stakeholders to interact with each other	UP	The whole approach of having every requirement, every specification, and every query with its subsequent clarification document is very valuable. Because if anywhere along that system life cycle line, questions pop up, you have always got a solid history, documented to fall back on. The documentation, what one feel as an excess of documentation, has to be produced. The documentation has to be signed off. Every document has to be signed off. That I see as a benefit as well, because it forces the interaction review across stakeholders.	Any specific features of RUP would you say are beneficial to this specific dispersed environment?	C1.I3. C15

Documentation	Agreement seeking procedure	Having proper set of documentation which are signed off promotes agreement seeking procedures	UP	The whole approach of having every requirement, every specification, every query with its subsequent clarification document is very valuable. Because if anywhere along that system life cycle line, questions pop up, you have always got a solid history, documented to fall back on. The documentation, what one feel as an excess of documentation, has to be produced. The documentation has to be signed off. Every document has to be signed off. That I see as a benefit as well, because it forces the interaction review across stakeholders.	Any specific features of RUP would you say are beneficial to this specific dispersed environment?	C1.I3. C16
International meeting purpose	Agreement seeking procedure	International meetings are used to reach agreements	UP	I think that our infrastructure really supports our communication. We have a communal mail boxes in both London and Copenhagen. So email happens basically uninterrupted in our network. Then teleconferences are allowed at anytime or for any length of time, as well as one-on-one phone call. They'll even promote travel in order to reach agreement and optimum communication.	How about the infrastructure? Does it facilitate communication or prevent communication?	C1.I3. C30
Meeting minutes	Issue prevention	Having meeting minutes recorded at each meetings can be used to prevent issues	DOWN	Even in teleconferences, we always try to have somebody to take minutes of it. If you don't do those kinds of things, you can get into trouble. Because behind all of that, there's some kind of decision taking that's taking place. And you have to record that decision making somewhere.	How effective are each of these tools?	C1.I4. D26
Requirements issues	GSD Project delays	Requirements issues and unclear requirements introduces project delays. But technologies like emails can be used to get clarifications quickly	INT	Recently we were developing two design packages; we had some queries ALIAS which were not able to understand. So what we did, we forward any questions that we had and it was cleared out.	In terms of requirements engineering? Have you ever had misinterpretation on issues of the requirements?	C2.I1. D28

International meeting purpose	International meeting site	The international meeting site is chosen based on the purpose of the meetings	UP	If there's any training required, we've got someone coming from England and they deliver the training to the testers.	And has anyone from the testing team ever been to the UK?	C2.I2.E6
Customer site	Design site	Design site is normally chosen to be the same as the customer site. This is due to the need for informal communication, which is crucial to ease communication	UP	I think that it's not an issue and it's not a problem, because all the main customers are found in England. They are in England, they are on site, there's communication between the system analyst or the project manager with the client over there. Because informal communication is very important. If they've got all the contact and all the communication with the client over there, so I think that the best thing is to do the analysis and design work over there. I don't think that it would be wise to let the team here do the analysis work.	How effective is this work setup?	C2.I2.E17
International meeting purpose	Training	International meeting can be used for training purposes	UP	We went there for business and training. 2000 and 2001 we went there. And then recently, last month, in October, we were there for one week. Just to meet the team. We've got a new manager now. And also take over some of the new systems that we are supporting.	Under what circumstances	C2.I3.E32
Documentation versioning	Uncertainty level	Documentation versioning can be used to overcome uncertainty issues	DOWN	Then what I do is I update my document. The good thing with CUSP is that you have different versions. Every times you update a document, it creates a new version for it.	Do the British tolerate any uncertainty?	C2.I3.F6
Procedure oriented	Collaboration across sites	Having proper procedures in place can promote collaboration across sites	UP	Yes we do. We have code standards for both Crystal and VB developers. Documentation as well and work processes of course. We do have a work process in place because otherwise, it would be very difficult to organise ourselves. Also there are some templates and code reuse.	Have you got standardised activities?	C2.I4.F23

Procedure across dispersed sites	Collaboration across sites	Having procedures in place does not help the collaboration process if the other sites do not respect these procedures	DOWN	Yes of course. We do encounter difficulties whenever a process is setup, but the client does not respect the process. For example, whenever we receive a request, we expect a signoff. We send a quote for the work and we expect the client to approve. When the client approves, the specs are the final one. If the client comes back and says that he or she wants something modified on it, normally we have to charge. Because it has been approved that it will be done that way, and the change that he or she wants has not been approved, it needs to be charged. But very often, we don't charge. And this is where sometimes it really affects the process.	Do you encounter any difficulties?	C2.14. F24
Design site	Analysis site	The design site is dependent on the analysis site. Most of the time, both work are done at the same time	UP	Design... it depends. If the design is dependent on the analysis, that is if the analyst designed something, it is done in Canada. But sometimes the design for Crystal is done in Mauritius. We just have a look at what the customer wants and we just put it in the design.	How is the development work organised throughout the dispersed team?	C2.14. F26
Project type	Design site	Internal projects can be designed at offshore	UP	For the internal projects, we are free. We get a project and we have to design it here. But for the clients, France is mainly designing and the analysis is done there.	So what I would like to know now is how the development work is organised here? Where is the design done, analysis, testing... how is it organised?	C3.11. F50
Project type	Analysis site	For internal projects, analysis can be done at offshore	UP	For the internal projects, we are free. We get a project and we have to design it here. But for the clients, France is mainly designing and the analysis is done there.	So what I would like to know now is how the development work is organised here? Where is the design done, analysis, testing... how	C3.11. G1

Project type	Analysis site	For internal projects, analysis can be done at offshore	UP	In both places. Sometimes we do the analysis here and the design here. Sometimes they've already done the analysis and we just have to design and implement.	is it organised? So let's talk about the internal. Do you do analysis here or in France?	C3.11. G2
Customer site	Analysis site	The analysis site is normally chosen to be the same as the customer site	UP	Analysis is always done in France. Because they have to go to the hyper market... We would like to do it ☺ For the design it depends. Normally they will do a design, as they are well experienced in design	I would like to know how the development work is organised. Where is the analysis done, design coding testing? What are the different kinds of test that you do?	C3.13. H45

Table 15 - From GSD Governance to GSD Governance

3.3. From GSD Governance to GSD Process Issues

This section provides evidence for the axial links between categories GSD Governance and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Additional resources	GSD Project delays	The unavailability of additional resources whenever required introduces project delays	UP	But we also have project delays because we don't have the resources to do something that took longer that we thought. Then we have to communicate to them that we're not going to be able to make it	Do you have any work coordination issues?	C1.12. B28



Work priority defined by	Coordination issues	By having the customer defining the tasks priority, coordination issues can be managed	DOWN	No there is not issues.... We know what we always do if there is issues and if there is conflicts. Because we've got limited amount of resources, and there is always more work and more requests from the customer than the amount of resources that there are. And anytime issues arise, we will always go back to the customer and say: "we've got this amount of resources to do the work, we've got this amount of work to be done, you prioritise what needs to be done or what doesn't need to be done. Where the priority does lies? What is important for you?" We don't make this decision. Then they decide what must be done. And I think that they're comfortable that we'll never make decisions on their behalf	And how is work coordination defined?	C1.I4. B29
Procedure oriented	Requirements issues	Having proper procedures in place to manage requirements engineering can reduce requirements issues	DOWN	No, not really, we have lots of standards. Well, actually we had a time where the business... mmm... this was a month where we weren't really involved initially. But where we've agreed to the project but the business hadn't actually given us decent requirements and we committed to a six month contract and when we actually looked for the requirements, they didn't have all the details in them. So we've really had problems like that in the past so we really put processes in place to ensure that this doesn't happen again	Do you encounter any difficulties with all the templates that are in place?	C1.I2. B33
Procedure across dispersed sites	Communication issues type	Having similar procedures followed across dispersed sites helps to overcome communication	DOWN	This is an example of [...]. This makes it so much easier to communicate is that both T1 and T2 are	Do you always follow that?	C1.I3. C13

		issues. All sites are thus aware of the procedures to be followed across the sites		both used to following these processes. We know that first we need to fetch the requirements, and then it has to be reviewed, then it needs to be signed off. Both organizations are used to working this way, and its for control, traceability		
International meeting purpose	Communication issues type	International meetings are used to solve communication issues to achieve optimum communication	DOWN	I think that our infrastructure really supports our communication. We have a communal mail boxes in both London and Copenhagen. So email happens basically uninterrupted in our network. Then teleconferences are allowed at anytime or for any length of time, as well as one-on-one phone call. They'll even promote travel in order to reach agreement and optimum communication.	How about the infrastructure? Does it facilitate communication or prevent communication?	C1.I3. C29
Project meetings	Coordination issues	Regular project meeting can be used to overcome coordination issues	DOWN	But at the same time, we've got monthly project board meetings with the customers, and those kinds of issues get discussed.	How is work coordination managed?	C1.I4. D8
Standard processes	Geographical distance	Having proper standards in place can be used to overcome geographical distance	DOWN	Yes, and since we're so far remote, it's far more important.	So there are definite procedures in place that everyone has to follow?	C1.I4. D18
Similar requirement standards followed by foreign team	Requirements issues	When the foreign teams do not follow similar standards, requirements issues cannot be avoided	UP	The main difficulty is it doesn't matter how well and how properly your standards or procedures insides are. If you customer... they don't follow the same standard.... So the requirements that comes from them, because they haven't got the same standards to put those requirements together, (business requirements), it can be... depending on who is doing this in the business before they reach our analysis.	Do you encounter any difficulty due to lack of standards somewhere?	C1.I4. D19



Documentation quality	Requirements issues	Having documents of high quality can overcome requirements issues	DOWN	It can be written very well, or it can be very limited. And depending on how that comes, it defines how long the analyst doing the requirements has to spend on it. If it's well defined, and is well put together,... we went as far as sending them the template saying: "those are the kinds of information that we are looking for business requirements".	Do you encounter any difficulty due to lack of standards somewhere?	C1.14. D20
Cultural understanding	Language accent	Having a team members being aware of their cultural differences helps them to make an effort to understand each other and to overcome the language accent problem	DOWN	But I think that they are aware of that. And on their part, they also make a lot of effort to understand us. For instance, they might talk slowly. But they told us that they have not made that much adjustment. They've told us that communication is fine	Do you think that there is a cultural difference between the Mauritian people and the US people?	C2.11. D33
Uncertainty minimisation	Requirements issues	Unclear requirements are clarified by having uncertainty minimisation techniques which call for constant probing	DOWN	Sometimes we don't understand, and then we have to ask for more clarification. But at the end, we do resolve	Do you easily understand what they want?	C2.11. D39
Additional resources	GSD Project delays	Additional resources placed on a project can be used to overcome GSD Project delays	DOWN	The tester or the developer? Let's say for the developer, if he has to deliver something and he finds that there is some backlog. He just communicates with the manager and asks for some more time. Or they tend to put additional developers to the project, working overtime. If it's a very important customer who requested to deliver the project in time, I think that they put additional resources and tend to honour their agreement.	What happens if somebody doesn't meet the deadline? How is it managed?	C2.12. E14

Agreement seeking procedure	Requirements issues	Having proper agreement seeking procedures in place overcomes and reduces requirements issues	DOWN	It's very rare, because in the first instance, when the document has been placed on share point, they do a review. And in the review we've got a project manager, a developer and also a tester. And then, when you are going through the document, if you don't understand something, you have the opportunity to ask for clarifications on the document itself. You tend to have some more requirements, some more difficulties when you start with the testing.	Are there times where there are some misunderstandings about the requirements?	C2.I2. E15
Documentation quality	Communication issues type	When documentation are not up to date and is of poor quality, communication issues are introduced	UP	Well in terms of communication, especially when the documentation is not that up to date and not that detailed, we have some issues. Then we need to phone them, or email them. And the distance makes a difference. It sometimes gets difficult. It's easier for me if we are talking face to face. Just hearing the voice on the phone does not make it easy to explain things sometimes. You don't see the body language.	I would like to know about the communication issues that you encounter while working with people who are far away.	C2.I3. E35
Project planning	Coordination issues	Coordination issues can be avoided through careful project planning	DOWN	In my plan, I put some buffer.	Does it affect your work? Or do you plan accordingly?	C2.I3. F5
Work re-allocation	Priority issues	Work re-allocation can be used to overcome priority issues	DOWN	Sometimes, we have to do reallocation. For example it might happen that somebody has so many priorities work to do, and then we have to break it down and assign it to other developers. So that's the main way I'm dealing with that right now.	How do you overcome the work coordination issues?	C2.I4. F17

Uncertainty minimisation	Requirements issues	uncertainty minimisation procedures, through constant probing and asking of questions can be used to overcome requirements issues	DOWN	Very rarely, but when this happens, we are not afraid to ask for clarifications. So this is not really like a road block. We can easily overcome it.	But do you sometimes have some requirements specification issues?	C2.I4. F21
Uncertainty minimisation	Requirements issues	uncertainty minimisation procedures, through constant probing and asking of questions can be used to overcome requirements issues	DOWN	By basically asking questions whenever we have issues	How do you overcome these issues?	C2.I4. F22
Design site	Development issues	When the design site is not the same as the development site, development issues can be introduced as the team members might have trouble understanding the logic behind the codes	UP	In fact it was last month, I had a project on Timorc. The instructions were not difficult to understand but the codes were difficult to understand. They told me, "you go in this part of the project, you copy it here, and then you modify something in it". It was about 2000 lines of codes. But the problem is... I should know what these codes are doing. This method calls this method and the latter calls another method and then I'm lost. It's very difficult in those cases to implement what they're asking. If had to design it again, it would be better because I know what I'm doing, even if it is the same code. This the main issue.	Do you have any work coordination issues?	C3.I1. G10
Documentation quality	Requirements issues	Documentation of poor quality introduces requirements issues	UP	Normally we do have precise documentation, but sometimes it happens that we only get one page documentation. It rarely happens but I know that my colleagues have sometimes got only one page saying: "OK, do this part". Then we have to do it and ask: "Is it OK?" No it's not ok, then we come back and it goes on like this.	Do you have very clear documentation or does it ever leave room for your own interpretation?	C3.I1. G17

Project management	Information loss	Project management techniques like tight project monitoring and control can be used to overcome information loss due to relay of communication. The team leader has to be well aware of what is happening in the project	DOWN	No because our team leader monitors our work. All the work has to be validated by the team leader. We can't just write some part of the codes, we have to complete it.	Wouldn't you rather contact them yourself? Because there are a lot of relay of communication? Does information get lost somewhere along the way?	C3.12. G33
Project management	Information loss	Project management techniques like tight project monitoring and control can be used to overcome information loss due to relay of communication. The team leader has to be well aware of what is happening in the project	DOWN	No because as I said, the team leader has to validate the work and the work has to be done completely right. So the team leader will validate it and he must understand what is going on	But is information distorted somehow?	C3.12. G34
Uncertainty minimisation	Information loss	Uncertainty minimisation techniques which requires the team leaders to be fully be aware of the all aspects of the project, is used to minimise information loss due to the customer-team communication strategy	DOWN	This does not happen because the team leader is here. He conveys the message. He knows exactly what the problem is and we explain it to him and he explains it to them.	The fact that you have to transfer information to the team leader and the team leader transfer information to the project managers, do you feel that somewhere along the way, information is lost?	C3.15. H7
Cultural understanding	Language interpretation issues	Cultural understanding can be used to minimise language interpretation issues as all parties involved will make some effort to promote the communication process	DOWN	Yes, but the project manager told us that they understand that we have a problem with the grammar. So, now after two or three months, it's not a problem. We have a dictionary whenever we're not sure. And we have the auto correct to correct the spelling.	But do they understand you when you speak?	C3.15. H11
Standard processes	Development issues	Standardised activities present across the sites help to reduce GSD issues	DOWN	Everyone has to develop the code standards when developing the projects. The code standards are important at C3 because it prevents us from doing petty mistakes like [...]. These are very important. Document standards you have	Are there standardised activities in place? Like code standards or documentation standards?	C3.15. H17

Standard processes	Development issues	Standard processes in place throughout the development process (documentation standard, code standard etc) helps to overcome development issues	DOWN	models, so it saves time and it gets the job completed quickly. And the code standards are important for understanding. Because we do the framework ourselves, we limit the properties that we are allowed to use. We write the functions ourselves. For example, for formatting dates, we have a function in French that formats date. This is to ensure that if a developer develops something, the other team understands it immediately. We don't use a property that's farfetched	Why?	C3.I3. H42
Documentation	Development issues	Proper documentation can be used to overcome development issues	DOWN	The developer does the unit testing and put their test results in the documentation itself. Sometimes, they don't put the results but it's OK. The rule is that you have to put the result, but we're not forced into it. But I think it's good because we are protected. If something goes wrong we can say "No, but we tested this. Maybe someone has modified it". And then, when they finish, they give it to me. Me, I do what I call the integration testing. That is, put it in the environment, put it under stress, performance testing.. what happens if connection breaks out... if there is a problem how is it reacting... I also verify the documentation to see that it is up to date. And then I send a mail to the chef de projet and copy all the persons who have to be copied. And then, there they do a test again. If there is a problem, they come back to me and give like a compte rendu. When it comes back, I	Do you use UML?	C3.I3. H48

