

**An Empirical Study of
ISD Methodologies and
Socialisation Tactics
In Virtual ISD teams**

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Declaration:

The author hereby declares that, except where duly acknowledged, this thesis is entirely her own work and has not been submitted for any degree in Waterford Institute of Technology or in any other University.

Signed: _____

Brenda Mullally

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“Speak properly, and in as few words as you can, but always plainly: for the end of speech is not ostentation, but to be understood.” William Penn (1644-1718)

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ABSTRACT

In recent years more and more systems development projects involve distributed, virtual teams of system developers, analysts and other experts in the design and construction of information technologies. These ISD teams work in separate locations using computer based tools to coordinate and structure their work. This mode of work creates problems associated with both the use of ISD methodologies and the socialisation of team members. For example, current ISD methodologies do not take into account the particularities of virtual development. Whilst many researchers have investigated the dynamics of co-located ISD teams, studies of virtual ISD teams are rare.

This study investigated the use, in practice, of ISD methodologies and socialisation tactics by information systems professionals in virtual ISD teams. A conceptual framework was synthesised from the ISD methodology and socialisation literature. The central contention of the theory was that successful virtual ISD required well structured and complementary ISD and socialisation processes. The framework was tested empirically using an online survey which gathered both quantitative and qualitative data from 15 virtual ISD teams. Successful teams with excellent team communication, collaboration and cohesion used a bespoke ISD methodology and an institutionalised socialisation strategy. Internally developed ISD methodologies provided a structured, consistent and common approach by which team members could engage in their systems development process whilst also supporting knowledge sharing and social interaction. Institutionalised socialisation tactics were important for these teams because they enabled members to interact and create an integrated social system which contributed to the success of the projects. Virtual ISD work was also improved by mentor programmes, formal socialisation documentation, regular online meetings, facilitated informal communication, and the easy identification of expertise within the team by team members. The conceptual framework was revised on the basis of these findings and implications were drawn for both ISD practice and theory.

This thesis therefore provides a fundamental contribution to the ISD literature by developing and validating a new theoretical framework for virtual ISD teams which has not previously appeared. This framework provides a basis for improved practice in the organisation and management of ISD projects, and the use of ISD methodologies in emerging ISD contexts. It also provides a springboard for deeper research into the particular nature of virtual ISD activities.

CHAPTER 1 INTRODUCTION

1.1 Background

In a recent survey the Industrial Development Agency (IDA) in Ireland found a significant increase in the outsourcing of research and development (R&D) activities. They termed this phenomenon a global innovation network (The Economist 2007). For Ireland, the provision of a highly qualified workforce was essential in order to tap into this network. Towards the end of the 1990's the Irish government prioritised and financially supported the advancement of Ireland's communications infrastructure. This was to ensure Ireland's future in the information, communications and technology (ICT) and R&D sectors. The government committed to spending €8.2 billion on science and technology activities by 2013 (Forfás 2007).

The European Union (EU) aimed to become the "most dynamic competitive knowledge-based economy in the world". The seventh framework programme (FP7) offered research funding to meet the broad objectives of cooperation, ideas, people and capacities. Through FP7, joint technology initiatives, national research programmes and collaborative research in the area of ICT had access to €9050 million in funding. The submissions for 2007 included; pervasive and trusted network and service infrastructures, cognitive systems, interaction, robotics, components, systems engineering, digital libraries and content, personalised healthcare, ICT for mobility, environmental sustainability and energy efficiency, and ICT for independent living and inclusion. Many of these collaborative research projects took place across great distances involving many participants. Despite the increased trend in outsourcing, and the significant amount of collaborative research projects there was still a lack of understanding as to how virtual teams socialise and work together.

1.1.1 Personal Statement

The researcher experienced three years working as an applications developer on several virtual information systems development (ISD) teams. From a technical perspective, a highly structured ISD methodology and software quality standard guided the development process. From a social perspective, some team members were only known by a voice on the phone and an email address. The lack of physical face-to-face contact delayed the establishment of trust, familiarity, communication norms, mutual understanding and collaboration. Exchanging information, the allocation of tasks, clarity of team member roles, and effectively communicating at a distance were all problematic. These experiences led the researcher to investigate the use of ISD methodologies by the virtual ISD team and the socialisation of the development team members.

Advances in technology, and the widespread use of the internet has contributed to the popularity of geographically distributed teams. Virtual information systems development has facilitated access to distributed resources. These "virtual" teams needed support to overcome the negative impact of using technology to communicate. The lack of face-to-face contact between team members intensified the sense of distance. Team members that never or rarely met physically encountered problems while communicating, collaborating and becoming socially integrated as a team. The research reported in this thesis investigated two of the supports available to virtual ISD teams. Socialisation tactics used to socially integrate virtual team members and an ISD methodology used to structure the ISD process.

1.2 Definitions

Information System: "An information system is a sub-system of an organizational system, comprising the conception of how the communication- and information- aspects of an organization are composed and how these operate, thus describing the communication-oriented and information-providing actions and arrangements existing within that organization" FRISCO report (Falkenberg et al 1996).

Information Systems Development: "the way in which information systems are conceived, analysed, designed, and implemented" (Avison and Fitzgerald 2003a).

Information Systems Development (ISD) Methodology: "A systematic approach to conducting at least one complete phase (e.g. requirements analysis, design) of systems development, consisting of a set of guidelines, activities, techniques and tools, based on a particular philosophy of systems development and the target system" (Wynekoop and Russo 1993).

Virtual Team: "A virtual team is a group of people who work interdependently with a shared purpose across space, time, and organizational boundaries using technology". (Lipnack and Stamps 2000)

Socialisation: "the process by which an individual acquires the social knowledge, and skills necessary to assume an organizational role" (Van Maanen and Schein 1979).

1.3 Problem Description

A Forfás report published in 1999 indicated that the leading driver of enterprise in Ireland was e-commerce and the supporting information and communication technologies. Overseas companies located in Ireland were encouraged to undertake additional development work using virtual teams (Forfás 1999). Virtual teams were seen as a way to initiate research and development with multinational companies outside of Ireland. The pressure to lower costs, the shortage of information systems (IS) professionals, and the ready availability of communication technologies all contributed to the popularity of virtual ISD teams. However, few studies have investigated the practices of virtual ISD teams. Traditionally, ISD involved small projects undertaken by collocated teams. In the modern business environment, organisations spanned countries and continents. Information systems existed across geographic boundaries, and teams comprised of individuals located around the globe. A virtual team was a flexible organisational form that was appropriate to this new environment.

However, the difficulties of virtual working were well documented in the literature. Computer mediated communication has relied predominately on the written word and auditory exchange. The omission of facial expressions and body language from a message could result in misunderstanding. Electronic mail was relied upon heavily by IS professionals, particularly as an asynchronous method of communication. Consequently, all visual and auditory cues were omitted. Coordinating work and collaborating with unfamiliar team members located elsewhere was problematic. Conflict was common through misinterpretation of language, content and behaviour. To form a social connection with team members required additional time and effort not available to teams with time constraints. However without the connection the exchange of information and collaboration on complex tasks was difficult. It was of primary importance that the IS industry in Ireland maximised the potential of virtual ISD teams through a thorough understanding of their complexities and workings.

Understanding the process of virtual ISD was integral to its success. Research in the information systems development domain ultimately sought to improve the success rates of information systems projects. ISD projects often did not fulfil stakeholder expectations of completion time, quality and budget. Traditional ISD methodologies sought to standardise and rationalise the ISD process. This scientific approach concentrated on the technical and procedural aspects of ISD. In contrast socio-technical systems development (STSD) methodologies recognised the importance of the social aspects of ISD. For example STSD methodologies addressed user participation, interaction and debate amongst the participants of ISD. The current methodological practices of virtual ISD teams were unknown.

The context of virtual ISD was of primary interest in this research. Virtual teams have lacked the contact of face-to-face communication and therefore the social ties that formed through these interactions. Studies combining the ISD domain and the distributed work domain were sparse. This research aimed to coalesce these areas, conducting a study that concentrated on the virtual environment of ISD. The study focused on the IS professionals that comprised the virtual ISD team. This would lead to further understanding the socialisation and methodologies in use by the development team.

1.4 Research Objectives

Little was known about virtual ISD teams yet they were frequently used to access available resources and provide on-site customer support. Similarly little was known of the use of ISD methodologies by these teams. Authors that investigated this area called for further research to investigate current systems development environments and practices (Cramton and Webber 2005; Ovaska 2005; Faraj and Sproull 2000; Fitzgerald 2000). The key concerns of these authors were the

difficulties of working in the virtual environment, and the use of ISD methodologies to support the development process.

To this end the objectives of this research were

1. To examine the current methodological practices in virtual ISD teams.
2. To examine the current socialisation practices in virtual ISD teams.
3. To examine the relationship between ISD methodology use, socialisation tactics and ISD success.
4. To develop a model for successful virtual ISD which incorporates both ISD methodologies and socialisation tactics.

The following two sections set out the study's approach to meet these objectives.

1.5 Research Questions

A key area of research in the ISD domain was information systems development in practice. Studies examined IS professionals in their work context, such as the use of information systems development methodologies, the types of methodologies in use and whether they were effective. These studies investigated co-located teams. Few studies identified the use of ISD methodologies in the virtual team environment. It was therefore necessary to ask virtual IS professionals "Are methodologies used?" in the virtual ISD context, and if so "How are they used?" Therefore, the first research question posed by this study was as follows:

1. *"To what extent do virtual ISD teams use ISD methodologies?"*

Virtual teams would co-ordinate their work primarily using electronic means. The socialisation of team members encouraged familiarity with their

surroundings and work environment. Socialisation tactics could potentially influence the effectiveness of IS professionals in virtual ISD teams. It might be possible to enhance communications, collaboration and cohesion within virtual ISD teams. It was necessary to identify the current socialisation tactics that were in place in virtual ISD teams. The second research question was as follows.

2. *“What types of socialisation tactics are currently used by virtual ISD teams?”*

A traditional ISD methodology supported the identification of requirements and the delivery of an appropriate information system. STSD methodologies extended this remit to include the participation and consideration of the users of the information system. Organisations used socialisation tactics to integrate and socialise new staff members. This integration could familiarise people with the values, norms and expected behaviour of organisational members. In this way, the application of socialisation theory to the virtual team context might provide a crucial support to the IS professionals in the virtual ISD team. Without face-to-face contact, familiarisation with team values, norms and expected behaviour may have to take place through technological means. Perhaps ISD success might therefore be improved by combining appropriate socialisation practices to address the human factors and appropriate ISD methodologies to address the procedural issues. In line with the context of this study, success was determined by the IS professionals in each virtual ISD team. Examination of these relationships in practice might lead to new theory and inform future practice. The final question addressed this relationship.

4. *“Does a relationship exist between ISD methodology usage, socialisation tactics and ISD success?”*

The following section describes the research approach undertaken in the study.

1.6 Research Approach

Early research has concentrated on the technical aspects of ISD. Today, ISD encompassed technological and social aspects of the development of information systems. The considerable changes in information technology over the past forty years have resulted in significant changes in the focus of the IS field. New organisational forms have emerged in response to; business occurring across continents, teams communicating remotely and information systems influencing all levels and aspects of work. This study would need to draw from organisational, and information systems literature in a trans-disciplinary approach to the virtual ISD phenomena.

The following section provides a synopsis of each chapter to guide the reader through this thesis.

1.7 Thesis Structure

Chapter one introduces the reader to the research problem, research objectives and research questions. This chapter also includes a description of the research approach undertaken by the study and sets out the overall structure of the thesis.

Chapter two is the first of two chapters in the literature review. This chapter presents the ISD literature relevant to the research questions. Included are sections on the process of ISD, the social needs of ISD, and ISD success. The final section of this chapter presents literature on the emergence of the virtual ISD environment

Chapter three is the second and final chapter in the literature review. This chapter presents the organisational and team socialisation literature which informed the research propositions.

Chapter four presents the theoretical framework arising from the literature. The combination of ISD theory and socialisation theory was used to generate a series of propositions for investigation.

Chapter five selects a research design appropriate for examination of the propositions. The chapter describes the research approach undertaken by this study. The chapter includes details of data gathering techniques, administration of the survey and data analysis techniques.

Chapter six presents the findings of the survey in relation to ISD methodology usage by virtual ISD teams, socialisation tactics used by virtual ISD teams, and the success of the ISD projects investigated.

Chapter seven interprets the data in light of the propositions in chapter 4.

Chapter eight summaries the findings, the contribution to practice, and current theory as derived from this study. This chapter also reviews the study's objectives, examines limitations and implications to current theory and future research.

The following framework (Figure 1-1) summarises the research study, depicting the interrelationships between chapters. The literature review clearly informed the theoretical framework and the discussion of findings. The theoretical framework determined the type of study and consequently the research approach, which in turn collected the data for the findings chapter. The theoretical framework chapter linked to the discussion and conclusion chapters and provided answers to the propositions.

The following chapter begins the literature review in the information systems development by virtual teams.

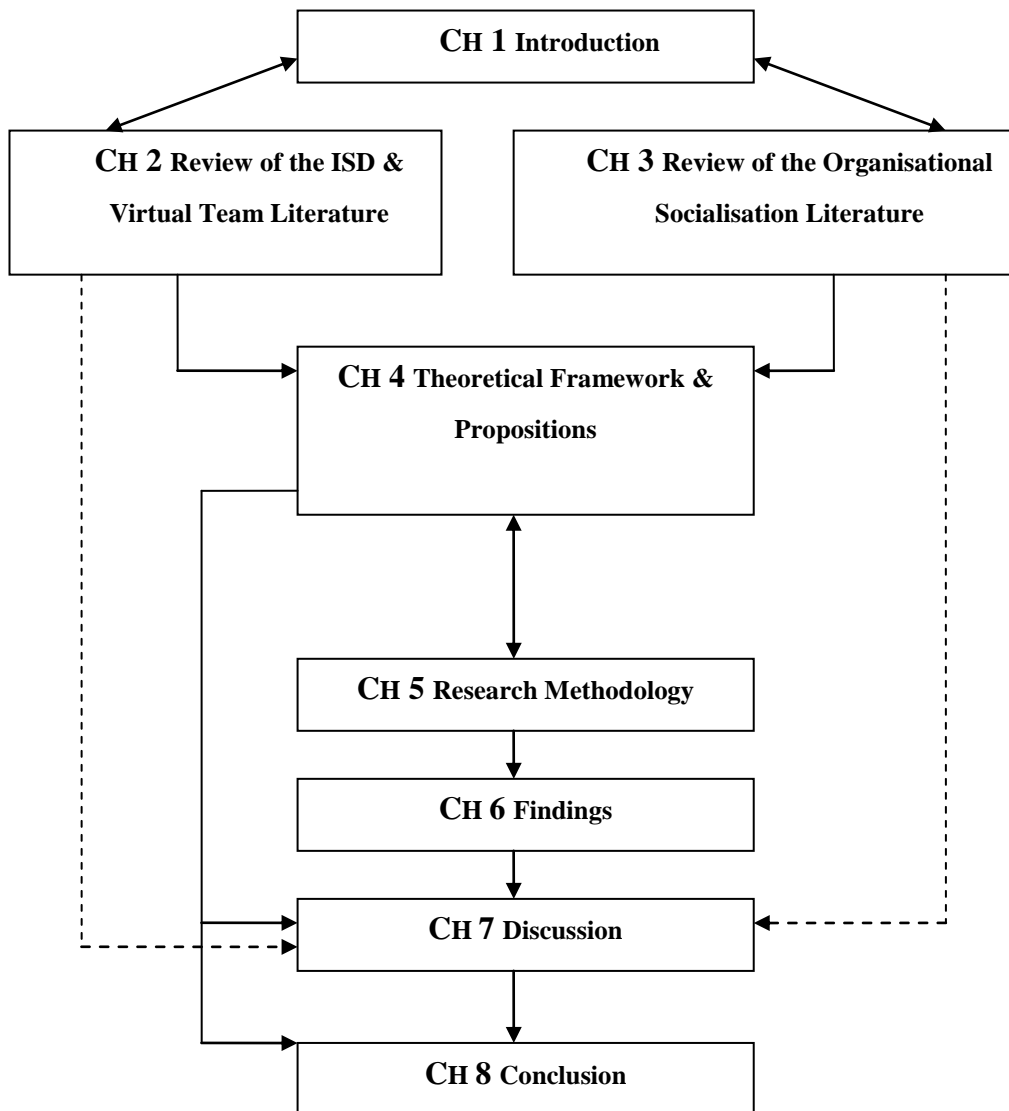


Figure 1-1: Research Structure

CHAPTER 2 INFORMATION SYSTEMS DEVELOPMENT IN THE VIRTUAL CONTEXT

2.1 Introduction

This chapter presents the literature on virtual information systems development. A significant dimension of that literature was the existence of ISD methodologies. A methodology was thought to provide a systematic approach to systems development. The first section in this chapter addresses the ISD process in relation to the classification of the methodologies into functionalist and interpretive perspectives of ISD. Specific attention is also given to the use of ISD methodologies in practice. The second section addresses the social needs of ISD. The third section addresses success factors of ISD. The fourth section then presents the emergence of virtual work and the effect it had on collaboration, cohesion, and communication in the ISD context. The chapter ends with a review of the research methodologies used in the ISD and virtual team literature.

2.2 The Process of ISD

The ISD process involved multiple stakeholders working together to design and create a computer based information system suitable for a specific business domain. Though a collective process, ISD required independent problem-solving and knowledge intensive work (Clegg et al 1996). Research in the information systems development domain sought to understand and improve that process. ISD in the 1960's resulted in the emergence of the term 'software crisis' which referred to systems that took too long to develop, cost too much and did not match the customer's requirements (Fitzgerald 1996). Studies showed that ISD projects did not fulfil stakeholder expectations of completion time, quality and

budget (Standish Group 2000; Lyytinen and Robey 1999). To combat this crisis, methodologies emerged to structure the development process in order to meet cost and time constraints. A methodology was defined as: "A systematic approach to conducting at least one complete phase (e.g. requirements analysis, design) of systems development, consisting of a set of guidelines, activities, techniques and tools, based on a particular philosophy of systems development and the target system" (Wynekoop and Russo 1993). Structured methods of working were a priority in order to formalise the process of development and reduce issues by following strict steps and procedures. A methodology told you what steps to take, the order in which to take them and how to perform the steps (Bennetts & Wood-Harper 1996). Over time hundreds of methodologies were created. Many of these methodologies applied scientific techniques to deconstruct an ISD project into manageable sequential steps. Researchers then attempted to categorise methodologies based on paradigms of philosophical beliefs (Avison and Fitzgerald 2003a; Mingers and Brocklesby 1997; Iivari 1991). Each paradigm was seen to influence the ISD methodology through assumptions. These assumptions in turn influenced how the project team sought and dealt with information. Epistemological assumptions related to the generation and acquisition of knowledge. Ontological assumptions related to the representation of the physical and social reality within which the system existed. Two key paradigms that emerged from the literature were the functional and interpretive paradigms. The following sections describe each paradigm with examples of ISD methodologies that fell within their philosophical beliefs.

2.2.1 Functionalism

Information systems development had a natural and applied science background and hence a strong link with positivist assumptions. The functionalist paradigm formed the basis for many methodological approaches to ISD, for example

structured, information modelling and decision support systems (Iivari et al. 1998; Iivari and Hirschheim 1996). These methodologies considered the information system a technical artefact created from objective facts and used in a structured organisational setting (Nandhakumar and Avison 1999). In the 1960's the increased size of systems development projects exacerbated the problems of costs, time and functionality. Structured methodologies emerged as a solution. Structured methods among others had their foundations in the functionalist paradigm (Fitzgerald 1996). The functionalist paradigm viewed an information system and its environment in a rational, functional and structured way. This paradigm offered a universal approach to information systems development by reducing any problem into a set of manageable components in order to arrive at a solution (Baskerville et al. 1992).

One of the earliest methodologies was the “waterfall” methodology. The methodology set out a sequence of steps through which systems development progressed. Documentation and software quality standards were important control tools used in the waterfall methodology (Bennetts & Wood-Harper 1996). These control tools and the sequenced approach attempted to reduce time delays and high costs (Avison 1996). The waterfall methodology was used as a basis for many subsequent methodologies. Control and standardisation were two of the key concepts associated with methodologies falling into the functionalist paradigm (Stage 1991). Control was maintained throughout the development project by reducing the problem domain into manageable segments and adherence to a phased approach (Russo et al 1996). The manageable segments were then allocated to team members. Team members followed the phased approach thus ensuring each segment was created in a similar way. The phased approach supported the standardisation of the process and skills required. For example, analyst skills for the requirements gathering phase or programmer skills for the implementation phase. The formalisation of knowledge further supported the standardisation of the process. For example, knowledge was formalised

through standardised documents that were completed, reviewed and approved at each phase of the development process.

Documentation played an important role in the application of the phased approach. For example, requirements, technical and functional specifications were essential for the analysis phase. Similarly the construction of models, diagrams and work flows was essential for the design phase. Documentation provided guidelines for carrying out tasks and support through checklists and forms (Bennett & Wood-Harper 1996). A methodology stored, represented and disseminated knowledge through the phases and tools such as diagrams, data dictionaries and documents (Ovaska 2005). In theory, the methodology stored the knowledge in a standard and objective way therefore reducing reliance upon subjective humans. This meant that ISD professionals could obtain complex and detailed knowledge about the problem situation from users in a standard manner. The same format was used for a requirements specification document regardless of the project description. Each document provided a history of the project work conducted. The documents also provided stepping stones for moving through the phases of the project.

Structured systems analysis and design method (SSADM) was an example of a methodology influenced by the functionalism paradigm. SSADM provided a detailed set of rules and guidelines for an ISD team. Documentation was of paramount importance to this methodology. The methodology contained five modules; feasibility study, requirements analysis, requirement specification, logical system specification and physical design. The emphasis was on modularisation, specification and documentation throughout the ISD process.

Other functionalist based methodologies included object oriented analysis (OOA), Agile methods, Information Engineering (IE), and Rapid Application Development (RAD). Each of these methodologies utilised a systematic and modularised approach to the collection, analysis and dissemination of

information during the ISD process. OOA used notation in the analysis and design phases to represent and explain the problem domain. Key activities were performed to accurately represent the problem. Agile methods concentrated on flexible development practices with less documentation and greater communication between team members. Usage-centred design from the beginning of a project established commitment, understanding of the domain, identification of roles, and the creation of social linkages sustained throughout the process (Hoffer et al. 2005). IE supported all aspects of the ISD life cycle with a strong focus on systematically representing data through diagrams. RAD applied an evolutionary approach to the four phases of requirements planning, user design, construction and cutover.

The scientific foundations of the functionalist paradigm led to many methodologies that concentrated only on the technical aspects of ISD. Few methodologies existed that recognised the social aspects of ISD. Research found that ISD required considerable negotiation, interaction and communication between individual developers (Ovaska et al 2005; Stapleton 2001; Hirschheim et al. 1991). Methodologies falling under the interpretive paradigm went some way towards recognising the importance of the social side of ISD. The following section introduces the interpretive paradigm.

2.2.2 Interpretive

In contrast to functionalism, the interpretive philosophy focused upon the human contribution. It was considered that the pure scientific nature of functionalism was not wholly appropriate to the development of information systems. Understanding the system as a whole was important to methodologies falling under the interpretive paradigm. Rather than breaking the system down into modular parts, development was approached in a holistic manner. Interpretive

ISD methodologies formed a socio-technical system development (STSD) viewpoint. The key principle was that systems development required an understanding of both the technical and the social or organisational structures. The resulting information system would be technically efficient and have consideration for the social characteristics of the business (Mumford, 2000). This brought recognition to the importance of the organisation and its members throughout the development process. That recognition was shown through user participation, discussion, cooperation, knowledge management, planning and modelling (Avison and Fitzgerald 2003a; Hirschheim and Klein 1989). The developer was seen to be a change agent helping to make sense of the reality within which the new system was developed. It was equally important that development took place within the frame of reference of the stakeholders of the new system. Rather than simply observing, the stakeholders became involved in the process. Participation occurred through decision making, feedback, and interpersonal interactions with the development team. This paradigm influenced the classified methodologies to the extent that the developer or analyst was primarily a facilitator, working within the stakeholders perspective facilitating change (Hirschheim and Klein 1989).

Examples of methodologies falling under this paradigm included Soft Systems Methodology (SSM), Effective Technical and Human Implementation of Computer-based Systems (ETHICS) and Multiview. Checkland (1981) developed SSM, a methodology that recognised the importance of people in the process of development. The methodology placed emphasis on interaction and debate with the actors of the system. Enid Mumford (1995) set out the ETHICS methodology. It was based on the socio-technical approach to information systems development. The social and organisational aspects associated with a new information system were considered of paramount importance throughout the methodology. Additionally the methodology used a participative approach to development. Those people impacted by the new system participated in the decision making process regarding the design of the system. Many

methodologies gave a cursory glance to participation, however ETHICS deemed it vital. Multiview was influenced by ETHICS, SSM and by functionalist methodologies such as IE. Multiview considered the development of an information system as contingent upon skills and situations. It was a flexible methodology that addressed both the technical and social aspects of each individual development project (Avison and Fitzgerald 2003a). It was considered that no one methodology was appropriate to all situations; multiview offered an alternative to a single methodology.

The domain was often described as a ‘method jungle’ as over a thousand methodologies existed (Avison and Fitzgerald 1995). The following provided a simplified categorisation of methodologies for the purposes of measuring their use in practice. Firstly, all those methodologies typically found in manuals, education, training or consultancy support, could be termed formal^a systems development methodologies (FSDM). Regardless of the influencing paradigm a FSDM directed the information system development process. The FSDM’s varied in focus; some directed the process from project initiation to the implementation of the system. Other FSDM’s only directed the analysis and design phases. Secondly, the methodology usage literature also showed evidence of bespoke methodologies. Organisations or teams used an internally developed methodology that was created for their own use (Fitzgerald, 1997; Coleman, 2005; Kiely & Fitzgerald, 2005). This bespoke methodology could be based on one or more existing methodologies or be an entirely new methodology. These bespoke methodologies were not publically available and thus did not fall under the FSDM category. Thirdly evidence of ad-hoc development or the pragmatic mixing of methodologies during the life cycle was found. This required the

^a The term formal was used to refer to systems development methodologies that were brand-named, contained in a textbook, published, or formally-defined (Fitzgerald, 1996; Avison & Fitzgerald, 2003a). There were many examples in the literature some of which were contained in sections 2.2.1 and 2.2.2.

development team to choose appropriate tools, techniques and elements of existing methodologies for the situation at hand (Mingers and Brocklesby 1997). The following sections present the literature on the use of FSDM, bespoke and ad-hoc mixing.