Testing procedures	Development issues	Proper testing procedures can be used to overcome development issues	DOWN	either do the correction or send it to the developer to correct. The developer does the unit testing and put their test results in the documentation itself. Sometimes, they don't put the results but it's OK. The rule is that you have to put the result, but we're not forced into it. But I think it's good because we are protected. If something goes wrong we can say "No, but we tested this. Maybe someone has modified it". And then, when they finish, they give it to me. Me, I do what I call the integration testing. That is, put it in the environment, put it under stress, performance testing. What happens if connection breaks out... if there is a problem how is it reacting... I also verify the documentation to see that it is up to date. And then I send a mail to the chef de projet and copy all the persons who have to be copied. And then, there they do a test again. If there is a problem, they come back to me and give like a compte rendu. When it comes back, I either do the correction or send it to the developer to correct.	Do you use UML?	C3.I3.H49
Project planning	Coordination issues	Proper project planning can overcome coordination issues	UP	A project can have hundreds of tasks and at any point we can know if there is some overlap so we try to plan in advance also. We ask the people to give us their holidays in advance	How do you overcome work coordination?	C3.I4.I29

Table 16 - From GSD Governance to GSD Process Issues

3.4. From GSD Governance to GSD Project

This section provides evidence for the axial links between categories GSD Governance and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Expertise	Expertise level	The proper team structure, like competency centres introduces some best practices and increases the level of expertise for a project	UP	But basically, people who are experts in business intelligence work there (BICC), ... and then for any one project, you have resources from [each CC], hmm, you have an analyst, a project manager and all of them come together on a project	Can you please explain the concept of competency centres?	C1.12. A10
Procedure oriented	Productivity	Having tight procedures in place is crucial to the success of the GSD Project	UP	Absolutely, it is crucial, it is absolutely vital for the project.	Do you have a definite set of procedures in place to overcome coordination issues?	C1.13. C4
Standard processes	Project delivery speed	Standard processes help to increase project delivery speed	UP	Everyone has to develop the code standards when developing the projects. The code standards are important at C3 because it prevents us from doing petty mistakes like [...]. These are very important. Document standards you have models, so it saves time and it gets the job completed quickly. And the code standards are important for understanding.	Are there standardised activities in place? Like code standards or documentation standards?	C3.15. H18
Project management	Project visibility	Proper project management introduces project visibility	UP	We tend to monitor the time spent... because here in the projects we tend to subdivide everything carefully. We know who is working on what, for how much time.	How do you overcome work coordination?	C3.14.1 28
Project planning	Project visibility	Project planning introduces project visibility	UP	We try to get a visibility of about 4 months. There's better planning.	How do you overcome work coordination?	C3.14.1 30

Table 17 - From GSD Governance to GSD Project

3.5. From GSD Governance to GSD Team

This section provides evidence for the axial links between categories GSD Governance and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Use of a mentor	Prior training on methodology	The use of a mentor can help if a new team member has no prior training at using the methodology employed throughout the dispersed team	DOWN	Because when you bring people in, you set up the environment already, so you've got guide people. Everyone new in the team has got a mentor. And a mentor will have to show you how to do things. Technically it is good, experience-wise it is OK, Knowledgeable he's got a qualification. So when you come on board, you've got to be guided by somebody who's been in the process already because we don't want anybody to come in and start using their own methodology.	It takes time for the people to learn how to use it?	C1.11. A30
Team age	Design site	The design site is chosen based on the age of the team located at that site		Since this is a new department, my department has started in February; we have not had the chance to do that much design. But it might be in the future	But for the big projects, are analysis / design done over there?	C2.11. B30
International meeting purpose	Product knowledge	International meetings can be used to improve the resources' product knowledge	UP	Of course! We didn't know anything about these products before. They had to come here to provide us with the training.	Was it helpful that you actually met them?	C2.11. B34
International meeting purpose	Product knowledge	International meetings can be used to improve the resources' product knowledge	UP	They just come to get more contact or to do some training. Let's say they come mainly for contact, and then they seize the opportunity to do some training and to be aware of any problems that were encountered while doing the work	Under what circumstances do they come visit?	C2.12. E3

International meeting purpose	Affiliation level	International meetings can be used to improve the affiliation level between the team members	UP	They just come to get more contact or to do some training. Let's say they come mainly for contact, and then they seize the opportunity to do some training and to be aware of any problems that were encountered while doing the work	Under what circumstances do they come visit?	C2.I2. E4
International meeting purpose	Affiliation level	International meetings can be used to promote team affiliation level, for instance when there is a new manager for the team	UP	We went there for business and training. 2000 and 2001 we went there. And then recently, last month, in October, we were there for one week. Just to meet the team. We've got a new manager now. And also take over some of the new systems that we are supporting.	Under what circumstances?	C2.I3. E33
Documentation	Product knowledge	Having clear documentation available to everyone contributes to increasing the product knowledge.	UP	Of course there's the documentation for all the codes. It's documented in French. If you don't understand something, you just have to read the documentation and understand what the functionality is and work with it.	Isn't documented?	C3.I2. G37
International meeting purpose	Affiliation level	International meetings help to promote the level of affiliation among the team members	UP	When you have talked to a chef de project, your relationship afterwards is much better. You know to what kind of person you are talking, how to present him a problem	Is it a disadvantage for them that they didn't meet the person over there and see the work environment? Does it affect the work or not really?	C3.I3. H26

Table 18 - From GSD Governance to GSD Team

3.6. From GSD Governance and GSD Value Issues

This section provides evidence for the axial links between categories GSD Governance and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Agreement seeking procedure	Uncertainty level	By having formal review cycles, agreement is reached among the stakeholders and uncertainty is reduced	DOWN	In the document that we write, we do a formal review cycle. So somebody would review it and add the comments and somebody would update it. And also at the beginning of a project when an analyst has got all the requirements documents they would then do kind of workshops where they take the developer through the various kind of functionality that's required .	Are there sometimes misunderstandings in terms of software requirements?	C1.I2. A48
International meeting purpose	Trust level	International meetings held at the right stage help to promote the trust level among the team members	UP	A feel that after this workshop, things were actually voiced by London. So Denmark now has complete trust in the capability of the team and is now relaxed. It perhaps enabled the trust component	Was there some sort of lack of trust from the parties from Denmark and London?	C1.I3. B18
Contract	Uncertainty level	Having a contract with everything clearly stated can help to reduce uncertainty	DOWN	We fight about contractual issues and try to decide who's right in some of the grey areas but usually there's a contract, a word document that is very clearly defined. And what we try to do is to define this word document so clearly that there can't be a disagreement about anything	Is there any uncertainty issues?	C1.I2. B37



Uncertainty minimisation	Cultural difference impact	Uncertainty minimisation procedures can be used to overcome negative cultural influences of cultures with high tolerance to uncertainty.	DOWN	We have to contact them again. Rephrase the question, ask again. I know that sometimes they feel that it is a bit much. But I'm not aware of that. What is important for me is having complete clarity, and understanding and agreement on the requirements.	How do you overcome the fact that the brits are very tolerant for uncertainty and u guys are not?	C1.I3. C21
International meeting frequency	Trust level	Frequently held International meeting can be used to increase the trust level	UP	I'm here for 18 months, and when I got here, there was not much trust. And the main reason was, there was bigger separation than there is now. And one of the first things I've done was to go see them at least twice or three times a year. In these 18 months, I've been there 4 times. And that just lift the level of trust because then they now can relate to who you are and what kind of service you give.	How was it in the beginning?	C1.I4. D6
Cultural understanding	Cultural difference impact	When team members are aware of their cultural differences, it helps them to make an effort to understand each other and to mediate the cultural difference impact	DOWN	But I think that they are aware of that. And on their part, they also make a lot of effort to understand us. For instance, they might talk slowly. But they told us that they have not made that many adjustments. They've told us that communication is fine	Do you think that there is a cultural difference between the Mauritian people and the US people?	C2.I1. D32
Documentation quality	Cues transmission	Having documentation of high quality can be used to overcome the lack of cues transmission during communication and the resulting communication issues	DOWN	Then what I do is, I try to document as clearly as possible. Going through the details, telling them step by step what we need, what is required. Sometimes when I ask questions, I ask not only one question, but two or three questions, one after the other, just to make sure that I understand the problem from 2 different angles. So they don't misunderstand my question.	But how do you overcome the body language problem?	C2.I3. E38

Uncertainty minimisation	Cues transmission	Proper uncertainty minimisation techniques like constantly asking for clarifications can be used to overcome the lack of cues during communication and the resulting communication issues	DOWN	Then what I do is, I try to document as clearly as possible. Going through the details, telling them step by step what we need, what is required. Sometimes when I ask questions, I ask not only one question, but two or three questions, one after the other, just to make sure that I understand the problem from 2 different angles. So they don't misunderstand my question.	But how do you overcome the body language problem?	C2.I3. E39
International meeting purpose	Cues transmission	After having physically met, team members are no longer affected by lack of visual cues	DOWN	If you don't know the person, it does make a difference. But if you have met that person, it doesn't make that much difference.	Do you think that visual cues are important during communication?	C2.I3. F8
Cultural understanding	Cultural difference impact	Cultural understanding among the team members so that they are aware of their differences can be used to reduce cultural issues	DOWN	If you know well what are the things that affect a particular person or a particular group, yes you can make some amendments to it. For example lets say that in my team, I know that there is somebody who is not very keen to working overtime. For example I will have to make sure that whenever a project gets assigned to her, it's not project where that person will have to stay overtime.	How does the project design compensate or take advantage of this?	C2.I4. F44

Table 19 - From GSD Governance to GSD Value Issues

3.7. From GSD Governance to Culture

This section provides evidence for the axial links between categories GSD Governance and Culture.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Uncertainty minimisation	Cultural difference impact	Uncertainty minimisation procedures can be used to overcome cultural differences for culture with high tolerance to uncertainty.	DOWN	We have to contact them again. Rephrase the question, ask again. I know that sometimes they feel that it is a bit much. But I'm not aware of that. What is important for me is having complete clarity, and understanding and agreement on the requirements.	How do you overcome the fact that the British are very tolerant for uncertainty and u guys are not?	C1.13 .C21
Cultural understanding	Cultural difference impact	Having a team members being aware of their cultural differences helps them to make an effort to understand each other and to mediate the cultural difference impact	DOWN	But I think that they are aware of that. And on their part, they also make a lot of effort to understand us. For instance, they might talk slowly. But they told us that they have not made that many adjustments. They've told us that communication is fine	Do you think that there is a cultural difference between the Mauritian people and the US people?	C2.11 .D32
Cultural understanding	Cultural difference impact	Cultural understanding among the team members so that they are aware of their differences can be used to reduce cultural issues	DOWN	If you know well what are the things that affect a particular person or a particular group, yes you can make some amendments to it. For example let's say that in my team, I know that there is somebody who is not very keen to working overtime. For example I will have to make sure that whenever a project gets assigned to her, it's not project where that person will have to stay overtime.	How does the project design compensate or take advantage of this?	C2.14 .F44

Table 20 – From GSD Governance to Culture

3.8. From GSD Governance to Technology

This section provides evidence for the axial links between categories GSD Governance and Technology.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Work format	Task-technology-structure fit	Each technology is appropriate when used for the particular work type or context	UP	Till now I haven't had any problems with those communication tools. Each one has its purpose. As long as you use each one of these tools in the proper context its fine.	Are there any limitations from these tools?	C2.I1. D45
Uncertainty minimisation	Tool disadvantage	Proper follow up of emails can be used to overcome the tool disadvantage of having emails overlaps	DOWN	Then you have to make sure that you don't miss anything from these mails. You have to follow up	Does it create a problem?	C2.I3. E40

Table 21 - From GSD Governance to Technology

GSD PROCESS ISSUES

4.1. From GSD Process Issues to GSD Governance

This section provides evidence for the axial links between categories GSD Process Issues and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Time difference	Best Practice Oriented	Time difference can be considered as advantageous when minimal and it helps to promote best practice within the dispersed teams	UP	I'm quite happy so that we can come to the office before they do and you get a chance to refine email and refine some stuff before they come and say "what happened??"	Do you have trouble with the time zone difference?	C1.I2. A41
Time difference	Work collaboration ability	Time difference can be used to improve work collaboration ability as depending on the site, team members come to work and their fellow team members are already available for communication. However, this is not the cases for teams that are ahead in the time zones.	UP	And that's why they like what we've done. Because they come to the office, we're already in the office. We leave and they're about to leave	How do you overcome the time difference?	C1.I1. A43
Geographical distance	Collaboration across sites	Geographical distance decreases the ease for collaboration across the sites. This can only be mediated through tight procedures being put in place	INT	Absolutely, it is crucial, it is absolutely vital for the project. If you want to work across continent and distance between one another, it cannot be developed in collaboration unless you have very very tight procedures in place.	Do you have a definite set of procedures in place to overcome coordination issues?	C1.I3. C5
Geographical distance	Project planning	Due to geographical distance, projects planning have to be carefully managed	UP	Also our project plan, in all three places, London, Denmark and Cape Town, needs to be managed very very tightly.	Do you have a definite set of procedures in place to overcome coordination issues?	C1.I3. C8



Geographical distance	Project planning	Geographical distance affects the project planning as more variables have to be taken into consideration	UP	And also development done remotely can become time consuming. Because everything has to be sent to somebody and then you have to wait for the response to come back. Whereas if they're local, you can stand up and walk to the person. So it takes longer and you have to work that in your plans and delivery.	What are the main problems that you encounter while working in global software development?	C1.14. D2

Table 22 - From GSD Process Issues to GSD Governance

4.2. From GSD Process Issues to GSD Process Issues

This section provides evidence for the axial links between categories GSD Process Issues and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Geographical distance	Requirements issues	As can be found in other evidence, geographical distance introduces issues during the requirements elicitation stage. This can be alleviated by having International meetings at this specific stage	INT	We couldn't agree, then we go for emergency workshop	How do you manage the requirements engineering process?	C1.13 .A4
Geographical distance	Requirements issues	International meetings help in the design work, and solves requirements issues introduced by geographical distance	INT	But agreement was reached on the issues that were not clarified before. Work could actually start on the on the training. All the parts collaborating, we designed the framework, or the layout that the rest of the training course was going to be based on.	So you told me that you went to UK recently? Can you please tell me about it? Under what circumstances was that?	C1.13 .A5
Geographical distance	Communication delays	Geographical distance is bound to introduce communication issues. This can be alleviated by having constant communication throughout the dispersed team	INT	We bridged problem because this is bound to happen if one has distance between groups that work with each other. We bridge that by having constant communication.	Is there a problem as you guys are far away and you don't know what the other are doing?	C1.13 .A6

Language interpretation issues	Concepts misunderstanding within documentation	Wrong language interpretation within the business world can cause the concepts to be wrongly understood within the documentation	DOWN	It is not the culture, it is the language, how the language is used in the business world. Sometimes it would influence your spoken English and that could impact on the concepts, as written in the document.	Do you think that culture has an impact on this issue?	C1.11 .A18
Language interpretation issues	GSD Project delays	When stakeholders wrongly understand each other throughout the project, delays are introduced.	UP	And you might say "wait a minute this is not right"! That's not what I meant! This is what I mean" and he comes back and say "Oh Sorry! I thought you meant this!" And this is a day gone!	Do you think that culture has an impact on this issue?	C1.11 .A21
Coordination issues	Development issues	Evidence suggests that coordination issues introduce development issues, but a recognised and process driven methodology like RUP can help.	INT	And also in terms of the client, they are very process driven. And the fact that RUP is a very recognized methodology is fairly advantageous	What specific features of RUP would you say are advantageous to you?	C1.12 .A26
Coordination issues	Development issues	Evidence suggests that coordination issues introduce development issues, but a recognised and process driven methodology like RUP can help.	INT	I think that it is a method that relies heavily on artefacts as you have to produce documents at the end of it. This is quite useful if you have a remote client and then say "Ok here's the document, here's the test report, here's the this and that"	What specific features of RUP would you say are advantageous to you?	C1.12 .A29
Time difference	Geographical distance	With minimal time difference between the dispersed sites, geographical distance is not felt and coordination issues are minimised	DOWN	Because we work with the Danes who are only one hour or two ahead, we don't have that problem. And that's why they like what we've done. Because they come to the office, we're already in the office. We leave and they're about to leave	How do you overcome the time difference?	C1.11 .A40
Time difference	Coordination issues	Time difference introduces coordination issues when having to schedule meetings. Email tools can be used to schedule these meetings in the proper time zones	INT	But if you schedule meeting in email then it normally takes care of this issue. So that's not too much of an issue	Do you have trouble with the time zone difference?	C1.12 .A42

Geographical distance	Meeting planning effectiveness	The geographical distance reduces the meeting planning effectiveness	DOWN	Also the need to... hmm... we've got project going on at the moment with people sitting in Copenhagen, London and South Africa and to get those three people together at an agreed time for a teleconf is actually sometimes difficult. We have to phone around and... OK now I'm on the call, now you phone them, oohh now wait it is busy now....	What are the barriers that hinder proper communication?	C1.I2 .B21
Requirements issues	GSD Project delays	Incomplete requirements introduces project delays, especially when a contract has been signed	UP	No, not really, we have lots of standards. Well, actually we had a time where the business... mmm... this was a month where we weren't really involved initially. But where we've agreed to the project but the business hadn't actually given us decent requirements and we committed to a six month contract and when we actually looked for the requirements, they didn't have all the details in them. So we've really had problems like that in the past so we really put processes in place to ensure that this doesn't happen again	Do you encounter any difficulties with all the templates that are in place?	C1.I2 .B32
Information loss	Assumptions	When information is lost during the communication process, it causes team members to make assumptions about what is truly happening	UP	I think... assumptions. I think that if they (or us) hear kind of half of the story, ... if we hear half of the business requirements or they hear half of what the issue is... then you make assumptions about what the real issue is. And then when you're talking to somebody trying to understand the issue, you may not really be listening because you've already preformed your ideas. And you can be more likely to perform those ideas in an offshore environment where	What prevents proper communication flow?	C1.I2 .B49



				the information is not that easily available. So you grab whatever you can, you perform your ideas of what's happening and you start chasing the idea and actually you're completely wrong cause you missed a whole piece of information.		
Geographical distance	Coordination issues	Geographical distance introduces coordination issues which can be mediated by having international meetings at the proper stages	INT	That is being laid firm (planned??) in our workshop in London. It's also shared in our minutes. They either have my version of the workshop, as we don't want roles to (be mixed up) and dates for delivery etc. which we discussed in the workshop. They then take my minutes and draw up their official minutes and yesterday eventually I received that. On that I made a number of changes. It was a 3 hours job. Questions, Need more information, clarify this, specify... and I got back to them. So, with this document in place we, incur roles and responsibilities and deadlines. It's the only way that we can bridge the coordination issues.	In terms of coordination, is there any issue?	C1.13 .C6
Foreign language difference	Foreign language issues	When employees have some basic notions of the native language spoken by the other team members, communication issues can be bridged and a certain level of understanding can be captured	INT	Luckily for us, or for me, Flemish is very close to Afrikaans, so if I ask them to talk a little bit slower, I can understand	And does it exceed the hour?	C1.14 .C40
Geographical distance	Coordination issues	Geographical distance introduces coordination issues, which can be handled by having proper work allocation procedures in place	INT	It's the project manager who distributes the work. There is a project plan and everything.	Oh there is a team doing coding there too? How do you organise the coding work then?	C2.11 .C10