2.2.3 ISD Methodology Use

Methodologies attempted to organise and structure an increasingly complex systems development process. Various factors encouraged the use of a methodology: Managers assumed that methodologies were beneficial; consequently, they were adhered to (Introna and Whitley 1997). Much of the early literature was biased towards the need for and use of a FSDM (Huisman and Iivari 2002). It was considered that all that was required to analyse and specify a problem situation, and all that was needed to design a solution, could be found in the chosen methodology. The creation of an information system was an uncertain and complex process involving many stakeholders. The functionalist approach to ISD rationalised that developers need only use a methodology to succeed (Truex et al. 2000; Avison & Fitzgerald 2003b). A methodology was seen as a means to consistency and control of the development process (Nandhakumar and Avison 1999). However despite these reasons, recent research indicated that this bias towards the use of a methodology was not mirrored in practice (Kiely & Fitzgerald 2005; Fitzgerald 2000).

The literature also contained arguments against the use of methodologies: The choice of hundreds of formal systems development methodologies made it difficult for practitioners to have a clear understanding of the differences between each methodology (Fitzgerald 1998b). Additionally, the needs of today's development environment may not be met by existing methodologies (Russo et al 1996). There was inadequate recognition of the social interaction

and mutual understanding between project participants (Ovaska 2005). In support, the human centred tradition recognised the importance of the social process of development through participation and involvement (Gill 1996). These challenged the Taylorist view that ISD was a set of predefined steps concerned with the production of a technical system for organisational gains. Application of these arguments meant ISD should consider further the stakeholders, and the context within which development occurred. The methodologies that were classified as interpretivist attempted to address some of the social and organisational needs of ISD.

External pressures to use methodologies also stemmed from governments and software process improvement models. Some governments involved in systems development required the use of specific methodologies. For example, SSADM in the UK, Ireland, Malta, Hong Kong, and Israel (Fitzgerald, 1998). Software process improvement models represented a publically recognised certification and quality standard (Fitzgerald et al 2003; Bennetts & Wood-Harper 1996). That publically recognisable quality standard was important to organisations. For example, the Capability Maturity Model Integrated for Software (CMMI-SW) and the International Organisation for Standardisation (ISO) 9001 series. Each of these models placed strict documentation requirements on the systems development process adding costs in terms of administration and time (Coleman 2005).

Throughout the historical development of methodologies, there was not enough research concentrating on analysing and monitoring the use of methodologies in practice. There were many calls to investigate the use of methodologies in practice (Kiely and Fitzgerald 2005; Ovaska 2005; Iivari and Maansaari 1998; Russo et al 1996). The following sections review the studies conducted on methodology usage.

2.2.4 FSDM

Studies that investigated the use of methodologies showed evidence of FSDM's in use. Chatzoglou and Macaulay (1996) found 53% of those surveyed used a FSDM. The study determined that the use of a methodology meant either the use of a specific methodology or the use of techniques incorporated into a contingency based strategy. Iivari and Maansaari's (1998) study showed 39% used the object oriented approach and 23% used structured systems analysis and design. Russo et al (1996) found that 64% of respondents indicated use of a FSDM in the form of structured analysis and design, information engineering, object-oriented, or prototyping.

However, there were significant variations in how they were used. In Wastell's study, (1996) the methodology was a symbol of quality or an indication of procedural compliance rather than informing the process and adding value to the project. Project teams also deviated significantly from the methodology as the development process emerged (Baskerville et al, 1992). Changes were made to the methodology as the project progressed. A field study in a large organisation found the methodology was used as a demonstration of quality and provided integrity and credibility to the project whilst not actually supporting the process effectively (Nandhakumar and Avison 1999). In this instance, the project adhered to a methodology on paper, but in practice the methodology was essentially ignored. The methodology did not drive the development team. It was symbolic rather than active. Methodologies appeared to provide some degree of credibility to a project from a management and customer perspective. A recent study by Ovaska & Stapleton (2007) found that despite the use of a FSDM, the ISD strategy changed from waterfall to cyclical during the requirements engineering phase of the case study. The findings suggested that a contingent approach was more suitable for requirements gathering. Further studies supported these findings. Fitzgerald's (1998) study found 14% of the 162 surveyed used a FSDM of which only 6% made no changes to the methodology. Similarly, Russo's

(1996) study also found of those using a methodology only 6% reported that their methodology was always used as specified.

Clearly, the strict adherence to a FSDM in practice was challenging. This was due firstly to the fact that the method authors were in the most part academics who had little practical experience of development work (Introna and Whitley 1997; Wastell 1996). Secondly, questions arose concerning the scientific assumption that a solution could be found by the systematic progression through a set of methodological steps (Fitzgerald 1996). Inherent in many FSDM's was the concept of a staged, sequential process, however in practice that was not the case. Thirdly, FSDM's did not place adequate emphasis on the importance of social interactions. Studies found ISD involved a significant amount of communication, negotiation and common understanding (Ovaska 2005; Ovaska et al 2005; Ovaska and Stapleton 2007; Stapleton 2001). Ovaska and Stapleton's (2007) study of multi site teams found that a lack of interaction during the design phase led to narrow interpretations of the system. It was evident in the study that attitudes and expectations changed during systems development thus affecting the understanding of requirements. Ovaska et al (2003) also found architecture was used as a coordination tool in multi site ISD. An understanding of the architecture of the system helped to direct the development work across multiple sites.

Nandhakumar and Avison (1999) found development was guided by existing communication patterns and social relations. The case characterised development improvisation, opportunism, interruption and mutual negotiation of equal importance to progress milestones, planning and management control. Cycles of interactions denoted the development process. Despite this, FSDM's concentrated on technical, operational and procedural interactions through documentation, formal meetings and specifications. Communication, negotiation and mutual understanding through social interactions were not prioritised.

2.2.5 Ad-Hoc Mixing

Research showed that ISD practitioners often utilised specific techniques appropriate to the situation at hand. ISD methodologies were tailored to the actual needs of the development context. A study by Mingers & Brocklesby (1997) concentrated on instances where methodologies were mixed resulting in a pluralist approach. They designed a framework for mapping ISD methodologies. How an ISD methodology addressed social, personal and material aspects during an ISD project determined where it was mapped in the framework. The framework helped to identify the methodologies support in specific aspects. Choosing and mixing the most appropriate methodologies had the potential to deal with the richness of the real world in a more complete way. Clarke and Lehaney (2000) believed the question in ISD should be “what critically, theoretically, and practically informed mix of methods best deals with the problem context encountered?” (pp 555).

Nandhakumar and Avison (1999) studied the development of an enterprise information system (EIS) where much of the work used fourth generation languages to enhance the existing package. That type of development work required ad-hoc problem solving which was not pre-planned using an ISD methodology. The development team began with ad hoc development practices which evolved into common team practices. The findings indicated that the development process involved continuous intervention, improvisation, opportunism, interruption and mutual negotiation. Nandhakumar and Avison (1999) found ISD was a complex social process.

Wynekoop and Russo (1993) found 89% of organisations adapted systems development methods on a project-by-project basis. Russo et al (1996) found of the 74% of the study’s organisations used more than one methodology, and 20% were using no methodology. Ovaska and Stapleton (2007) case study of a multi-site ISD project found that during requirements capture the development

methodology shifted from the waterfall approach towards a prototyping approach. It was not clear if the project's methodology remained waterfall outside of the requirements phase.

Fitzgerald (1997) found that experienced developers were less likely to follow a methodology rigorously. Experienced practitioners had the ability to pragmatically choose the appropriate techniques for the situation. Those with less experience preferred to follow a methodology step by step. Introna and Whitley (1997) wrote that methodologies could not force understanding. Methodologies simply facilitated understanding of the problem domain (Baskerville et al 1992). The effective use of a methodology depended on the understanding of the organisational context, which was not provided by the methodology itself (Nandhakumar and Avison 1999). If a method was to be adapted to suit the development situation, even greater communication would be needed than if the method was simply adopted.

2.2.6 Bespoke

Some organisations found FSDM's did not suit their development profile. Others found the pragmatic mixing of methodologies required an organisation or project team to have a range of familiar methods available to choose from (Fitzgerald et al 2003). This would not only require competency in several methodologies but also time to conduct the tailoring process, both of which were lacking in ISD projects. This was impractical and unrealistic in practice. As an alternative, a bespoke methodology was used. The organisation either tailored existing methodologies to suit their profile or created a brand new methodology. Some organisations documented their methodology in one or two manuals. The methodology concentrated on the elements of the life cycle most relevant to them. The methodology was generic and high level in approach so that it was

appropriate for all development situations within the one organisation (Fitzgerald 1997; Fitzgerald et al 2003). A well known example is Nokia's OMT++ used for designing network management systems (Ovaska, 2005). A methodology created in a software house could emphasise testing, version control and support. Conversely a methodology from a bank may emphasis strategic planning and the business case (Fitzgerald 1997). A case study by Kiely and Fitzgerald, (2005) found two of the three participating organisations developed bespoke methodologies. The main reason given for creating a bespoke methodology was the inflexibility of FSDM's. Following a FSDM rigidly was considered cumbersome and consumed time and resources not always available. Participants also said that less complex projects did not require the complete methodology (Fitzgerald 1998). Again this suggested a broad methodology with some flexibility as to its uses.

Coleman (2005) found none of the 15 companies interviewed used a methodology in a "text book" manner; rather they added or dropped elements thus making it their own. Fitzgerald's (1997) findings also showed that none of the organisations using methodologies followed them rigorously. Iivari and Maansaari (1998) found 35%, and Fitzgerald (1998) found 26% created bespoke methodologies. Chatzoglou and Macaulay (1996) study compared the use of methodologies by software houses or consultancy companies to general industry. They found that 70% of software houses or consultancy companies used a methodology. Only 34% of project in other industries used a methodology. Six out of eight industry projects used either prototyping or in-house methodologies. These studies provided some insights into the use of bespoke methodologies. However, the reasons for and influences on were not entirely clear. Little research had been conducted on the creation and use of bespoke methodologies

Fitzgerald et al (2003) found Motorola created a bespoke ISD methodology tailored to the needs of their development projects. Motorola recognised the benefits of using a standardised development methodology but at the same time

using one that fit appropriately to the development project. The resulting methodology provided the general process that each project followed.

In general the studies suggested a preference towards the pragmatic mixing of methodologies or the creation of new bespoke methodologies. Following a FSDM did not occur in practice. Research also showed that the type of development had changed. A large portion of development involved the customisation of packages (Fitzgerald 2000). This new type of development consisted of small-scale projects with a short time span. FSDM's were conceived during a time when large scale, complex and lengthy projects were common. Questions arose about the appropriateness of those methodologies for modern development practices and team structures. A revised view of today's methodological needs in relation to the development environment was necessary. Some of the studies indicated that ISD methodologies supported the process aspects of ISD but not the social aspects. Social interactions, negotiation, and communication were highlighted as significant elements to ISD. The following section describes the research on the social aspects of ISD.

2.3 The Social needs of ISD

Despite the choice of methodologies available in ISD, many of the well known methodologies were based in the functionalist paradigm thus addressing only the technical perspective of ISD (Nandhakumar 1999). That technical perspective dealt with the process of ISD, such as the collection, analysis and dissemination of information, or the systematic deconstruction of problems into manageable components. Some recognition of the human component in ISD emerged later in the form of the socio-technical systems development (STSD) perspective. Avison and Fitzgerald (2003a) described the ISD process as “more about social interaction and mutual understanding between project participants than

progressing according to milestones and strictly following the prescribed phases of the method” (pp.185).

Studies showed that ISD failure occurred due to human factors such as poor strategy, poor communications, control, training and user resistance (McManus and Wood-Harper 2003; Akkermans and van Helden 2002). For these reasons it was widely recognised that organisational and social factors were equally if not more important than technological factors in information systems development (Avison et al. 2001). Nandhakumar and Avison’s (1999) study suggested that social structures that encouraged collaboration and the use of established routines appeared to have a greater influence on work than an ISD methodology.

A study by Curtis et al. (1988) identified people, not methodologies, as the key that could lead to greater improvements in software productivity. An implication of Curtis’ study was to highlight the fact that existing methodologies did not reflect the social aspects of ISD. There was little guidance to developers in how to negotiate requirements, and resolve conflicts. The findings also showed that abilities in conflict resolution, building mutual understanding, and interpersonal communication were crucial to project success. No tool or technique could provide these abilities. According to Curtis et al (1988) the key was to develop these skills through training and team building.

The importance of the ISD team became an area of interest within the literature (Glass 2003; Brooks 1995). Peterson et al. (2002) conducted a study that compared the perceptions of success and failure by developers from the United States, Japan and Korea. The results in all three groups found organisational integration and the communication of project goals as the most important components for successful and unsuccessful projects. Despite research that identified social issues in ISD, there continued to be a concentration on the improvement of the process aspects of development such as tools, techniques and methodologies. Ciborra (1998) acknowledged that new technology development

across the globe meant that systems design methodologies were widespread and familiar. 10 years later, despite this familiarity with methodologies, systems continued to fail. The blame could no longer fall on the doorstep of methodologies.

Kautz et al (2007) reviewed the literature and found recurrent problems in ISD regardless of the project type or methodology in use. These included time pressures, parallel work, quality, fixed architecture and a reliance on good people. Consistently the literature reported problems with the social aspects of information systems development. Methodologies falling under the interpretive paradigm outlined in section 2.2.2 went some way towards addressing these issues. However there was little evidence of these methodologies in use. Advances in development technologies and the creation of new methodologies alone did not necessarily improve the success rates of ISD. The social nature of ISD attracted some attention by researchers particularly by studies that identified success and failure factors.

2.4 Success Factors of ISD

The Standish Group Chaos research (2000) provided some insight to the relative success of ISD projects across many industries. The research defined:

1. A failed project as cancelled or never implemented.
2. A challenged project as one that was completed and operational but over-budget, over the time estimate and with fewer features than initially specified.
3. A successful project finished on time, on budget and with all the expected features operational.

These definitions provided quantifiable success measures based on the budget, timeline, and operational features of a project. The Standish Group's analysis showed an improvement in the results of the 2000 study over the 1994 (Standish Group 2004) study. Time overruns that were 222% above estimate dropped to 63%. Failed projects decreased from 31% to 23% and successful project increased by 12% to 28%. One of the reasons for these improvements was the existence of a good project manager in those projects that were successful. The project manager had to have certain skills and methods available in order to succeed. Communication skills were the cornerstone of successful projects. The study's results showed that project managers with excellent communications skills ran successful projects. Those projects that had a project manager with poor communications skills lead to a challenged or failed project (Standish Group 2000). Similarly, an extensive review by Clegg et al, (1997) found that up to 90% of all IT projects failed to meet their goals. 80-90% of IT investments did not meet their performance objectives. Organisational and social issues were among the primary reasons for failure whether a methodology was used or not.

Lyytenin & Hirschheim's (1988) paper on information systems as rational discourse applied Habermas's theory of communicative action to the ISD domain. They identified two distinct functions within the IS discipline; the communicative function and the purposive-rational function. The communicative function was concerned with reaching mutual understanding and open discourse between stakeholders in ISD. The basis of the communicative function was social norms, conventions, habits and language. The purposive-rational function was concerned with the action necessary to achieve a particular outcome. For example, an analyst wished to create a representation of the information system. The basis of the purposive-rational function was to predict the outcome of action and place control on the process. This control may have been in the form of an ISD methodology appropriate to the situation for example a use case drawing. In support of the purposive-rational function, research showed that methodologies were selected based on what the problem situation required (sections 2.2.5 and

2.2.6). Vitalari (1985) found social and technical competencies were needed in ISD. They addressed the process and social needs of ISD (sections 2.2 and 2.3). Problems arose in both the process and sociology of ISD. To be successful in ISD it was necessary to address the process of ISD (purposive-rational) and the social needs (communicative) of ISD. The next section reviews the contribution of both process and social factors in ISD projects.

2.4.1 ISD Process

Methodologies emerged as a solution to the software crisis. The motivation was to introduce scientific rigor into the systems development process (Baskerville et al. 1992). The availability of hundreds of methodologies for systems developers to follow step by step led to the belief that adherence to a methodology would lead to success (Mathiassen and Puroo 2002). Methodologies organised the overall ISD process. According to Baskerville et al. (1992) methodologies served four major purposes.

1. Group activities together.
2. Organisation of activities through phases or steps.
3. Activities are comprehensive and complete thus reducing rework.
4. Eliminate unnecessary activities.

Walz et al (1993) found top performing members of a software design team possessed expertise in the problem domain. They also found their skills included the ability to acquire, exchange, and integrate knowledge. Methodologies helped to structure and guide the development process; they provided a common language for communicating and included tools and techniques to help with design (Mathiassen & Puroo 2002). Methodologies supported the design team in acquiring, exchanging and integrating knowledge. Methodologies moved on

from the “waterfall” life cycle to include systems thinking (SSM), object-orientation, participation (ETHICS), evolutionary development (prototyping), and contingency theory (Multiview). There had been a move towards more flexible approaches to ISD, so that the methodology provided a means to represent and understand the user’s needs rather than a framework that was adhered to (Bennetts & Wood-Harper 1996).

The literature in section 2.2.5 showed that methodologies were often mixed together during development. Developers chose appropriate tools and techniques from several methodologies that were suitable for the situation. Computer architecture was a tool that helped to coordinate tasks in an ISD projects. Ovaska et al (2003) observed that the system architecture contained details on the interfaces between components. That information served as a vehicle for communication between participants. Task allocation could be done based on the system architecture with special consideration for task interdependencies. The study suggested that coordination of activities alone was not sufficient; coordination of interdependencies between activities was required. Without understanding and good communication, software integration problems occurred. Other means of coordinating in ISD included; planning, specification documents, regular meetings and reviews. These activities supported ISD by providing a means to store and disseminate a shared understanding of the information available to the team. ISD methodologies strove to guide the development process to a successful end but their use did not guarantee ISD success. It was difficult to account for all potential risks and be aware of all events when planning an ISD project.

Interdependent work was an integral element of ISD along with the exchange of complex information, and difficult decision-making. Team members worked on parts of the system sequentially or in parallel. The interdependent nature of ISD required team members to communicate frequently and exchange information. It was difficult for team members to communicate and coordinate successfully as

there were many parts to the system and many team members (Herbsleb, 2007). Consequently, changes affected multiple team members (Dubé and Robey 1999). It was essential that teams conversed to exchange information in a consistent manner. A methodology provided that consistency using documentation, modelling and diagrams. ISD methodologies attempted to organise, structure and control the process of ISD.

2.4.2 Social needs of ISD

In practice few methodologies were used rigourously (Kiely & Fitzgerald 2005; Fitzgerald 2000). The ISD literature also showed that following a methodology alone did not guarantee success. New methodologies were created (section 2.2.6), methodologies were mixed (section 2.2.5) and formal methodologies were followed (section 2.2.4). Despite the creation and mixing of methodologies, ISD projects continued to fail (section 2.4). Methodologies appeared to address the process of ISD in terms of organising activities, documenting the process, and representing the design of the new system. Some methodologies attempted to incorporate the social aspects through participation, negotiation and communication with stakeholders (section 2.2.2).

Early research highlighted the importance of organisational and social skills in development teams. Forty years ago Churchman & Schainblatt (1965) studied how the relationship between a scientist and a manager could be improved. The study demonstrated that mutual understanding must develop between the two parties to agree and make decisions successfully. Little changed in the last forty years, mutual understanding between ISD team members continued to be important.

A study by Vitalari (1985) identified the knowledge domains used by analysts during the requirements gathering phase. It showed that analysts spent the majority of time focused on the requirements of the system with less time spent on people and organisational issues. However, highly rated analysts did spend more time on people and organisational issues than did lower rated analysts. White & Leifer's (1986) study showed that a mixture of technical and process skills were necessary for successful systems development. Those skills varied according to the stage of the project. During analysis, technical skills ranked highly, during planning communications skills ranked highly. The top five skills found to affect the success of an information system were business knowledge, communications skills, technical expertise, analytical skills and organisational skills. The ranking of those skills varied depending on the phase in the project. The study recommended the creation of a core team that possessed these skills. It also recommended the addition of resources to the core team when appropriate.

Bostrom's (1989) research supported White & Leifer's (1986) findings that communication skills at the requirements gathering stage were very significant and essential for systems design. Researchers have since investigated the interpersonal relationships amongst systems development stakeholders (Aladwani 2002; Mathiassen & Puroo 2002). The findings showed that social integration and effective communication were essential and perhaps a solution to many of the problems during development. Aladwani's (2002) study found social integration had a positive relationship with project performance. Added this, the study found positive outcomes where management initiatives promoted social integration. Bostrom's (1984) early study highlighted the importance of communication throughout the development of an information system. Bostrom's work has equal importance today for co-located teams and of greater importance to virtual teams.

Carrying on from Churchman & Schainblatt's (1965) work, Tan (1994) researched mutual understanding between systems professionals and their clients.

The field study involved 28 dyads of systems analysts and their clients. Tan (1994) found a relationship between the strength of the interpersonal relationship and the effectiveness of the communication. The study supported the view that the quality of communications and solicitation of information linked directly to the ability to collaborate, form interpersonal relationships and create mutual understanding between communicators. Aladwani's (2002) recent study also found that social integration through improved project management resulted in higher performance.

ISD consisted of many interdependent activities. The interdependent nature of ISD teams required effective coordination of expertise to produce quality work (Faraj and Sproull 2000). The coordination of resources and expertise required team interaction (Faraj and Sproull 2000). Through interactions, team members became aware of the expertise within the team. The team could then respond to the knowledge demands of the project. This concept was similar to that of Gestalt theory whereby the whole is greater than the sum of the parts. Each team member contributed knowledge and expertise. However, to successfully create an information system the team must collectively coordinate their expertise.

The literature showed that failure was in part due to the organisational and social issues associated with ISD (Avison et al 2001). Human factors such as communication (Umble et al. 2003; Akkermans and van Helden 2002; Vaughan 2001), project planning, project team competence (Akkermans and van Helden 2002) and coordination (McManus and Wood-Harper 2003) caused serious problems. An empirical study by Stapleton (2000) found that ISD professionals spent a significant amount of time engaged in social interactions. These social factors were of the utmost importance in a successful ISD project. Additionally, the process of ISD required an excellent project leader, project management tools and a formal methodology to be successful (Standish Group 2000).

In conclusion, the studies presented in this section supported the theory that an ISD methodology provided support and structure to the process of ISD. It was also established that the ability to communicate, negotiate and form relationships with other ISD team members was essential to the social aspects of ISD (Curtis et al. 1988). The literature presented a clear indication that both the process and social aspects had to be addressed for ISD to be completely successful.

It was also apparent in the literature that the context of ISD was changing. A lack of skilled resources, globalisation and the advancement in communication technologies provided an opportunity to utilise people located around the globe. This meant that the process and social aspects of ISD had to be re-framed in the context of virtual work. The following section provides insights to the changes and advances in the ISD environment.

2.5 The Emergence of Virtual Work

Virtual work was not a brand new phenomenon; shepherds and hunters worked at great distances to forage what nature provided. Technology changed the meaning of the word distance from ten to ten thousand miles. Modern technology provided the ability to manage workers at a great distance crossing both space and time boundaries.

The structure of society had changed from localised groups interacting with each other, such as neighbourhoods, voluntary groups and workgroups to networks of people with permeable boundaries, multiple connections and fewer hierarchies (Wellman 1999). Organisations required flexibility to adapt to changing environments and markets. Flexibility arose through structural and procedural changes, and the use of information technology. Organisations experienced a flattening of hierarchies, greater use of teams and a move towards virtual

networks of people (Caldwell and Koch 2000; Nohria and Eccles 1992). Information systems supported these networks of people through the ability to access, exchange and create information from any location in the organisation.

Distributed computing was one of the major technical advances in the last decade. That type of technological change brought with it many social and organisational challenges. Avison et al. (2001) viewed distributed computing at the heart of IS, epitomising the changes made to organisational and social systems through technology. Distributed technology resulted in many new organisational forms such as virtual teams and social changes such as email etiquette. A virtual team was defined as “a group of people who work interdependently with a shared purpose across space, time, and organizational boundaries using technology” (Lipnack and Stamps 2000). The move towards team based organisations removed barriers such as time and space. The nature of work changed; lack of skilful resources on site, globalisation and the availability of technology led to the formation of teams that worked remotely (Cramton and Webber 2005). Virtual team members used networks to communicate, coordinate, and collaborate with each other. Geographic and organisational boundaries no longer presented a logistical problem (O'Brien 1998).

2.5.1 Virtual ISD

Large companies like IBM developed systems in a dispersed way since the 1970's (Carmel 1999). Ubiquitous virtual teams emerged relatively recently in ISD (Martins et al. 2004; Piccoli et al. 2004; Powell et al. 2004). Traditionally ISD teams were large, located together and worked on centralised computer based systems. New trends emerged such as client/server, relational database, object-oriented, distributed computing, multimedia and web development. Those new trends in technology changed the nature of information systems

development. ISD involved stakeholders from varying organisational functions (Kraut and Streeter 1995). Those stakeholders included programmers, systems analysts, business analysts, project managers, senior IT management and chief information officers (Avison & Fitzgerald 2003a). In more recent years those stakeholders could collaborate across multiple locations. The breadth of stakeholders in ISD offered diversity in experience, knowledge and perspectives. However, that diversity often resulted in diminished interaction, lack of commitment and the inability to unite in decisions (Gruenfeld et al. 1996).

Findings showed that rapid short term projects that consisted of three developers were commonplace, with customisation of 'off the shelf' packages also common (Fitzgerald 2000). Off the shelf information systems allowed the organisation to tailor the system without the costs of developing a bespoke system. Enterprise resource planning (ERP) applications were popular with medium to large organisations (Ketikidis et al. 2008). Those ERP applications required frequent customisations and maintenance. That type of development involved smaller project teams, shorter time scales, and close contact with users. Consequently, ISD team structures also evolved. Virtual teams emerged with the development of distributed computing, groupware, electronic communications media and the globalisation of organisations. They offered the flexibility to cross geographical, temporal and organisational boundaries (Lipnack and Stamps 2000). In a competitive labour market, the creation of a virtual team with only some members on site was frequently the adopted solution (Cramton and Webber 2005). Virtual teams offered membership flexibility. Team members worked on several virtual teams thus maximising the availability of resources (Bergiel et al 2008).

Introna and Whitley (1997) argued that a methodology was often perceived as necessary for ISD. Nandhakumar and Avison (1999) found that a methodology did not support the social activities in ISD. Those complex social interactions required good communication (Ovaska 2005). In the virtual environment mixing

of methodologies could be problematic. ISD involved complex social interaction and mutual understanding (section 2.3) both of which were found to be problematic for virtual teams (section 2.5.2.2 and 2.5.2.5). The effective use of a methodology required good communication between its users (Ovaska 2005). Ovaska et al (2003) research investigated the virtual ISD context, highlighting the coordination problems. Ovaska and Stapleton (2007) found some changes did occur in the type of methodology in use at the requirements gathering phase. The need for a multi-site development methodology was evident. Ovaska et al (2003) suggested that any such methodology should support multi-site coordination, and work practices for the team environment. A methodology provided a common language for communicating about the project (Mathiassen & Puroo 2002). If the methodology was not pre-determined the common language would have to be agreed and developed during the virtual ISD project. In addition, the ad-hoc mixing of methodologies during development required the time to conduct the tailoring (Fitzgerald et al 2003). In the virtual ISD context that tailoring would have to take place remotely and within the time constraints of the project.

2.5.1.1 Virtual ISD Team Composition

Virtual ISD teams consisted of distributed members (Cramton and Webber 2005) whom frequently lacked history as a team (Faraj and Sproull 2000). This type of team spent the majority of time working autonomously or in pairs. A small percentage of time was spent working together as a team in a single location (Goodman and Wilson 2000). Despite this, systems development involved interdependent work and required constant communication and collaboration (Herbsleb and Mockus 2003; Howard 1996; Perry et al. 1994). A study of co-located software developers found that as much as 70% of a developers time was spent working with others (DeMarco and Lister 1987). Hersleb and Mockus (2003) found that 50% of time was spent in group work during the first month of

a telecommunications software project. Perry et al (1994) found on average each day, developers spent 75 minutes in informal interactions. These interactions helped in problem solving and code reviews. The system itself was usually the outcome of the interactions between those participants (Yang and Tang 2004). Detrimentally, virtual teams could not always experience those interactions face-to-face or collectively as a team. Consequently, virtual teams encountered problems with conflict, communication and a lack of unity amongst the team members.

2.5.1.2 Virtual ISD team Leadership

Sakthivel (2005) pointed out that ISD involved high task couplings where tasks required extensive interaction and mutual understanding between team members. Team members frequently engaged in collaborative work such as problem solving and knowledge acquisition. In the virtual ISD team these activities took place electronically and were subsequently reported on in physical form such as a document. Management of team communications and documentation in a virtual ISD project may help the organisation to create new, retain old, and disseminate information. A critical challenge for management in virtual ISD was to ensure team members focused on shared goals, schedules and quality. The existence of a good leader was shown to be of great importance to the success of a virtual team (Kayworth & Leidner 2002, Moon & Sproull 2002, Standish 2000). An effective virtual team leader was attentive to task-related and relational aspects of the virtual team. The leader initiated structures within the team whilst also acting as a mentor thus establishing strong relational links with team members (Kayworth & Leidner 2002).

2.5.1.3 Virtual ISD team Work Processes

Goal setting was of primary importance where teams did not physically meet. Moving off course could lead to undisciplined behaviours resulting in poor performance (Bergiel et al 2008). Katzenbach and Smith (2001) suggested that “team performance be it virtual or not, is primarily about discipline – leader, peer and self-imposed”. Sections 2.2.1 and 2.2.2 described how an ISD methodology could provide discipline in the form of work processes and behaviour controls. Powell et al (2006) found that work processes were a clear predictor of trust for virtual teams. They concluded that work processes and structures should be clearly specified to virtual team members in order to encourage trust. Work processes occurred as the team worked together to accomplish a goal; they included communication, coordination, and task-technology fit. Ratcheva and Vyakarnam (2001) also found that members’ actions helped maintain trust later in the team’s life. Once the rules of work were established, cycles of action and trust in the members’ abilities to deliver characterised the interpersonal relations. Jarvenpaa and Leidner (1999) found coordination could be facilitated by the clear definition of responsibilities. A lack of clarity could lead to confusion, frustration, and disincentive. Guidelines on communication would increase predictability and reduce uncertainty.

2.5.1.4 Virtual ISD team Control Structures

Piccoli et al (2004) categorised team control structures into self directed and behaviour controlled. In contrast to Jarvenpaa and Leidner (1999), Piccoli et al (2004) found that behaviour control structures had no significant impact on virtual team performance, communication or coordination. Behaviour controls included procedures which team members had to complete throughout the project such as project plans, work assignments, and reports. Piccoli et al’s (2004) study did suggest that future research should investigate different forms and applications of behaviour control mechanisms appropriate to the virtual team

context. An important finding from their study was that simply applying a traditional behaviour control mechanism to the virtual environment may be ineffective.

Ancona et al (2008) studied a new form of organisational team called X-teams. These were used predominately for research and development or new product development purposes. A distributed leadership approach meant either the leadership responsibility migrated over the team lifespan, or a leadership team was used to ensure the work was in sync with the overall plan. The teams were considered highly innovative and flexible. Similar to virtual team research, X-teams showed the need for leadership, establishing connections of expertise within and outside of the team, and the constant exchange of information.

In line with Jarvenpaa and Leidner's (1999) findings, Faraj and Sproull (2000) recommended that support must be given to newly created teams in order to figure out who is who, and who knows what on the team. For example, a face-to-face meeting held at the formation of the team. Kiesler and Cummings (2002) undertook a review of the literature on proximity in work groups. They proposed that electronic communication would be more effective when groups were cohesive and that structured management was likely to be needed in groups lacking cohesion. In support, a recent study by Horwitz et al (2006) found the main contributing factor to the successful start of a virtual team was the clarification of objectives, roles and responsibilities. The study also found a strong link between how well teams were organised, level of planning, review mechanisms, and ease of obtaining expert assistance. All of these factors also correlated to performing well in a virtual team.

2.5.1.5 Summary

Virtual teams emerged through technological advancements and the globalisation of organisations. High task couplings synonymous with ISD required constant communication and collaboration. The literature showed that virtual ISD teams need an effective leader, clearly defined work processes and appropriate control structures. Jackson (1999) summarised the key issues highlighted by various authors in the book titled ‘Virtual Working’. In conclusion, it appeared that a careful balance was needed between management and control, and encouraging learning and innovation at the organisational, team and individual levels. At the team level, the coordination of tasks, establishment of trust and fostering communication between team members were important management issues. These in turn could help to create opportunities for knowledge to be transferred thus encouraging innovation and mutual understanding. At the individual level, the socialisation of each team member, building commitment through collective goals and individual inputs were also important management tasks. These in turn could encourage the development of norms and values amongst team members and provide opportunities to learn and form relationships with other team members. Two positions emerged from the virtual team literature. First, the need for flexible work structures that allowed teams to perform without the constraints of strict behaviour controls. Secondly, there was the need for structure, clear work processes, and behaviour controls that supported virtual working. The following section explains why there was a need for these structures and controls and how they could support the work processes of a virtual team.

2.5.2 Effects of Virtual Work

According to Jackson (1999) the assumption that virtual teams worked in a similar way to collocated teams was mistaken. Powell and Picolli’s (2006) study also indicated that traditional behaviour control mechanisms may not be

appropriate in the virtual environment. Kraut and Streeter's study revealed that coordination was one of the major causes of the 'software crisis' in the development of information systems (1995). Research continued to highlight the importance of communication and coordination to the success of ISD (McManus and Wood-Harper 2003; Mathiassen and Puroo 2002) and for the success of virtual teams (Powell & Picolli 2006). The literature on electronic communication made it clear that the importance of these factors increased when virtual teams were operating. Carmel and Agarwal (2001) identified distance as a negative influence on coordination, control and communication. Consequently, ISD managers required awareness of the effects of virtual work in order to effectively manage such teams. The following sections detail the literature on the negative effects of virtual work.

2.5.2.1 Message Interpretation

The meaning of words, facial expression, and body language contributed to the interpretation of messages. Face-to-face communication occurred sequentially through oral discussion, and in parallel through body language, gestures, and facial expressions. The sender of the message instantly saw the response and adjusted their argument or message accordingly. Verbal and non-verbal cues conveyed emotion and strength of argument. Verbal cues of intonation, emphasis, and volume supported meaning. Body language normally accounted for a large portion of a messages meaning. Non-verbal communication conveyed interest, reinforced meaning, indicated degree of openness, and liking of a person or situation. Body movement, eye contact, tone, pitch, and touch were all active ways to communicate. Virtual teams had to rely predominately on electronic communication. The removal of some of these elements negatively affected the accurate interpretation of a message (Mannix et al. 2002; Walther 2002; Sproull and Kiesler 1991). Virtual teams also comprised of members from different

countries. Missinterpretation could result from communicating electronically in a non-native language.

2.5.2.2 Mutual Understanding

A study of virtual teams by Cramton (2002b) found mutual knowledge was sparse. Mutual knowledge consisted of situational and task information specific to the team. Virtual team participants assumed others understood or had access to the same information. Those working in different locations had a higher likelihood of having incorrect or incomplete task and situational information. Consequently, participants reached conclusions regarding the behaviour of others based on dispositional rather than situational attributions (Cramton 2002a). Dispositional attribution related to personal factors such as personality and attitude. Misattribution occurred in newly formed teams, where members lacked unity and social identity. Virtual teams were composed of people from different locations united to combine skills that may not be available in one site. They lacked knowledge of team member skills, perspectives, interpersonal styles, work environment and other situational information (Mannix et al. 2002). Similarly, Peters & Manz (2007) highlighted the importance of shared understanding. This included an understanding or awareness of the expertise within a team, the development of shared mental models and an understanding of the roles and responsibilities of team members. Moon and Sproull (2002) found the enabling factors for the open source development of the Linux kernel were a great leader, task structure, incentives to contribute and communities of practice. Task structure was seen in task decomposition and rapid development similar to the principles of some ISD methodologies. Communities of practice contained specific norms and roles with obligations and responsibilities that were clearly identifiable and understood by community members.

2.5.2.3 Culture

Traditional work teams typically comprised of people that spoke the same language and took their non-verbal cues from the same culture. Globalisation and open borders in Europe led to a higher likelihood of teams that contained people that spoke different languages and came from different cultures. Situational information such as travel time to work, location, facilities, team structure, culture, language, and holidays differed across locations. Consequently, it was said that virtual teams were more aware of cultural differences due to their familiarity with communication barriers (Lipnack & Stamps 2000). From a sociological perspective a virtual team may experience national cultural differences in relation to communication, collaboration and cohesion. These cultural differences may be more apparent in a face-to-face encounter. For virtual teams the differences may be subtle when communicating electronically. Literature showed that a lack of contextual information resulted in misattribution of behaviour (section 2.5.2.2), and misunderstanding due to language differences (section 2.5.2.1). Carmel (1999) asserted that good teams develop their own culture through collective or common work experiences. Armstrong and Cole (2002) found that the establishment of a cohesive work culture was of great importance to virtual team members in dealing with these issues. Work roles, procedures, goals and methods defined the work culture which was then shared by all team members.

A study by Oertig and Buergi (2006) found four issues that required management's attention in virtual teams. They were, managing the task, managing people, managing language and cultural issues, and managing the matrix. Within the language and cultural issues, differences between the USA and Europe were considered minimal in contrast with those who worked with Japan. This was also evident in research investigating the differences in national cultural traits (Gannon 1994). Research showed that it was helpful to spend time face-to-face, exchanging social information that improved their mutual

understanding and social presence. In some circumstances where face-to-face meetings were not possible Agerfalk et al (2005) suggested that the use of asynchronous communication could alleviate some of the pressure on non-native speakers. Electronic mail could allow non-native speakers to formulate their position and ensure their point was clear prior to sending the email. A further study by Komi-Sirvio and Tihinen (2005) surveyed distributed software development participants. Respondents were asked to indicate the problem areas they experienced in software development projects. 52% of the respondents indicated that cultural differences posed a problem. Overall culture was the fifth highest problem, with development tools, communication, and design knowledge as the top three. The study suggested face-to-face communication, kick off meetings at the beginning of a project and technical meetings during the project would alleviate difficulties associated with culture.

Agerfalk et al (2005) identified socio-cultural distance as an integral dimension of virtual teams. This distance comprised of organisational culture, national culture, language, politics, and individual motivations and work ethics. Socio-culture was seen to impact on the processes of communication, coordination and control. High socio-cultural distance could create misunderstandings due to language difficulties and a lack of mutual understanding between participants. Literature showed the importance of mutual understanding for successful virtual team communication (Cramton 2001). National culture affected behaviour (Gannon 1994), negotiations (Ebert and De Neve 2001), and work practices (Brannen and Salk 2000). A greater understanding or awareness of national cultural differences between team members could help to prevent misunderstandings. Knowing a country's language does not ensure that one has an understanding of the country's culture (Gannon 1994). Religion, family structure, public behaviour, group behaviour, and general interests were just some of the many complex dimensions of culture. The lack of face-to-face contact associated with virtual teams posed a significant obstacle to familiarisation and understanding of team members' cultures. Ebert and De Neve

(2001) suggested that all locations within a global software development team use the same processes, methodology and terminology to help develop mutual understanding across cultures. The exchange of team members and managers also helped to build mutual understanding. Ebert and De Neve (2001) asserted that the standardisation of organisational work processes facilitated the integration and interfacing of work across development centres.

In the context of work, culture affects everyone. An individual has at least one national culture, a professional culture, and possibly a corporate, functional and a team culture. National culture posed a concern for virtual teams that cross geographical boundaries. Simple differences in how a nationality approaches requirements gathering or quality assurance may cause conflict between virtual team members. Carmel (1999) cited differences between American and Japanese software professionals. Western designers were more likely to approach design in a top down approach Eastern designers appeared to favour a bottom up approach. Working in a multicultural context required an awareness of differences and the implementation of initiatives to reduce those differences. From the literature, those initiatives included; communication to enhance mutual understanding, team cohesion, development of a team culture, face-to-face meetings, and the exchange of contextual information for successful collaboration.

2.5.2.4 Communications Media

The communications media available to virtual teams was extensive. Fax, voice-mail, e-mail, the Internet, Intranets, groupware applications, and conferencing systems were some of the electronic communication technologies available. These types of communication technologies provided a fast way to send and store information and to record messages. The speed and accessibility of electronic communication was a distinct advantage. However, electronic

communication depersonalised the communication experience. Consequently, it was difficult to form an accurate mental image of the person with whom you were communicating. Instead, a speculative mental image formed. From this mental image personality, beliefs, behaviour, and expectations of how this person acted in a given situation was inferred (Nohria and Eccles 1992). The same obstacles of attention, context (Martin 1998), expectations, perception, and involvement (Drucker 1970) existed for electronic communication as did for face-to-face communication. Additional obstacles existed for electronic communication. For example, decreased social presence, the removal of status and social cues, the lack of non-verbal cues (Sproull and Kiesler 1991) and the lack of normative information in the message concerning norms, identity and attitudes of the sender and receiver (Ahuja and Galvin 2003).

2.5.2.5 Virtual ISD Social Processes

The distributed nature of virtual teams and the necessity to use electronic communication resulted in other problems such as conflict (Jiang and Klein 2000), unequal distribution of information (Cramton 2001), and a lack of trust (Kanawattanachai and Yoo 2002). A research review by Martins et al (2004) categorised the virtual team studies into team inputs, processes and outputs. The majority of studies addressed the outputs of virtual teams and the communication and participation processes in place. For example, there was much research into the affect technology had on the ability of team members to communicate and interact (Warkentin and Beranek 1999; Kraut and Streeter 1995; Sproull and Kiesler 1991). Studies have looked at the issues of time (Walther 2002; Manzevski and Chudoba 2000), trust (Massey et al. 2003; Jarvenpaa and Leidner 1999), coordination (Espinosa et al. 2002; Sproull and Finholt 1990), mutual knowledge (Cramton 2001, 2002b) and the effectiveness of teams using computer-mediated communication (Gonzalez et al. 2003; Furst et al. 1999). In many cases, the studies found that the virtual environment impacted negatively

on the variables measured. The studies demonstrated problems with coordination, communication, performance and the exchange of complex ambiguous information using electronic means.

2.5.2.6 Summary.

This literature provided a rich source of knowledge and insight into managing virtual teams. However, few studies in Martins et al. (2004) review focused on social processes within virtual teams. Conflict and trust were the two areas that did receive some attention. From the literature summarised in section 2.5.2, it was possible to identify three social processes that were very important for the success of virtual teams. These were excellent communication to reduce message misinterpretation and misunderstanding and improve the use of communications media, cohesion to reduce the effect of cultural differences, and collaboration to improve mutual understanding, build trust, and reduce conflict. These social processes were intertwined whereby cohesion may reduce cultural issues and it help towards mutual understanding. Similarly, collaboration between team members would lead to mutual understanding and improve the quality of communications. The three processes are equally important and necessary for successful virtual teams. The following sections define each of these processes and highlight their importance to the virtual ISD environment.

2.5.3 The Problems of Virtual ISD Team Communication

Communication during ISD involved; expressing requirements, demonstrating functionality and negotiating changes. Teams encountered daily work-related issues that would normally be resolved by walking down the hallway to a team member. Many virtual ISD teams did not have the luxury of informal face-to-face interactions for problem resolution. Not only were requirements sought from

users, they also had to be understood and disseminated amongst the project team. These processes were fraught with problems of frequent changes to requirements, lack of understanding of requirements and insufficient communication between project participants. ISD involved a high degree of uncertainty, where familiarity with the problem domain was usually low (Cusumano 2004; Curtis et al. 1988). Teams reduced uncertainty and became familiar with the problem by communicating with each other. Studies showed that subjective, social, complex, and ambiguous information was difficult to disseminate within the virtual environment (Ahuja and Galvin 2003; Yoo and Alavi 2001; McKenny, McKenney et al 1992; Nohria and Eccles 1992). Virtual teams were shown to perform less effectively than teams working face-to-face. Warkentin et al. (1997) found that virtual teams required longer to build interpersonal relationships. Research also showed the time to accomplish a task in a virtual environment was considerably longer than in a face-to-face environment. This was particularly true when the complexity of the tasks undertaken increased (Straus and McGrath 1994).

2.5.3.1 Social Presence Theory

Social presence theory offered some insight into the problems of communicating electronically. The theory referred to the degree of presence or connection felt when interacting with someone. Low social presence meant that messages were impersonal. For example, when paying for a parking fine social presence was low. The degree of presence determined the importance of the interpersonal relationships between communicators (Short et al. 1976). Social presence also varied with the communications medium chosen. Face-to-face interaction had a high degree of presence. It was a personal and sociable method of communicating. Therefore, it was likely that it led to an enhanced level of interpersonal relationships between communicators. The theory predicted that where teams used technology to communicate there would be low social

presence and consequently impaired interpersonal relations. Establishing social presence required the exchange of social information through social exchange and personal observation (Ahuja and Galvin 2003). This was particularly important in the virtual context where different nationalities had to work together. McKenny et al (1992) found that groups who communicated over a long period of time possessed an increased social understanding of its members. This social knowledge led to the ability to exchange information in complex and ambiguous environments. Joy-Matthews and Gladstone (2000) suggested that members who worked together previously have already formed bonds and their social and professional suitability was already proven. Nohria & Eccles (1992) discovered that face-to-face communication strengthened the ability to react in volatile, high risk, and uncertain environments. Its role in establishing and maintaining robust relationships was essential (Horwitz et al 2006, Maznevski and Chudoba 2000). Electronic mail on the other hand had a low degree of social presence, it lacked cues that were available in face-to-face contact, and therefore the quality of the relationship reduced.

2.5.3.2 Informal Communication

Research found there was a reduction in the frequency of communication by virtual teams. This resulted in poor dissemination of task related information and diminished coordination (Cramton and Webber 2005; Armstrong and Cole 2002; Kraut et al. 2002b). The communication that did occur was also less effective (Herbsleb and Mockus 2003). Komi-Sirvio and Tihinen (2005) found communication was the second highest problem encountered by the distributed software development teams surveyed. The study found that as distance increased, the number of face-to-face meetings decreased accordingly. Differences in time zones, culture, and language caused misunderstandings in task allocation, and a lack of knowledge concerning who was in charge. The teams used teleconferences and email to replace and substitute the lack of face-

to-face meetings. The study concluded that communications tools did not necessarily create nor solve the problem of poor communication. Additional behaviour supports were necessary. Respondents identified informal team building sessions as a way to build trust and cohesiveness early on in the project. They considered that team members should be suitably familiar to each other so that no barrier to communication existed between them.

Kraut & Streeter's (1995) research suggested the use of informal communication mechanisms to coordinate work in an uncertain environment. Informal communication included face-to-face unscheduled meetings; such as meeting in the hallway, the lift or at the coffee station. Findings showed larger projects were more likely to use formal communication when the project had passed the uncertain requirements and design phases. Projects tended to use informal techniques such as unscheduled meetings during the early stages of development when the project was uncertain. In general, formal communication mechanisms were beneficial and commonly used to share information and to coordinate tasks. However, the study also found written documentation less valuable than personal contact. Informal communication was important for the successful exchange of information rather than relying solely on documentation and formal methodologies.

A recent study by Ocker and Fjermestad (2008) found high performing teams communicated significantly more than low performing teams. They used active debate and commentary to develop ideas. Two techniques used to counter the drawbacks of asynchronous communication were to review and summarise content from electronic communication. These techniques allowed informal communication to emerge in the form of 'idea lists' to which team members responded. These techniques also facilitated the creation of the formal communication tool which was a final design report.

2.5.3.3 Media Richness Theory

Extensive research existed on the use of electronic communication. Media richness theory proposed that the type of information to be exchanged required different levels of communication richness. It also suggested that each media varied in richness according to the number of cues conveyed, the timeliness of feedback and the capacity for natural expression (Daft and Lengel 1986). ISD required varying degrees of communication richness. At the customer requirements stage complex information were exchanged and therefore the rich media of face-to-face contact was most suitable (Carmel 1999). In situations where complex information was exchanged, face-to-face communication supported this process through the high degree of social presence (Yoo and Alavi 2001; McKenny et al. 1992). Ocker et al (1998) used a combined communications approach of face-to-face and asynchronous conferencing to complete a group task of software development. Face-to-face meetings established roles, goals, norms, attitudes and other social information at the start of the task. Conferencing shared information quickly and frequently during the creation of the product. Face-to-face meetings at the end of the task tied together individual tasks and presented the final product. The study demonstrated the use of a combination of communication methods depending on the task and the information to exchange. These findings supported the theory that different skills were required at different stages of the ISD process (White & Leifer 1986; Vitalari 1985). A combination of face-to-face and electronic communication was a more effective means to communicate virtually (Ocker et al. 1998).

Virtual teams benefited from the accessibility and flexibility of electronic communication. However, the poor social presence, and difficulty of exchanging complex ambiguous information meant communicating virtually was problematic. In order to improve social presence the team must form social bonds. The following section addresses the interpersonal process of team cohesion.

2.5.4 The Problem of Virtual ISD Team Cohesion

According to DeMarco and Lister (1987), a cohesive team was one that had “jelled”. Support during tasks and assignments came from team members. Cohesion formed through the desire of the individuals to remain in the group. This desire stemmed from the individual’s attraction to the group and the group’s ability to reward and confirm the individual’s choice. It was important that team members had incentives to remain in a team (Appelbaum et al. 1974). It was essential to encourage and support team members in their activities in becoming a cohesive group, be it through incentives, team building exercises or collective workspaces.

Section 2.5.3 set out the difficulties of virtual team communication. However, recent studies found group cohesiveness contributed positively to the communication of complex information using electronic means (Peters and Manz 2007, Ahuja and Galvin 2003, Gonzalez et al. 2003, Joy-Mathews 2000). The research found that a history of communicating with the same people led to greater understanding of roles, status, interests, and improved interpersonal relationships. However, this type of history did not necessarily exist within virtual ISD teams. Many virtual teams emerged due to the availability of resources and team members may never have worked together previously. Instilling cohesion in a virtual ISD team could involve rotating team members to other sites for extended periods of work. New perspectives and understanding of the people, culture and situation of the remote sites return with the team member (Carmel 1999; Ebert and De Neve 2001). Other methods of instilling cohesiveness within a team included creating a common work culture (Armstrong and Cole 2002), team building activities and team events.

The importance of face-to-face communication in the initial phase of ISD work was well documented (Ocker et al, 1998; Tan 1994, Peters and Manz 2007). Face-to-face contact had a special importance in the process of getting to know

someone. As a team became familiar through collective experiences, a sense of cohesion emerged. This reduced any cultural differences and increased the exchange of contextual information needed to effectively communicate as a virtual team. The ISD environment often lacked routine and continuity. To create and sustain a robust team, the early establishment of interpersonal relationships was important (social presence theory section 2.5.3). A study by Aladwani (2002) found a link between the social integration of the project participants and the performance of the systems development project as a whole. The research recommended the use of training and rewards by management as a means to encourage the social integration of project participants. A team that had familiarity with the problem domain, shared knowledge of the tasks and of each other performed better (Faraj and Sproull 2000; Walz et al. 1993; Curtis et al. 1988). Gonzalez et al. (2003) tested 71 virtual teams of students engaged in solving cases via electronic communication in an education program. The findings showed cohesive teams were more effective conducting interdependent tasks than teams lacking cohesion

2.5.4.1 Social Information Processing Theory

Social information processing theory (SIP) proposed that while electronic communication media did lower the cues and presence conveyed through interaction, teams did over time develop ways of exchanging social information (Walther 2002). Repeated interaction using electronic means resulted in attitudes and feelings emerging. Where project teams had time constraints the team members were less friendly, more assertive, and more likely to disagree. Studies showed that over time some relational affiliation was established among users of a group support system (Warkentin and Beranek 1999; Chidambaram 1996). Rather than categorising media based on the richness and consequently discounting the use of electronic communication, SIP theory recognised the lack

of cues but differentiated itself by looking at the rate at which social information was exchanged over time (Burke et al. 2001).

2.5.4.2 Mutual Understanding

When a team reached the point where communication and interaction was fluid, cohesive and familiar, an improved shared understanding existed. Research supported the argument that possessing shared social knowledge enabled the exchange of complex and ambiguous information using electronic means (Yoo and Alavi 2001). Successful communication was thought to rest on shared understandings between the communicators (Peters and Manz 2007, Fussell and Krauss 1992). Face-to-face meetings instilled familiarity and cohesion at the outset of a project. Those meetings were also essential for the long term functioning of the project team. By meeting repeatedly, team members were able to revise and change their mental images and cultural understanding of one another thus improving the degree of social presence. As members gained experience through working together, they learnt about each other's view of the world. They also learnt to communicate effectively due to the increased understanding of each other (Nohria and Eccles 1992). Yoo & Alavi (2001) found that team cohesion increased the perceived levels of social presence among team members which resulted in the ability to successfully communicate via electronic means. Ahuja and Galvin's (2003) research provided support as they found a high degree of social presence in cohesive teams.