Geographical distance	Coordination issues	Geographical distance introduces coordination issues which can be mediated by proper documentations and properly managed meetings minutes	INT	That is being laid firm (planned??) in our workshop in London. Its also shared in our minutes. They either have my version of the workshop, as we don't want roles to (be mixed up) and dates for delivery etc. which we discussed in the workshop. They then take my minutes and draw up their official minutes and yesterday eventually I received that. On that I made a number of changes. It was a 3 hours job. Questions, Need more information, clarify this, specify... and I got back to them. So, with this document in place we, incur roles and responsibilities and deadlines. It's the only way that we can bridge the coordination issues.	In terms of coordination, is there any issue?	C1.I3 .C7
Time difference	Feedback time	If the time difference is too large, feedback time would increase and it would introduce coordination issues	UP	Had the time difference been more, it would have been disadvantageous. Because if you had one deliverable to hand in, we would have had to stay at work for 6 hours later. And we would have had to connect to them in the afternoon. But in our case, it doesn't really affect us.	But is the time difference advantageous?	C1.I3 .C12
Foreign language difference	Foreign language issues	When a common language is not maintained during communication process, communication issues are introduced	UP	But what might also happen is that they might have email communication which happens in Flemish and they must forward that mail to us! And then suddenly you have to start following some Flemish discussions.	And does it exceed the hour?	C1.I4 .C41

Foreign language difference	Communication delays	When a common language is not maintained during communication process, delays are introduced as the same things have to be repeated several times so that all parties can understand	UP	That's the problem. We sometimes happen to have a note like that and one of the developers might say! Hey I don't understand what's going on! We then normally send it back and ask "please repeat this in English". Because in translating it ourselves, we might lose some information	But YOU understand. How about somebody who doesn't understand any Flemish or Afrikaans?	C1.I4 .C42
Foreign language difference	Information loss	When a common language is not maintained during communication process, information might be lost while attempting to translate the terms	UP	That's the problem. We sometimes happen to have a note like that and one of the developers might say! Hey I don't understand what's going on! We then normally send it back and ask "please repeat this in English". Because in translating it ourselves, we might lose some information	But YOU understand. How about somebody who doesn't understand any Flemish or Afrikaans?	C1.I4 .C43
Geographical distance	Work interruptions	Geographical distance can be advantageous as it minimises work interruptions	DOWN	There's the pros also, where since the customer is so far remote, you don't find them knocking at your door. So you're free to do your job. You don't get interrupted; you can carry on whatever you need to do.	What are the main problems that you encounter while working in global software development?	C1.I4 .D3
Requirements issues	GSD Project delays	By allowing the analyst competency centres to handle the requirements, it can help to overcome GSD Project delays introduced by requirements issues	INT	No,... Since we've got a whole analyst team that does our requirements engineering for us. [...] Normally in our development pipeline, there's generally the bottleneck. And whatever they can produce on their side, we can develop. They're the ones that sit between the developers and the customers.	Do you have any requirements engineering issues?	C1.I4 .D14

Requirements issues	GSD Project delays	A rigid documentation process helps to overcome project delays introduced by bad requirements engineering process	INT	To a lesser extent yes. Because we go through quite a rigid process of requirements engineering, so the requirements analysis gets really well documented and then that gets signed by the customer before the developers get assigned. There's some times where there's slight changes to the requirements here and there, but not critical material changes. So, we haven't really had cases where we missed the bull very much	Does it happen that there are misunderstandings of the requirements?	C1.I4 .D15
Requirements issues	GSD Project delays	Proper agreement seeking procedure helps to overcome project delays introduced by bad requirements engineering process	INT	To a lesser extent yes. Because we go through quite a rigid process of requirements engineering, so the requirements analysis gets really well documented and then that gets signed by the customer before the developers get assigned. There's some times where there's slight changes to the requirements here and there, but not critical material changes. So, we haven't really had cases where we missed the bull very much	Does it happen that there are misunderstandings of the requirements?	C1.I4 .D16
Requirements issues	GSD Project delays	Proper standard processes in place can be used to overcome project delays introduced by bad requirements engineering process	INT	We get a request from the customer which is the business requirements, which might come in various ways or forms. It might come from a PowerPoint presentation, might be a long email, might be a spreadsheet with certain requirements, or whatever the case may be. And then a project manager gets appointed and an analyst gets appointed.	Can you please explain to me the process followed for the requirements?	C1.I4 .D17

Mother tongue influence	Foreign language issues	The mother tongue influence has a negative impact on communication and introduces communication issues	UP	I'm not saying that for all people there is a lack of confidence, some of us only. There is also the mother tongue influence in Mauritius. Our mother tongue language is closer to French. It will never be eradicated this mother tongue influence! And that's why I said that we must talk in such a way that all parties can understand	Is the lack of confidence in the English language the only problem that prevents proper communication?	C2.11 .D43
Spoken language	Communication issues type	The need to speak a language different from one's native language introduces communication issues, which can be mediated by using email	INT	Since we deal with Canada, there's also French for us. Sometimes we have to switch around French and English depending on the customer. Because some customers in Quebec only speak French. So we have to speak French. Even the emails sometimes need to be written in French. But emails are not that problematic, because personally, I think that it's much more difficult to speak in English rather than to write in English. So that's as far as communication is related.	Does it create some problems in terms of communication since you never saw the other team members?	C2.14 .F13
Spoken language	Communication issues type	The need to speak a language different from one's native language introduces communication issues, which can be mediated by using email	INT	How to overcome, like I said, we are more comfortable using email and to chat rather than making a phone call.	How do you overcome these issues?	C2.14 .F14

Geographical distance	Priority issues	Geographical distance enhances priority issues.	UP	Yes, sometimes we do. Because the thing again with working with different time zones and different locations, since we work in groups (one developer one analyst), the whole group needs to know what are the priorities. Because it could happen that one project is priority, but for some other analyst, there's another project which is top priority, but in both cases, the same developer is being used, then the developer has two important priorities. So, sometimes this is a problem, where there are so many people involved in the process, there might be some conflicts like priority issues, or some conflicting goals as well. These are the main coordination problems I think.	Do you have any work coordination issues?	C2.I4 .F15
Geographical distance	Feedback time	Geographical distance increases feedback time	UP	Yes! For example if we have a question, we have to wait for them to come to work to get an answer	Does the fact that the analyst and the developer located in different countries and that their do need to work in close collaboration create any problems?	C2.I4 .F32
Time difference	Communication issues type	Time difference introduces communication issues as the people have limited time to talk to each other	UP	I think that the fact that we don't work in the same hours can be a problem. Because then we only have a limited overlapping time to communicate with them.	What according to you hinder proper communication flow among team members?	C2.I4 .F47

Time difference	Communication issues type	Time difference introduces communication issues as the people have limited time to talk to each other	UP	Not really, but I think that in Winter yes as there is 3 hours time difference. For us, they come to work at 11hrs Mauritius time. So we have only four to five hours to discuss with them. Say that I'm having a problem at 9OK, I can't do anything until 11hrs. After that it's OK there is not problem. But the yes, the time difference actually does affect us.	Are you affected by the time difference between Mauritius and France?	C3.11 .G12
Language interpretation issues	Concepts misunderstanding within documentation	Language interpretation issues, in terms of poor understanding of the common language, can cause concepts or requirements to be misunderstood within the documentation	UP	The documentation, I think that it's fine too, because we have everything there. But the main drawback is if someone misinterprets something or if the person writing the documentation forgets to specify some important part, it becomes very difficult?	How effective are each of these tools? What advantages and disadvantages do you encounter with each of them?	C3.11 .G26
Spoken language	Foreign language issues	The lack of fluency in the commonly used language introduces communication issues	UP	Well, the problem is with myself because I don't speak French that fluently. But that is because I didn't work for a French company before. This is my first experience with a French company where I have to speak French. Because in my first job, I worked with two British people. Actually, one was from South Africa, and the other guy, the director of the company was from England. So we were just speaking English	Do you think that there are problems here that really prevent you from communicating effectively with the people in France?	C3.12 .G31
Time difference	Communication delays	Time difference introduces communication delays	UP	But the only problem that we have here in Mauritius is the time difference. In Mauritius, we start at 8h in the morning during summer and in France it's night time. So if we are stuck somewhere, we have to wait for the project managers to come to work at 11hrs in Mauritius, then half of the day is gone	The fact that you have to transfer information to the team leader and the team leader transfer information to the project managers, do you feel that somewhere along the way, information is lost?	C3.15 .H8

time difference	GSD Project delays	Time difference introduces GSD Project delays	UP	But the only problem that we have here in Mauritius is the time difference. In Mauritius, we start at 8h in the morning during summer and in France it's night time. So if we are stuck somewhere, we have to wait for the project managers to come to work at 11hrs in Mauritius, then half of the day is gone	The fact that you have to transfer information to the team leader and the team leader transfer information to the project managers, do you feel that somewhere along the way, information is lost?	C3.I5 .H9
Time difference	GSD Project delays	Time difference enhance GSD Project delays as in case of blocking problems, nothing can be done and the resources have to wait for people from the foreign site to come to work	UP	The problem that we have is the time. The time difference between France and here. If I have a blocking problem now, (it was during morning), there's nothing that I can do. I have to wait for the afternoon to call that person and report the problem ☺.	What are the main problems that you encounter while working in the global software development environment? First in terms of communications, what are the barriers that prevent you from properly communicating with them?	C3.I3 .H30
Language accent	Communication issues	Even for technical terms, the language accent introduces communication issues, as resources sometimes do not understand the pronunciation of the words	UP	And then... Initially... you know, we learn in English, and when they say a word in French, sometimes we don't understand, because we know the word in English and the way that it is said in French might be different. Especially technical terms. For example, when Fabrice (the French representative) did our training, the SELECT statement count, he said SELECT "cooont" (the pronunciation is different, as if with a French accent). And in the beginning, you know, you don't talk much, you only say the minimum, and you wonder what the other person might say.	What are the main problems that you encounter while working in the global software development environment? First in terms of communications, what are the barriers that prevent you from properly communicating with them?	C3.I3 .H31

Foreign language difference	Foreign language issues	Foreign language difference introduces foreign language issues	UP	And mostly you have to write in French and the keyboard is in English. So Accent grave and accent aigue ☺ we have to put them because they are very strict on the writings. I once used the word <i>exemplifier</i> and I got a message saying "this word is not a French word".	Do you find any limitations for the tools?	C3.I3 .I15
Time difference	Communication issues type	Time difference introduces communication issues when the time overlap is minimal	UP	It's mostly when there is 3 hours difference. We only have 3 hours exposure in total with them. We've got 3 hours difference + our lunch time here + their lunch time there. We've got three hours to talk to them	And the time difference between Mauritius and France, are you affected by it?	C3.I4 .I31

Table 23 - From GSD Process Issues to GSD Process Issues

4.3. From GSD Process Issues and GSD Project

This section provides evidence for the axial links between categories GSD Process Issues and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Geographical distance	Project delivery speed	Geographical distance decreases the project delivery speed	DOWN	And also development done remotely can become time consuming. Because everything has to be sent to somebody and then you have to wait for the response to come back. Whereas if they're local, you can stand up and walk to the person. So it takes longer and you have to work that in your plans and delivery.	What are the main problems that you encounter while working in global software development?	C1.I4. D1

Table 24 - From GSD Process Issues to GSD Project

4.4. From GSD Process Issues to GSD Value Issues

This section provides evidence for the axial links between categories GSD Process Issues and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Geographical distance	Cues transmission	Due to the geographical distance, visual cues like body language cannot be transmitted, which causes communication process to be more difficult	DOWN	Well in terms of communication, especially when the documentation is not that up to date and not that detailed, we have some issues. Then we need to phone them, or email them. And the distance makes a difference. It sometimes gets difficult. It's easier for me if we are talking face to face. Just hearing the voice on the phone does not make it easy to explain things sometimes. You don't see the body language.	I would like to know about the communication issues that you encounter while working with people who are far away.	C2.I3. E34

Table 25 - From GSD Process Issues to GSD Value Issues

GSD PROJECT

5.1. From GSD Project to Communication Practices

This section provides evidence for the axial links between categories GSD Project and Communication Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
GSD Project Phase	Communication need	There are different communication needs at different project phases	UP	Yes, definitely. I think that at the beginning and the end of a project, there's the biggest communication needs. I think that in the main construction time, you can tell the client, "It's going OK, It's going OK". Then when you're getting closer to the end, you're chasing things or you need to start deploying, or you're missing those deadlines, I think that when they start getting concerned	Do you have different communication needs at different project phases?	C1.I2. B47
GSD Project Phase	Communication need	There are different communication needs at different project phases	UP	And I think that they're very keen, as everybody in IT is, to get the project started as soon as possible. So they want to make sure that at the beginning of a project that things are actually happening and going. But quite often, it's a slow process to get it kicked and going. Quite often they need lots of information in the beginning and lots and lots of information in the end. And in the middle they get distracted.	Do you have different communication needs at different project phases?	C1.I2. B48
GSD Project Phase	Communication need	There are different communication needs at different project phases	UP	Definitely! Oh yes, that is very important. Not that it depends on the type of information that needs to be shared.	Do you think that you have different communication needs at different levels of the project?	C1.I3. C26

Individual culture description	Communication need	The individual personality description of the resources will impact on the communication need. Each person needs to be approached differently	UP	Definitely! Oh yes, that is very important. Not that it depends on the type of information that needs to be shared. But it also depends on the individuals' personality. How to approach them... I find that with the UK client, professional tone of voice, terminology, are far more appropriate. That's the way they're approached. Whereas in South Africa, we like to relax and relax the terminology. And information flows more freely then.	Do you think that you have different communication needs at different levels of the project?	C1.I3. C27
GSD Project Phase	Communication need	There are different communication needs at different project phases	UP	I think that at the beginning, when we have everything being setup, there is a lot of communication. But when we are implementing the solution, it will decrease. It might also happen when we are encountering an issue during the software development. And also during support in terms of issue fixes.	Do you have different communication needs at different levels of the project?	C2.I1. D37
Work type	Communication level	The communication level depends on the job nature. Developers have higher communication requirements than testers	UP	Because my work is here and I know what I must do. I just enter the project site on share point and I know what I have to do. Anything special is via email. I don't understand something I just take the phone or mail. No issues for a tester. Lets say for a developer, if they want to have some further details about how they should develop the system, what they should include in their coding, they also communicate with the people concerned over there.	And how about the fact that you don't see them when you are talking to them?	C2.I2. E20

Project type	Communication level	The communication level depends on the project type	UP	The main problem is that they tend to have more meetings, more video conference or phone conferences. They do at least one per week because it's a big team. But it's not the case for me. Everything is done by phone or by email. But it depends on the project. If you're a big team, you must communicate effectively between yourself here in Mauritius and in the UK. I see that they done the teleconferencing here once or twice a week. IF they have any problems, its delt with immediately.	How about you personally? Do you prefer working as a group or individually?	C2.12. E22
Work type	Collaboration across sites	The level of collaboration across the sites is dependent on the work type.	UP	The framework is a bit different than Evolutel, because it is the framework and you have to contact the person. Normally the procedure is if you have to ask a developer something if there is a problem, we just contact the chef de projet there; he deals with the developer and then tell us. Instead, in the framework, we have the liberty to deal with the developer directly.	So for the framework you deal with these people in Toulouse. And these persons in Paris?	C3.13. H25
GSD Project Phase	Communication need	There are different communication needs at different project phases	UP	It's mainly when you are starting a project. When you are starting a project, you sometimes need clarifications on specifications. If there's a blocking issue on a program we are writing, we have to contact the project leaders over there. And the project leaders over there are very good technically. And if there is some problems, we have to get back to them. For example if we come in the morning and there is a problem that I can't resolve, and the IT quality engineer can't resolve here, I have to wait. So there's no way that we can get passed that.	How does it affect the work?	C3.14.1 32

Table 26 - From GSD Project to Communication Practices

5.2. From GSD Project to GSD Governance

This section provides evidence for the axial links between categories GSD Project and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Project type	Expertise	The project type will determine the expertise level of the resources required for the work	UP	And usually depending on what type of project it is, we might take a technical architect from one of the others and then they will talk about the project and about what is needed. And then based on the requirements, then we would get developers from the various areas that we need.	So when a new project comes along, you pick people from the competency centres?	C1.I2. A11
Project type	Project task allocation site	The project type will determine how the resources will be allocated to the project	UP	And usually depending on what type of project it is, we might take a technical architect from one of the others and then they will talk about the project and about what is needed. And then based on the requirements, then we would get developers from the various areas that we need.	So when a new project comes along, you pick people from the competency centres?	C1.I2. A12
Work type	Project task allocation site	The project type will determine the expertise level of the resources required for the work	UP	And usually depending on what type of project it is, we might take a technical architect from one of the others and then they will talk about the project and about what is needed. And then based on the requirements, then we would get developers from the various areas that we need.	So when a new project comes along, you pick people from the competency centres?	C1.I2. A13
Dependency of deliverables	Project planning	Due to dependency of deliverables, for both documentation and development work, project planning has to be carefully managed	UP	Also our project plan, in all three places, London, Denmark and Cape Town, needs to be managed very very tightly. Apart from the fact that this project has a very tight timeline, if we didn't stick to the dates determined initially, the others have dependency on deliverables and documentation and impacts to us. It is managed really tightly.	Do you have a definite set of procedures in place to overcome coordination issues?	C1.I3. C9



Time frame delivery	Collaboration across sites	Having a limited timeframe for delivery calls for tight collaboration across the sites	UP	Yes. I would imagine that if there was not the time constraint, if one had a load time to complete the project, in only the cape town component, it wouldn't call for collaboration [...]	The same procedures are followed for every project?	C1.I3. C11
Project type	Collaboration across sites	The amount of collaboration required across the sites depends on the project type	UP	No. The problem that I'm working on now requires constant interactions with the guys overseas. So there's continuous collaboration with them.	But now, when you have to work in a team with people who are abroad, does it creates problems?	C1.I3. C20
Project task	Collaboration across sites	The tasks involved in the project will impact on the amount of collaboration required among the team members. Simple tasks that can be performed by one person requires minimal or no collaboration	UP	But the actual construction of the project, the work I'm responsible for, depends on me only.	But now, when you have to work in a team with people who are abroad, does it creates problems?	C1.I3. C38
Project size	Design site	The design site is sometimes chosen based on the project size. For small projects design can be made at offshore		I think that you can have some small projects which the system analyst or the analyst programmer here can take charge. But mainly 95% is done in the UK.	Does it ever happen that maybe for some projects, you do the design here in Mauritius itself?	C2.I2. E16
Work type	Uncertainty minimisation	Uncertainty minimisation is more important based on the work type.	UP	Normally we don't want uncertainty and ambiguity because since we work with money, payroll and salaries of people, we don't really want to make mistakes. So we really have to be very careful. So the word of advice here was, any uncertainty that the developer has needs to be raised	To what extent does the method tolerate uncertainty and ambiguity?	C2.I4. F34
Project type	Uncertainty minimisation	The level of uncertainty tolerated by the team is dependent on the project type. For internal projects teams tend to be more tolerant on uncertainty	DOWN	They have to be very precise, but for the internal part I would say that they do tolerate. We're only developing a service that manages the alert.	When they are doing their design, do they tolerate the fact that some things might be clarified later, or are they very precise?	C3.I1. G16

Project type	Project deadline management	Project deadline is dependent on the project type. For internal projects some teams are more inclined to accept delays where as external projects are more tightly manages	DOWN	That depends on the project. You see, for the internal team it's not very critical. Sometimes they need something by the end of January and we have to do everything to deliver it by then. But most of the time they are OK with the delay. If we say that we will not be able to deliver it on that date, is that other date OK? They say yes, agreed. That depends on the project	How would you describe their work attitude? Are they flexible towards project delays?	C3.11. G21
Project type	Analysis site	The analysis site is chosen based on the project type. For some projects, like migration work, not much analysis is required and it can thus be handled at offshore	UP	But as I've said, I've worked with the projects involving migration. So we just have to take the codes from VB and change it to dotnet. There are some problems you have to contact. But most of the time, it's the same piece of code, the same functionality that we have to put in place in dotnet. So there's not much analysis and design because this is not new development.	Where is the analysis done?	C3.12. G36
Project importance	Requirements details	The more important the project, the clearer the requirements details.	UP	In fact, an important point that I would like to mention is that it is required in the project is that the project manager gives the specifications very clearly. We don't have any big problem because everything is clear. This is for important issue. For minor issues, they just explain, the team leader notes down and if it is very very important, the team leaders convey the message to the software developers.	Do you feel that everything should be written clearly in a document before coding? Or do you accept documents that are not very clear?	C3.15. H22

Project urgency	Development site	The development site is chosen based on the project urgency. Urgent projects are developed offshore because of the expertise level of the people there	UP	No, we do also. If there is something that needs to be delivered very fast and it has to be delivered in dotnet, we do it here. For example, I've done a new project called GIFT CARD, where instead of buying someone a gift or giving that person money to buy the gift, you buy a card for a certain amount and then you give him that card. He then goes to the supermarket. This card has been approved by all LeClerc supermarkets. So part is being done there in Toulouse, and part in Mauritius.	So does anybody do the development on the actual functionalities here? Or is it only the migration?	C3.I5. H23
Project type	Documentation	The amount and type of documentation being used depends on the project type	UP	It depends on they type of project. So, I'll say for the normal projects like the migration, there is the specification fonctionelle, this is the more detailed one. You give the algorithm. For this, everything has been done. The preliminary investigation, the analysis, the design have been done.	Can you please tell me about the different documentation that you use?	C3.I3. H43
Project type	Analysis site	For highly technical projects, without much customer requirements, analysis can be done offshore, even if the customer is onshore	UP	It depends; some analysis is done which is done on projects which are highly technical. From onset, if something is very technical like if you are encapsulating a dotnet functionality. We won't need to know what the customer wants, and we can do it here. Some people are very good at it.	All the analysis, all the time?	C3.I4.I 39
Project importance	Documentation quality	The documentation quality depends on the project importance. For more important projects, documentation tend to be more precise	UP	The project manager can ask for certain type of technology to be used, because he has already used it somewhere else and he has some examples. He also can propose something if he feels that there is a better way to solve the problem. So this is the process here. But it's not documented a lot. It depends on the project. If it's something which is critical, it has to be documented a lot.	And the design?	C3.I4.I 40

Table 27 - From GSD Project to GSD Governance

5.3. From GSD Project to GSD Process Issues

This section provides evidence for the axial links between categories GSD Project and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Project urgency	Time difference	Time difference impact is enhanced when the project or the task at hand is urgent	UP	It might happen when we have something urgent. But otherwise, we have to plan everything before hand and see that we have all the required information in our hands. I think that it comes with proper planning.	But it's a small overlap... does it create any problems?	C2.I1. D9
Project urgency	Time difference	Flexitime implementation can also be used to overcome time difference issues	INT	At the moment there is 1 hour. For six months of the year, the times are equal. Their summer months are the same as our winter months. And from now on, everything moved for us an hour later. Actually, I've adjusted my hours. Basically, I come to work an hour later, and I might leave an hour later.	And how about the time difference?	C1.I4. D11
Work type	Language interpretation issues	The work type being very technical, language interpretation issues are minimised. Technical jargon are understood by everyone	DOWN	But underlying, the work that you're doing is a very technical work. It's a very black and white and there's not so much grey in between. So there's not so much that problem if you would if your function was Public relation work, where's there's a lot of grey in between. Or communication style of work, or human resources type of work. And software development is technical. Everybody knows Java as Java and what all those things mean. It's very black and white. So those kinds of things don't really become an issue.	No misinterpretation?	C1.I4. D23

Work type	Time difference	The time difference impact depends on the job nature. For instance support work is more affected as opposed to development work	UP	For development no, but for support sometimes yes. Sometimes we get a request at 16h30, when we're about to go home☺ Then what we do is we just forward it to a UK colleague. But the problem is that sometimes, they are on leave. Then we have to ask the user if they don't mind that we do it the next day.	Are you affected by the time difference between the UK and Mauritius?	C2.I3. E41
Time frame delivery	Time difference	The time difference impacts on the support work because it has a shorter delivery time frame as opposed to development work	UP	Because the development work is more on a larger timeframe while the help desk is more on the helpdesk, we need to be working together with the end-user. What creates concerns is when we have to leave at 16h30 and then we need to either send it to one of the colleagues there and if it's not urgent, then we can do it on the next day.	Can you please tell me again how the time difference affects the work support and not the development work?	C2.I3. E43
Project urgency	Time difference	Urgent projects are more affected by the time difference	UP	Because the development work is more on a larger timeframe while the help desk is more on the helpdesk, we need to be working together with the end-user. What creates concerns is when we have to leave at 16h30 and then we need to either send it to one of the colleagues there and if it's not urgent, then we can do it on the next day.	Can you please tell me again how the time difference affects the work support and not the development work?	C2.I3. E44
Work type	Communication issues	A highly technical work type reduces the amount of communication issues during GSD	DOWN	I don't think that they have some specific terms that we don't understand because everything is technical and we understand it.	Do you feel any cultural difference among the team members?	C2.I4. F37

Work type	Foreign language issues	Programming work reduces any foreign language issues as the syntax is in a language commonly understood by all parties	DOWN	Sometimes it happens that we use English with French. But it's OK with them, with the project manager as he understands English. Because we program in Visual Basic and some of the syntax is in English. But Creole yes. It often happens that we are speaking French and we add some Creole in there. But it's OK as there is not a big gap between Creole and French	In Mauritius, we are more prone to speaking English or Creole, but not French. But how do you overcome that?	C3.I1.G9
Project structure	Coordination issues	Having the project broken down into small independent parts contributes to minimising coordination and integration issues across the sites.	DOWN	I think that the chef de project have found a way to make good... because throughout a project, like a gift card, they will break it into very small parts. Very very small so that they are independent, and then finally there, they will integrate everything together. So, I don't find problems in getting the specs, asking questions and then they don't take time to answer back. I think that the fact they have broken every projects into so small parts, like printing reports will be a project, the interface for taking inputs from users will be a project, the service behind it that will answer your request will be a project, it's clearly broken. .	For this kind of environment, when the analysis and design is done in France, do you feel that the waterfall model is appropriate? Does it have some specific features that contribute to helping you to work in this kind of environment?	C3.I3.17

Table 28 - From GSD Project to GSD Process Issues

5.4. From GSD Project to GSD Team

This section provides evidence for the axial links between categories GSD Project and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Work type	Team member independence level	Team members should be able to work both independently and in group. Some job type requires people to work in group while others do not	DOWN	I would say that it depends on what type of work I'm doing. If it's a team work, let's say that I have to build something; I would prefer to work in a group, where I can ask questions. Individually, it depends on what I'm doing. Let's say that I'm doing performance review, I'll prefer to work individually.	Do you prefer to work as a team or individually?	C2.14. F38
Work type	Team member uncertainty acceptance	The level of uncertainty tolerated by the team members is dependent on the task at hand	DOWN	Yes, because sometimes, all the things that I need to know to make a decision, I might not know it right now. Sometimes I need to make a decision and see things happening and then readjust. But it depends on what type of decision it is. If it's something which is important, no I will not tolerate uncertainty, but if it's something which is less that can be amended, then I don't have any problems.	Do you tolerate uncertainty while making a decision	C2.14. F39
Project size	Team member independence level	Bigger projects require team members to work in group. So GSD team members should be able to work both in groups and individually, depending on the project size	DOWN	Actually I think that it's better to work as a group. Because the projects are big, there are lots of projects to migrate and you have to migrate certain parts, some other developer will migrate some other parts. And of course you have to work in a team to do that	Do you prefer to work as a group or individually?	C3.12. G48

Table 29 - From GSD Project to GSD Team

5.5. From GSD Project to GSD Value Issues

This section provides evidence for the axial links between categories GSD Project and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Productivity	Trust level	Having a high productivity level increases the level of trust among the team members and reduces trust issues	DOWN	Because until now, we have delivered everything on time and as accurate as possible, I think that we've established the required trust. I think that we are delivering OK.	Is there any trust issues between you people working together?	C2.I1.B 17
Productivity	Trust level	Having a high productivity level increases the level of trust among the team members and reduces trust issues	DOWN	So it's all based on the previous success or failure I think. Which is all that they have since they don't have that personal connection in a relationship.	How about working as a team with them?	C1.I2.B 44
Project visibility	Cues transmission	The lack of visual cues can be overcome by having proper mechanism in place to enhance project visibility	DOWN	And we, on a monthly basis have to report on the amount of hours we spent on some activities on development. And we hardly ever get questions on that	As you can't see them on a daily basis, they don't see you working and you don't see them working, one might think that one is not working enough. Do these kind of issues ever arise?	C1.I4.D 5
Productivity	Trust level	High level of productivity promotes the level of trust among the team members	UP	And trust goes to whether they get what they asked for or more, to a certain extent. And the fact that over the 18 months, they got delivered mostly what they were expecting to get means that the trust level improves. But trust is something that you have to earn.	How was it in the beginning?	C1.I4.D 7
Project complexity	Cues transmission	The more complex the project, the higher the impact of the lack of visual cues during communication in GSD	UP	Well it depends on the work. If it is a simple work, then we just phone them or email them. If it is a complex issue then... It is more difficult to talk to people on the phone.	Is it a problem that you don't see the person in the UK? And you don't know whether they are available or not?	C2.I3.E 42



Productivity	Trust level	High level of productivity promotes the level of trust among the team members	UP	Yes, and also on the trust that the person has in you. If you have sent 5 good projects and then you sent one not good, you won't get that reaction. They will just say "make sure that this does not happen". But if you are sending and they get issues... because it takes a lot of time for them. They have to reset the environment, do their test...	Does it matter on the personality of the chef de project?	C3.I3.I2
Project importance	Collaboration issues	The higher the GSD project importance, the higher the chances of having collaboration issues, as people are more stressed on these projects	UP	Yes, part of it is due to the fact that I am working with him for that statutory product (Evolutel) and the company earns a lot of money from that. So if there is something going wrong he has more pressure. It also depends on the kind of pressure being placed on the person	Does the other one mind?	C3.I4.I2 2

Table 30 - From GSD Project to GSD Value Issues

5.6. From GSD Project to Software Development Practice

This section provides evidence for the axial links between categories GSD Project and Software Development Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Project size	Percentage use of components	The percentage use of the components of the methodology depends on the project size. Smaller projects require less components and larger projects more components	UP	We might not be using it with everything; we take out what's necessary for our projects. Like right now, we've got a project which is very small. So sometimes, we say, it's not needed for a project because the project is small, we only need this little piece out of it. So it's important because the work that we deliver is really smaller type of delivery work than T1. T1 might have 10000 hour project or 5000 hour project, whereas our project might be anything up to 3000 hours. Most of our projects are a couple of hundred hours	How effective do you think is RUP?	C1.I4.D 22

Project size	Ease of adaptability	The ease of adaptability of the software development method depends on the project size. For smaller projects, it's harder to apply the UML methodology	DOWN	UML is a more object oriented approach to software development. But it might be the case that we are not developing a fully object oriented piece of code and that we are just developing a small screen. So we don't use that much UML in there. We just write a small paragraph in there	Can you think of any disadvantage that you have in using UML?	C2.I1.D 36
Project size	Percentage use of components	The project size impacts on the percentage use of components of the methodology. For smaller projects, smaller components are used	UP	When we first implemented that methodology in the UK, we did have problems about how to fill in the documents. And also the number of documents that we need to fill in is quite enormous. That's why we have got that light version. For the small projects we use the light version and for the bigger ones, we use the full version.	For the problems that you encounter with CUSP, is it only the quality?	C2.I3.F 4
Work type	Software Development choice	The choice of software development method is dependent on the work type	UP	For crystal we do prototyping	What software development method do you use?	C2.I4.F 27
Work type	Method effectiveness level	The method effectiveness level depends on the work type. For instance, prototyping is more efficient for report development	UP	This is pretty recent, but we have found out that prototypes can be better for Crystal. I'm not saying best, but it is good because with prototypes sometimes, if we get simple reports, right at the prototyping level, we can deliver. That is the prototype is actually the correct report, so we stop. We don't have to go through the whole process. So this is the main method we use for crystal, we use prototyping. Of course, it could happen that there are some modifications after the prototype, so we change it, but the main idea was to get rid of all the small reports right at the beginning.	What software development method do you use?	C2.I4.F 28

Work type	Iteration length	The iteration length for the method depends on the work type, that is the simplicity of the report	UP	This is pretty recent, but we have found out that prototypes can be better for Crystal. I'm not saying best, but it is good because with prototypes sometimes, if we get simple reports, right at the prototyping level, we can deliver. That is the prototype is actually the correct report, so we stop. We don't have to go through the whole process. So this is the main method we use for crystal, we use prototyping. Of course, it could happen that there are some modifications after the prototype, so we change it, but the main idea was to get rid of all the small reports right at the beginning.	What software development method do you use?	C2.I4.F 29
Work type	Software development disadvantage	The disadvantage of the waterfall model is its iterative nature, repeatedly going back to the analysis. This effect is not felt by developers as they are only developing and do not have to work on analysis over and over again	UP	For us it is not a problem because we are only coding.	And how about the iterative thing of going back to the design?	C3.I5.H 19
Work type	Method effectiveness level	The method effectiveness level depends on the work type. For instance, prototyping is more efficient where maquette has to be produced before deciding on the final version	UP	It is very effective because it is the only model that you can use for this type of project. There is a person over there responsible for telling you which control to use. You have to give him something so that the person can see how it is now working. So you make a prototype, they call it a maquette, for them to see how it works. They don't do tests, they just see if it is OK and then they come back to us. So it is much faster if we are using prototyping instead of using the other model.	Yes, waterfall model for evolutel and prototyping for the framework. How effective is prototyping for the framework development project?	C3.I3.I4