Research found virtual teams faced serious challenges in creating and sustaining a social system that connected individuals to each other (Cramton and Webber 2005). Team boundaries were often blurred, with members unsure of the team composition. Boundary disagreement made it difficult for team members to identify and access expertise on the team (Mortensen and Hinds 2002). Cohesion was positively linked to overall performance in ISD (Yang and Tang 2004;

Carmel 1999). Burke et al., (2001) conducted two longitudinal studies on the effects of media choice on workgroup cohesion. In support of S.I.P theory the studies found that over time all media allowed the growth of cohesion within the workgroup. It was imperative that virtual team project managers were aware of the importance of cohesion and strive to create and sustain it in all virtual ISD teams. A cohesive team could only be successful if they also had the ability to co-ordinate their activities to accomplish the project goals. The following section presents the literature on the collaboration of ISD team members.

2.5.5 The Problems of Virtual ISD Team Collaboration

Collaboration was described as the act of “working jointly on an activity or project”. A key characteristic of ISD projects was the interdependence of tasks. ISD teams must work collectively towards a common goal. Knowledge creation, knowledge acquisition and knowledge dissemination occurred so that the team reached a comprehensive and consistent understanding of the problem domain (Ocker et al. 1998). Each of those activities required collaboration. Collaboration tasks included, initiating conversation, establishing common ground, problem solving and maintaining awareness of changes in the team’s environment.

2.5.5.1 Transactive Memory

ISD utilised complex technical knowledge and business knowledge to solve problems. Individuals could not store all the information that was required to solve the problem. Additional information was accessible by knowing the location of that information. For example, a programmer had to implement a new piece of functionality. The programmer knew that her colleague was an expert in the area and conversed with her in order to apply new information to the

problem. The result was a reduction of the individual cognitive load, and less overlap of knowledge amongst team members (Wegner 1986).

Wegner (1986) identified this phenomena as transactive memory. Transactive memory was described as an external memory system that existed between two or more people. Transactive memory systems allowed individuals to have access to vast amounts of knowledge through membership of a team. Team members had access to each other's information by knowing the member that contained it. Team members depended on communication in order to enhance and add to their transactive memory without overloading their cognitive memory (Faraj and Sproull 2000).

Hollingshead (1998) conducted research investigating the relationship between successful recall of the location of information and the communication process between the individuals. Location recall scored the highest for those using face-to-face communication. This reiterates the importance of face-to-face communication during ISD. The establishment of a transactive memory system may be difficult for virtual ISD teams, particularly if an initial face-to-face meeting had not occurred. ISD team members should be aware of the location of information within the team. Ehrlich and Chang (2006) used social network analysis to investigate how global software development teams located expertise within the team. A link between frequency of communication and awareness of team members existed. Mockus and Herbsleb (2002) designed and deployed a tool for locating expertise in ISD projects. The tool used data from a version control system to identify and locate expertise within a team. The study found the tool particularly useful for distanced team members.

A second mechanism to aid coordination and the development of a team's transactive memory was the use of "Does anybody know" questions. Meetings provided an opportunity to ask a short question. These types of questions usually sought an answer to a common problem or an old one not well documented.

Electronic communication greatly facilitated this type of information seeking. A product developer studied by Sproull & Kiesler (1991) posed just such a question and received 150 responses from people he had never met. He did not know where the information would come from but had access through technology to a large pool of potential experts. Consequently, a transactive memory system was established. A virtual ISD team could pose these questions to the team thus building up the team's transactive memory.

Prior to the establishment of a team's transactive memory, virtual ISD team members would be unsure of whom to contact. It was difficult to find out who was responsible for a particular function of the system (Herbsleb and Grinter 1999). Co-located development allowed team members to visually be aware of where other members were located, thus providing easy access to them. It was helpful to see an office door open or someone sitting at their desk prior to initiating contact. It was also more obvious through visual observation as to how busy the individual was at the time. For virtual teams this was not the case, no cues were available to determine, mood, workload, availability or openness to questions. Additional barriers for virtual teams were time differences and lack of familiarity thus reducing responsiveness.

Analysts, engineers, programmers, testers, users and many others collaborated at meetings, presentations, phone calls, training, observing and through documents. Facilitating collaboration during ISD was important for mutual understanding, time scheduling and agreement between participants. Encouraging this continuous interaction among all parties was critical (Hirschheim and Klein 1989). Where physical proximity promoted these collaborative tasks (Kraut et al. 2002a) the virtual environment made it harder to establish and maintain mutual knowledge. Hinds and Weisband (2003) study found geographical distance brought with it dissimilarity. Working at a distance lacked shared context, which was important for comprehension. Teams benefited from knowledge concerning team members, such as roles, activities, vacation time, sick leave and other social

aspects of a team. Collaboration at a distance was considerably harder to achieve. This was true even with the new technologies that supported and mediated distance collaboration. Electronic mail, bulletin boards, instant messaging, document sharing, and videoconferencing all offered support.

2.5.5.2 Summary

Section 2.5.1 described the use of virtual teams in ISD. They offered flexibility by accessing resources across temporal, geographical and organisational boundaries. However, section 2.5.2 highlighted the negative impact virtual work could have on the effectiveness of a team. The lack of face-to-face interactions effected message interpretation and mutual understanding, highlighted cultural differences, and caused problems with the communication, cohesion and collaboration processes of a virtual team. Greater structure and control was one solution to the problems of working virtually (Powell and Picolli 2006, Kiesler and Cummings 2002; Faraj and Sproull 2000). By placing greater management controls and structures on the virtual ISD process fewer problems were likely to occur. In the virtual environment an ISD methodology could provide these controls and structures. Peters and Manz (2007) concluded that organisations must recognise the importance of providing suitable task and relationship building supports to virtual teams. A virtual ISD team could use an ISD methodology as a task support mechanism for organising and structuring their work. An ISD methodology grouped and organised activities, provided standard documentation to support communication, and a common language for consistency of design. Due to the nature of virtual work and the supporting literature, without these supports virtual ISD could result in time overruns, poor quality systems, expanding costs and dissatisfied users.

It was imperative that virtual ISD teams excelled in their communications techniques, the cohesiveness of the team and the collaboration of all team

members. Some researchers argued that, given sufficient time and adequate management, virtual teams could exchange social information, establish strong relational links, trust, and work as effectively as face-to-face teams (Warkentin et al. 1997). The difficulty for ISD teams was a scarcity of time. Consequently, relations may not initially establish and strong links may not forge. Iivari and Hirschheim (1996) suggested “that sophisticated social theories are needed to understand and make sense of IS development activity.”

Organisational socialisation theory may provide the relationship supports suggested by Peters & Manz (2007) that would address the complex social context associated with virtual ISD. The following chapter addresses the theory of organisational and group socialisation. The application of socialisation tactics to the virtual team environment may help to diminish some of the negative factors of virtual working and improve the social processes required for effective ISD.

The following section presents a review of the research methodologies used by the studies presented in sections 2.2 through 2.5.

2.6 Researching Virtual Teams in ISD

Chen and Hirschheim’s (2004) research showed surveys and case studies were the most popular information systems research methodologies. Empirical studies that investigated the use of ISD methodologies predominantly used the survey method. A review of virtual team literature by Martins et al (2004) found that much of the research conducted in the area of virtual teams used experiments in a laboratory setting. These experiments predominantly used student teams working on short term tasks. Martins et al (2004) recognised that it was hard to gain access to virtual teams in a field setting, however it was strongly suggested that

virtual team research move out of the laboratory setting and into the field in order to advance the literature. The following sections set out the research methodologies used to investigate the ISD process and social aspects of development.

2.6.1 The Process of ISD

Fitzgerald's (2000, 1998b) studies used the survey methodology to identify what ISD methodologies were in use by organisations engaged in ISD. Fitzgerald (1998b) gathered data from a variety of organisations. The study used the following seven part scale to classify business category or industry sector for background purposes:

Consultant/software house
Government/public sector/education
Construction/manufacturing/distribution
Wholesale/retail trade
Finance/insurance/real estate
Service/communications
Other

A survey allowed Fitzgerald to gather and apply statistical techniques to interpret the findings. Fitzgerald used non-probability sampling to access the target population. A four part scale was used to categorise methodology usage:

- those using a third-party or commercial formalised systems development methodology (FSDM);
- those using an internal formalised methodology, based on a commercial systems development methodology;
- those using an internal formalised methodology, not based on a commercial systems development methodology;
- those not using any formalised systems development methodology;

Fitzgerald's (1997) study used a case study method to investigate the use of systems development methodologies in practice. Interviews gathered data on the tailoring of methodologies and the extent to which a methodology was rigorously followed. Further details of these studies were contained in section 2.2.3. Ovaska's (Ovaska & Stapleton 2007, Ovaska 2005, Ovaska et al. 2005) research also used the case study methodology to investigate requirements engineering and the role of ISD methodologies in systems development.

Iivari and Maansaari (1998) study firstly reviewed the existing literature on the use of methodologies in practice and secondly surveyed eighty seven

organisations on the use of CASE tools. The questionnaire contained two hundred and fifty detailed questions with a small section on the use of ISD methodologies. The study placed great importance on clearly representing the use of systems development methodologies in a survey. The questions were kept as simple as possible. The following questions were contained in the methods and techniques section of the study:

What analysis and design methods (such as SA, JSD, OMT) and how effectively does your organisation use currently?

Is the method standard (commercial) or in-house developed?

If “In-house”, was it developed on a standard method?

Primarily due to the length and complexity of the questionnaire the number of participating organisations was low. The authors suggested the use of ethnography in real systems development projects as a means to accessing richer data. Nandhakumar and Avison (1999) investigated information systems development in a large organisation using ethnography. Few studies in information systems development used this approach. Qualitative data was gathered by one of the authors using participant observation as a member on the development team. This data collection technique resulted in hundreds of pages of field notes that were transcribed into a rich case study describing the development process.

A study investigating the software process in practice used a case study approach (Coleman, 2005). Interviews conducted with software development managers in indigenous Irish software companies gathered data relating to the use of ISD methodologies and software process improvement models. Kiely and Fitzgerald (2005) also used the case study method to investigate the use of ISD methods in three organisations. In-depth interviews with those involved in ISD gathered rich data on the use of ISD methodologies.

Chatzoglou and Macaulay's (1996) study focused on the requirements gathering phase of ISD. Using a random sample the survey gathered data from eighty two respondents (38.9% response rate) on the use of ISD methodologies, choice of methodology, requirements gathering and the use of other tools. Similarly, Russo et al (1996) used a random sample and survey to gather data on ISD methodology usage, productivity, and quality metrics. A response rate of 20% yielded ninety two questionnaires from IS managers.

2.6.2 Social needs of ISD

One of the few studies that focused on the social aspects of co-located ISD was conducted using a survey. Aladwani (2002) investigated the links between social integration in an ISD team to the project team's performance. A random sample of five hundred manufacturing organisations yielded eighty four usable questionnaires giving a 17.3% response rate. Those studies that investigated virtual ISD all used organisational teams. In line with information systems research the most popular methods were the survey and case study method. Kraut and Streeter (1995) empirically tested sixty five projects in a software development company. They used non-probability sampling to access the software development teams. A minimum of two team members were surveyed from each team. The survey measured the consequences of using different coordination techniques. Faraj and Sproull's (2000) study used non-probability sampling to collect data on software development teams using a survey. Three hundred and thirty three respondents from sixty nine teams participated in the study which measured performance, expertise, experience, and coordination mechanisms. The study concluded that team members needed to know who had what knowledge and skill on the team. Familiarisation with this information facilitated coordination.

Herbsleb and Mockus (2003) chose two departments from one company as a case for their research. Each department had several locations in different countries. The study used an online survey and documentation produced from the change management system to gather data on communication, working relationships, coordination and information exchange. Herbsleb and Mockus (2003) believed that the goal of a distributed software development team was to stay in contact using simple, natural and straightforward ways regardless of location. Komi-Komi-Sirvio and Tihinen (2005) conducted a survey on distributed software development. The survey gathered data on the use of communication tools, common problems, advantages of distribution and satisfaction. The survey was administered through mail, and electronic mail to the participants.

Cramton and Webber (2005) used non-probability sampling and conducted an online survey of thirty nine software development work teams. The study investigated the relationships among dispersion, team processes and effectiveness. The survey was administered online with a 49% response rate. A minimum of three team members were surveyed per team. Some follow-up interviews with team leaders were conducted to gather data on geographic dispersion, task descriptions and team operations.

2.6.2.1 Virtual Work

Past research in the virtual team domain concentrated on small laboratory teams of students. Experimental methods were used to measure the virtual team's effectiveness (Gonzalez et al 2003; Piccoli 2000), performance (Straus & McGrath 1994) communication (Warkentin & Beranek 1999), coordination (Espinosa et al. 2002) and trust (Kanawattanachai & Yoo 2002). Teams were created primarily using students from educational institutions across the world. These teams were established solely for the purposes of research and did not necessarily reflect organisational virtual teams formed for a business purpose.

Lurey et al (2001) conducted an exploratory study using a survey. The study explored the effectiveness of virtual teams. The participants were located across the world and were selected by the organisation based on their membership of a virtual team. This ensured all participants were knowledgeable of the virtual team environment and capable of answering the survey questions. This also meant that teams varied in life span, industry sectors, and geographic and time boundaries, thus extending the generalisability of the study.

Many of the studies that investigated virtual teams used an online survey for data collection. The use of an online survey was highly appropriate in the studies due to the virtual context. Gaining access to virtual team members proved very difficult. The key disadvantage of online surveys was the coverage, whereby many households and people did not have access to the Internet. In the case of the described studies the target population worked in the virtual context and therefore had to have network access.

2.6.3 Success Factors of ISD

Some studies that investigated the success of ISD projects focused on IS development factors such as top management support, user participation, project leader experience, team member commitment and using an effective methodology. These studies investigated the views of IS designers, managers, users and other stakeholders. Peterson et al. (2002) developed a list of eighteen IS development strategies. Using non-random sampling, eight companies examined the adequacy of the eighteen strategies. Procaccino et al. (2002) investigated some of the most influential factors early in the development process from the developer's perspective. Markus et al (2000) approached the measurement of success using several dimensions. The study viewed success in

technical, economic, financial or business terms, the smooth running of the business operations, manager and employee perspective, and customers, suppliers and investors perspectives. The study focused on three different points in time; the configuration and roll out of the system, the transition phase from go live to normal operations and the time afterwards when the company reaped the business benefits. To measure the success of the configuration and roll out of the system the following were used:

1. Project cost relative to budget.
2. Project completion time relative to schedule.
3. Completed and installed system functionality.

Measurements used for the other two points in time focused on changes to system, key performance indicators, impact on suppliers, customers and employees, and the ease of adopting the system.

Further studies investigating the success of an information system used evaluation tools. Historically evaluation occurred at the completion of a project. The results of the project were assessed, such as costs, functionality and return on investment (ROI) (Remenyi and Sherwood-Smith 1999). Evaluation conducted at the end of a project was considered summative. Management and the development team were involved at that stage. Management had responsibility for the cost aspects of the project. The development team were responsible for the functionality of the information system. More recently, formative evaluation was conducted throughout the project and continually influenced the development process and decision making. This type of evaluation provided greater support to IT investment decisions as much more was learnt than through summative evaluation.

From the review of the ISD and virtual team literature it was clear that case studies and surveys were appropriate and well proven research methodologies for use in these domains.

2.7 Conclusion

It was clear that virtual teams faced multiple obstacles regarding their effectiveness and efficiency. Extensive research found that the exchange of complex, ambiguous information required close social ties (Cramton and Webber 2005; Nardi and Whittaker 2002; O'Leary et al. 2002). Shared mental models, routines and practices, tacit knowledge, team identity, (Jackson 1999) trust, (Jarvenpaa and Leidner 1999) and cohesion (Chidambaram 1996) were elements that required time to develop in teams that did not meet face-to-face. Communication practices, effective project management and an excellent project leader could overcome some of these difficulties. However, it was more likely that virtual teams be effective when members have strong social links. Those teams that do not have strong links could require more structured management, control and coordination (Kiesler and Cummings 2002). Formal controls existed in the form of task supports such as technical reports, performance, supervision, and policies. Informal controls included informal communications, and the socialisation of a team in terms of culture, shared values, training and reward systems (Cramel, 1999). Relationship supports could be provided by a social theory such as organisational socialisation, the purpose of which was to ensure new recruits were socialised into the existing social system. Familiarity and social integration of virtual team members was problematic due to distance. The application of this theory may help towards improving the social processes of a virtual team. The following chapter presents the literature on organisational and group socialisation applying it to the context of virtual ISD teams.

CHAPTER 3 SOCIALISATION THEORY

3.1 Introduction

Socialisation was defined as the process of ‘learning the ropes’ through training, mentoring, role models and other tactics (Schein 1988). Organisations expected members to act, interact, and perform work in a particular manner. These expectations dictated how an employee carried out their daily routine. The socialisation process consisted of stages through which the newcomer progressed. During the process, the newcomer acquired information that fell into three categories. Organisational information consisted of norms, policies and reporting structures that informed the newcomer of the organisational context. Job information pertained to work activities, tasks and practices that allowed the newcomer to master their work. Finally role information related to a newcomers role, responsibility and position in the organisation leading to role clarity (Morrison 2002). A newcomer was unaware of this information until the organisation introduced it to them through socialisation practices. Sections 2.4.2 and 2.5.2 set out the importance of social aspects for successful ISD particularly in the virtual environment. These social aspects included communication, mutual understanding, participation, social presence, and familiarity with team member’s roles, culture, abilities and behaviours. Some of these social aspects could be addressed through the use of a virtual team socialisation process. For the newcomer the socialisation process facilitated integration and the ability to choose appropriate action in routine and extraordinary events based on the organisational, job and role information they possessed. ISD literature in sections 2.2.4, 2.2.5, and 2.2.6 set out the use of methodologies by co-located ISD teams. Ovaska (2005) found that “requirements were shaped and interpreted through a social and organisational process of filtering, negotiating and shifting”. This process required excellent communication and collaboration skills. Over time the

project participants developed mutual understanding thus reducing the differences in assumptions and expectations. These findings were of even greater importance for virtual teams. This chapter outlines the theory of socialisation and how it could be applied to the virtual ISD environment.

3.2 Organisational Socialisation

Socialisation involved the integration of a newcomer into an organisation through acquiring the attitudes, norms, behaviour, and skills necessary to perform the role she or he took on (Van Maanen and Schein 1979). Ashforth et al (2007) found two theoretical perspectives existed in the literature. The first organisational perspective identified organisational socialisation as a process initiated by the organisation through a set of tactics. Early research concentrated on the moulding of newcomers by the organisation. The initial emphasis during the 1970's was that the organisation demonstrated and ensured compliance by the newcomer to the rules and procedures of the organisation through the socialisation process (Van Maanen 1976). It was felt that the socialisation process could be designed through the use of tactics developed for example by Van Maanen & Schein (1979) to produce particular outcomes. The second interactionist perspective viewed socialisation as the newcomer demonstrating proactive behaviour. Development of theory during the late 1980's recognised the proactive nature of the newcomer (Reichers 1987). The newcomer actively participated and sought out information throughout the socialisation process (Morrison 2002).

Jablin (1982, 2001) identified pre-entry, entry, assimilation and exit as distinct processes that newcomers experienced in an organisation. Much of the socialisation literature focused on the entry and assimilation of newcomers to an organisation (Van Maanen and Schein 1979; Miller and Jablin 1991; Cooper-

Thomas and Anderson 2002). Others recognised socialisation as a multi stage process that took place over a longer time (Goodman and Wilson 2000; Orpen 1995; Ashforth and Saks 1996; Ostroff and Kozlowski 1992; Morrison 1993). Newcomers interacted with management, other newcomers, supervisors, and co-workers through orientation, socialisation, formal training and mentoring processes. Filstad (2004) found newcomers used established colleagues as role models, leading to self confidence and pro-activity. These activities took place over time, not only at the point of entry. Evidence suggested that interactions with peers, supervisors, and senior colleagues were the most important supports a newcomer needed during socialisation (Louis et al. 1983). Reicher (1987) shed new light on the rate at which newcomers progressed through the initial stages of socialisation using the interactionist perspective. The key tasks at the early stage of socialisation were for the newcomer to develop understanding of organisational norms, practices and procedures and to establish an identity. From the interactionist perspective, individuals required interaction with socialisation agents to speed up the socialisation process. Long et al (2005) also highlighted the importance of peer, supervisor and mentoring relationships to virtual team socialisation. Despite this recognition of peers and supervisors, little research had been conducted in the area of the newcomers social network of people with whom they interacted while ‘learning the ropes’.

Studies conducted in the late 90’s concentrated on socialisation outcomes and showed strong links with performance outcomes (Ashforth and Saks 1996), and behavioural outcomes such as communication satisfaction, reduced uncertainty and a greater understanding of individual roles (Mignerey et al. 1995). Cooper-Thomas and Anderson (2006) identified role performance, extra-role performance, social cohesion, internal stability, and external representation as key outcomes of the socialisation process. Extra-role performance related to the newcomers ability to help others. Internal stability related to the team, department and organisational stability; for example intention to quit and absenteeism. External representation was the portrayal of the organisation by the

employees to external individuals. The first three outcomes were of primary interest to the context of virtual teams. Extensive research investigated the socialisation outcomes for co-located teams (King et al. 2005; Fogarty 2000; Moreland and Levine 1999; Schein 1988). Application of this theory to the virtual team and ISD context was limited. Virtual team socialisation could help the development of the interpersonal relationships necessary for virtual ISD success. Organisational socialisation theory provided formal and informal supports to newcomers in relation to policies, work practices, value systems, norms and required behaviour patterns of an organisation or team.

3.2.1.1 Uncertainty Reduction

Uncertainty reduction theory (URT) proposed that newcomers experienced high levels of uncertainty at the initial stages of organisational entry. Upon entry newcomers were motivated to reduce the uncertainty by acquiring information through various sources, bringing order and predictability to their daily work (Saks and Ashforth 1997). Newcomer behaviour and role adjustment research examined the need by the newcomer to reduce uncertainty at the early stages of entry. URT helped to examine and explain the relationship between the newcomer and the organisation. Research showed that interactions with peers and superiors were important for uncertainty reduction. Consequently, newcomers were dependent on effective communication with others at the earliest stage of entry. An early study showed that daily interaction with peers was the most important factor in helping newcomers to feel effective (Louis et al. 1983). Ostroff and Kozlowski (1992) found that newcomers relied primarily upon the observation of others, followed by supervisors and co-workers as a means to acquiring information. Communication behaviour in terms of the availability of information and feedback could help to reduce uncertainty (Haueter et al. 2003; Ashforth et al. 1998; Mignerey et al. 1995). As uncertainty

reduced, newcomers became more adept at their job and the likelihood of staying with the organisation increased.

Mignerey (1995) developed an uncertainty reduction model containing three components; communication antecedents, communication behaviour, and communication outcomes. The model recognised that communication behaviour was moderated by organisational and individual influences thus determining communication outcomes. In the study, socialisation tactics were a communication antecedent thus affecting the behaviour of newcomers and the outcomes of organisational entry.

3.2.1.2 Information Seeking

Morrison (1993) conducted a longitudinal study that investigated the affects of information seeking on newcomer socialisation. The study found that newcomers were engaged in information-seeking behaviours that influenced the socialisation process. The previously identified information domains of organisation, job and role existed in the study as task mastery, role clarification, and acculturation. Social integration existed as an important fourth domain in this study. The development of relationships with co-workers helped the newcomer integrate with the work group. The research supported the interactionist perspective that newcomers were active participants in the socialisation process (Griffin et al. 2000; Miller and Jablin 1991; Reichers 1987).

The information sought by newcomers in the socialisation process was of importance. Information concerned acceptable social behaviour, organisational culture, and evaluation mechanisms allowed newcomers to understand how they needed to behave, how their behaviour was evaluated and what attitudes and norms they should possess. Morrison (1993) found that social integration linked directly to the level of normative information sought by newcomers. Normative

information pertained to social and personal information. Information acquisition research looked at the means by which newcomers sought information. Ostroff and Kozlowski (1992) concluded that observation and experimentation were the best sources of knowledge. The study also indicated that newcomers gained social support through co-workers which led to progression in other areas such as task mastery.

One of the most influential theories in the field of organisational socialisation was Van Maanen and Schein's model (1979). Using empirical evidence the model categorised specific tactics used by organisations to socialise newcomers. Specific tactics influenced the reduction of uncertainty and produced specific behavioural and role outcomes.

3.3 Van Maanen and Schein's Organisational Socialisation Model

Van Maanen and Schein's (1979) organisational socialisation model posed the theory that newcomers responded to their roles based on the socialisation tactics used by the organisation. Thus, the organisation was seen to have the ability to mould the newcomer. These socialisation tactics could be formally chosen by the organisation for example, an induction course and training session attended by all newcomers. Alternatively, there could be informal use of the tactics. For example, newcomers to the organisation had no formal induction and learnt on the job. These decisions could be based on functional, economic, social or purely random reasons. From a management point of view, it was important to understand the reasoning behind the decisions and the effects on newcomers so that improvements could benefit both the individual and the organisation.

The model was developed with a variety of organisational structures in mind; it could be used in any setting in which careers evolved. The tactics were not

mutually exclusive; they overlapped, and several tactics fitted together so that the outcomes were cumulative. The tactics were not absolute as they were organisational processes that were open to invention and modification (Van Maanen and Schein 1979). The model comprised of six dimensions of organisational socialisation. These were explored and refined by Jones (1986) in his classification of socialisation tactics (Figure 3-1).

Organisational Socialisation

Collective	Individual
Formal	Informal
Serial	Disjunctive
Investiture	Divestiture
Sequential	Random
Fixed	Variable

Figure 3-1: Classification of Socialization Tactics by Van Maanen & Schein (1979).

3.3.1.1 Jones' (1986) Classification

Socialisation theory continued to develop and seven years after the creation of Van Maanen and Schein's model, Jones (1986) conducted an examination of how specific tactics affected a newcomers adjustment into an organisation. Jones concluded that each of the six dimensions in Van Maanen and Schein's model existed on a bipolar scale where one end represented an institutionalised socialisation strategy and the other an individualised strategy (Jones 1986). Institutionalised tactics consisted of collective, formal, sequential, fixed, serial and investiture tactics. Institutionalised tactics reflected a formal and structured approach to socialisation. Alternatively, individualised tactics included

individual, informal, random, variable, disjunctive, and divestiture tactics. Individualised tactics reflected an informal approach to the socialisation process.

Each end of the scale offered a different approach and consequently different outcomes to the organisation. Institutionalised tactics were seen to be structured, providing the ability to control the newcomer's exposure to the organisation and the job. Individualised tactics recognised the individual as an active participant in the process and less structure was placed on the socialisation process.

This classification formed the basis for much research in the identification and measurement of socialisation outcomes. Jones's (1986) research found positive relationships between institutionalised tactics and compliance, loyalty, job satisfaction, and commitment. The newcomer was found to be more compliant and accepting of the organisations norms and values (Griffin et al. 2000). The institutionalised tactics formally introduced newcomers to the organisation, imparted knowledge through assigned mentors, provided detailed steps of career paths, and supported the newcomer through acceptance. Ashforth and Saks (1996) also found evidence that institutionalised tactics produced increased job satisfaction and commitment, as well as reducing uncertainty and anxiety. Allen (2006) found serial and investiture tactics were positively related to newcomer embeddedness and negatively related to employee turnover. Saks et al (2007) found institutionalised tactics were negatively related to role ambiguity, role conflict, and the intention to quit. The same tactics were found to be positively related to job fit, job satisfaction, commitment, performance, and role orientation.

Individualised tactics provided a less structured approach to socialisation. The newcomers were left to "sink or swim". This type of socialisation could in fact occur by default rather than design (Ashforth et al. 1996). These tactics were thought to produce innovative self-directed employees that were independent and questioned each new situation (Jones 1986; Van Maanen and Schein 1979).

There were some studies that found evidence which conflicted with Jones' (1986) categorisation. Ashforth and Saks (1996) studied business graduates and found use of institutionalised tactics including investiture tactics. Fogarty (2000) found that divestiture tactics were the preference of accounting firms. The categorisation of investiture and divestiture into either the individualised or institutionalised was questioned. Ashforth et al. (1996) found investiture tactics were often not any more structured than divestiture tactics. The investiture/divestiture category of tactics demonstrated inconsistencies in the outcomes; however this could be due to the kind of sample studied. Research in this area relied upon new college graduates who usually experienced investiture tactics (Jablin, 2001). The conflicting empirical evidence suggested that socialisation tactics varied depending on the context within which socialisation took place. The choice of tactics could differ according to the industry and chosen organisational structure.

A later study carried out by Ashforth et al., (1998) identified a link between organisational structure and the socialisation strategy used by an organisation. Structures with hierarchies and of a mechanistic nature used institutionalised tactics to socialise newcomers as it encouraged custodial roles that sustained the status quo. The study argued that institutionalised tactics were seen as a human resources function used to protect the organisations investment in the new recruits. The emergence of virtual teams meant that organisational structures changed. Social presence theory in section 2.5.3.1 highlighted the importance of exchanging social information in order to establish and maintain robust relationships in the virtual team environment. Section 2.5.4.2 detailed the need for cohesion and establishing a social system in a virtual team in order to have shared understanding. Possessing shared social knowledge enabled the exchange of complex and ambiguous information using electronic means. Transactive memory theory in section 2.5.5.1 addressed the need for shared knowledge. Team members were aware of the skills and expertise on the team, this allowed

each team member access to a vast amount of knowledge by simply asking the appropriate team members. In the context of virtual teams the establishment of transactive memory without face-to-face contact was potentially problematic. Socialisation theory presented a possible means to help virtual team socialise and therefore establish social presence, mutual understanding and a transactive memory system. These in turn would support the social processes of communication, collaboration and cohesion. However, to date few researchers had investigated the relationship between team structures and socialisation tactics. The focus of organisational research was on the socialisation strategy employed by organisations at the entry point of newcomers to the organisation. Little research addressed the ongoing socialisation of team members, particularly of virtual teams.

3.3.1.2 Socialisation Tactics & Outcomes

Most empirical studies measured the relationship between socialisation and behavioural outcomes such as satisfaction, anxiety, commitment and intention to stay in the role. Jones (1986) and Ashforth and Saks (1996) linked institutionalised tactics with reduced role ambiguity and conflict. A more recent study by King et al (2005) found that institutionalised tactics had a positive effect on role adjustment variables for IT professionals. Other studies have also supported the links between role adjustment outcomes and tactics (Fogarty 2000; Orpen 1995). However, those outcomes had many antecedents such as motivation, tenure and job specification. According to Ostroff and Kozlowski (1992) it could be more appropriate to measure outcomes that linked directly to the socialisation process. Such primary outcomes may be those of role adjustment, social integration, knowledge of co-workers, establishing interpersonal relationships, forming mutual understanding between colleagues, and social interaction through communication and collaboration between colleagues.

There has been some research into these primary outcomes of socialisation tactics. A study on the information seeking behaviour of newcomers discovered that social integration was positively linked to the frequency that normative information was sought by a newcomer (Morrison 1993). This type of informal, ambiguous, tacit knowledge was established during face-to-face meetings, when normative information concerning social norms, expectations, roles and attitudes was exchanged. It took more time to exchange normative information using electronic means. These primary outcomes of the socialisation process could be critically important for a virtual team. Further research into primary outcomes of socialisation was required.

3.3.1.3 Summary

Van Maanen & Schein's (1979) socialisation theory was well established and tested in the organisational socialisation field. It provided a means to categorise the methods used by an organisation to socialise newcomers. This categorisation then allowed relationships with outcomes to be established. Initially, their theory was used to measure tactics applied by the organisation at the point of entry of newcomers. Over the past twenty years socialisation became recognised as a prolonged process rather than taking place only at the time of a newcomer's entry into an organisation. Organisational literature assumed that socialisation only occurred between the organisation and the individual at the time of entry. Research then discovered that group socialisation was just as important, if not more important than organisational socialisation (Goodman and Wilson 2000; Moreland and Levine 1999). Consequently, Van Maanen's & Schein's (1979) theory is now used to measure tactics at various times and in various contexts. The following section concentrates on work groups as a primary context where socialisation was extremely important and influential.

3.4 Work Group Socialisation

Work group socialisation concerned a newcomer's familiarisation with the work group and the social environment. A new member learnt the value system, norms, and appropriate behaviour of the work group. Van Maanen and Schein (1979) defined organisational socialisation as a newcomer being "taught what behaviours and perspectives are customary and desirable within the *work setting* as well as what ones are not" (pg 211). It has long been established that socialisation occurred when individuals crossed boundaries. In this case the boundary may not be the organisation but the work setting or more specifically the work group. As organisational structures evolved; work commonly took place in distinct work groups. Consequently socialisation occurred within the work group. The literature suggested that the influence of work groups on newcomers was greater than that of the organisation (Moreland and Levine 1999). This research identified the ISD project team as a workgroup. For the purposes of this study, substitution of the term 'team' for 'workgroup' was appropriate.

Some organisational socialisation research provided findings that supported the argument for team socialisation. An early study showed that daily interaction with peers was the most important factor in helping newcomers to feel effective (Louis et al. 1983). Peer interaction was positively linked to job satisfaction, commitment and intention to remain in the job. Ostroff and Kozlowski (1992) found that newcomers relied primarily upon the observation of others, followed by supervisors and co-workers as a means to acquiring information. The importance of peers and supervisors was also well established in the organisational socialisation literature (section 3.2) and the ISD literature (section 2.5.1.1). Miller and Jablin (1991) found interaction, surveillance, observation, and overt methods were used to promote interaction with peers, supervisors and

management. Team socialisation facilitated effective planning of work, anticipation of behaviour and assigning of tasks (Moreland and Levine 1999). ISD literature suggested the importance of planning work and assigning tasks (section 2.4.1) for the success of a project. Virtual ISD teams must be organised in order to transfer complex information in the highly interdependent environment of ISD. Task supports, goal setting, common methodologies and terminologies and clear work processes were found important to virtual ISD teams (sections 2.5.1.2, 2.5.1.3, and 2.5.2.3). Virtual teams that could anticipate behaviour may relieve the common issues of misattribution and mutual understanding (section 2.5.2.2). A recent study on the socialisation of IT professionals reported serial tactics as highly influential on the role adjustment variables of job satisfaction and commitment (King et al. 2005). Serial tactics involved interaction with a mentor and other peers. This interaction led to the learning of norms, acceptable behaviour, best practices, politics of the work setting, and the understanding of relationships and people involved in the team. All of these factors could contribute towards the effective communication (section 2.5.3), cohesion (section 2.5.4) and collaboration (section 2.5.5) of virtual teams.

Moreland and Levine (1999) believed that socialisation occurred primarily in work groups and that work group socialisation had a stronger impact than organisational socialisation on the behaviour of most employees. Therefore, work group socialisation research should have been a priority in order to understand and predict how employees act, feel and think. It was thus surprising that the area of work group socialisation had not received greater attention from researchers over the years. Nor had it been integrated with organisational socialisation theory to investigate the use and outcomes of organisational socialisation tactics in the work group context. Given the trends in organisational team working, there have been calls for further research in the area of work group socialisation (Ahuja and Galvin 2003; Moreland and Levine 1999; Anderson and Thomas 1996).

Anderson and Thomas (1996) offered the following definition of work group socialisation.

“Work group socialisation is newcomer acquisition of knowledge, abilities and attitudes needed to perform a work role, and the assimilation of the newcomer into the proximal work group via exposure to its norms, psychological climate, rituals and rites de passage, and the concurrent accommodation of the work group to the newcomer over time.” pp.428

Moreland & Levine (1982) developed a model of the psychological processes that underlie group socialisation. They sought to answer such questions as ‘How do groups instil commitment in their members, and how does this commitment affect members’ within the group? Why do groups have so much trouble expelling problem members, and why are members sometimes reluctant to leave unrewarding groups? The model assumed that both individuals and the group influenced the socialisation process. Three psychological processes existed; they were evaluation, commitment and role transition. The socialisation cycle was complete when an individual passed through these three processes. Evaluation involved the individual and the group assessing the attractiveness of one another. This process produced commitment, which rose and fell over time. When commitment reached a certain level a role transition occurred. According to the model, a change occurred with the relationship and the evaluation began again. The model attempted to describe the passage of individuals through groups (Levine & Moreland 1994). They theorised that an individual could pass through five phases of group socialisation; investigation, socialisation, maintenance, resocialisation, and remembrance. Over this time their commitment fluctuated and several role transitions could take place.

Moreland and Levine (1999) stated that the model best suited small, autonomous and voluntary groups. The lack of consideration for organisational and group characteristics restricted its application to organisational work groups (Anderson and Thomas 1996). Consequently, Moreland and Levine's (1999) model had not been thoroughly tested in the field. In contrast, Van Maanen & Schein's (1976) model had been tested in the organisational setting where the findings offered an explanation of how tactics influenced outcomes such as role adjustment, forming interpersonal relationships and the social integration of newcomers. According to the theory, newcomers responded to their roles differently because the socialisation tactics used by organisations shaped the information newcomers receive. By providing or restricting information, the organisation could control or predict to a degree the behaviour of newcomers. Van Maanen and Schein's (1979) work supported the theory that outcomes such as commitment and role adjustment were influenced by socialisation. The two research domains of organisational socialisation and group socialisation could be integrated and inform each field. Those studies conducted in the organisational socialisation domain could influence the psychological processes identified by (Moreland and Levine 1999).

Van Maanen and Schein's (1979) theory offered a means to investigate the socialisation phase of group socialisation. By investigating that phase primary outcomes could be identified in relation to social processes such as communication, cohesion and collaboration between virtual team members. The use of socialisation theory in the virtual ISD domain could inform and lead to successful information systems development in the virtual team environment. The following section applies Van Maanen and Schein's (1979) organisational socialisation model to the virtual ISD domain.

3.5 Socialisation of ISD Professionals in the Virtual Context

King et al's (2005) research found that socialisation tactics affected IT professionals in a different manner than the outcomes reported in the general organisational socialisation literature. King's findings presented the theory that IT professionals in particular and knowledge workers in general should engage in a socialisation process designed specifically for their work situation. The study found investiture tactics had strong links with outcomes such as reduced role conflict, greater job satisfaction, and increased attachment to the organisation. The study found that as an individual's professional skills were recognised by the organisation (investiture tactics) the individual also perceived a greater fit with the organisation's values and norms. The study also found mentoring programmes (serial tactics) reduced the IT professional's intention to quit. The provision of a mentoring programme helped to guide organisational adjustment and provide social supports to the individuals. This finding supported the theory that peers, supervisors and mentors had a significant role in newcomer socialisation (section 3.2).

A significant finding of the King et al (2005) study was that four institutionalised socialisation tactics affected role adjustment outcomes. Role conflict was reduced through clear acceptance of skills and identification of roles (investiture tactics) and by providing specific timetables for role progression (fixed tactics). Role ambiguity was reduced through common learning experiences (collective tactics). Interestingly role ambiguity increased due to clear steps for role progression (sequential tactics). This finding was unusual and contradicted Jones (1986) theory and Ashforth and Saks' (1996) findings that an institutionalised socialisation strategy reduced uncertainty. The application of Jones (1986) classification of institutionalised or individualised socialisation tactics did not guarantee consistent outcomes. This suggested that each category of tactics may produce different outcomes depending on the context. Organisations could choose categories of tactics that were appropriate to the context. King et al

(2005) research supported earlier studies by Fogarty (2000) and Ashforth et al (1998). All of which found that socialisation outcomes depended on the industrial context or organisational structure.

Virtual ISD teams emerged as a popular team structure, resulting in a high use of electronic communication in the 1990's. These communication technologies connected team members across time and space boundaries. Section 2.5.2 detailed the negative affect of electronic communication. For example inaccurate interpretation of messages (section 2.5.2.1), lack of mutual understanding (section 2.5.2.2), cultural differences (section 2.5.2.3), and poor social processes including increased conflict and reduced trust amongst other problems (section 2.5.2.5). Section 2.5.3.1 presented literature describing how the absence of contextual and social cues in electronic communication reduced the social presence between the participants. Research showed that groups who communicated over a long period of time possessed an increased social understanding of its members. This social knowledge led to the ability to exchange information in complex and ambiguous environments. Research in section 2.5.4.1 showed that virtual teams took longer to build interpersonal relationships. Social information processing theory concurred with those findings, whereby teams would over time develop ways of exchanging enough social information to perform effectively. Many of these negative effects could be addressed through appropriate socialisation tactics. Studies revealed the importance of the forming (Joy-Mathews and Gladstone 2000) or entry (Levine and Moreland 1994) stage of teams which incorporated socialisation and the use of behaviour controls. Jackson et al (2006) found controls served the interests of the workers more than the managers. Their study found the procedures helped workers to maintain control over the project work. Section 3.4 suggested planning and task allocation were outcomes of socialisation. Conversely, Picolli et al (2004) found no impact of control structures on the virtual team performance. Despite these conflicts in views, further literature did support the need for control and structure in the virtual team environment (Peters and Manz

2007, Kiesler and Cummings 2002; Kayworth & Leidner 2001, Faraj and Sproull 2000).

In summary, the socialisation literature demonstrated a clear link between the socialisation tactics adopted by organisations and positive relational outcomes. In turn the virtual team literature recommended social integration and clear work processes for success. The model validated by researchers of organisational socialisation since the 1980's is the Van Maanen and Schein (1979) model and Jones' (1986) categorisation of that model. The following sections applied Van Maanen and Shein's (1979) socialisation tactics model to the context of virtual ISD teams. The review of each socialisation category considered the context of virtual ISD noting the potential positive and negative affects of each socialisation category to the virtual ISD team.

3.5.1 Collective vs. Individual socialisation

The collective tactic referred to the socialisation of a group of newcomers through a collective induction or training course. This reinforced the organisations norms, expectations and procedures through the agents delivering the induction or training course. Upon completion of the collective socialisation process the group of newcomers had a sense of shared experience (Moreland and Levine 1999) and enhanced workgroup integration (Kowtha 2008). Collective socialisation produced newcomers that met the organisational requirements in terms of knowledge of their role, the work situation, and acceptance of work practices. Collective experiences resulted in cohesiveness within the group and collective understanding through the sharing of the experience. This could lead to the establishment of a team history (section 2.5.4.1), and a cohesive team (section 2.5.4). The experiences shared by a team during collective socialisation could create a foundation for future problem solving (section 2.5.4). ISD involved a great deal of problem solving based on the knowledge exchanged

between members, the understanding of the problem domain and the application of methodologies (section 2.5.1). These activities required a considerable understanding of the complex relationships that existed within and surrounding the team. Section 2.2.1 described ISD methodologies as tools that allowed knowledge to be stored, systematised, disseminated and exchanged. ISD was dominated by functionalist methodologies and therefore a modularised approach to work was common (section 2.2.1). ISD tasks were highly interdependent; each piece of work was considered a pre-requisite for the next stage of development (section 2.5.1). Collective socialisation could encourage team members to familiarise themselves with the ISD methodology in use. Regular collective meetings during the ISD process would encourage mutual understanding and sharing of knowledge. Without mutual understanding cultural differences emerged (section 2.5.2.3) and interdependent work was problematic (section 2.5.2.2). In the virtual team environment, observation of localised team members could be possible. However physical collective socialisation with distanced team members could be limited. For those located at a distance use of collaborative software, instant messaging, telephone and electronic mail could be appropriate for the purposes of collective socialisation.

In contrast, individual socialisation processes allowed the individual to experience induction separately from others for example an apprenticeship. This style of socialisation encouraged the individual to take on the organisational norms, expectations and procedures to a lesser degree than the collective process. Placing the responsibility for newcomer socialisation in the hands of one person could indicate that the role was a complex one that required a high degree of on the job training and direction. Individual socialisation produced newcomers that, took on the knowledge and teaching of the socialisation agent and brought new ideas to their role in the organisation (Van Maanen and Schein 1979). Individual socialisation involved each new member experiencing socialisation independently of others. The most common form was apprenticeship, where the newcomer had on-the-job training and was expected to learn as they went along.

Information systems development required independent knowledge intensive work. Individual socialisation tactics encouraged independent behaviour and the ability to use one's own initiative. Independent problem solving and interdependent work were both characteristics of ISD (section 2.2).

3.5.2 Formal vs. Informal Socialisation

Formal socialisation tactics involved newcomers experiencing a formal training course, segregated from the other organisational members. Collective and formal socialisation tactics were often combined, for example when a group of new recruits partook in a training course before starting work. This type of socialisation tactic allowed the organisation to instil the knowledge and information necessary for the new recruit to function in the manner appropriate to the organisation. Attitudes, norms, work practices and traditions were imparted clearly to the new recruit during the formal sessions. For some organisations, this was extremely important as the new recruits success in a role depended not on the activities undertaken but on the status and customs ingrained in the organisation to which the new recruit must conform. Formal socialisation could be used in situations where a cultural gap existed for the new recruit. For example, a new member joined a team consisting of people from another continent and thus another culture. Formal socialisation could involve training in cultural differences and may be necessary to perform effectively in the new role (Van Maanen and Schein 1979). In the virtual team context formal socialisation could clarify the differences in team member cultures. This could create awareness and mutual understanding between distanced team members from varying cultural backgrounds.

Evidence suggested that hierarchical, more formal organisational structures were associated with institutionalised tactics (section 3.3.1.1). Formal tactics could be influential when combined with an ISD methodology (sections 2.2.4 and 2.2.6).

Teams using an ISD methodology usually required team member roles to be clear and established early in the project. Analysts, programmers and testers were designated specific responsibilities. This could be difficult for a virtual team without knowledge of the team composition, team member abilities, background and experience. A formal socialisation process could help to impart this information and establish roles and responsibilities of the team. The use of formal tactics could also include cultural training where virtual teams cross geographical boundaries (section 2.5.2.3). Research suggested that training of team members could encourage social integration and improve a team's cohesion (section 2.5.4).

ISD involved interdisciplinary teams containing members from business and technical domains. Research carried out found that virtual teams had difficulty identifying team boundaries and knowing who was part of the team (section 2.5.4.2). Team membership information was normally exchanged during the initial formation of a team. In the virtual team environment face-to-face meetings may not be feasible and therefore other mechanisms could be used. A formal process of exchanging membership and role information through electronic mail or collaborative software may be one such mechanism. Formal tactics could be useful to establish an understanding of team roles and responsibilities leading to mutual understanding and the ability to share information effectively.

Informal tactics provided a loose structure to the socialisation of new recruits, individuals learnt on the job. Informal socialisation tactics did not formally introduce the new team members, highlight the newcomers role specifically, nor demonstrate the difference between the new members and existing members (Van Maanen and Schein 1979). This unstructured training placed the responsibility on the new recruits to learn task and culturally related information from other organisational members. This method reduced the collective group-think phenomena and allowed the new recruit to think for themselves and bring new ideas to the work place (Jones 1986). This tactic placed the responsibility for

socialisation into the hands of the new recruit. Similar to the interactionist perspective, the individual had to seek out information from other organisational members when necessary. Thus, the challenge for the new recruit was to find others with the practical expertise willing to teach, and to avoid too many costly mistakes while learning. New roles were learned through experience on the job and task assignments. Informal tactics allowed newcomers to become familiar over time with norms, accepted behaviour and other aspects that were not formally documented. This could lead to expensive mistakes. Miscommunication, misinterpretation and a lack of mutual understanding between virtual team members could occur as information sourced by the newcomer may be inadequate or misinformed.

As suggested by previous research in section (section 2.5.4.1) virtual teams took longer to establish and perform effectively. Virtual teams varied in composition, members resided in multiple locations and brought different norms and practices to a team. This diversity offered strengths in experience, knowledge and ability; however it also brought weaknesses in communication, cohesion and collaboration. Informal tactics offered no prescriptive way of socialising. Therefore the virtual ISD team members would have to communicate and acquire the necessary information from each other in order to work through the ISD process.

3.5.3 Serial vs. Disjunctive Socialisation

Serial socialisation tactics focused on the individual recruit using a mentor or guide as the socialisation agent. The experienced mentor tutored the new recruit for a position similar or the same as their own. Much knowledge was imparted to the new recruit concerning task and culture (Ostroff & Kozlowski 1993). A strong bond usually established between the recruit and the mentor; the recruit identifying a future picture of themselves in the experienced mentor. Conversely,

this method was problematic when the recruit and mentor did not form a bond or when the recruit did not favour the future image. Van Maanen and Schein (1979) proposed that serial tactics promoted the protection and sustainability of the status quo, where the norms and attitudes, the work practices and traditions were handed down from mentor to new recruit.

Organisational socialisation research showed the influence a mentor could have for a new recruit (section 3.2). ISD research highlighted the importance of interactions with peers during the ISD process (section 2.5.1) and the importance of a good leader in the success of a virtual team (section 2.5). Mentoring virtual ISD teams could help to create greater understanding of team members, the problem domain, the ISD methodology in use and the approach to problem solving. Section 3.4 highlighted the importance of work group socialisation as team members needed to learn about their role, group, and tasks. A mentor provided access to knowledge of team member skills, expertise and location. Serial tactics resulted in team members spending time working together and thus becoming familiar with each other. That familiarity could lead to greater mutual understanding (section 2.5.2.2) and reduced cultural differences (section 2.5.2.3). Research showed that serial tactics were extremely important for IT professionals (section 3.5). Serial tactics promoted the establishment of a transactive memory system between those working together (section 2.5.5.1).

Disjunctive tactics required the new recruit to support themselves. They interpreted situations based on their own knowledge as no role models or mentors existed. Disjunctive socialisation could occur due to organisational choice, changes in the organisations structure or economic situation, or a reduction in employees could result in many experienced personnel leaving and the younger inexperienced left to socialise any new recruits. In unusual situations, few role models may exist that could provide insight and past experience to the new recruit. Disjunctive tactics promoted independence, and individual growth and development, allowing the new recruit to determine their

own socialisation. In the virtual ISD context this could mean a lack of familiarity with team members and processes. Without a formal mentor and frequent face-to-face contact virtual team members may not form a cohesive team.

3.5.4 Investiture vs. Divestiture Socialisation

This tactic determined the acceptance or rejection of the new members personality and attitudes through positive or negative support by the established members of the organisation (Jones 1986). That support could be in the form of immediate job responsibilities based on their experience and knowledge, or recognition of work achieved during a project. Investiture socialisation aimed to accept and confirm the positive benefits gained through the new member's personal characteristics. The investiture tactic said to the recruit 'We like you just as you are'. The organisation did not want to change the new member. It was thought that carefully selected recruits already conformed to the set of beliefs and attitudes established by the organisation (Van Maanen and Schein 1979). Consistencies in organisational norms were retained. Investiture tactics were therefore categorised into the institutionalised strategy (section 3.3.1.1). Investiture tactics reinforced the newcomer's belief in their abilities and competencies thus capitalising on their existing skills and knowledge. King et al (2005) found IT professionals to exist in an environment where roles were not clear, new skills were continually learnt, business knowledge updated, and constant changes in client requirements were the norm. The study found that investiture tactics reduced role conflict for IT professionals. Investiture tactics recognised worth in the IT professional skills, values and personality which in turn reduced uncertainty in their role. Consequently less conflict occurred (section 3.3.1.2). Kawtha (2008) also found investiture tactics to be of great benefit to workgroup integration and role clarity.

Divestiture socialisation aimed to contest the perceptions and beliefs that a new recruit held. This tactic aimed to overwrite the existing norms and behaviour ingrained in the newcomer, replacing them with skills that were desirable by the organisation. The idea was that a new recruit would have habits or behaviours that were undesirable to the organisation. Those behaviours then had to be replaced with more appropriate ones (Fogarty 2000).

According to Van Maanen and Schein's (1979) theory, divestiture tactics questioned the skills of the newcomer encouraging them to seek new solutions and approaches to their work. The application of this type of tactic in the virtual ISD team context was not fully known. Virtual ISD teams could contain a diversity of experience and skills (section 2.5.1), it was not expected that the team would attempt to force a new set of values on the members. However, research did find that it was important for team members to recognise cultural differences and in some cases create a team culture (section 2.5.2.3). It was also important to encourage creativity and innovation in software development (Glass 2001; Wastell 1996). Similar to disjunctive tactics (section 3.5.3) divestiture tactics encouraged creativity and innovation at an individual level. According to Lemon & Sahota (2004) innovation required the creation, capture, harvest, sharing and application of knowledge and expertise. In the context of an ISD team, these tasks must occur predominately at a team level. The collective goal of an ISD team is the creation of an information system. Essential to the success of any innovation is the knowledge that underpins it. In the team environment the ability to share expertise, ask and receive information is of the utmost importance. Peters & Manz (2007) indicated that a focus on the individual and resisting collaboration could serve to promote distrust and miscommunication in a team. They went on to suggest that team members should have ownership of the team goals and not overly focus on individual contribution. Bergiel et al (2008) supported the theory that team goal setting encouraged team members to work interdependently with a shared purpose. A significant inhibitor to the success of virtual teams was found to be a lack of shared understanding (section

2.5.2). Similarly the inability to reach agreement or consensus in a team inhibited the virtual team's creativity (Ocker 2005). Levine and Moreland (1994) suggested that the more commitment felt by a group towards a member then the more likely the group will allow innovation. Similarly the more committed a member is to the group the higher the motivation to be innovative. This suggested that, for virtual ISD teams, creativity and innovation should be encouraged at the team level through investiture tactics.