Work type	Software development method disadvantage	The waterfall model disadvantage is more felt depending on the work type. For instance, analyst do feel it more	DOWN	I think that the problem will be more with the French team, with the chef de project. Because if there is something that we find that is not in the specs, we just ask them. Then they have to go back to the supermarket, to the client to get the information. Because we, on our side, we deal only with the technical part. Either something is here or is missing; we still have other projects going on at the same time. But they are really fast to give us back our answer, because they have good experience on the system. They can imagine things that we can't imagine here, and any situations that could happen. So, these two models are working. We don't have much problems	And the waterfall model with the Evolute! Do you have any issues with that?	C3.I3.I5

Table 31 - From GSD Project to Software Development Practices

5.7. From GSD Project to Technology

This section provides evidence for the axial links between categories GSD Project and Technology.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Project urgency	Task-technology-structure fit	Each technology is appropriate when used for the particular work type or context. Phone is appropriate when task is urgent	UP	Phone and conference calls are important when there is something very urgent. For example there might be two issues that must be fixed urgently, we just call them. WebX is for troubleshooting any issues that we may have on our system. Share point is just to track messages. For example I might have a question over an issue. I will post that message there. Its advantageous for tracking down of messages	How effective are each of these tools?	C2.I1.D46

Project urgency	Task-technology-structure fit	Each technology is appropriate when used for the particular work type or context. Conference call is appropriate when task is urgent	UP	Phone and conference calls are important when there is something very urgent. For example there might be two issues that must be fixed urgently, we just call them. WebX is for troubleshooting any issues that we may have on our system. Sharepoint is just to track messages. For example I might have a question over an issue. I will post that message there. Its advantageous for tracking down of messages	How effective are each of these tools?	C2.I1. D47
Project task	Task-technology-structure fit	Each technology is appropriate when used for the particular work type or context. Chat is appropriate during troubleshooting of issues	UP	Phone and conference calls are important when there is something very urgent. For example there might be two issues that must be fixed urgently, we just call them. WebX is for troubleshooting any issues that we may have on our system. Sharepoint is just to track messages. For example I might have a question over an issue. I will post that message there. Its advantageous for tracking down of messages	How effective are each of these tools?	C2.I1. D48
Project task	Task-technology-structure fit	Each technology is appropriate when used for the particular work type or context. Project management tool is appropriate for message and issue tracking	UP	Phone and conference calls are important when there is something very urgent. For example there might be two issues that must be fixed urgently, we just call them. WebX is for troubleshooting any issues that we may have on our system. Sharepoint is just to track messages. For example I might have a question over an issue. I will post that message there. Its advantageous for tracking down of messages	How effective are each of these tools?	C2.I1. D49
Project type	Frequency of use	The frequency of use of the conference call depends on the project type. Bigger projects require more frequent meetings	UP	Depending on the project, at least one teleconferencing per week	Can you please tell me how often do you use each of these tools?	C2.I2. E28

Project urgency	Task-technology-structure fit	Communication technology is chosen based on the project urgency	UP	Hum If it's an urgent question, we use the Sametime chat because it's instantaneous. But if it's not really urgent, or if it's something big, we use the email and sometimes we use phone calls. It can also be that the give an answer that don't really makes sense to us. So these are the challenges that we face.	And do they reply on time?	C2.I4. F33

Table 32 - From GSD Project to Technology



GSD TEAM

6.1. From GSD Team to Communication Practices

This section provides evidence for the axial links between categories GSD Team and Communication Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Customer facing team	Flexitime implementation level	The level of flexitime implementation depends on whether the team member is customer facing or not	UP	No, not necessarily because most of the people are not customer facing so they're not affected. Most of the developers are just internal. But some of the project managers might do it because suddenly at 4 o'clock, a meeting for the customer becomes a 5O'clock meeting for us. My job is customer facing, so I adjusted to fit with the customer.	Does everybody do that?	C1.I4. A15
Customer facing team	Flexitime implementation level	The level of flexitime implementation depends on whether the team member is customer facing or not	UP	No, not necessarily because most of the people are not customer facing so they're not affected. Most of the developers are just internal. But some of the project managers might do it because suddenly at 4 o'clock, a meeting for the customer becomes a 5O'clock meeting for us. My job is customer facing, so I adjusted to fit with the customer.	How about the time difference? Does everybody do that?	C1.I4. D13
Product Knowledge	Communication level	The amount of knowledge about the product detained by the resources will determine the amount of communication required. Resources with minimal knowledge will ask more question	DOWN	This will depend on the product knowledge. If you are a new team, you might ask a lot of questions	But is the message passed correctly?	C2.I1. D40



Team age	Communication level	The team age and the amount of knowledge about the product detained by the resources will determine the amount of communication required. Resources with minimal knowledge will ask more question	DOWN	This will depend on the product knowledge. If you are a new team, you might ask a lot of questions	But is the message passed correctly?	C2.11. D41
Product Knowledge	Communication level	The amount of knowledge about the product detained by the resources will determine the amount of communication required. Resources with minimal knowledge will ask more question	DOWN	I think that it has more to do with the product knowledge.	Is the communication problem enhanced by the fact that you are so far away from the customers?	C2.11. D42
Team size	Communication level	The bigger the team, the higher the communication level required	UP	The main problem is that they tend to have more meetings, more video conference or phone conferences. They do at least one per week because it's a big team. But it's not the case for me. Everything is done by phone or by email. But it depends on the project. If you're a big team, you must communicate effectively between yourself here in Mauritius and in the UK. I see that they done the teleconferencing here once or twice a week. IF they have any problems, it's dealt with immediately.	How about you personally? Do you prefer working as a group or individually?	C2.12. E23
Job title	Team-customer-communication strategy	The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers	UP	Not really with the people in the team. We deal mainly with the project manager. But it happens that sometimes.... See the project manager has several team leaders under him. He gave a development work to us, but there is some other team leader who is very familiar with the problem. So we have to deal with the other team leader there. It happens very rarely and most of the time we deal	So you deal with the project manager and the people in the team also?	C3.11. G4

with the project manager directly

Job title	Team-customer-communication strategy	The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers	UP	Technical person no, because we haven't been there. And for the visio, it's only the team leaders who do the visio.	You never met with the technical person there?	C3.I2. G27
Personal experience	Affiliation level	Personal experience in working together eases the contact initiation	UP	In the beginning, there was some hesitation. He's not the same as a Mauritian guy where we could just ask him. Actually, he did our formation and in those two months time, we got used to him and we started speaking. So in the beginning, there was some hesitation.	In terms of dealing with him, in the beginning, was it a problem?	C3.I2. G40
Adaptability of offshore team members	Ease of contact initiation	The adaptability of offshore team members can be used to enhance the communication process. They are able to force themselves to communicate in spite of some initial apprehension	UP	It was the attitude of the persons that worked here previously that helped. When I saw them going to him at anytime and asking questions, I told myself that there wouldn't be any problem if I went to ask him anything. That was one thing.... And later on there was not more problem for me to communicate with him.	What according to you helped to overcome these issues?	C3.I2. G42
Job title	Team-customer-communication strategy	The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers	UP	In fact, for the technical people, mostly team leaders are concerned. I'm just a software developer.	No technical people?	C3.I5. H4



with the project manager directly

Job title	Team-customer-communication strategy	The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers	UP	Technical person no, because we haven't been there. And for the visio, it's only the team leaders who do the visio.	You never met with the technical person there?	C3.12. G27
Personal experience	Affiliation level	Personal experience in working together eases the contact initiation	UP	In the beginning, there was some hesitation. He's not the same as a Mauritian guy where we could just ask him. Actually, he did our formation and in those two months time, we got used to him and we started speaking. So in the beginning, there was some hesitation.	In terms of dealing with him, in the beginning, was it a problem?	C3.12. G40
Adaptability of offshore team members	Ease of contact initiation	The adaptability of offshore team members can be used to enhance the communication process. They are able to force themselves to communicate in spite of some initial apprehension	UP	It was the attitude of the persons that worked here previously that helped. When I saw them going to him at anytime and asking questions, I told myself that there wouldn't be any problem if I went to ask him anything. That was one thing.... And later on there was not more problem for me to communicate with him.	What according to you helped to overcome these issues?	C3.12. G42
Job title	Team-customer-communication strategy	The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers	UP	In fact, for the technical people, mostly team leaders are concerned. I'm just a software developer.	No technical people?	C3.15. H4



Job title	Team-customer-communication strategy	The team-customer communication strategy depends on the job title. In some teams, developers are not allowed to communicate with project managers	UP	First of all, I'm just a software developer as I just mentioned. Software developers don't have the right to mail directly the software managers. We have to forward the mail to the team leaders. And the team leaders forward the mail to the project managers. And if ever we can't wait for the mail to come back, then the team leader has to call the project manager in France and gather information for the project to continue.	What are the problems that you encounter while working in a dispersed team?	C3.15. H5
Affiliation level	Ease of contact initiation	With a good affiliation level, communication level among the team members is good	UP	But it's better when you know the person and now it's OK. Communication is good.	What are the main problems that you encounter while working in the global software development environment? First in terms of communications, what are the barriers that prevent you from properly communicating with them?	C3.13. H32
Level of expertise	Communication channel	The communication channel warmth depends on the level of expertise of the project managers in dealing with offshore projects	UP	Part of it is because he was someone who had a lot of experience in leading projects.	Is it a problem that you've never met with that person before?	C3.14.1 17
Adaptability of offshore team members	Communication channel	Team members with low level of adaptability to other cultures have trouble communicating and decreases the warmth of the communication channel	DOWN	On the other hand the other project leader is a new one. He had just joined C3 and at the beginning he had some trouble adapting to the Mauritian culture. I also had some difficulty adapting to him	Is it a problem that you've never met that person before?	C3.14.1 18

Table 33 - From GSD Team to Communication Practices

6.2. From GSD Team to GSD Governance

This section provides evidence for the axial links between categories GSD Team and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Expertise	Expertise level	A proper team structure, like competency centres introduces some best practices and increases the level of expertise	UP	The test manager will be saying "this is how we should be doing testing, are we doing that across all the projects". Because the project manager that has been assigned to one of the project is not an expert in all of these areas. So they can't say we should be doing analysis like this, we should be doing testing like that. They're just using the resources from the centres and the centre managers from the centres are saying "this is how we should be doing that"	But those are the teams?	C1.I2. B12
Job title	Collaboration across sites	The level of collaboration across the sites depends on specific job titles. Some resources with specific job titles tend to collaborate more among each other	UP	I think that the closest collaboration is between the project managers on either side, the analyst and the business representative from their side who knows what is it they want to do. And also our architect from our side would work quite closely with them. They have designers who ... they've got a lot of rules	When using RUP, does it require your team and the other team to work in close collaboration?	C1.I2. B38
Job title	Collaboration across sites	The level of collaboration across the sites depends on specific job titles. Some resources with specific job titles tend to collaborate more among each other	UP	So those are the probably the three. I don't think that our developers will work that closely with them. They would get the information via those two people	When using RUP, does it require your team and the other team to work in close collaboration?	C1.I2. B39

Job title	Collaboration across sites	The level of collaboration across the sites depends on specific job titles. Some resources with specific job titles tend to collaborate more among each other	UP	So we need to make sure that we're compliant with that and to do that our architect need to work quite closely with their designers and make sure that the whole architecture department which we need to make sure that we're compliant with them, will review our documents and say yes, you can develop the system for T1.	When using RUP, does it require your team and the other team to work in close collaboration?	C1.I2. B40
Employees motivation level	Work attitude	Employees with a high level of motivation have a better attitude towards work and the work is done better	UP	Much better indeed. Employees are generally more positive. And like I've said earlier, the inspiration is such that one wants to get things done.	Is the work done better?	C1.I3. C23
Job title	Collaboration across sites	The level of collaboration across the sites depends on specific job titles. Some resources with specific job titles tend to collaborate more among each other	UP	Yes, obviously yes! Communication between a developer and an analyst is totally different from a project manager and me for instance. Because the level of details differ. I'm not interested when I talk to teams at what they do at a low level. But I'm interested in different things. And the same applies to a developer who will be interested in details! He's not interested in what the budget of the project is. He's only interested in his deliverable. So that applies to any project environment where there is different communication needs. And depending on whether you're communication on a project level, on a task level, or whether you're communicating with your line manager. That's also a different communication need. Because now you're saying that you're worried about your leave, your medical	Have you got different communication needs at different levels of the project?	C1.I4. D25

Testing competency centre	Error recording efficiency	By having a proper structure for the testing team, error recording efficiency is improved as error tracking mechanism is better handled	UP	aid, and that kinds of things The main reason is that.. Let's take the example of Mauritius here, if we're used to work with the developers directly, the developers... lets say before the changes... they were not doing the unit testing properly. Let's say they develop some programs, they just give it to the tester and say, "please test it and report errors to me". So maybe, given that we are very close together, if there are 2 or 3 errors, they just correct it and give it back to you. So there is no proper recording of errors at the very start. So what we ended up doing is not a system testing but a unit testing for the developer. So we are doing his work in the first place. Secondly, the management wants to have a proper recording of all errors encountered during the development. So the testing team must report directly to the testing manager here, so as to have a proper record of what has been recorded as errors. I think that it's the main reason behind this.	Do you happen to know why they changed the system as such?	C2.I2. E1



Testing competency centre	Testing procedures	By having proper structure for the testing team, testing procedures can be improved and better followed		The main reason is that.. Let's take the example of Mauritius here, if we're used to work with the developers directly, the developers... lets say before the changes... they were not doing the unit testing properly. Let's say they develop some programs, they just give it to the tester and say, "please test it and report errors to me". So maybe, given that we are very close together, if there are 2 or 3 errors, they just correct it and give it back to you. So there is no proper recording of errors at the very start. So what we ended up doing is not a system testing but a unit testing for the developer. So we are doing his work in the first place. Secondly, the management wants to have a proper recording of all errors encountered during the development. So the testing team must report directly to the testing manager here, so as to have a proper record of what has been recorded as errors. I think that it's the main reason behind this.	Do you happen to know why they changed the system as such?	C2.I2. E2
Job title	International meeting frequency	The international meetings frequency depends on the job titles. For instance, developers tend to have more international meetings than testers	UP	I think that there have been 2 or 3 during the past 2 years. But there are not so many as the developers. The developers they tend to go more often to the UK than the testers.	And has anyone from the testing team ever been to the UK?	C2.I2. E5

Employees skills in using method	Documentation quality	The employees' skills in using the method impacts on the documentation quality. Employees with poor skills write poor documentation, no matter how effective is the method	DOWN	CUSP is effective in the sense that everything that we do has to be documented and approved. The only thing that might not be working in that is about the quality. Although the document has got some templates, the quality of the writing that we put in that is not very guaranteed. It depends on the individual who wrote it.	How effective do you think is CUSP?	C2.I3. E50
Job title	Collaboration across sites	The level of collaboration across the sites depends on specific job titles. Some resources with specific job titles tend to collaborate more among each other	UP	Yes. As I said, there's one analyst and one developer who are assigned to a project. So the developer has to deal with the analyst. So there is a close collaboration in that way. But between the developers, not that much because each and everyone of them has their own projects.	Does the method require the members to work in close collaboration or individually?	C2.I4. F31
Project experience	Requirements details	In some cases, the level of project experience determines the level of details provided for the requirements. Developers with higher level of project experience are given less requirements details as opposed to newer ones	DOWN	Normally at C3, when you are a beginner, they give us full specifications about the project. But later on, if the project manager doesn't have time, as I told you it's just a migration, we just have to understand the application and proceed. Specs usually are not needed as such.	The other point was poor project details	C3.I5. H12
Development tool knowledge	Specification writing site	The specification writing site is chosen based on the development tool knowledge of the team members. Sites with higher level of knowledge are chosen to write the specifications	UP	Yes. Sometimes we do the specs, sometimes they give us a preliminary investigation and then we do the specs based on that. There is a lot of communication going. And then we develop. Because if we had started working on dotnet and some of the chef de projet there didn't have training on dotnet, so they prefer to let us write the specs to show them what we are planning and then they give	Do you have to work in collaboration with them to develop your part here?	C3.I3. H24

Level of expertise	Specification writing site	The specification writing site is chosen based on the level of expertise of the resources at that site. Sites with higher level of expertise are chosen	UP	their experience here and there. So there is a big collaboration. Then they started to let us do the specification, so now we are doing the specification. In some teams, it depends on the level of expertise of the developers also. Like my team, I have experienced developers. So we can even work with preliminary investigation	Who writes this?	C3.13. H44
Level of expertise	Design site	The design site is chosen based on the level of expertise of the resources at that site. Sites with higher level of expertise are chosen	UP	Analysis is always done in France. Because they have to go to the hyper market... We would like to do it ☺ For the design it depends. Normally they will do a design, as they are well experienced in design	I would like to know how the development work is organised. Where is the analysis done, design coding testing? What are the different kinds of test that you do?	C3.13. H46
Project experience	Cultural understanding	Prior experience in offshore software development helps to promote cultural understanding	UP	It also depends on the experience exposure of the person. He might be someone from France, but I know that the other person has travelled a lot and has a lot of international exposure. In fact the first project manager was working for an English company so he was at ease with English speaking people. Even in the code, if there is something in English, he doesn't mind	What is the cultural barrier based on?	C3.14.1 20
Understanding of foreign language	Cultural understanding	Understanding of foreign language helps to improve cultural understanding	UP	It also depends on the experience exposure of the person. He might be someone from France, but I know that the other person has travelled a lot and has a lot of international exposure. In fact the first project manager was working for an English company so he was at ease with English speaking people. Even in the code, if there is	What is the cultural barrier based on?	C3.14.1 21

Project experience	Requirements details	Less requirements details can be given to resources with high amount of project experience	UP	something in English, he doesn't mind It depends on the project manager. Some will take the time to do it very detailed. It's mainly during the first months that you work here that they give you a lot of details. But as we advance in time, they will give you less and less details. They will assume that with some information you can expand yourself. It depends on the project. If it is something which is very specific to a customer and he needs the button on a screen to be at the top left, this kind of small details that has been specified by the customer, they will give this to you. If this is something that you can expand yourself, they will give fewer details. In this case, you can work on the specs yourself and expand on it.	Is it clear and complete the high level specs?	C3.I4.I 34