3.5.5 Sequential vs. Random Socialisation

Socialisation into certain roles required long-term commitment that could span many years e.g. medical doctor, accountant, barrister. In the ISD profession, eligibility to apply for the role as project manager could require the completion of an undergraduate programme and progression through roles such as graduate programmer, programmer, analyst and senior analyst. The incremental growth of the recruit through experience and various assignments was a sequential process. The degree to which an organisation specified the sequence of steps required determined the socialisation tactic. Those organisations using steps similar to the above example employed sequential tactics; inversely those with no specification of steps used random tactics. ISD teams could benefit from a sequence of steps that when completed provided the team member with the skills to perform in their given team role. Sequential socialisation could include experience or training in communications, problem solving, ISD methodologies and the problem domain. The time taken to complete these steps ensured that the individual gained experience and could perform in their role effectively. In some roles a clear set of steps was known organisation wide and sometimes country wide as in the case of medical professionals and barristers. These roles employed sequential socialisation tactics.

Random socialisation provided no information regarding advancement to the next role. The new recruit was unaware of the steps involved in reaching the role. In some organisations it may be common for career paths to lack clarity. Random socialisation could result in varying abilities and skills of team members in the same role. In a virtual ISD team, the interdependence between member's tasks required close collaboration (section 2.5.1). The assumption would be that team members had the skills and ability to perform their tasks. A lack of skills would be more apparent through formal face-to-face meetings, informal information exchange and problems that would occur. A lack of skills may be less apparent in a virtual team due to asynchronous communication (section 2.5.2.4), ambiguous team composition (2.5.4.2), and poor familiarity (2.5.2.2) between team members. Role clarification was highlighted as an important factor for successful virtual teams (sections 2.5.1.1- 2.5.1.4). Virtual ISD teams could benefit from the structure and formality provided by sequential tactics.

3.5.6 Fixed vs. Variable Socialisation

Closely linked to sequential tactics, fixed tactics determined the length of time it took to reach the target role. As previously stated the steps involved may be well known to the recruit. However the time frame within which progression took place could be variable or fixed. Fixed tactics provided information of exact periods for each step in the process. Variable tactics provided no information regarding the scheduling. Frustration occurred when an organisation provided neither the steps nor the timing to the recruit thus devaluing the recruit's long-term value to the organisation. Those organisations that did use fixed tactics could introduce multiple schedules for each role allowing for quality differentiation of recruits, and in some industries fluctuations in the market. Some recruits could experience a 'fast track' to a new role due to abilities and others a 'regular track'.

Variable socialisation tactics encouraged individualistic characteristics as each recruit moved through the socialisation process separately, and was continually unaware of their own and others stage in the process. Group solidarity was diminished as difficulties emerged when a recruit may be competing with team members for prospective roles (Van Maanen and Schein 1979). Loyalty to others and cohesiveness in this situation were not sustainable. Fixed tactics appeared to be more appropriate to the team environment particularly considering the importance of cohesion to virtual teams (section 2.5.4).

The literature showed short term systems development was popular (Fitzgerald 2000). Consequently, the use of fixed timetabled steps could be limited due to time constraints. However, Van Maanen & Schein (1979) highlighted the potential negative effect of variable socialisation in the context of groups. The use of variable socialisation did not instil cohesiveness and solidarity as team members were collaborating without fully knowing each member's timetable of role progression. Knowledge of a member's timetable provided information on their progress or stage in the socialisation process. Without this knowledge, team members held themselves at a distance from each other until the information became available.

3.6 Summary

The application of Van Maanen and Schein's (1979) model to the virtual ISD team showed potential rewards that could help with the difficulties of working in a virtual environment. Collective tactics could reduce misunderstanding, cultural differences, and improve familiarity and cohesion in a virtual ISD team. This could increase social presence and mutual understanding (sections 2.5.3.1 and 2.5.4.2). Formal tactics provided an opportunity to formally communicate, collaborate, transfer information, clarify work practices, and establish a team

culture. Virtual team members shared experiences through collective and formal socialisation. Over time social integration (section 2.5.4.1) and mutual understanding (section 2.5.4.2) would emerge. Serial tactics supported each individual through a mentor program. A mentor offered knowledge, expertise, cultural insights, and familiarity with existing practices or project tasks. A mentor provided a means to establish and maintain a transactive memory system (section 2.5.5.1). Investiture tactics accepted the individual into the team through positive support of their skills and expertise. Finally sequential and fixed tactics provided role clarification leading to group solidarity and cohesion (section 2.5.4). Socialisation of a virtual ISD team had the potential to positively affect communication, collaboration and cohesion. The following section reviews the methodologies used by the studies in the socialisation literature.

3.7 Researching Socialisation in Virtual ISD

To learn from the existing research conducted in organisational research it was necessary to review the methodologies selected by various studies. The majority of organisational research adopted one of three methodologies: experimental, survey or case-based research. The following sections provide examples of research undertaken in the areas of organisational socialisation and virtual team socialisation.

3.7.1 Socialisation Research Methods

Scandura and Williams' (2000) review of organisational literature found organisational behaviour studies employed laboratory experiment and field study methodologies. The field study methodology showed an increase in popularity during the 1990's, probably due to access constraints and ethics review boards.

Experiments required significant involvement and access rights, and some review boards did not approve of the intrusive nature of experiments. Their study found surveys were in use but to a lesser degree than field studies. Field studies provided a means to observe and gather data on the phenomenon in its natural setting. A review by Saks and Ashforth (1997) of the organisational socialisation literature showed that surveys were the most commonly used research methodology. The authors noted a lack of experimental research which restricted the identification of causal effect relationships. Generalisation was restricted due to many samples consisting of recent graduates thus being from a similar demographic.

Fogarty's (2000) study of socialisation in public accounting firms used random sampling and a cross sectional survey to assess the effect of socialisation tactics in a professional work context. The study recognised that socialisation occurred over time and thus a cross sectional study did not reflect that fact. However, the high turnover rate in public accounting and the rapid promotion policy made the use of a longitudinal study inappropriate. Ashforth et al (2007) studied how socialisation tactics and proactive behaviour jointly affected what the newcomers learnt. Participants from one university were surveyed three times in the seven months following graduation and employment. Their study found a positive relationship between the combined use of institutionalised tactics (except for investiture tactics) and proactive behaviour with learning. An earlier study by Ashforth et al (1996) measured graduates from one university after four and ten months in new jobs to assess the effectiveness of socialisation tactics on newcomer adjustment. Cooper-Thomas and Anderson (2002) conducted a survey of new recruits entering the British army. The study investigated the affect of socialisation on attitude and information acquisition. Surveys were conducted on day one, the end of week four, and at the end of week eight. The study used Jones (1986) thirty item scale to measure the use of socialisation tactics. Modifications were made the phraseology used in the questions as a pilot study showed some of the items were too complex. For example the collective item "In

the last six months, I have been extensively involved...” was changed to “During my training, I have been frequently involved...”. Orpen’s (1995) study surveyed business graduates from one university in relation to socialisation tactics in the initial months at the new jobs. Three years later the same graduates were measured for career success and satisfaction.

Morrison (1993) conducted a survey of newly appointed accountants in five accounting firms. The participants were surveyed at two weeks after orientation, at three months and again at six months after entry. The study concluded that newcomers engaged in a variety of information-seeking behaviours. These behaviours affected task mastery, role clarity and social integration at six months after entry. The use of a longitudinal survey in these studies likely reduced common method bias through multiple measures over time. However several of these studies used samples that were homogenous, each comprised of recent graduates of a university, all of whom were in a similar age bracket. Gruman et al (2006) surveyed students that were enrolled in a management program and on work placement. The survey gathered data on socialisation tactics, self-efficacy, proactive behaviours, and socialisation outcomes. Kim and Cable (2005) examined the link between socialisation tactics and person-organisation fit. Seven organisations were involved in the study, with two hundred and eighty three employee-supervisor pairs surveyed. The organisations varied from financial institutions to hospitals and advertising. Employees reported the socialisation tactics experienced and supervisors reported on proactive behaviours. King et al (2005) examined how socialisation tactics affected information technology professionals in relation to role conflict, role ambiguity, job satisfaction, commitment, and intention to quit.

Finally, a study by Allen (2006) measured the use of socialisation tactics and the affect on newcomer embeddedness and turnover. The study surveyed two hundred and fifty nine recently employed staff at a financial services organisation located in eighty two cities in the U.S.A. The main disadvantage of the cross sectional

research was internal validity. The potential for memory-related and common method bias increased due to gathering data at one point in time from one source. As a result the relationships discovered in the studies might be due to common method bias.

3.7.2 Virtual Team Socialisation Research Methods

One of the only studies that investigated the socialisation of virtual teams used case study as the methodology. Ahuja and Galvin (2003) conducted content analysis on e-mail communication gathered from members of a consortium of universities involved in the development of an artificial intelligence system. The study focused on the exchange of information in relation to tenure of position. The case study methodology facilitated access to detailed data, however generalisability was limited to the specific type of virtual team studied.

3.8 Conclusion

In order to address the issues raised in chapters two and three a continued emphasis was required on the social needs of information systems development. The development and application of methodologies, the establishment of a project team in the virtual environment, and the social constructs that supported an effective virtual ISD team all required attention. Given the trends in organisational team working, there were calls for further research in the area of team socialisation and more specifically in virtual team socialisation (Saks and Ashforth 1997; Anderson and Thomas 1996; Wanous et al. 1984). Research in virtual team socialisation was only beginning to emerge (Long et al. 2005; Ahuja and Galvin 2003).

This chapter reviewed the socialisation literature in relation to the virtual team environment and more specifically within the context of virtual information systems development. The literature suggested that the appropriate application of socialisation tactics had the potential to benefit the ISD team in the virtual context. Similarly the literature presented in chapter two indicated the appropriateness of ISD methodologies to the virtual team context. The following chapter explores the characteristics of a theoretical working framework for successful information systems development by virtual teams.

The following section presents two tables that chronologically summarise the literature contained in chapters two and three.

3.9 Literature Review Summary Tables

Table 3-1: I.S.D Literature & Virtual Team Literature

Year	Author(s)	ISD Literature	Year	Author(s)	Virtual Team Literature
2008-2006	Ketikidis et al	Information system use	2008-2006	Herbsleb	Coordination in virtual teams
	Kautz et al	Problems in ISD		Bergiel et al	Advantages & Disadvantages
	Ovaska & Stapleton	Requirements engineering		Powell et al	Team member Commitment
	Ehrlich & Chang	Global software teams		Oertig & Buergi	Cross-culture in virtual teams
				Peters & Manz	Virtual team collaboration
				Horwitz et al	Virtual team effectiveness
				Jackson et al	Electronic mail vs face-to-face
				Ocker & Fjermestad	Virtual team communication
2005-2004	Kiely & Fitzgerald	ISD methodology usage	2005-2004	Komi-Sirvio & Tihinen	Virtual ISD
	Coleman	ISD in practice		Cramton & Webber	Relationships in virtual teams
	Ovaska	Requirements gathering		Martins et al	Virtual teams
	Ovaska et al	Role of ISD methodologies		Agerfalk et al	Distributed software development
	Hoffer et al	Systems Analysis and Design		Piccoli et al	Effectiveness in virtual teams
	Cusumano	Software business		Yang & Tang	Team structure and performance
	Sakthivel	Virtual ISD		Powell et al	Virtual teams
	Standish	ISD success		Lemon & Sahota	Organisational culture and innovation

Year	Author(s)	ISD Literature	Year	Author(s)	Virtual Team Literature
2003-2000	McManus & Wood-Harper	ISD project management	2003-2000	Hinds & Weisband	Knowledge sharing in virtual teams
	Avison & Fitzgerald	ISD methodologies		Ahuja & Galvin	Socialisation in virtual teams
	Avison & Fitzgerald	ISD methodologies		Massey et al	Time in virtual teams
	Mathiassen & Purpao	Systems Developers		Gonzalez et al	Effectiveness in virtual teams
	Umble et al	ERP success and failure		Kayworth & Leidner	Virtual team leadership
	Glass	Software Engineering		Herbsleb & Mockus	Communication in virtual teams
	Ovaska et al	Coordination in ISD		Jiang & Klein	Effectiveness in teams
	Huisman & Iivari	ISD methodologies		Mannix et al	Conflict in virtual teams
	Stapleton	Social setting of ISD		Walther	Time effects in virtual teams
	Peterson et al	ISD success and failure		Mockus & Herbsleb	Identifying Expertise
	Akkermans & Van Helden	ERP success and failure		Mortensen & Hinds	Boundaries in virtual teams
	Vaughan	ISD success		Kraut et al	Proximity in virtual teams
	Glass	Creativity in Software		Moon & Sproull	Virtual teams
	Avison et al	ISD in practice		Kraut et al	Visual cues in collaborative tasks
	Truez et al	ISD Methodologies		Armstrong & Cole	Distance in virtual teams
	Stapleton	ISD in practice		Kanawattanachai & Yoo	Trust in virtual teams
Fitzgerald	ISD methodologies	Kiesler & Cummings	Distance in virtual teams		
Standish Group	ISD success	Espinosa et al	Coordination in virtual teams		

Year	Author(s)	ISD Literature	Year	Author(s)	Virtual Team Literature
2003-2000	Mumford	Socio-Technical ISD	2003-2000	Burke et al	Cohesion in virtual teams
	Aladwani	Social integration in ISD		Cramton	Mutual knowledge in virtual teams
	Nandhakumar & Avison	ISD methodologies		Yoo & Alavi	Cohesion
	Dubé & Robey	ISD in practice		Carmel & Agarwal	Distance in virtual teams
	Herbsleb & Grinter	ISD methodologies		Manzevski & Chudoba	Global virtual teams
	Iivari et al	ISD methodologies		Lipnack & Stamps	Virtual teams
	Iivari & Maansaari	ISD methodology usage		Cramton	Virtual teams
	Fitzgerald	ISD methodology usage		Faraj & Sproull	Expertise in virtual teams
				Goodman & Wilson	Socialisation of teams
				Katzenbach & Smith	Virtual team discipline
99-95	O'Brien	ISD in practice	99-95	Ratcheva & Vyakarnam	Virtual team formation
	Ciborra	ISD methodologies		Caldwell & Koch	Virtual teams
	Forfás	E-commerce		Carmel & Agarwal	Distance in virtual teams
	Introna & Whitley	Against method-ism		Wellman	Virtual teams
	Chatzoglou & Macaulay	Requirements gathering in ISD		Carmel	Virtual teams
	Clegg et al	Human factors of ISD		Nandhakumar	Trust in virtual teams
	Wastell	ISD methodologies		Jackson	Virtual teams
	Gill	Human centred ISD		Warkenton & Beranek	Communication in virtual teams
		Jarvenpaa & Leidner	Trust in virtual teams		
		Furst et al	Virtual team effectiveness		
		Howard	Communication		

Year	Author(s)	ISD Literature	Year	Author(s)	Virtual Team Literature	
99-95	Fitzgerald	Formal ISD methodologies	99-95	Martin	Communication	
	Russo et al	ISD methodologies		Hollingshead	Transactive memory in virtual teams	
	Klein & Hirschheim	ISD methodologies		Ocker et al	Communication	
	Iivari & Hirschheim	ISD methodologies		Warkentin et al	Virtual teams	
	Avison & Fitzgerald	ISD methodologies		Gruenfeld et al	Familiarity in virtual teams	
	Mumford	ISD methodologies		Chidambaram	Virtual teams	
	Brooks	Mythical man month		Kraut & Streeter	Coordination in ISD	
	Fitzgerald	ISD methodology adoption		Perry et al	Process Improvement	
	Avison	ISD methodologies		94-90	Strauss & McGrath	Task type and performance
	Clegg et al	Software Development			Tan	Mutual understanding
	Falkenburg et al	IS concepts			Sproull & Kiesler	Communication
	Bennets & Wood-Harper	ISD Methodologies			Walz et al	Knowledge acquisition and sharing
	Lyytinen & Robey	Learning failure in ISD			Nohria & Eccles	Virtual teams
					McKenny et al	Communication
94-90	Wynekoop & Russo	ISD Methodologies	80's-60's	Fusell & Krauss	Coordination	
	Baskerville et al	ISD methodologies		Bostrom	Communication	
	Iivari	ISD methodologies		Demarco & Lister	Productive teams	
	Stage	ISD methodologies		Vitalari	Expertise	
	Hirschheim et al	ISD as social action		Daft & Lengal	Media richness	
	Hirschheim & Klein	ISD methodologies		Wegner	Transactive memory	
80's-60's	Lyytinen & Hirschheim	ISD as rational discourse	Drucker	Technology and society		
	Hirschheim & Klein	ISD methodologies				

Year	Author(s)	ISD Literature	Year	Author(s)	Virtual Team Literature
80's-60's	Checkland	ISD methodologies	80's-60's	Van Maanen & Schein	Socialisation
	White & Leifer	ISD success		Short et al	Social psychology
	Zuboff	ISD and society		Applbaum et al	Communication
	Curtis et al	ISD in practice		Churchman & Schainblatt	Relationships

Table 3-2: Socialisation Literature

Years	Authors	Socialisation Research Topics
2008	Kowtha	Socialisation tactics
2007	Ashforth et al	Socialisation tactics
	Saks et al	Socialisation tactics
2006	Gruman et al	Socialisation tactics
	Allen, David	Socialisation tactics
	Cooper-Thomas, H D. & Anderson, Neil	Organisational socialisation
2005 - 2001	R. C. King, W. Xia, J.C Quick, & V. Sethi	Socialisation outcomes
	Long et al	Virtual team socialisation
	T. Y. Kim & D. M Cable	Socialisation tactics
	Filstad	Role models in organisational socialisation
	M. K. Ahuja & J. E. Galvin	Socialisation in virtual teams

	Hauter et al	Newcomer socialisation
	Cooper-Thomas H & Anderson, N	Socialisation tactics
	Morrison	Newcomer relationships
	Jablin	Organisational entry, assimilation and exit
	Glass	Creativity in Software Work
2000-1996	A. Griffin, A. Colella & S. Goparaju	Socialisation of teams
	T. Fogarty	Socialisation tactics
	Goodman & Wilson	Socialisation of teams
	R. L. Moreland & J. M Levine	Group socialisation
Years	Authors	Socialisation Research Topics
2000-1996	B. E. Ashforth, A. M Saks & R. T. Lee	Newcomer socialisation
	A. M Saks & B. E. Ashforth	Organisational socialisation
	B. E. Ashforth & A. M Saks	Socialisation tactics
	Anderson & Thomas	Group socialisation
1995-1990	Mignerey et al	Organisational entry
	Orpen	Socialisation tactics
	E. W. Morrison	Information seeking in newcomer socialisation
	C. Ostroff & S. W. Kozlowski	Mentoring and socialisation
	C. Ostroff & S. W. Kozlowski	Organisational socialisation
	V. Miller & F. Jablin	Organisational entry
	Levine & Moreland	Group Socialisation

1989- 1976	Schein	Organisational socialisation
	A. Reichers	Newcomer socialisation
	G. R. Jones	Socialisation tactics
	Wanous et al	Organisational socialisation
	Louis et al	Socialisation practices
	Moreland & Levine	Group socialisation
	Jablin	Organisational socialisation
	J. Van Maanen & E. Schein	Organisational socialisation
	J. Van Maanen	Organisational socialisation

CHAPTER 4 THEORETICAL FRAMEWORK

4.1 Introduction

Over time, virtual teams emerged as an alternative to the traditional work setting. The use of this new work setting grew and virtual team theory developed alongside. Chapter two, section 2.5.2 described some of the problems that virtual teams faced and sections 2.5.3 - 2.5.5 presented several theories that were developed to relieve these problems. The literature clearly highlighted the importance of communication, collaboration and cohesion between virtual team members. However, each of those was difficult to manage effectively in the virtual context. The application of this new work setting to the ISD context became increasingly popular in response to changing technologies and resource allocation problems described in section 2.5.1.

4.1.1 Virtual ISD

The literature suggested that Virtual ISD involved a diverse team (section 2.5.1.1), with a skilled leader (section 2.5.1.2), engaged in work processes (section 2.5.1.3) to develop an ISD with some control structures in place to ensure the team worked effectively (section 2.5.1.4 and 2.5.2.3). Despite the popularity of virtual ISD teams, an integrated and synthesised theory which addressed the virtual team context, ISD, and the socialisation of members had not emerged.

4.1.1.1 The Process of ISD

In the ISD literature, few studies to date had investigated the use of ISD methodologies by virtual ISD teams. Chapter two presented the ISD methodologies

available to the practitioner and the application of those methodologies. Section 2.2.1 showed that functionalist information systems development methodologies did not offer a complete solution to ISD. Interpretive ISD methodologies offered an alternative approach which recognised both the social and technical aspects of ISD (section 2.2.2). A limited volume of recent research existed that had considered the social nature of ISD. This study aimed to add to that research and theory by addressing the social and procedural nature of virtual ISD. In practice co-located teams did not adhere to methodologies rigidly. Studies found some use of FSDM's (section 2.2.4), substantial pragmatic mixing of methodologies (section 2.2.5), and the creation of bespoke methodologies (section 2.2.6). There was also evidence of teams using no methodology. It was not clear from the literature how virtual ISD teams used ISD methodologies. To develop new theory it was necessary to understand the use of methodologies by virtual ISD teams.

4.1.1.2 The Social Needs of ISD

Section 2.3 highlighted the importance of the social aspect of ISD. Studies showed ISD failure occurring due to human factors (2.4.2). However, attempts to improve the development process continued to concentrate on tools and techniques that structured and controlled the process. The virtual context and the social nature of ISD needed further investigation. Information systems development required the project team members to exchange technical and business related information along with subjective user requirements. Some social information must be exchanged between team members to establish familiarity and function effectively as a team (sections 2.5.2.1 and 2.5.2.2). Despite this evidence, a coherent theory of successful virtual ISD had not emerged.

4.1.1.3 Virtual Context of ISD

The virtual team literature set out the effects of virtual work. Problems associated with interpretation, understanding, culture, media use, and social processes existed (section 2.5.2). Social theories described in sections 2.5.3, 2.5.4 and 2.5.4 such as media richness, social presence, transactive memory and social information processing had already been applied to the virtual context. Those theories addressed the use of electronic communication by virtual teams in terms of its appropriateness and long term effectiveness. The literature showed how important leadership, work processes, and structure and control (section 2.5.1) were to virtual teams. However some literature argued that virtual teams should have flexibility, with few controls in place and be organic such as the X-teams and other new product development teams. The structure and control required by virtual teams appeared in conflict with the business need for flexibility and freedom. In order to address this conflict a complex theory of successful virtual ISD teams was required. The theory had to consider all aspects and needs of the ISD, virtual and social contexts.

Chapter three reported on the organisational and group socialisation literature. Section 3.3 described the organisational socialisation theory developed by Van Maanen & Schein (1979) and the research that comprehensively tested the theory in the organisational environment. Socialisation helped to establish relationships through the sharing of collective experiences (section 3.5.1), the exchange of social information (section 3.5.2), the provision of support to new members through role models (section 3.5.3), the clear description of roles, responsibilities (sections 3.5.5 and 3.5.6), and experience and the acceptance of new members for their skills, knowledge and expertise (section 3.5.4). In the virtual context, section 2.5.2 highlighted the importance of social interaction between team members. Message interpretation (section 2.5.2.1), mutual understanding (section 2.5.2.2), recognition of cultural differences (2.5.2.3), media usage (section 2.5.2.4), and social processes in general all contributed to effective virtual team communication, collaboration and cohesion. Finally, ISD success appeared to rely upon a combination of process &

social needs in ISD (sections 2.4.1 and 2.4.2). Evidence suggested that an appropriate socialisation process and an appropriate ISD process would significantly improve virtual ISD success. Firstly, this could be achieved by nurturing social processes such as communication, collaboration and cohesion amongst team members using socialisation tactics. Secondly, the use of an ISD methodology to provide structure and control in the virtual context. However no theoretical framework existed which would enable the empirical investigation of the socialisation tactics and ISD methodologies in use in the virtual ISD context.

4.2 A Theoretical Framework of Virtual ISD

The literature showed how virtual ISD required a balance between managing the process of ISD and managing the social aspects of ISD. This balance could ensure effective collaboration, communication and cohesion for the purposes of developing an information system. This study proposed that to succeed in virtual ISD there had to be recognition of the difficulties of communicating electronically, and at the same time recognition of the complexities of developing an information system. The framework would need to propose the use of, an ISD methodology to address the process of ISD, and an appropriate socialisation strategy to address the social aspects of ISD (see Figure 4-1).

The framework had three dimensions, the process of ISD (section 2.2) (blue circle), the social needs of ISD (section 2.3) (green circle) and the virtual context (section 2.5) (red circle). Much was known in the co-located team literature of the ISD and social dimensions. However, little research had been published about these dimensions in the virtual context. The framework showed how socialisation had the potential to socially integrate and encourage interactions between the virtual team members. Social integration was highlighted as an important outcome of socialisation (sections 3.2.1.2 and 3.3.1.2) and for the success of ISD (section 2.4.2).

Social integration occurred through forming relationships, establishing familiarity, and exchanging social information. Ultimately the virtual team became cohesive and culturally aware over time (section 2.5.4). Social interaction encouraged communication and collaboration amongst virtual team members. It was of great importance in this study to apply a social theory that would relieve many of the negative effects detailed in section 2.5.2. Socialisation theory offered that relief. The framework also depicted the theory that an ISD methodology could provide a structured work process for the virtual ISD team to follow (sections 2.5.1.3, 2.5.2.3). Lastly the framework showed three competencies needed by the virtual team in order to perform effectively in the virtual context, communication (section 2.5.3), cohesion (section 2.5.4), and collaboration (section 2.5.5). The following sections deal with each dimension separately. It was clear that the ISD and social dimensions intersected with the virtual dimension thus creating interrelationships between the dimensions. The later section deals with these intersection relationships.

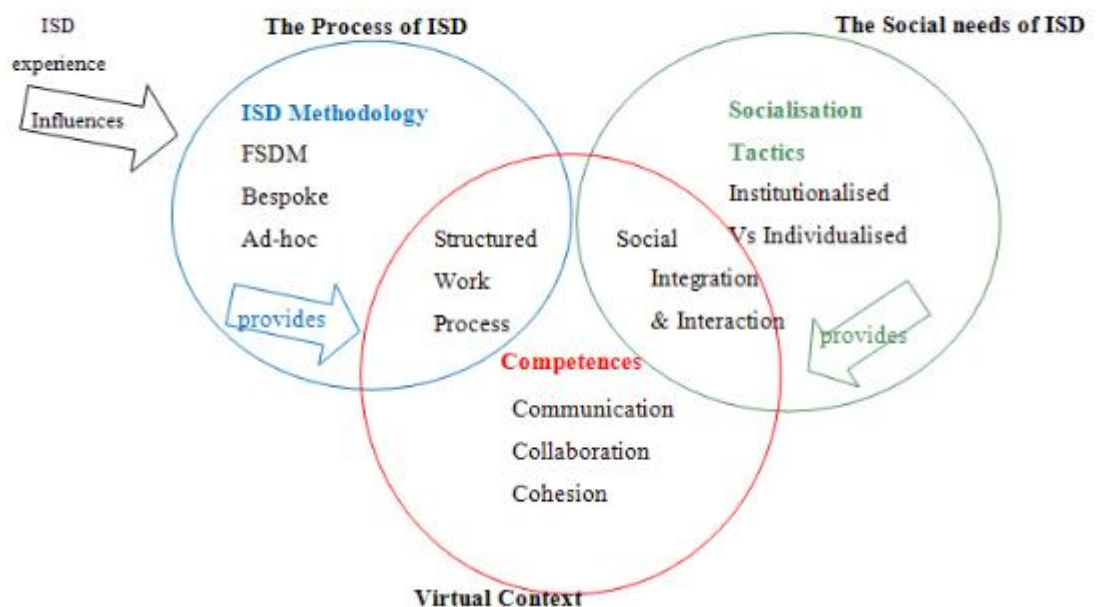


Figure 4-1: Virtual ISD Framework

4.3 The Process of ISD

Figure 4-2 represents the ISD dimension of the conceptual framework. Traditional FSDM's helped to manage the ISD process but did not address the social needs of ISD (section 2.2.1). As an alternative, the socio technical systems development (STSD) methodologies attempted to balance these two sides (section 2.2.2). However, few STSD methodologies were found in use. Research also showed that co-located teams rarely followed a single methodology as per the textbook. There was little evidence of a FSDM being rigorously followed (section 2.2.4). Instead ISD teams used methodologies in an ad-hoc manner, selecting appropriate tools or techniques during the project life cycle. Information system professionals proved to be creative, and in some cases adapted methodologies to the situational needs of each project (section 2.2.5). This type of development offered a contingent or situational approach to ISD. The methodology usage was determined during each individual project. Studies also found that the creation of a bespoke methodology prior to the project initiation was popular (section 2.2.6). A bespoke methodology was created by the organisation or team prior to project initiation. The bespoke methodology could be based on a FSDM, incorporate tools and techniques from several FSDM's, or a brand new methodology. The team then followed the bespoke methodology during ISD. Bespoke and ad-hoc differed in that a bespoke methodology was created prior to the project initiation, whereas ad-hoc mixing occurred during the project life cycle. Where a methodology was in use its primary purpose appeared to be process-oriented. The methodology supported the management, organisation, distribution, storage and presentation of information and tasks relating to the ISD project. Some studies also found evidence of no ISD methodology in use by the participants. All of those studies concentrated on co-located ISD teams. Little was known of the use of ISD methodologies by virtual ISD teams.

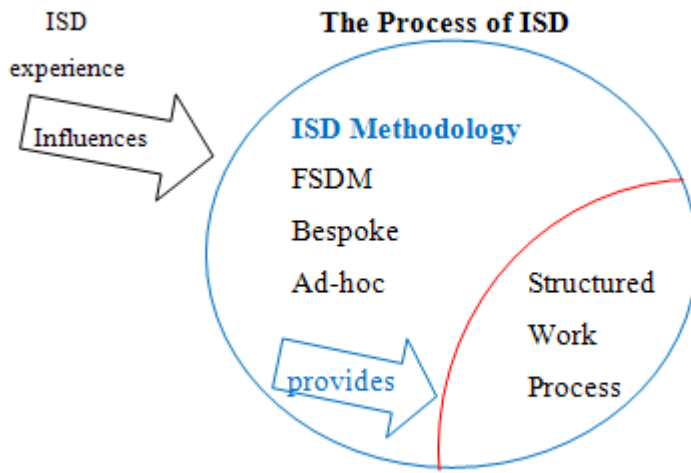


Figure 4-2: ISD Context

The first step in the development of a new virtual ISD theory was to assess the current use of ISD methodologies by virtual ISD teams. It was shown in section 2.2.4 that few co-located teams used FSDM's. Many teams reportedly pragmatically mixed several methodologies in an ad-hoc manner during the ISD process (section 2.2.5). Others created bespoke methodologies prior to the start of the ISD process (section 2.2.6). Consequently, the theoretical framework categorised ISD methodologies as FSDM's, bespoke methodologies and ad-hoc mixing.

Co-located teams had the advantage of face-to-face contact that supported negotiation, task allocation, problem solving and review. Virtual teams had the disadvantage of little or no face-to-face contact. This made message interpretation (section 2.5.2.1), mutual understanding (section 2.5.2.2), and other social processes (section 2.5.2.5) more difficult. The literature suggested that virtual teams needed additional structure and control to support them in communication, cohesion and collaboration (section 2.5.5.2). This suggested that virtual ISD teams would require more control and structure than co-located ISD teams. This structure and control could be in the form of the specifications, diagrams, charts, models, prototypes, and general documentation that were incorporated into many ISD methodologies. The use of a single ISD methodology (FSDM or Bespoke) was considered the most appropriate for the virtual team environment.

Figure 4-3 theorised that due to the virtual context of this study, evidence would be found of widespread use of bespoke methodologies and FSDM's. This theory proposed the following:

P1.1 A virtual ISD team will show evidence of a single ISD methodology usage.

The social needs of ISD required constant negotiation, interaction and interpretation between participants. Currently many ISD methodologies lacked the support for the social side of ISD (section 2.3). Ad-hoc mixing required knowledge of several methodologies and the time to tailor them together. In some co-located teams, development began with ad hoc practices which evolved

into common team practices. Virtual team literature indicated that team practices, supports and controls should be clearly established at the beginning of a project (sections 2.5.1.3, 2.5.1.4, and 2.5.2.3). Research indicated that the development process involved continuous intervention, improvisation, opportunism, interruption and mutual negotiation (section 2.2.5). In the virtual environment these social interactions were problematic (sections 2.5.3, 2.5.4, and 2.5.5) but achievable over time (2.5.4.1). Virtual ISD provided a solution to resourcing, cost and time constraints (section 2.5.1). The time needed to tailor a methodology could exacerbate the issues in virtual teams and negate their benefits.

It was therefore important to test whether ad-hoc mixing of methodologies was a common practice in virtual ISD teams. Communication, social interactions and mutual understanding were essential when using a methodology (section 2.2.4). Choosing appropriate tools and techniques during development whilst located separately could prove problematic (section 2.5.1). The transfer of complex information was found to be extremely difficult for virtual teams. The idea that team members with little familiarity or mutual understanding could successfully evaluate various methodologies and make a decision on which methodology was appropriate at each stage of the ISD process was not supported by the virtual team literature. Teams that had history had a greater understanding of roles and their social and professional suitability was already proven (sections 2.5.3.1, 2.5.4). In teams that had some history as shown in co-located teams there could be the ability to mix methodologies. However, virtual teams formed and disbanded as the needs arose; few teams were re-used thus losing the established history. ISD literature did emphasise the use of ad-hoc mixing of methodologies in co-located teams. Some research did indicate the shifting of methodology usage during requirements gathering by a multi site project (section 2.2.5). However, this study theorised that based on the extensive research on virtual team effectiveness, the virtual ISD environment was not conducive to the successful ad-hoc mixing of methodologies. Some adjustment to the ISD

methodology in use would be expected however the tailoring described in section 2.2.5 would not be in evidence.

P1.2 A virtual ISD team will not engage in the mixing of ISD methodologies during a development project.

To further develop the theory, it was also necessary to consider why a FSDM or bespoke methodology would be chosen for use. One antecedent emerged from the literature that may influence the choice of methodology; years of experience. Indications in the literature (section 2.2.5) were that ISD professionals with years of experience adapted and created their own methodology. ISD professionals with few years of experience in ISD relied upon a FSDM. It was theorised that a similar relationship could exist in virtual ISD teams. Those teams that lacked experienced members in virtual ISD might be more likely to rely on a formal systems development methodology.

An FSDM offered a set of steps that all team members followed. Mutual understanding of project related information could be reached by using an ISD methodology (section 2.5.2.2). In contrast, teams with experienced virtual ISD members might be more likely to mix methodologies in an ad-hoc manner. However, it was determined in proposition 1.2 that those teams would not be successful as the virtual context required structure and formality. Consequently figure 4.3 does not show experienced and successful virtual ISD teams engaged in ad-hoc mixing. It was theorised that teams with experienced virtual ISD members would have the knowledge to create their own bespoke methodology suitable to the development taking place. Bespoke methodologies offered the flexibility of a contingent approach whilst also providing structure and control to the virtual ISD context. Prior to the project initiation, a new methodology could be created or an existing bespoke methodology used. Some organisations used their own bespoke methodology for each project (section 2.2.6). This provided a familiar set of steps, a common language, and a methodology tailored to the

needs of the development taking place. Figure 4.3 depicts the relationship between the experience of the team and the type of methodology in use.

P1.3 Virtual ISD teams with inexperienced members will use a FSDM.

P1.4 Virtual ISD teams with experienced members will use a bespoke methodology.

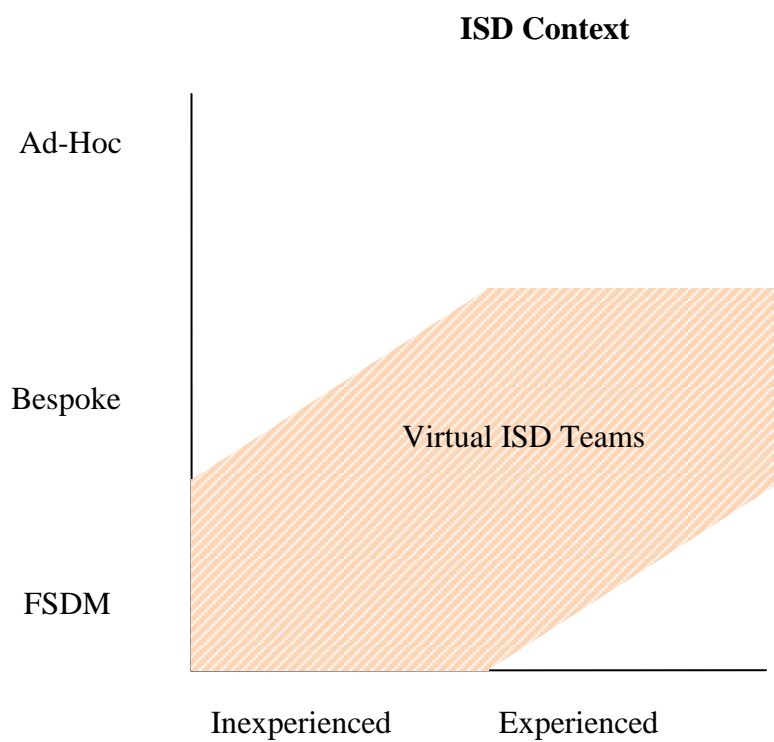


Figure 4-3: ISD Context

ISD methodologies (FSDM, Ad-hoc, or Bespoke) offered a distinct way of structuring the ISD process in the virtual context. Section (2.5.1) indicated the importance of work processes, mutual understanding and clarity of task allocations and responsibilities. An ISD methodology had the potential to alleviate some of the process difficulties of working virtually (section 2.5.2). Historically, ISD methodologies (section 2.2) served to improve schedules, the organisation of tasks and aimed to formalise the process. This need did not change over the last forty years. However, further needs arose as outlined in the social needs of ISD (section 2.3). These included social interaction, mutual understanding, and communication practices amongst team members. The literature indicated that virtual ISD teams needed structure and formality for mutual understanding (section 2.5.2.2), cultural awareness (section 2.5.2.3) and cohesion (section 2.5.4). This theory proposed that virtual teams who utilised an ISD methodology would do so for the purpose of structuring the ISD process.

P1.5 Where proposition 1.1 is shown to be true, the chosen ISD methodology will be used to structure the ISD process.

The intention of the five propositions was to address the gaps in the literature concerning the extent to which methodologies were used by virtual ISD teams and in what circumstances an ISD methodology was used. The following section presents the propositions relating to the socialisation of virtual ISD teams.

4.4 The Social needs of ISD

Section 2.4.2 described the importance of social interaction for the success of ISD. Research showed that interactions with peers and superiors were particularly important for uncertainty reduction (section 3.2.1.1). Newcomers

were dependent on effective communication with others at the earliest stage of entry. An early study showed that daily interaction (social interaction) with peers was the most important factor in helping newcomers to feel effective. The literature in these sections showed how essential the social side of ISD was to its success. Many projects failed due to social rather than technical or process reasons. Sections 2.5.3, 2.5.4, and 2.5.5 set out the problems of communication, cohesion, and collaboration encountered by virtual teams. The lack of verbal and non-verbal cues that added meaning and context to a message was of primary concern. Without these cues, messages were easily misinterpreted and misunderstood. Reduced social presence due to the virtual context impaired interpersonal relationships. The reliance on electronic communication created problems in the exchange of complex ambiguous information. Virtual teams that lacked cohesion did not perform interdependent tasks as well as those that were cohesive. Mutual understanding and familiarity with team members was essential. Virtual teams had difficulty identifying team membership, and the location of expertise or skills within the team. Collaboration at a distance was harder to achieve. Social problems in ISD teams were well documented; similarly social problems in virtual teams were well documented. Theory to address these problems was lacking.

Section 3.2 described how organisational socialisation helped employees to reduce the uncertainties and adapt to a new organisation, coordinate with colleagues, and become familiar with their surroundings and work environment (social integration). Section 3.4 set out the theory of workgroup socialisation, through which team members became familiar with the practices and expectations of working in a new team. Socialisation aimed to socially integrate newcomers to the organisation or work group so they could perform effectively in their job role. Much of the organisational literature assumed that socialisation only occurred between the organisation and the individual. This in fact was not necessarily the case; socialisation also took place between the individual and the team within the broader organisation (sections 3.2 and 3.4). Socialisation

occurred through an organisationally driven process such as socialisation tactics, and by the individual seeking out information. Given the current trends in organisational team working, there were calls for further research in the area of team socialisation and more specifically in virtual team socialisation.

Section 3.3 set out the theory of socialisation tactics as proposed by Van Maanen and Schein (1979) and later developed by Jones (1986). The theory comprised of six dimensions of socialisation tactics. Each dimension consisted of a bipolar continuum: collective-individual, formal-informal, sequential-random, fixed-variable, serial-disjunctive, and investiture-divestiture. Sections 3.5.1 through 3.5.6 contained detailed descriptions of each dimension as it applied to the virtual ISD team context. Collectively the choice of tactics determined the socialisation strategy an organisation had in place. Section 3.3.1.1 set out Jones' (1986) classification of socialisation strategies see Figure 3-1. Those strategies were included in the research framework as potential socialisation strategies in use by virtual ISD teams (Figure 4-4).

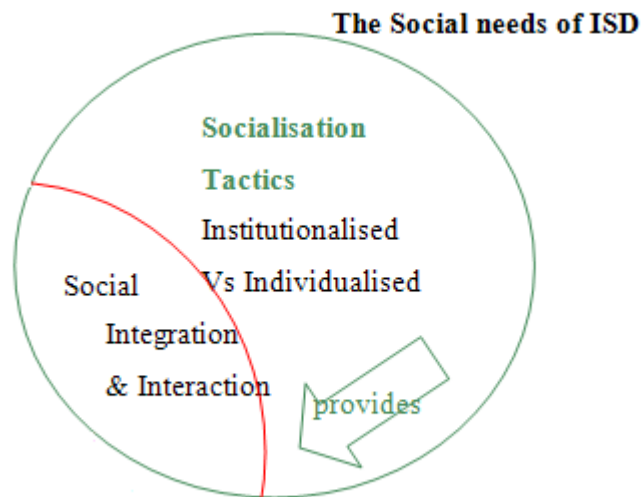


Figure 4-4: Social needs of ISD

4.4.1 Institutionalised Tactics in the Virtual ISD team

Section 3.3.1.1 described a study that established a link between organisational structure and the type of tactics used by an organisation. Institutionalised tactics were positively linked to mechanistic or structured organisations. Individualised tactics were positively linked to less structured organisations. Institutionalised tactics were found to be functional and a means to place controls over the newcomers' attitudes and behaviour. An institutionalised socialisation strategy promoted conformance to work place norms, compliance to the work place procedures, and assimilation into the work place. This strategy utilised peers and supervisors as active participants in the socialisation process. Behavioural and role adjustment outcomes such as uncertainty reduction, compliance, loyalty, job satisfaction and commitment were associated to an institutionalised socialisation strategy (section 3.3.1.2). This type of strategy was considered appropriate to both the individual employee and the team environment. The application of Van Maanen's (1979) organisational socialisation theory to the ISD team environment in section 3.5 showed that an individualised socialisation strategy was not wholly appropriate for a team environment. Individualised tactics did not encourage interaction with peers, supervisors or mentors in a decisive way, rather the individual was left to "sink or swim". An individualised socialisation strategy was thought to promote self direction, and independence and a lack of conformance to work place norms. Divestiture and disjunctive tactics encouraged self direction in terms of individual creativity and innovation. These outcomes though beneficial and important for the development of new and innovative information systems could be encouraged and instilled in team members through alternative methods. The core benefits of institutionalised tactics were the provision of structures to encourage social integration and interactions such as effective communication, cohesion and collaboration between team members particularly at the crucial stage of team formation. In contrast individualised tactics did not provide any support to the team members in finding their way in the virtual environment. Consequently research in section 3.5 indicated that

institutionalised tactics were important for team based work, and that individualised tactics could lead to ineffective work processes in the virtual ISD team environment.

This theory built upon the existing work theorising that structure and conformance to team norms and procedures was important to virtual teams whilst also recognising the importance of learning and innovation (section 2.5.1). An institutionalised approach was seen to address both the need for structure and the need to foster the exchange of knowledge to promote innovation. Institutionalised socialisation could encourage virtual team members to become more socially integrated thus having the ability to interact and exchange knowledge more effectively. Less structured organisations had fewer management hierarchies and role divisions, and less bureaucratic procedures thus a less structured socialisation process was appropriate. In some circumstances, virtual teams could be considered less structured organisational forms. In the general virtual team context less structure was demonstrated by the flexibility of membership, formation, wide span of control, and the use of resources (section 2.5). In contrast virtual ISD teams showed the need for leadership, clarity of roles and responsibilities, and structure (section 2.5.1). Even the highly unstructured X-teams showed use of a collective training program and encouragement of establishing connections and identifying expertise similar to serial tactics. Despite research showing that less structured organisations used individualised tactics (section 3.3.1.1); this study suggested that institutionalised tactics applied to the virtual team context should not impede the flexible nature of virtual teams. This study suggested that the use of institutionalised tactics would socially integrate the team members thus improving the shared understanding, and interpersonal relationships formed in a virtual team and the likelihood of success (see Figure 4-5).

The application of specific organisational socialisation tactics to the virtual ISD team environment had yet to be investigated. Each category of tactics was

assessed in section 3.5 for appropriateness to the virtual ISD environment. Based on the literature and that assessment, the following theory suggested itself.

- Collective tactics encouraged cohesiveness and sharing of experiences (sections 2.5.2.3 and 2.5.4.2) supporting the theory of social presence (section 2.5.3.1).
- Formal tactics reduced role ambiguity, uncertainty of tasks (section 3.5.2), and had the potential to clarify virtual team boundaries and create awareness of cultural differences (section 2.5.2.3).
- Serial tactics supported the establishment of a transactive memory system (section 2.5.5.1), mutual understanding and familiarity (sections 2.5.2.3 and 2.5.4.2) and a network for accessing information from peers and mentors (section 3.2).
- Investiture tactics recognised the importance and worth of each IT professional which encouraged the newcomer to become embedded into the work setting (sections 3.5.4).
- When applied to the team context, sequential and fixed tactics may not be significant as virtual teams can exist for a short period of time thus the importance of role progression may be more organisationally based. However, virtual teams could require the formality and structure provided by sequential and fixed tactics in order to clarify roles and responsibilities in the project team (sections 3.5.5 and 3.5.6).

4.4.2 Individualised Tactics in the Virtual ISD team

Based on the literature it was not envisaged that individualised socialisation tactics would be appropriate for the virtual team environment. Individualised

tactics lacked formality, clarity of roles, and created an individualised environment that was not considered appropriate for the virtual ISD team. Virtual ISD required an interdependent, integrated environment. Individualised tactics did not support the structure, control and deliberate social integration required by virtual ISD teams. For example individual tactics encouraged self directed socialisation which led to independent employees unsuitable for a team environment (section 3.5.1). Informal tactics placed the responsibility of socialisation, and training firmly with the individual. They had to seek out information and support from other members, something which can take time and additional effort (section 3.5.2). Disjunctive tactics provided no role models or mentor to the new recruit (section 3.5.3). This promoted self interest and individual growth unsuitable for the team environment. Divestiture tactics sought to reject the individual's personality and attitudes through negative feedback. This tactic developed an individual whom questioned their ability and found new ways to approach their work. This approach was considered inappropriate to the ISD team environment as research suggested that ISD professionals benefited from positive feedback relating to their ability, attitude and personality (section 3.5.4). Random tactics offered no information regarding role progression. Individuals were not aware of the steps involved to progress through the roles in an organisation. Consequently each employee was treated as in individual rather than having a collective approach that clearly stated the steps for each role. In a team environment the knowledge that each member had progressed through specific steps to arrive at a role was important (section 3.5.5). Variable tactics meant that there was no timetable for role progression. Similar to random tactics, the lack of timetable further defined socialisation at an individual level (section 3.5.6).

The following propositions were theorised:

P2. Virtual ISD teams use institutionalised socialisation tactics over individualised socialisation tactics.

P2.1 Virtual ISD teams use collective tactics over individual tactics.

P2.2 Virtual ISD teams use formal tactics over informal tactics.

P2.3 Virtual ISD teams use serial tactics over disjunctive tactics.

P2.4 Virtual ISD teams use investiture tactics over divestiture tactics.

P2.5 Virtual ISD teams use sequential tactics over random tactics.

P2.6 Virtual ISD teams use fixed tactics over variable tactics.

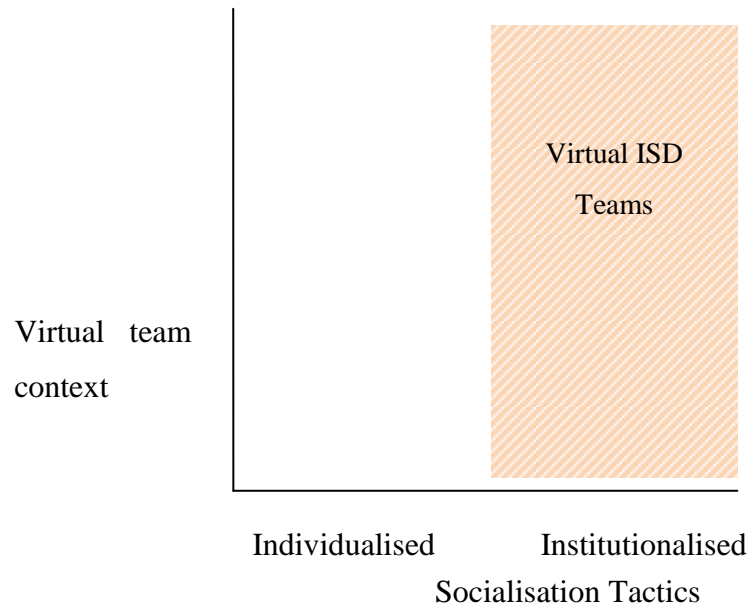


Figure 4-5: Socialisation tactics and the virtual ISD team context

4.5 Virtual Context

The literature demonstrated that there were significant implications to working virtually (section 2.5.2). Messages were frequently misinterpreted (section 2.5.2.1), a lack of mutual understanding was common (section 2.5.2.2), and cultural differences existed (section 2.5.2.3). A lack of social presence was known to create problems with the exchange of complex ambiguous information (section 2.5.3.1). The design of a new information system relied upon the successful exchange and interpretation of complex and uncertain information. The lack of social presence in virtual ISD teams presented a serious threat to the success of ISD. Media richness theory suggested that specific modes of communication were appropriate for specific purposes (section 2.5.3.3). Face-to-face communication was seen to establish strong links between communicators. Those links then helped in subsequent electronic communications. Social information processing theory proposed that over time virtual team members would communicate effectively (section 2.5.4.1). ISD projects commonly operated under strict time constraints and project schedules. Virtual ISD teams formed for a business purpose and dissolved upon fulfilment of that purpose. Those teams may not have the time needed to reach effective communication levels. This was particularly significant where team members had not worked together on previous occasions. Transactive memory theory encouraged the development of a shared memory to alleviate team member information overload (section 2.5.5.1). ISD involved stakeholders in a variety of specialised domains. Face-to-face access to those stakeholders in co-located teams supported the theory of transactive memory. In virtual ISD teams the establishment of transactive memory could be harder due to team boundary disagreement (section 2.5.4.2) and to the lack of face-to-face contact. Virtual teams required structure to encourage social interactions leading to mutual understanding through the exchange of contextual and task information (section 2.5.2.2). They also required roles and responsibilities to be clearly defined (section 2.5.1), team members to know the appropriate media to use

(section 2.5.2.4), and the location of expertise and skills within the team (section 2.5.2.2). Virtual teams also needed members to be socially integrated so that team culture, norms and customs were familiar thus increasing social presence.

Each of these theories contributed to the development of a new virtual ISD framework. From these theories, three key areas of concern emerged for virtual ISD teams, communication (section 2.5.3), cohesion (section 2.5.4) and collaboration (section 2.5.5). Each of these areas would need to be supported either through the ISD or the Social dimensions of the framework. To function effectively in the virtual context a team must communicate, collaborate and be cohesive across a distance. Figure 4-6 shows the structured work process and social integration and interaction needed to perform in the virtual ISD context.

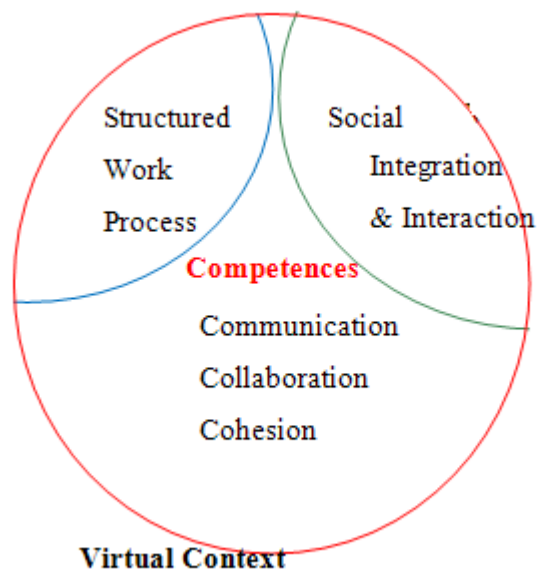


Figure 4-6: Virtual Context

In the ISD dimension the ISD methodology attempts to deal with the process of managing a complex task such as ISD (section 2.2). The benefit of using that process in the virtual ISD context was contained in the intersection between ISD methodology and virtual ISD (structured work process). Virtual teams required

greater structure and control to communicate and interact effectively (sections 2.5.1.3 and 2.5.1.4). Proposition 1.5 theorised that a single ISD methodology would be used to structure a project.