Table 34 - From GSD Team to GSD Governance

6.3. From GSD Team and GSD Process Issues

This section provides evidence for the axial links between categories GSD Team and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Employee confidence	Communication issues type	The lack of confidence in speaking a foreign language introduces communication issues	UP	I think that the main issue for Mauritian people is the lack of confidence in talking with people in the UK or in the US. And I think that to communicate, we don't need to use big English words to communicate. We can use simple English words that both parties can understand. I think that the most important issue is confidence. Mauritian can speak English well, but its just the confidence which is sometimes lacking	What would you say are the most common communication problems that you encounter while working and communicating with the US?	C2.11. B46
Employees skills in using method	Requirements issues	The lack of skills in using the method to set out the requirements introduces requirements issues	UP	But I don't think necessarily they've got the skills in the business to be able to do it. They've got this idea in their head: 'I've got this problem, find a solution for me'. And then you find that the problem was only about 1% of the real problem and we have to figure out about the other 99%	Do they use the template?	C1.14. D21
Job title	Communication issues	The amount of communication issues felt depends on the job title. Testers are less inclined to feel communication issues	DOWN	As a tester, I've not encountered any great issue of difficulty or any communication problems. [...] For the testing team I don't think that there's any communication or even cultural problem. We don't have any direct communication with the customer over there. People from UK deal with the customers. And the customers are mainly Europeans and are based in England.	Can you please tell me about the problems that you encounter while working in GSD?	C2.12. E7



Product Knowledge	Requirements issues	The lack of knowledge on the system or product being maintained or developed can cause requirements to be misunderstood	UP	Yes we do. First of all, I'm not really conversant with the payroll system. My system mainly records hours and works with the company setup. But the mainframe will be working with the payroll processing and also part of it with the company setup. So sometimes when the customer explains a bit of the payroll processing, for me it's a bit of Chinese. The misunderstanding comes from the terms that they use. The terms are more payroll oriented. But for me, I'm more technical people. But then, I just email the person who wrote the specs and ask for more details.	Do you happen to have misunderstandings pertaining to the requirements before coding?	C2.I3. E47
Employee confidence	Communication issues type	The lack of confidence in speaking a foreign language introduces communication issues	UP	One of the things I believe is that if somebody is a bit shy, this might be a problem. For example, if I have somebody shy in my team, he or she will have to communicate with outside, and is not really willing to do it, then it is a problem. In this situation, the question will never get sorted.	What according to you hinder proper communication flow among team members?	C2.I4. F45
Employee confidence	GSD Project delays	Team members with poor level of self-confidence can introduce project delays as they will be unwilling to communicate	UP	One of the things I believe is that if somebody is a bit shy, this might be a problem. For example, if I have somebody shy in my team, he or she will have to communicate with outside, and is not really willing to do it, then it is a problem. In this situation, the question will never get sorted.	What according to you hinder proper communication flow among team members?	C2.I4. F46

Understanding of foreign language	Foreign language issues	When all team members have some notion of the foreign language used by each other, fewer issues are encountered due to misunderstanding. The communication process is thus not broken	DOWN	Sometimes it happens that we use English with French. But it's OK with them, with the project manager as he understands English. Because we program in Visual Basic and some of the syntax is in English. But Creole yes. It often happens that we are speaking French and we add some Creole in there. But it's OK as there is not a big gap between Creole and French	In Mauritius, we are more prone to speaking English or Creole, but not French. But how do you overcome that?	C3.11. G8
Understanding of foreign language	Requirements issues	Poor understanding of the foreign language can introduce requirements misunderstanding	UP	In my case, it happens rarely. For some software developers, yes. Some people are not at ease at all with French. French people are very proud of their language. So if they're going to write something, it's going to be very complex. Even in their requirements specifications, it will be something which is alive. It won't be something like "point 1 do that, point 2 do that". It will be a whole paragraph, they will explain it, "you need to do it for this reason". They will take all factors into consideration. "Maybe if you do that, it will cause some problems," they will also include all the references. If they are going to give you a specification it will be with all the details. So if you are not at ease with French, you will have problems. You can completely misunderstand the point of the project.	Does it happen that you misunderstand the specs?	C3.14.1 35

Understanding of foreign language	Concepts misunderstanding within documentation	The understanding of foreign language is important to understand the specifications	UP	They do not follow a documentation standard. They have their own models that they have developed themselves and it's not something that you will find anywhere else in the world. They have defined their own rules. So to be able to understand the specs, you need to understand the French language very well.	Does it happen that you misunderstand the specs?	C3.14.1 36

Table 35 - From GSD Team to GSD Process Issues

6.4. From GSD Team to GSD Project

This section provides evidence for the axial links between categories GSD Team and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Team member independence level	Productivity	Team members who are given a high level of independence are more productive	UP	And the group of people on this floor are probably more productive and they operate a lot better when being allowed to do their own things. With much less structure. And that's the C3 way of doing things.	Do you in SA tolerate uncertainty? Or do you like things to be clear and precise?	C1.14. B43

Table 36 - From GSD Team to GSD Project

6.5. From GSD Team to GSD Team

This section provides evidence for the axial links between categories GSD Team and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Employee well-being promotion techniques	Employee motivation level	Appropriate well-being promotion techniques is crucial to maintain the employees motivation level in a dispersed environment	UP	Ceridian... they want to be a world wide company which is a good place to work. I think that there's a big effort from the directors to make you feel happy, happy in your work. And they give you the tools that you need.	How would you describe your organisational culture?	C2.12. E24

Personal experience	Affiliation level	Affiliation level can be improved through the team members experience in working together	UP	The trust takes some times to grow. I remember at the beginning, we were dealing with a lady. She was a system tester. We were new to the system, we were new to her. Whenever we sent things for testing, she was quite rude. Even her mails were sometimes quite rude! But actually, it is her way of replying mails. Even now, when I tell her "I would like to tell you about changes about system testing", she will reply "OK, just put it there, as long as it doesn't mess up everything!". But now I know that it's the way she is. But now it's getting better. Because before, when we asked her for testing, if it is urgent, she will say "you should have notified me a couple of days before!". But now it's better. We get a response fairly quickly. But even if her mails are quite "rude", once, we were having problems with the documentation; she said that she could not test it, so I phone her. But when I talked to her, I was surprised as her voice was really nice! Even though the mail is deflected! I don't know why!	Do you have any trust issue with the people over there? Do they trust you guys? Or do you trust them?	C2.13. E37
Personal experience	Affiliation level	Personal experience in working together helps to improve affiliation level among the team members	UP	In the beginning, there was some hesitation. He's not the same as a Mauritian guy where we could just ask him. Actually, he did our formation and in those two months time, we got used to him and we started speaking. So in the beginning, there was some hesitation.	In terms of dealing with him, in the beginning, was it a problem?	C3.12. G39



Adaptability of offshore team members	Adaptability of offshore team members	The adaptability of the offshore team members can be used to set an example for the others and entice them in increasing their adaptability level	UP	It was the attitude of the persons that worked here previously that helped. When I saw them going to him at anytime and asking questions, I told myself that there wouldn't be any problem if I went to ask him anything. That was one thing.... And later on there was not more problem for me to communicate with him.	What according to you helped to overcome these issues?	C3.I2. G41
Personal experience	Accent familiarity	With experience, resources get used to each others language accent	UP	In the beginning maybe... but not really because we are used to the language. It's just that at the beginning, to get their accent it's a bit difficult.	Is it a problem for you to communicate with them in French?	C3.I5. H10

Table 37 - From GSD Team to GSD Team

6.6. From GSD team to GSD Value Issues

This section provides evidence for the axial links between categories GSD Team and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Team building exercise	Team frustration level	Having proper team building exercises and making the team members feel part of the team helps to reduce frustration	DOWN	Normally what is important is to make these people have a sense of belonging to Ceridian. I try to make them as happy as possible in their workplace. Whenever we have birthdays, organise something. We do a lot of jokes in the team. I talk to them on an individual basis; I try to keep them up to date with technology as well. I try to avoid frustration in the team	Have you adopted these values in your team too?	C2.I1. D34
Work dedication	Cooperation issues	Work dedication eventually overcomes cooperation issues introduced by work redundancy	DOWN	It can affect the work temporarily. [...] are gone, and those working they feel that you are here to work, they cooperate. It doesn't affect the work really.	Does it affect the work relationship? Is it difficult to get information from them?	C2.I2. E26

Adaptability of offshore team members	Cultural difference impact	The adaptability of the offshore team members can be used to reduce the negative impact of the cultural difference	DOWN	In the beginning it was a bit different. But then you have to adapt to them.	Since you are working with your team leader who is French, is there any cultural difference between him and you? For instance in the way that we Mauritian speak, or in the way that we work and the way that he works, is it different?	C3.12. G38
Adaptability of offshore team members	Cultural difference impact	Adaptability of offshore team members reduces the cultural difference impact. Team members adopt some cultural attitudes which bridges the gap	UP	In certain ways, we become like them. The reaction that we get is acceptable to all people. So if we find a problem, we give the same thing in return.	How do you accommodate that?	C3.14.1 48

Table 38 - From GSD Team to GSD Value Issues

6.7. From GSD Team to Software Development Practices

This section provides evidence for the axial links between categories GSD Team and Software Development Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Employees skills in using method	Percentage use of components	Resources with the proper skills at using the method can make the different components of the methodology relevant	UP	You need to have experienced and skilful people to take components of the methodology and make it relevant	You don't encounter any problems using it?	C1.11. A27
Generation	Software development method acceptance	Older generation take longer and are more resistant in accepting new methodologies	UP	Yes, in South Africa. And I find that the South Africans here, especially the older generation, opposed to change. They find it very difficult to change.	You mean here in SA?	C1.13. C36
Generation	Software development method acceptance	Newer generations are more likely to accept change and embrace new software development methods	UP	They're not because that's what they learnt. They have not been exposed to the old ways. They are more flexible and opened to change.	And how about the younger generation? Are they opposed to change?	C1.13. C37
Employees skills in using method	Method effectiveness level for GSD	Employees with high skills in using the method help to promote the method effectiveness level for GSD. For instance, employees with low	UP	When we first implemented that methodology in the UK, we did have problems about how to fill in the documents. And also	For the problems that you encounter with CUSP, is it only the quality?	C2.13. F3

		skills encountered issues when requested to fill in the huge amount of documentation for UML		the number of documents that we need to fill in is quite enormous. That's why we have got that lite version. For the small projects we use the lite version and for the bigger ones, we use the full version.		
Level of expertise	Software development method disadvantage	Analyst with high level of expertise will mitigate the disadvantages of the waterfall model as they will do the rework rapidly	DOWN	I think that the problem will be more with the French team, with the chef de project. Because if there is something that we find that is not in the specs, we just ask them. Then they have to go back to the supermarket, to the client to get the information. Because we, on our side, we deal only with the technical part. Either something is here or is missing; we still have other projects going on at the same time. But they are really fast to give us back our answer, because they have good experience on the system. They can imagine things that we can't imagine here, and any situations that could happen. So, these two models are working. We don't have much problems	And the waterfall model with the Evolutel? Do you have any issues with that?	C3.I3.1 6

Table 39 - From GSD Team to Software Development Practices

6.8. From GSD Team to Technology

This section provides evidence for the axial links between categories GSD Team and Technology.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Affiliation level	Frequency of use	The frequency of use of the chat tool sometimes depends on the affiliation level that the team members have among each other	UP	Yes, sometimes, only with the ones we like :) Yes, there are some people with which we use Google talk.	Even Google talk with the people in Denmark too?	C1.I2.B50
Team size	Frequency of use	Bigger teams tend to have more frequent conference calls meetings	UP	The main problem is that they tend to have more meetings, more video conference or phone conferences. They do at least one per week because it's a big team. But its not the case for me. Everything is done by phone or by email. But it depends on the project. If you're a big team, you must communicate effectively between yourself here in Mauritius and in the UK. I see that they done the teleconferencing here once or twice a week. IF they have any problems, its dealt with immediately.	How about you personally? Do you prefer working as a group or individually?	C2.I2.E21

Table 40 - From GSD Team to Technology

GSD VALUE ISSUES

7.1. From GSD Value Issues to GSD Process Issues

This section provides evidence for the axial links between categories GSD Value Issues and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Uncertainty level	GSD Project delays	A high level of uncertainty increases GSD Project delays but having proper uncertainty minimisation mechanisms is helpful	INT	There must be a reason for that; there might be some specifications that were not cleared. That's why it's important to clear everything before hand and make them aware that there is an issue.	But what happens if the product is not delivered on time?	C2.I1.D31

Table 41 - From GSD Value Issues to GSD Process Issues

7.2. From GSD Value Issues to GSD Project

This section provides evidence for the axial links between categories GSD Value Issues and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Cues transmission	Project visibility	The lack of cues transmission reduces the project visibility	DOWN	Because people believe in the visual thing that if you are sitting around and typing furiously, or if you're sitting relaxed and munching... so because they don't see us, they don't have a feeling of are we working that hard or if we're sitting idle...	Can you please tell me again about the trust issue?	C1.I2.B22

Table 42 - From GSD Value Issues to GSD Project

7.3. From GSD Value Issues to GSD Team

This section provides evidence for the axial links between categories GSD Value Issues and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Cues transmission	Affiliation level	The lack of cues transmission through emails or other forms of communication reduces the amount of affiliation among the team members	DOWN	The trust takes some times to grow. I remember at the beginning, we were dealing with a lady. She was a system tester. We were new to the system, we were new to her. Whenever we sent things for testing, she was quite rude. Even her mails were sometimes quite rude! But actually, it is her way of replying mails. Even now, when I tell her "I would like to tell you about changes about system testing", she will reply "OK, just put it there, as long as it doesn't mess up everything!" But now I know that it's the way she is. But now it's getting better. Because before, when we asked her for testing, if it is urgent, she will say "you should have notified me a couple of days before!". But now it's better. We get a response fairly quickly. But even if her mails are quite "rude", once, we were having problems with the documentation; she said that she could not test it, so I phone her. But when I talked to her, I was surprised as her voice was really nice! Even though the mail is deflected! I don't know why!	Do you have any trust issue with the people over there? Do they trust you guys? Or do you trust them?	C2.I3.E3 6
cues transmission	affiliation level	Having a high level of cues being transmitted helps to promote the team's affiliation level	UP	The visio is something that is very important now. Before the visio, we were doing meetings on the	How effective are each of these tools?	C3.I3.I14



phone. Now the message is passed much better. **We are talking to a person, you see his reactions. And the fact that the persons see you, it has become friendlier.** That helped a lot. It is a crucial tool in our work. And even sometimes we fight to have free time to do a visio. Because this room is not only taken for visio but for interviews,

Table 43 - From GSD Value Issues to GSD Team

7.4. From GSD Value Issues to GSD Value Issues

This section provides evidence for the axial links between categories GSD Value Issues and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Cues transmission	Trust level	The lack of cues transmission reduces the trust level	DOWN	Because people believe in the visual thing that if you are sitting around and typing furiously, or if you're sitting relaxed and munching... so because they don't see us, they don't have a feeling of are we working that hard or if we're sitting idle...	Can you please tell me again about the trust issue?	C1.I2.B23
Work redundancy	Cooperation issues	Work redundancy at the local site introduces some cooperation issues. Employees are not willing to cooperate fully with offshore team members	UP	Not trust, lets say that you can have the feeling that they are not cooperating with you. Because "here in Mauritius you are taking all of our jobs, you are making people redundant here, and you are growing here in Mauritius. You were 20 people four years backwards, and now you are 250 and there has been some redundancy here." So you can expect that these people don't have you as "a modele de saintete". Because they take you as a competitor, a competitor for their job.	Is it trust?	C2.I2.E25



Work redundancy	Cooperation issues	Work redundancy at the local site introduces some cooperation issues. Employees are not willing to cooperate fully with offshore team members	UP	But personally you feel that you can't rely on these people sometimes, you can ask for relevant details, but personally you know that let's say they have been spot for redundancy in two or three months. If you are working on a project with those people, you can't expect those people to be 100% of their time to satisfy your demand. But generally speaking it's not really a problem.	Does it affect the work relationship? Is it difficult to get information from them?	C2.I2.E27

Table 44 - From GSD Value Issues to GSD Value Issues

SOFTWARE DEVELOPMENT PRACTICES

8.1. From Software Development Practices to Culture

This section provides evidence for the axial links between categories Software Development Practices and Culture.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Method effectiveness level for GSD	National culture description	The adapted waterfall model fits some cultural traits that try to minimise uncertainty as much as possible	UP	Yes, in the sense that with the waterfall model, you get to plan in the beginning. They like to know where they're stepping. They won't take any risks. So they like to know all the limitations of something before using it. They can spend hours in meetings discussing about something.	Does the waterfall model fit the French cultural traits needs?	C3.I4.I44

Table 45 – From Software Development Practices to Culture

8.2. From Software Development Practice to GSD Governance

This section provides evidence for the axial links between categories Software Development Practices and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Method effectiveness level for GSD	Collaboration across sites	The Rational Unified Process forces collaboration across the dispersed sites	UP	They work! They really do! They allow for tight control, they allow for traceability, and they obviously allow for constant interaction. What needs to be reviewed, to be signed off, agreed upon... Collaboration across business areas is forced by that.	How advantageous is this method for you?	C1.I3.A2 4
Method effectiveness level for GSD	Ease of resource deployment	A method which is highly effective for GSD helps in the resource deployment throughout the sites	UP	You're also on top of your resource management. You are able to manage the resource of your project in a way that resources can easily be deployed.	What benefit do you get from RUP?	C1.I1.A3 4
Project visibility	Effectiveness level	A method that provides a high level	UP	It provides visibility, it provides reliability, it	What benefit do you get	C1.I1.A3 5



		of visibility can improve the effectiveness of project management		provides efficiency, and we become more effective in managing the projects	from RUP?	
Software development approach	Uncertainty minimisation	A software development approach which requires the business to be involved at an early phase helps to reduce uncertainty throughout the project	DOWN	And what we also try to do is actually involve the business as early as possible in the team as we're developing. So that if we're actually developing, they can have a look and see if that's exactly what they're expecting.	Are there sometimes misunderstandings in terms of software requirements?	C1.I2.B7
Software development approach	Uncertainty minimisation	When having a software development approach which requires an analyst to be present at any phase of the project, uncertainty is reduced	DOWN	We have an analyst on the project the whole time that we're developing. Its not that they finish their work and then leave. They stay on the project the whole time and anytime [...] we ask the analyst and then the analyst will clear with the business.	Are there sometimes misunderstandings in terms of software requirements?	C1.I2.B8
Software development approach	Project planning	By having a stage for analysis review in the software development approach, project planning and estimate can be properly managed	UP	What we find that we prefer is when we do a review of the analysis cause then we have a better understanding and we can estimate how long the project is actually going to take	In terms of requirements engineering, do you do analysis on their side, or do you do analysis on your side? How does it work?	C1.I2.B3 1
Method standard	Collaboration across sites	The use of RUP as a software standard forces collaboration across the sites	UP	So we need to make sure that we're compliant with that and to do that our architect need to work quite closely with their designers and make sure that the whole architecture department which we need to make sure that we're compliant with them, will review our documents and say yes, you can develop the system for C1.	When using RUP, does it require your team and the other team to work in close collaboration?	C1.I2.B4 1
Uncertainty minimisation	Uncertainty minimisation	RUP promotes uncertainty minimisation	UP	It certainly them, and help us to have a history of whatever's been agreed upon to call upon, where they might want to fold things up in their own way. I would say RUP really helps us to do that. RUP provides a little bit of structure and responsibility	Is the fact that you're using RUP helping?	C1.I3.C1 7

Best Practice Oriented	Best Practice Oriented	RUP promotes best practice throughout the dispersed team	UP	where it's needed. It certainly them, and help us to have a history of whatever's been agreed upon to call upon, where they might want to fold things up in their own way. I would say RUP really helps us to do that. RUP provides a little bit of structure and responsibility where it's needed.	Is the fact that you're using RUP helping?	C1.I3.C1 8
Method effectiveness level for GSD	Collaboration across sites	RUP promotes collaboration across sites	UP	Definitely, because best of information needed constantly	Would you say that RUP requires you to work in close collaboration with the people from Denmark and UK?	C1.I3.C1 9
Method effectiveness level for GSD	Uncertainty minimisation	The adapted waterfall model can be used to minimise uncertainty as early in the project as possible UP	UP	No, I mean, most of the time we are not working for more than 30 days on one part of the project. So, by 30 days, you get to clarify everything concerned with that part of the project. So we know everything that needs to be done, what external factors might be affecting our development. We're kind of confined to a limited environment for the project. So we get to clarify that well, and we don't have to mind about what will come next. So we're in the mindset that we're doing that now, and we have to finish that in a certain number of days	How effective is it to use the waterfall model in such a situation where the team is dispersed? Are you having problems with waterfall?	C3.I4.I41

Table 46 – From Software Development Practices to GSD Governance

8.3. From GSD Software Development Practices to GSD Process Issues

This section provides evidence for the axial links between categories Software Development Practices and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Software development approach	Development issues	The correct software development approach can be used to minimise development issues. For instance, a method that minimises uncertainty right at the beginning can be used to enhance software quality	DOWN	No, it's not like that. What happens is that when you are developing a software, if you don't see a problem at the start, you'll get it in the end, when the project is completed. So, every time you have to go back and change the code. Here it's different. You don't have to wait till the end to see the problems. It's better if you deal with the problems in the beginning; you don't leave any bugs in your code, so it's better.	Is it different here? Does it interrupt you in your work?	C3.I2.G45
Software development approach	Backlogs	The software development approach, which requires the team leader to handle all the verification and the testing procedures introduces backlogs	UP	One of the problems that I've got is that, the developers do the coding, they do the test, and then everything that they do, I have to check to ensure that all the rules are included. I got this problem where I was sick for one week. I had three persons working with me. When I came back, I had 15 days of work (1 X 5) that I had to validate. And then they had already completed their work and so I had to find new projects for them.... So you see the problems that I have here. Before you finish the verification, they are already over with their work.	In terms of coordination now, do you have any issues for coordinating the work with the employees here and the project managers over there?	C3.I3.H35

Software development approach	Coordination issues	The software development approach introduces coordination issues. Especially when one small project is dependent on other smaller ones that have not yet been completed	UP	But the problem will come when... like this one we had, we had already developed our form which we have to work with a service which is being developed in France, which they have not yet finished with. They tell you to leave it, to ignore some small errors. But you lose a lot of time in testing. Sometimes it crashes and we say Why!! And we have not developed this service and we are not aware of how it works. You have to go there in the code. But if they are working on the code, you can't work now. You have to send them the problem. Now they investigate.... This could be the problem. But I think that the fact that they have broken it into small parts, makes the waterfall more appropriate	For this kind of environment, when the analysis and design is done in France, do you feel that the waterfall model is appropriate? Does it have some specific features that contribute to helping you to work in this kind of environment?	C3.I3.I8

Table 47 – From Software Development Practices to GSD Process Issues

8.4. From Software Development Practice to GSD Project

This section provides evidence for the axial links between categories Software Development Practices and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Project delivery speed	Speed of delivery	RUP can contribute to GSD Project success as it provides speed of delivery	UP	The benefit is speed, speed of delivery.	What benefit do you get from RUP?	C1.I1.A3 1
Uncertainty minimisation	Quality	The proper choice of software development method (for instance RUP) increases Project Quality, by identifying issues at an early stage thus reducing uncertainty	UP	Quality – you are able to identify problems. So, you're on top of your quality.	What benefit do you get from RUP?	C1.I1.A3 3
Project size	Stage	The number of stages involved in a project depends on the project size	UP	They would vary depending on the size of the project and how many people are involved etc.	For all the projects, are all the stages the same? Or do they vary?	C1.I2.B3 5
People involved	Stage	The number of stages involved in a project depends on the number of people involved in the project	UP	They would vary depending on the size of the project and how many people are involved etc.	For all the projects, are all the stages the same? Or do they vary?	C1.I2.B3 6
Phases	Project task allocation	Having software development process broken down into an appropriate amount of phases helps to facilitate the project task allocation	UP	I think that for the traditional software development life-cycle, for example, there was too many information concentrated in a single document. But with the CUSP methodology, it's broken down into more pieces. Long time ago, before that, we had the external design document. But now we have the analysis package and the design package. It's more broken down. The analyst will do the analysis package and the software engineer or the designer will do the design package. Someone else will do the build of materials. It's kind of broken down. And I think that different people with different roles will fit into this methodology.	How effective is this method, especially since you are working in a dispersed team with the US?	C2.I1.D3 5

Iteration length	Time frame delivery	The iteration length impacts on the time frame delivery of the project	UP	You have the project manager doing meetings, the analyst will do the analysis package, and the QA will do the test cases. The problem with that is that it can take a lot of time. But the advantage is that the number of modifications or rework tends to be less and you can get a project completed at one go. So there are some advantages and some disadvantage to it.	What specific features of the method are advantageous to GSD?	C2.I4.F3 0
Software development method disadvantage	Quality	A software development method like the waterfall which introduces a lot of iterations can however promote software quality	UP	The advantage I would say that the software will be better like this. Better the way they want it and not better the way we want it. So we have to do what the client wants, and not what we want.	Can you think of any advantage or disadvantage of using this method?	C3.I1.G1 5
Method effectiveness level for GSD	Quality	The adapted waterfall model can be used to improve Project quality	UP	The reason is that they want stable parts to evolve. For example, at least you know that one event is working correctly. Even if you move not [??] at least you know that this dll needs to do that and it's correct. You don't get cases where in the last phase of the project where the first "dossier" was wrong. That will never happen. And they will always screen the most critical person. They try to limit the risks.	So they don't mind doing analysis, design, coding, then testing and redesign and recoding again?	C3.I4.I42

Table 48 – From Software Development Practices to GSD Project

8.5. From Software Development Practices to GSD Team

This section provides evidence for the axial links between categories Software Development Practices and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Methodology learning curve	Team culture description	Software development methodology learning curve depends on the team culture. Team cultures that have some notion about the method learn more easily	UP	In the organisation I was before, it was a very big learning curve to introduce this methodology in the IT environment, cause they were not used to it	Does RUP meet your cultural requirements here? How are the South Africans?	C1.I3.A2 8
Software development method disadvantage	Employee motivation level	A software development method like waterfall, which introduces numerous iterations and reworks has a negative effect on the employees motivation level	DOWN	The disadvantage is as follows. We have on average one day per function. So if it's five functions, it's five days. So I put all my effort on that function for one day. So when they say that we have to delete this part and do it some other way, it's a bit de-motivating. Because I've spent a lot of time in it and I thought that it was good and I have to delete it, I see my efforts being washed away. It's de-motivating	Can you think of any advantage or disadvantage of using this method?	C3.I1.G1 4

Table 49 – From Software Development Practices to GSD Team

TECHNOLOGY

9.1. From Technology to Communication Practices

This section provides evidence for the axial links between categories Technology and Communication Practices.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Infrastructure setup	Bridging distance	A good infrastructure setup for communication, in terms of phone lines, communal mail boxes etc, bridges geographical distance and facilitates communication process	UP	I think that our infrastructure really supports our communication. We have a communal mail boxes in both London and Copenhagen. So email happens basically uninterrupted in our network. Then teleconferences are allowed at anytime or for any length of time, as well as one-on-one phone call. They'll even promote travel in order to reach agreement and optimum communication.	How about the infrastructure? Does it facilitate communication or prevent communication?	C1.I3.C3 1
Task-technology structure fit	Communication need	There are different communication needs at different project phases, and different communication technologies are used to cater for these needs at these different phases. For instance, the video conference is used during analysis	UP	Yes, I would say Yes. During the analysis and design, we have the visio. Mainly the visio, the briefing, we talk to them, we design everything. And then we have the second phase, where we use the phone. We talk to them about the problem that we're having. The third thing is the mail. They mail us and officially tell us what the problems are because the mail is attached to other persons, like their manager, their team leader and all other responsible members.	Do you think that you have different communication needs at different levels of the project?	C3.I1.G2 3



Task- technology structure fit	Communication need	There are different communication needs at different project phases, and different communication technologies are used to cater for these needs at these different phases. For instance, the phone is used in the second phase to inform about the problems being encountered	UP	Yes, I would say Yes. During the analysis and design, we have the visio. Mainly the visio, the briefing, we talk to them, we design everything. And then we have the second phase, where we use the phone. We talk to them about the problem that we're having. The third thing is the mail. They mail us and officially tell us what the problems are because the mail is attached to other persons, like their manager, their team leader and all other responsible members.	Do you think that you have different communication needs at different levels of the project?	C3.I1.G2 4
Task- technology structure fit	Communication need	There are different communication needs at different project phases, and different communication technologies are used to cater for these needs at these different phases. For instance, the mail is used in the third phase to communicate with the managers and all the responsible members	UP	Yes, I would say Yes. During the analysis and design, we have the visio. Mainly the visio, the briefing, we talk to them, we design everything. And then we have the second phase, where we use the phone. We talk to them about the problem that we're having. The third thing is the mail. They mail us and officially tell us what the problems are because the mail is attached to other persons, like their manager, their team leader and all other responsible members.	Do you think that you have different communication needs at different levels of the project?	C3.I1.G2 5

Table 50 - From Technology to Communication Practices

9.2. From Technology to GSD Governance

This section provides evidence for the axial links between categories Technology and GSD Governance.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Task-technology structure fit	Agreement seeking procedure	A communication technology like email can be used to support the work process and promote agreement seeking by sending documentation and agenda prior to any meeting	UP	Agenda is sent, documentation are sent before the meeting, before we go to get agreement	Let's talk about for instance the conference call. How effective is that?	C1.11. A45
Task-technology structure fit	Agreement seeking procedure	A communication technology like email can be used to support the work process and promote agreement seeking distributing meeting minutes across sites after a meeting	UP	you are in agreement with what you're doing, you send an email to confirm. An then we upload everything and we attach and then store it to our project management directory	It takes precedence over the national culture?	C1.11. A46
Task-technology structure fit	Agreement seeking procedure	A communication technology like email can be used to support the work process and promote agreement seeking by sending documentation across the sites	UP	The approach is that you send a document and setup a meeting to go through the document. We don't give it to them to create their own interpretation. This would create a lot of problem. That's why I call it collaborative software development.	And in terms of explaining, describing?	C1.11. A47
Task-technology structure fit	Documentation sharing	A communication technology like email can be used to support the work process and promote documentation management	UP	Agenda is sent, documentation are sent before the meeting, before we go to get agreement	Let's talk about for instance the conference call. How effective is that?	C1.11. A49
Task-technology structure fit	Documentation sharing	A communication technology like email helps in the sharing of documentation management across the sites	UP	That is what was agreed initially, we enclose that again during each workshop. Any documentation filled by any party will immediately be shared and be CCed. And we do that and it works wonderfully.	Let's talk about for instance the conference call. How effective is that?	C1.13. A50
Task-technology structure fit	Agreement seeking procedure	Communication technology like email can be used for documentation sign offs	UP	We even get to a point where we get sign off for documents by email.	Is it effective?	C1.11. B2
Task-technology structure fit	Agreement seeking procedure	Communication technology like email can be used for confirmations and	UP	If you are in agreement with what you're doing, you send an email to confirm.	Is it effective?	C1.11. B3



Task-technology structure fit	Uncertainty minimisation	thus promotes agreement seeking across sites Tele conferences are used to promote uncertainty minimisation	UP	We use telephone conference. The approach is that you send a document and setup a meeting to go through the document. We don't give it to them to create their own interpretation. This would create a lot of problem. That's why I call it collaborative software development.	And in terms of explaining, describing?	C1.11. B4
Task-technology structure fit	Uncertainty minimisation	Tele conferences are used to promote uncertainty minimisation	UP	Then I take you through the documentation and say "Chapter 1, this is what we mean" I read it and say "this is what I'm looking for, can you change it to this and that and that". And that's how we work.	And in terms of explaining, describing?	C1.11. B5
Task-technology structure fit	Uncertainty minimisation	The ability to save chat conversations can be used as evidence to reduce uncertainty at a later stage in the project	DOWN	I do, especially with same time, you can save the communication, so I do that. So after I've done an instant message communication with the customer, I always save it and send it by email to the customer and say "enclosed is what we said". And it tends to resolve those issues.	How effective are each of these tools?	C1.14. B9
Task-technology-structure fit	Uncertainty minimisation	Emails can be used to get clarifications to promote the uncertainty minimisation process	UP	Recently we were developing two design packages; we had some queries ALIAS which were not able to understand. So what we did, we forwarded any questions that we had and it was cleared out.	In terms of requirements engineering? Have you ever had misinterpretation on issues of the requirements?	C2.11. D29
Task-technology-structure fit	Collaboration across sites	Project management tool can help in the collaboration process between internal customers and project team, by automatically firing emails whenever required	UP	Yes, with internal customers, we do utilise something called share point, where we post all our resources. It will fire a mail to the one that has been assigned to and the latter will reply	When you are doing issue fixing with the customer, do you need a lot of communication with the customer?	C2.11. D38
Task-technology-structure fit	Project visibility	Project management tool can be used to provide project visibility to all stakeholders of the project. Details like time allocated for project, delivery date, testing schedule etc. can all be made available to everyone	UP	Let's say that you are working on a project, everything is put on a share point. All the documents we need for a project are on specific links which you can access. You have everything you want there.[...]. But everything, let's say the project itself, the time	And how about the work coordination? Is it well organised?	C2.12. E10

				that's been allocated for it, when it is scheduled to be delivered, what is the testing schedule, everything is on share point.		
Task-technology-structure fit	Documentation sharing	Project management tool can be used for documentation sharing management	UP	Let's say that you are working on a project, everything is put on share point. All the documents we need for a project are on specific links which you can access. You have everything you want there.[...].... But everything, let's say the project itself, the time that's been allocated for it, when it is scheduled to be delivered, what is the testing schedule, everything is on share point.	And how about the work coordination? Is it well organised?	C2.I2. E11
Task-technology-structure fit	Uncertainty minimisation	Communication technology like email can be used to obtain clarifications and thus promote uncertainty minimisation	UP	You have everything you want there. And if you don't understand something, you just have to pick the phone or mail the project manager or the testing manager for additional details. [...] if you don't understand something, you just request for additional details with those in UK	And how about the work coordination? Is it well organised?	C2.I2. E12
Task-technology-structure fit	Project visibility	Project management tool can help to provide project visibility as all stakeholders are aware of what is expected from them	UP	Because my work is here and I know what I must do. I just enter the project site on share point and I know what I have to do.	And how about the fact that you don't see them when you are talking to them?	C2.I2. E19

Demonstration ability	Issue resolution	The demonstration ability of the net meeting tool helps in fast issue resolution	UP	Let's say they were working on a system, I've got some problems and the person who is supposed to resolve the issue doesn't know easily what I am talking about. What are the errors I'm having while testing? So OK, we do a net meeting. Because maybe I'm testing something here on my machine and we cannot reproduce it over there. If we are working on the UAT server, its OK, we'll have the same results. But if we're working on the local machine, on my work environment here, there might be some things that are not reproducible. So you just let them connect to my machine and we do the same thing. He will then be convinced that this is not working, or there is something that I was not doing as requested.	And net meeting?	C2.I2. E29
Task-technology-structure fit	Agreement seeking procedure	The conference call is of great assistance for agreement seeking procedures during analysis	UP	They will then roll out an SRS. And then after that, we have a walk through via the teleconference. We will go through the SRS paragraph by paragraph. If there are issues, we raise them, and if there are changes, we update the document.	Can you please explain how the development work is organised with the UK team?	C2.I3. E48
Task-technology-structure fit	Uncertainty minimisation	The conference call is of great assistance for uncertainty minimisation processes during analysis	UP	They will then roll out an SRS. And then after that, we have a walk through via the teleconference. We will go through the SRS paragraph by paragraph. If there are issues, we raise them, and if there are changes, we update the document.	Can you please explain how the development work is organised with the UK team?	C2.I3. E49
Task-technology-structure fit	Document sharing	Project management tool can be used for documentation sharing management	UP	Everybody is aware of what the procedures are. And if there is something you just go there and look for the right documentation. And our CUSP repository for the documentation is the share point.	How does the fact that you're using CUSP help in such a dispersed environment?	C2.I3. F1

Connection speed	Best-practice oriented	Procedures might be in place to promote best practices (E.g working on Citrix), but if the connection speed is bad, the work process is hindered	DOWN	We are very well equipped here. We normally work on Citrix. Citrix what it does is to allow you to access a server in Canada but from your PC here. So the main advantage with that is that the customer data doesn't reside here. So we are SOX compliant in that sense. The main disadvantage is that we are very dependent on the internet connection. So if the internet goes down, we can't work	In terms of infrastructure, is it the same thing than what you have here?	C2.I4. F16
Task-technology structure fit	Project task allocation site	Project management tool to handle the work allocation	DOWN	And also we have like a global tool. There's only one tool where the work allocation is done. There's only one tool where everything resides and everybody is on the same level as far as the work is assigned.	How do you overcome the work coordination issues?	C2.I4. F19
Task-technology structure fit	Project task allocation site	Project management tool can be used for work and task allocation and issue notification for developers	UP	I'm working on my PC, after 5mins, I have an alert mechanism. Every five minutes it goes and searches if I have problem to solve. So I get a message saying that I've got an issue, and all the details about the issue are given. If I can solve it on the spot, it's OK, I solve it and put a small message saying: "It's OK, it's done". If it's not me and someone in France, the person will go there and see what the problem is and handle it.	But C3 itself, is it a software development company? What kind of software do you develop here? Is it for clients or Internal?	C3.I1. F49
Task-technology structure fit	Issue fixing	Remote desktop sharing tool are useful for issue fixing procedures	UP	We have a software called VLC, that allows our project manager to see what we are doing on our computer here. This facilitates the communication by the fact that, say I have my codes here, and I can't explain to the project manager what is happening and what the problem is. So he will enter our computer and have a look at the parts that are causing the problem. If he can solve it he just type it there and we will see the changes and so on	What according to you are the barriers that prevent good communication flow between the people here and the people in France?	C3.I1. G5

Task-technology structure fit	Issue fixing	Remote desktop sharing tools are used for issue fixing	UP	Talking to them is OK I think. If they don't understand our question, they just enter our PC and see what we are doing and they say: "this part is ok, but this part is not OK and we should do it like this".	Before taking a decision, do you think that it is important to see the person with whom you are communicating before hand?	C3.11. G20
Task-technology structure fit	Requirements elicitation	Technologies like video conference, mail or phone support the requirements elicitation process across dispersed sites	UP	Because at C3 here, we have the video conferencing here. So the project manager just explains to the team leader what he wants and we proceed. And if we have further problems, give a call or an email to find the solution. But the specs is not a problem	The other point was poor project details	C3.15. H13
Task-technology structure fit	Requirements elicitation	Technologies like video conference, mail or phone support the requirements elicitation process across dispersed sites	UP	Because at C3 here, we have the video conferencing here. So the project manager just explains to the team leader what he wants and we proceed. And if we have further problems, give a call or an email to find the solution. But the specs is not a problem	The other point was poor project details	C3.15. H14
Task-technology structure fit	Requirements elicitation	Technologies like video conference, mail or phone support the requirements elicitation process across dispersed sites	UP	Because at C3 here, we have the video conferencing here. So the project manager just explains to the team leader what he wants and we proceed. And if we have further problems, give a call or an email to find the solution. But the specs is not a problem	The other point was poor project details	C3.15. H15
Task-technology structure fit	Requirements issues	Video conferences are used to overcome requirements misunderstanding	DOWN	Sometimes you misunderstand, but as I said, there is the video conferencing and the telephone.	When they write it down, do you have problems understanding it, or do you misunderstand it? Or is everything clear?	C3.15. H16
Task-technology structure fit	Uncertainty minimisation	video conferences are used to minimise uncertainty	DOWN	. If there are a lot of things that are unclear, then we do a visio with them. Normally, at the start of a project, we do a visio. They explain to us, not only the specs but the context. Why this project, where it will be implemented....	They send you specs and then you develop. Does it ever happen that the specs is unclear?	C3.13. H38
Task-technology	Uncertainty minimisation	video conferences are used to minimise	DOWN	Everything that is unclear, I call them	Any misunderstan	C3.13. H39

structure fit		uncertainty			immediately and ask. But this problem has not occurred because, first there is one level. The chef de projet explains to me and if there is something that is not clear, I ask them in the visio. And then when I explain to the developer, he also will see something strange and then we call them.	dings pertaining to the specs? I get that the terms are in French right? Did it ever happen that they meant something and you misunderstood it and implemented something else? How do you ensure that this does not happen?	
Task-technology structure fit	Uncertainty minimisation	phone are used to minimise uncertainty	DOWN		Everything that is unclear, I call them immediately and ask. But this problem has not occurred because, first there is one level. The chef de projet explains to me and if there is something that is not clear, I ask them in the visio. And then when I explain to the developer, he also will see something strange and then we call them.	Any misunderstandings pertaining to the specs? I get that the terms are in French right? Did it ever happen that they meant something and you misunderstood it and implemented something else? How do you ensure that this does not happen?	C3.I3.H40
Task-technology structure fit	Project management	Project management tools are very effective for handling project management	UP		We try to monitor the development more regularly, using that project management software that we have	How do you overcome work coordination?	C3.I4.I27

Table 51 - From Technology to GSD Governance



9.3. From Technology to GSD Process Issues

This section provides evidence for the axial links between categories Technology and GSD Process Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Efficiency level	Information loss	Having really inefficient phone lines causes communication issues	UP	Really bad phone lines!!	What are the barriers that hinder proper communication?	C1.I2. B19
Connection speed	Communication delays	Having bad connection speed and bad infrastructure introduces communication delays as phone calls take longer than necessary	UP	Yeah, we had this situation where we had really bad phone lines and we had to ask them to phone them because the connection was really terrible. So if you can't quite hear the other person, telephone calls take a lot longer than they need to	What are the barriers that hinder proper communication?	C1.I2. B20
Connection speed	GSD Project delays	Slow connection speed introduces GSD Project delays as the work is not delivered on time	UP	Or as we've had in the last two days, we need to test something which is sitting in Copenhagen and the network is just really really slow and we think that its actually going to take us a day to get done with that and it actually take us three days because we just can't get it to the network.	Do you have any work coordination issues?	C1.I2. B27
Tool disadvantage	Coordination issues	Email disadvantages (jumbled up emails) introduces coordination issues	UP	Yes, email delays. We get every now an then when we would send an email and the order would get jumbled and they'll get the first email twelve hours later. And this causes quite a lot of confusion. And "what are you working on? I told you to stop doing it, and then I told you to do it. Which one did you get first?" That's the point where you need to pick up the phone... Yes that's quite of the problem with email.	Do you encounter some problems with the tools?	C1.I2. C2
Tool disadvantage	Communication delays	Phone disadvantages (line out unavailable) introduces communication delays	UP	And occasionally, you can't get a line out on the phone.	Do you encounter some problems with the tools?	C1.I2. C3



Cues transmission level	Communication delays	Email which has low cue transmission level introduces delays during communication	UP	When you get to communicating via voice and email, it's sometimes very difficult where you can't explain things with the hands, you can't draw things on the board, and that's the difficulty. And that is time consuming	What are the main problems that you encounter while working in global software development?	C1.I4. C49
Ease of explaining	Communication delays	Phone which does not allow things to be easily explained introduces delays	UP	When you get to communicating via voice and email, it's sometimes very difficult where you can't explain things with the hands, you can't draw things on the board, and that's the difficulty. And that is time consuming	What are the main problems that you encounter while working in global software development?	C1.I4. C50
Cost	Meeting planning effectiveness	Tele conferences being expensive, team members tend to stick to the meeting planning schedule and stick to the point	UP	And since teleconferences are expensive, (it's not the cheapest thing to do), they stand to the point. There's a not chat going on for 2-3 hours. So there's always a clear agenda on what needs to be discussed and it gets discussed	What are the main problems that you encounter while working in global software development?	C1.I4. D4
Connection speed	Communication delays	Bandwidth limitation causes communication delays as the tools used for communication are no longer effective	UP	Bandwidth limitation. In SA we've got serious bandwidth problems for communicating out of south Africa to Belgium or the rest of the world. Sometimes when we're talking to Belgium, we find that the thing goes down. Then the email goes down also. Then you're forced to pick up the phone. So we do get interruptions of communication because of limitation of bandwidth in South Africa.	Do you encounter any problems with these communication tools? What are their limitations?	C1.I4. D27
Task-technology-structure fit	Communication issues	A wide range of communication technologies can be used to support the communication process and reduce communication issues	DOWN	As a tester, I've not encountered any great issue of difficulty or any communication problems. Because we've got all the electronic tools, we've got video conference, we've got teleconference, we've got net meeting.	Can you please tell me about the problems that you encounter while working in GSD?	C2.I2. E8

Task-technology-structure fit	Requirements issues	When requirement are unclear or when the terms used to describe the requirements are not clear, email can be used to ask for clarifications	DOWN	Yes we do. First of all, I'm not really conversant with the payroll system. My system mainly records hours and works with the company setup. But the mainframe will be working with the payroll processing and also part of it with the company setup. So sometimes when the customer explains a bit of the payroll processing, for me it's a bit of Chinese. The misunderstanding comes from the terms that they use. The terms are more payroll oriented. But for me, I'm more technical people. But then, I just email the person who wrote the specs and ask for more details.	Do you happen to have misunderstandings pertaining to the requirements before coding?	C2.I3. E46
Task-technology-structure fit	Language accent	Email can be used to request confirmation when the language accent is too strong and the message cannot be understood	DOWN	Then when we talk we just say, "can you just confirm what you just said on an email?".	And how do you overcome that?	C2.I3. F7
Task-technology-structure fit	Mother tongue influence	Email can be used to limit the negative effect that the mother tongue influence has on communication process	DOWN	Communication there's always the language barrier which is the problem between our country and Canada. Because we are not native English speaking people. But whenever this happens, we try to, as much as possible we try to communicate by email. And also we have the chat system which allows us to have instant chatting, so we can quickly ask a small question to the person.	Does it create some problems in terms of communication since you never saw the other team members?	C2.I4. F11
Feedback time	Mother tongue influence	Technologies like chat, which has a high feedback time but without requiring the team member to actually talk can be used to overcome the mother tongue influence and provide quick response	DOWN	Communication there's always the language barrier which is the problem between our country and Canada. Because we are not native English speaking people. But whenever this happens, we try to, as much as possible we try to communicate by email. And also we have the chat system which allows us to have instant chatting, so we can quickly ask a small question to the person.	Does it create some problems in terms of communication since you never saw the other team members?	C2.I4. F12

Task-technology structure fit	Coordination issues	Project management tool to handle the work allocation can be used to overcome the coordination issues	DOWN	And also we have like a global tool. There's only one tool where the work allocation is done. There's only one tool where everything resides and everybody is on the same level as far as the work is assigned.	How do you overcome the work coordination issues?	C2.I4. F18
Tool disadvantage	GSD Project delays	Disadvantages of an asynchronous tool like email introduces GSD project delays	UP	And also for asynchronous tools like email, if the person doesn't understand you properly will only reply in the way the he thinks is right. And if that's not right, you have to wait again. And this can take a lot of time.	Do you enjoy real time interactions?	C2.I4. F48
Connection speed	Analysis site	When the network goes down or is slow, communication issues are introduced especially in urgent situations	UP	And the other issue is that sometimes we have communication problems in the sense that the network goes down. The line is very very bad sometimes and you might need to very very urgently to talk to someone. So it is very difficult in those cases. These, I would say are the main issues.	What according to you are the barriers that prevent good communication flow between the people here and the people in France?	C3.I1. G6
Task-technology structure fit	Requirements issues	Remote desktop sharing tool are useful for the fixing of issues that arise due to badly understood requirements	DOWN	But it did happen that we didn't understand it well. And when we give the project back, they told us: "Ok, this is not like this, but like that" On VLT they showed us the codes and how it should be, and how the output should be. And then we understood and changed everything.	Is there any work coordination issues?	C3.I1. G11
Task-technology structure fit	Requirement issues	Video conferences are used to overcome requirements misunderstanding	DOWN	. If there are a lot of things that are unclear, then we do a visio with them. Normally, at the start of a project, we do a visio. They explain to us, not only the specs but the context. Why this project, where it will be implemented....	They send you specs and then you develop. Does it ever happen that the specs are unclear?	C3.I3. H37

Table 52 - From Technology to GSD Process Issues

9.4. From technology to GSD Project

This section provides evidence for the axial links between categories Technology and GSD Project.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Task-technology-structure fit	Work type	Conference calls can be used to support the general GSD work type	UP	Yeah, coding issues, clarifications, project updates	The conference calls are only used for clarifications of issues?	C2.I1.D30
Task-technology structure fit	Project visibility	Project management tool helps to provide project visibility	UP	But globally, it just helps. Everyone knows what's happening. Everyone CAN know what's happening. For example, if I'm working on that project and I'm looking for information on another project I can go and look for it. But if I'm not concerned with that project, I won't bother to go and have a look. But the information is accessible and standard.	And the fact that you're using CUSP and that everything is clearly written in the documentation, does it help get rid of uncertainty	C2.I3.F2
Connection speed	Work type	Connection speed causes some tools like remote desktop sharing to be inappropriate for some work like remote desktop sharing	DOWN	Everyone yes. It's a bit slow but not actually a big problem. For programming though it's a bit slow ☺	Does everyone work like that?	C3.I2.H3

Table 53 - From Technology to GSD Project

9.5. From Technology to GSD Team

This section provides evidence for the axial links between categories Technology and GSD Team.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Tool efficiency	employee confidence	Email can be used as an efficient tool to overcome the lack of confidence of the resources in talking in a foreign language	UP	I think that the mail is a very important tool. It's better to type than to talk to someone else in another language.	How effective are each of these tools?	C2.I1.D44

Table 54 - From Technology to GSD Team



9.6. From Technology to GSD Value Issues

This section provides evidence for the axial links between categories Technology and GSD Value Issues.

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Cues transmission level	Feeling and emotions filter though	Email allows for cues to be transmitted about the feelings and emotions of the team members	UP	I think that what's important is that when you don't feel anything, you can interpret cues from their email. You start to see their email style when somebody's short and abrupt, they're either very busy or kind of upset with what you've said. And if they kind of waffle on, it usually mean that they're not really decided so you can probably sway them your way. So you can pick up cues like that from their emails especially when you get to know them.	Do you think that before making a decision about a project, visual cues are important	C1.I2.B4 2
Task-technology structure fit	Cues transmission	The video conference is very useful as it allows for cues to be transmitted	UP	The visio is something that is very important now. Before the visio, we were doing meetings on the phone. Now the message is passed much better. We are talking to a person, you see his reactions. And the fact that the persons see you, it has become more friendly. That helped a lot. It is a crucial tool in our work. And even sometimes we fight to have free time to do a visio. Because this room is not only taken for visio but for interviews,	How effective are each of these tools?	C3.I3.I13

Table 55 - From Technology to GSD Value Issues



9.7. From Technology to Technology

This section provides evidence for the axial links between categories Technology and Technology

Link emanating FROM the property	Link TOWARDS the property	Description	direction	Interview Statement	Interview Question	Rel. Code
Task-technology structure fit	Task-technology structure fit	The communication tools are selected based on how well they suit the dispersed teams communication requirements	UP	Video conference is not very effective for us, so we rather use conference calls. It is more effective than video conferencing	So you have the mail, you have the phone, you have the video conf. too?	C1.I1.A4 4
Connection speed	Frequency of use	The connection speed contributed to the choice of using video conference or not	UP	No, we don't believe in video conference. Well they're too slow. If we had really fast connection, they we would, but we don't really	No video conferencing?	C1.I2.C1
Connection speed	Tool disadvantage	Bad connection speed enhances the disadvantages of some communication tools like email, where the delivery speed is lowered	UP	There are times where the network is very slow, or they are out of the office, and they can't pick up the email.	Why is email 99%?	C1.I3.C3 9
Task-technology-structure fit	Tool disadvantage	One technology can be used to overcome the disadvantage presented by some other one. For instance, when the message is not properly conveyed by mail, the phone is used	DOWN	Sometimes no, and in those cases we have been using the phone. With the phone, let's say that we can understand 90%. And we have not understood, we might just ask them to repeat.	Can you always explain clearly what you want in the mail?	C2.I1.D5 0
Connection speed	Tool disadvantage	Poor connection speed enhances the disadvantages of the communication tools like remote desktop sharing	UP	Effective, but the only problem is the connection. Some times, it's a bit too....	How effective is that?	C3.I2.H2

Table 56 - From Technology to Technology