Socialisation aimed to socialise the team members thus counteracting some of the negative aspects of working virtually (section 2.5.2). The intersection in the framework between socialisation strategy and virtual ISD represented the possible benefits of socialisation to the virtual ISD team (social integration & interaction). By applying Van Maanen's (1979) socialisation tactics (sections 3.5.1 through 3.5.6), a virtual team could become more integrated (section 2.5.4) and interact more effectively (sections 2.5.3 and 2.5.5). It was speculated that this should improve the virtual ISD team performance. The following theory was proposed:

P3 The use of institutionalised socialisation tactics by virtual ISD teams will support social interaction and integration.

P3.1 Where evidence is found of institutionalised socialisation tactics in virtual ISD teams, there will also be evidence of effective communication.

P3.2 Where evidence is found of institutionalised socialisation tactics in virtual ISD teams, there will also be evidence of effective collaboration.

P3.3 Where evidence is found of institutionalised socialisation tactics in virtual ISD teams, there will also be evidence of a cohesive team.

4.6 Virtual ISD success

The literature described procedural and social factors that determined success or failure (sections 2.4.1 and 2.4.2). Early research showed that in an attempt to overcome high failure rates, ISD methodologies emerged to address such procedural issues as analysis and design, requirement gathering, information system complexity, project planning and coordination. However, continued failure led to the emergence of new ISD methodologies that sought to address the human factors required for success in ISD (section 2.2.2). The socio-technical viewpoint recognised the importance of the social side of ISD, but associated methodologies were not widely used. Human factors required significantly more investment in terms of time and effort. These human factors included communication, user participation, commitment, project planning, project team competence and coordination. Addressing these human factors in the virtual context had the potential to further exacerbate the failure rate. Poor social interaction and integration between virtual ISD team members could prevent effective participation, co-operation and discussion. Clearly all this suggested that the virtual context of modern ISD needed to be considered from a social perspective.

Section 3.3.1.2 identified key behavioural and role adjustments benefits of socialisation tactics such as reduced uncertainty, role ambiguity and improved social integration. Some of these benefits map directly to the negative affects of working in the virtual context. Boundary disagreement and conflict were common problems encountered by virtual teams (sections 2.5.4.2 and 2.5.2.5) and linked to uncertainty and ambiguity. A lack of social integration in virtual teams was seen to result in misattribution, miscommunication and difficulty with exchanging complex information in virtual teams (sections 2.5.2.1, 2.5.2.2, 2.5.2.5). Empirically, the links between socialisation tactics and factors such as performance, social integration, mutual understanding and reduced conflict were well established (section 3.3.1.2). However, few studies investigated the

socialisation process in place in virtual teams, and fewer still within the ISD context.

Firstly, this study theorised that the use of an ISD methodology by virtual teams would provide the procedural support required in both ISD and the virtual environment (section 4.3). Secondly, it was speculated that the use of appropriate socialisation tactics would encourage virtual team members to become socially integrated (section 4.4). Thirdly, it was proposed that the effective use of institutionalised socialisation tactics and an appropriate ISD methodology in this context would result in a greater likelihood of ISD success. The integration of these theories could inform and lead to successful information systems development in the virtual team environment. This led to the following proposition:

P4 A successful virtual ISD team will show use of a single ISD methodology (FSDM or bespoke) and institutionalised socialisation tactics (collective, formal, serial, investiture, sequential and fixed).

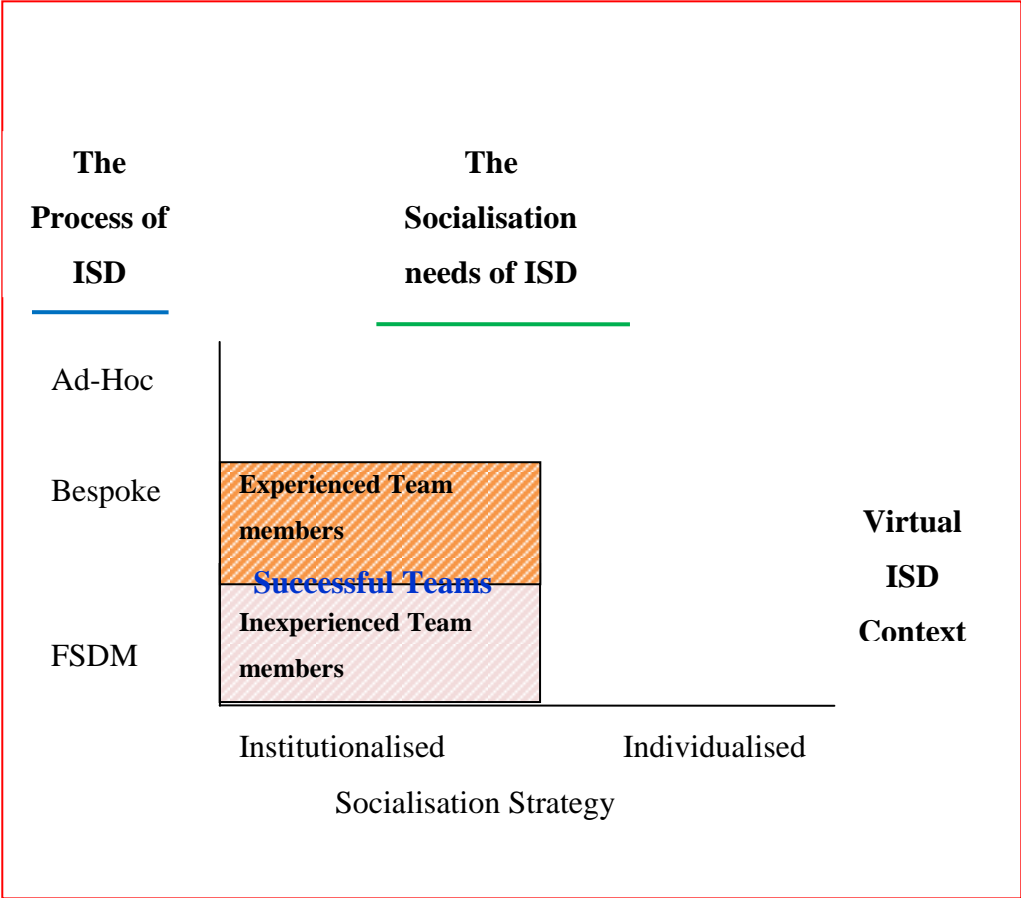


Figure 4-7: Successful Virtual ISD

Figure 4-7 presented an alternative view of the research framework. The ISD, social and virtual dimensions converge. The shaded area represents successful virtual ISD teams, using institutionalised socialisation tactics and either a bespoke or FSDM ISD methodology dependent on the teams level of experience. It was theorised that success could be achieved through the combination of an appropriate ISD methodology to support the procedural aspects of ISD; and an appropriate socialisation strategy to support the establishment of a socially integrated virtual ISD team. The left side of the graph depicted the use of ISD methodologies by experienced and inexperienced virtual teams (See Figure 4-4). In the context of virtual ISD it was theorised that those teams utilising a single methodology (i.e. a bespoke or FSDM) would be successful. The right side showed the socialisation tactics used virtual teams (see Figure 4-6). In the virtual team context it was theorised that those using institutionalised tactics would be successful.

ISD methodologies provided procedural support to the ISD process. Virtual teams required even greater support and control. It was theorised that where a virtual ISD team used an ISD methodology the process would succeed (section 2.4.1). That success would be seen in areas such as the schedule, appropriate design, testing, fulfilment of requirements and the budget. Institutionalised socialisation tactics aimed to socially integrate newcomers into an effective work unit. It was theorised that where an institutionalised socialisation strategy was used the virtual ISD team would succeed (section 2.4.2). That success would be evident in the effectiveness of a team's communication, collaboration and cohesion abilities. This suggested the following propositions:

P4.1 Where an ISD methodology is in use the project will succeed procedurally (budget, schedule, scope).

P4.2 Where an institutionalised socialisation strategy is in use the project will succeed socially (communication, collaboration, cohesion).

Four key propositions emerged in this theory of successful virtual ISD. Figure 4-8 presents each proposition in relation to the research framework.

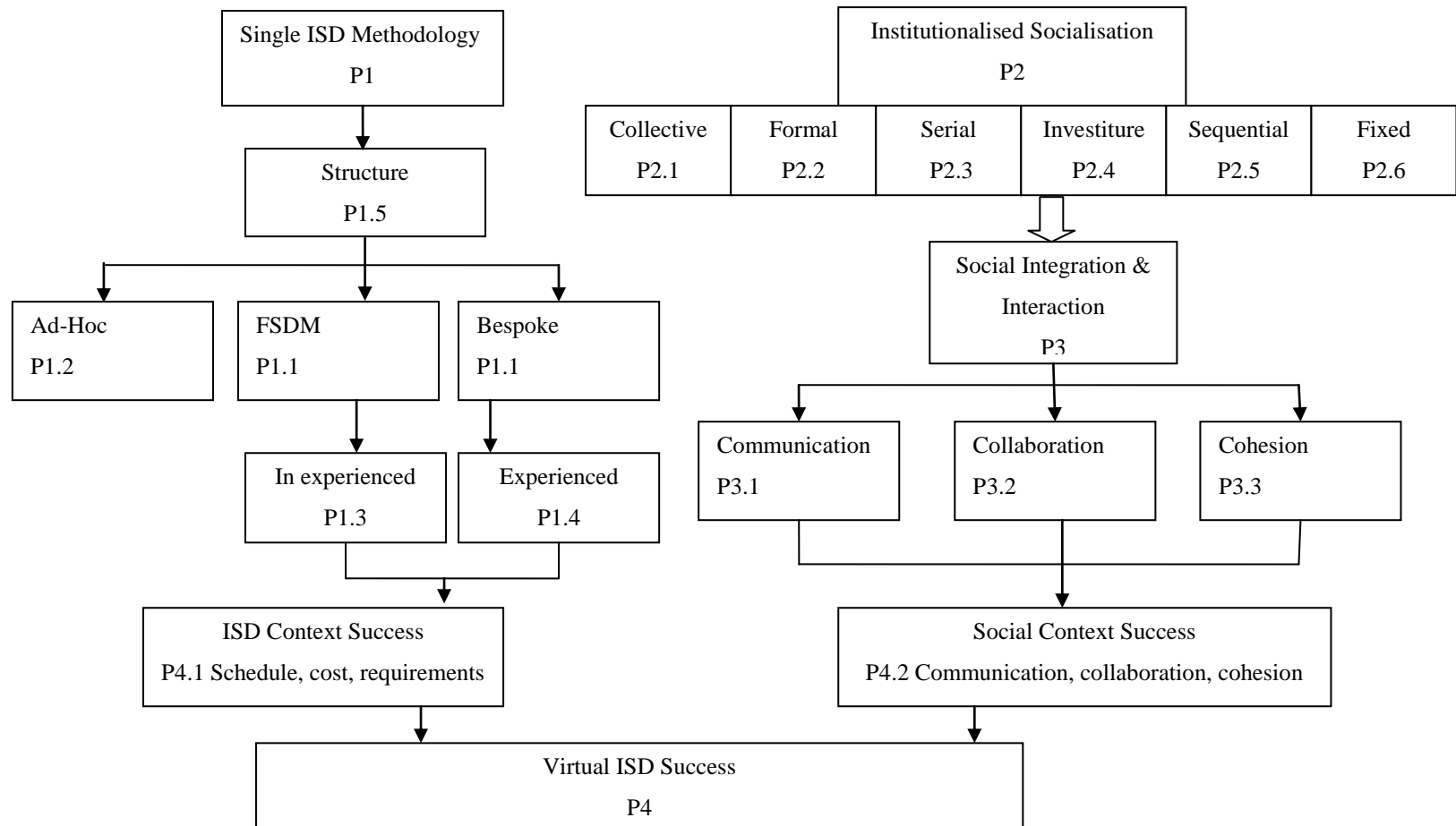


Figure 4-8: Research Framework Propositions

4.7 Conclusion

This chapter addressed areas that have traditionally received little attention in the literature but were relevant to the success of virtual ISD development. The framework developed from the literature was a theoretical framework that was then examined proposition by proposition. A research methodology was then selected to perform the testing. The following chapter addresses the research design employed by this study, detailing the method used and the consequent formulation of a survey.

CHAPTER 5 RESEARCH METHODOLOGY

5.1 Introduction

This chapter addressed the question of how to empirically test the propositions set out in chapter four. Prior to conducting the research it was important that the researcher was clear about their philosophical beliefs and their approach to the study (Falconer and Mackay 1999). Ontology concerned the beliefs about the 'real' world being researched. Ontologically the researcher considered that the virtual ISD team existed in a world where both the scientific process of development and the human process of team work sat side by side with equal importance. Epistemology concerned the theory of knowledge, especially in regards to methods, validity, and scope. The epistemological choices made by the researcher indicated the research approach undertaken for the study of a phenomenon. Therefore, it was important to consider from the outset what research approach was appropriate to the study.

At polar opposites were two epistemological directions; positivist and interpretivist. The dominant paradigm of positivism has had great success historically. Almost two decades ago Orlikowski and Baroudi (1991) conducted an empirical investigation into the methodological issues in the IS discipline. The findings showed that the positivist paradigm dominated (96.8%). Over a decade later Chen and Hirschheim (2004) report that the positivist paradigm continued to dominate with five out of eight journals occupied by the positivist approach.

The research question was the most important factor that determined the choice of research approach (Remenyi et al. 2003). The key research questions in this study sought to investigate virtual ISD teams. Firstly, the study needed to identify the habits of virtual ISD teams in relation to the use of ISD

methodologies and socialisation tactics. Secondly, the study wished to identify the relationship between these habits, and thirdly to examine the impact of these habits on the success of ISD projects. The following section presents the possible methods available for this study.

5.1.1 Methods

Positivists believed the world was measurable, controllable and explainable through an unbiased account of the world using an objective scientific method (Knox 2004). Ontologically, positivists viewed reality in an objective scientific manner that was independent from the social environment within which reality existed. Epistemologically, positivists verified theory by testing hypothetical propositions, with the aim of generalising the results to the wider population (Chen and Hirschheim 2004; Orlikowski and Baroudi 1991). This required the use of objective measurement methods to collect data in order to test hypothesis (Kaplan and Duchon 1988) add to theory and understand phenomena. For example, positivists commonly used the quantitative method of surveys (Chen and Hirschheim 2004). Burrell and Morgan defined the positivist approach as

“.. an epistemology which seeks to explain and predict what happens in the social world by searching for regularities and causal relationships between its constituent elements”. (Burrell and Morgan 1979).

Empirical tests conducted in the external world aimed to validate or reject hypothetical propositions. This assertion stemmed from the belief that the only way to collect information on the phenomena was through objective data as directly experienced through the senses.

The importance of establishing an appropriate research design was paramount to the success of any study. Positivism held the philosophical belief that objective facts were gained from direct experience or observation and this was the only knowledge available to science. This knowledge was largely based on quantitative data, gathered using rigorous data collection methods. Causal relationships were identified through empirical regularities and were then generalised to the greater population (Robson 2002). This objectivity was appropriate for testing the propositions contained in chapter four.

However, this study also considered the limitations of the positivist approach. Positivism prioritised the observable facts over and above the social aspects of environment within which they existed. A strict positivist approach may paint an incomplete picture of the phenomenon. The collection of some subjective data could add meaning and lead to greater understanding of the context of the phenomenon. In regard to this research, further insights into the use of ISD methodologies and socialisation tactics through subjective data gathered from team members could only lead to a more complete picture of the phenomenon. Traditionally the positivist approach focused on the measurement and analysis of specific stimuli within a controlled environment. The key stimuli measured in this study were ISD methodologies, socialisation tactics and ISD success.

5.2 Research Method Selection

Quantitative methods of data collection were synonymous with the positivist paradigm. These methods supported the gathering of objective data that sought to disprove or prove hypothetical propositions identified in the study. This type of approach was deductive, whereby the researcher developed a theory or proposition based on the literature and the research approach tested the hypothesis (Knox 2004).

The experiment method selected a sample and generalised the findings. The researcher subjected the phenomenon to a change or intervention and measured the impact whilst controlling all other factors that could influence the outcome during the experiment (Creswell 2003). Sections 2.6 and 3.7 detailed the research methodologies used by studies in ISD, virtual team, and socialisation research. In virtual team research the experimental method was used where teams in universities were formed for the purposes of the studies. This study aimed to extend the generalisability of the study by using real world organisational team members thus reducing the data base bias (Sears 1986). The experimental method was not appropriate for the investigation of organisational virtual ISD teams. Experiments required the researcher to control the stimuli through a designed environment. Using existing organisational teams meant controlling stimuli would not be possible. A survey method was considered the most appropriate and suitable for gathering data from virtual ISD teams.

5.2.1 Survey Method

The most popular quantitative research method found in both Orlikowski and Baroudi's (1991) and Chen and Hirschheim's (2004) studies was the survey. A survey provided a quantitative account of a sample population in terms of trends, attitudes and opinions. Where a random sampling method was in place, the researcher then generalised making a claim about the entire population (Creswell 2003).

Small and large scale surveys predominantly relied on self-reporting by the survey participants. The risk with surveys was that participants may inaccurately report their behaviour and attitudes thus leading to validity problems and common method bias. Large-scale surveys collected large quantities of data through questionnaires. This method was fast and convenient to many researchers. The questionnaire measured attitudes and opinions about events,

relationships, or behaviour. Structured measures were used in the questionnaire which provided specific choices in the answering of questions, and in some cases open ended questions allowed for expanded explanations (Miller 2001). To improve the validity of self reporting this study used existing well tested measures and additional information sources such as project managers and peers.

Surveys continued to be popular, however there were questions as to their suitability for studying organisational issues (Remenyi et al. 2003). One of the difficulties of the survey method was selecting a representative sample, due to access and other circumstances many researchers relied on non-probability samples that were not representative. Researchers criticised the lack of random sampling (Kraemer and Dutton 1991). However others highlighted the access problems associated with IS research (Mason 1991). To address this, researchers should strive to construct a sample that would allow the most generalisations to be made.

To construct an appropriate research instrument it was necessary to specify the type of data required to test the propositions. The propositions detailed in chapter four required the collection of data on virtual ISD teams, ISD success and the use of ISD methodologies and socialisation tactics. De Vaus (2001) identified this type of research as cross-sectional with the following as the basic elements:

- The cross-sectional design relied on existing variations in the independent variable(s) in the sample.
- At least one independent variable with at least two categories was present.
- Data were collected at one point in time.
- There was no random allocation to 'groups'.

This study sought to measure and explain the use of ISD methodologies and socialisation tactics by virtual ISD teams. The survey method was appropriate for this study. The measurements were to apply to a team therefore the survey method allowed access to team members located at a great distance from the researcher. It facilitated the collection and comparison of measurable data from several members of each participating team. The virtual nature of the target population in this study required administration of the survey to be online. The following section details the use of a cross-sectional study as chosen by the researcher.

5.3 Cross-Sectional Study

From the literature, little was known in practice about ISD methodologies or socialisation tactics in virtual ISD teams. This study explored the empirical validity of the theoretical framework presented in chapter four through propositions. Data on virtual ISD teams was gathered using a survey. The survey was administered at a single point in time. The data was then divided into groups for comparison. Project teams formed the basis for comparison and the unit of analysis in this study. The following sections set out the limitations associated with the cross-sectional design, the target population, and sample frame.

5.3.1 Limitations of a Cross-Sectional Study

A cross sectional design provided the means to describe the characteristics of a population. There were, however, methodological issues to consider when using this type of design. Internal validity referred to the situation where the logic and structure of a design did not allow the researcher to choose unequivocally one explanation of results. For cross sectional design the main threat to internal validity was the problem of establishing cause without a time dimension (De

Vaus 2001). At the data analysis stage, the researcher combated this threat by statistically removing the differences between groups so that they were as similar as possible. Similarity of groups made comparison and explanation of results easier. It was therefore extremely important to include in the research instrument all those variables that could statistically differentiate the groups under analysis. However, there was always the risk that a causal relationship was due to a variable that was not measured.

A longitudinal study would remove the threat of internal validity that the cross-sectional design posed. Research using longitudinal studies where data was collected on more than one occasion was detailed in section 3.7. The longitudinal studies recognised the time dimension of the socialisation process. For this reason, cross-sectional studies were limited by the lack of recognition for this time dimension. However a longitudinal was not appropriate for the virtual ISD context as the lifespan of each ISD project varied considerably. In a professional environment ISD teams existed for any period of time, short or long. Administering a survey at multiple points in time across many virtual ISD teams that vary in lifespan was logistically difficult for this study. Consequently, a cross-sectional design was more appropriate to this study. Sections 2.6 and 3.7 detailed research conducted using the cross sectional design. To accurately measure the socialisation tactics used, it was necessary to pick one point in time. For this study, that measurement took place upon completion of a recent ISD project. This allowed measurement of socialisation tactics and ISD methodology(s) used over the lifetime of the project. It also accommodated measurement of ISD success at the end of the project. For the purposes of this study one of the sample selection criteria was that the ISD project was completed within the previous twelve months. This criterion ensured details of the team's ISD methodologies and socialisation tactics were relatively recent memories.

It was also noted that a cross sectional design could provide knowledge indicating that a causal relationship did not exist. Eliminating variables as causes

held as much scientific importance as locating causes. External validity referred to the ability to generalise from the sample population. The sample had to represent the wider population in order to generalise. For a cross sectional design the sample had to be well selected for generalisation to be valid. The target population was considered in the next section.

5.3.2 Target Population

The target population had to be accessible, quantifiable and guided by the research questions (Balnaves and Caputi 2001). This study focused on the practices of virtual teams involved in the development of information systems. In order to assess the success of the ISD team and the use of socialisation tactics and ISD methodologies it was necessary to target virtual ISD teams as a unit. By targeting the team rather than the individuals comparisons could be drawn between teams of similar or differing characteristics. It was of great importance that this study targeted virtual ISD teams from the organisational world, rather than using research, student, or voluntary teams. Few studies as indicated in sections 2.6 and 3.7 investigated organisational virtual ISD teams. It was important to gain access to local and remote IS professionals in virtual ISD teams. As defined in section 2.5 a virtual team was defined as “a group of people who work interdependently with a shared purpose across space, time and organization boundaries using technology”. These teams could be located within the same or different county, country, or continent. For example, a team could comprise of four team members each located in Ireland, or each located in a different country across the world. The virtual team members had to have involvement in the development of an information system within the past twelve months. The dependent variable of ISD success required that only completed projects were surveyed. This ensured that the measures of time, cost, functionality, and quality could be answered accurately by project managers at the end of the project.

Section 2.5 described the historical progression of the ISD work environment. In the past development involved large teams that created complex information systems over a prolonged period. The more recent trend was small short term projects and the maintenance or customisation of off the shelf packages. This research targeted project teams that were involved in large scale IS development projects, small-scale maintenance IS projects, and those that fell in between these two extremes.

A constraint of this study was that not all systems development occurred through virtual teams. Therefore it was difficult to identify those organisations that partook in virtual development. Consequently, the virtual nature of the study considerably reduced the potential target population. The following section details the sample frame identified for the purposes of this study.

5.3.3 Sample Frame

The sample frame described the list of those teams that met the target population criteria. The goal of sampling was to obtain a sample that characterised the population it was designed to represent. To accomplish this goal two types of sampling existed, probability and non-probability. Probability sampling was the safest way to ensure the sample was representative. A probability sample also allowed you to perform statistical analysis on the data and generalise to the wider population. Each member of the population had an equal chance of being included in the sample. This type of sampling could only occur if a full list of the population was available. In this study, a probability sample was impractical as a list of the population members did not exist and access to the population was difficult (De Vaus 2002).

A non-probability sample allowed for the situation where the population defined by the researcher was neither easily accessible nor quantifiable. This meant that

each member of the population did not have an equal chance of being selected in the sample. Consequently, statistical analysis was limited and generalisation to the wider population was not possible. Obtaining a list of all population members was difficult to achieve in IS research. Kraemer and Dutton (1991) found that most research articles in their meta-research used non-probability samples.

This study constructed a representative sample of the population using purposive non-probability sampling (Robson 2002). Constructing a purposive sample involved the researcher selecting virtual ISD teams judged typical of the target population characteristics. In the absence of a clearly defined accessible sample frame of virtual ISD teams, the researcher utilised contacts in a wide range of organisations where it was known that virtual ISD teams were in use. The researcher also contacted other organisations with no links and these led to the identification of further virtual ISD teams. This strategy was sometimes used in information systems research (section 2.6.1), and often used in virtual team research (section 2.6.2) and socialisation research (section 3.7.1).

A total of 20 virtual ISD teams were presented with the survey, of which 15 became involved in the study. In several cases, teams were not forthcoming due to work commitments. In another case, the team was under represented as only two team members completed the survey. Contact with at least six other teams occurred, however due to the sensitivity of data, confidentiality of information, and difficulty with access they did not become involved.

The virtual ISD teams selected came from national to multinational companies, employing twenty five to one hundred and fifteen thousand people. The virtual ISD teams came from organisations specialising in a variety of professions ranging from manufacturing to financial institutions. Most of the participating teams were known to the researcher to be involved in virtual ISD and thus representative of the target population. In some cases, contacts in the positions of team leader or project manager were approached to gain access to virtual ISD

teams. The design of this study ensured that each organisation chose a team that represented the characteristics of the target population as set out in section 5.3.2. This ensured all project teams were familiar with virtual ISD and therefore had the ability to provide answers to the survey questions.

This study targeted ISD teams that met the following criteria:

1. Engaged in information systems development within the previous 12 months.
2. Existed across multiple locations.
3. Primarily using technology to communicate with each other.
4. A minimum of three team members per virtual ISD project team.

These criteria ensured that the target population was represented, memory recall was relatively recent, and a sufficient number of team members responded from each team (set out in section 2.6).

By targeting virtual ISD teams the following difficulties of access were encountered:

1. No list of companies that utilised virtual teams was available.
2. Not all virtual teams engaged in information systems development.
3. Not all virtual ISD teams had completed project in previous 12 months.
4. Access to a minimum of three team members including a project manager was difficult.
5. Access to a cross section of team members from all locations was difficult.

The following section describes the size of the sample yielded in this research.

5.3.4 Sample Size

A sample size of twenty teams was an aim of the study. However, due to the virtual nature of the study and the difficulties of access described in section 5.3.3 a sample size of fifteen teams was achieved.

Fifteen teams of varying sizes resulted in two hundred and fourteen potential respondents. The completion of sixty surveys gave a 28% return on that total figure. The sample size included ineligible and unreachable respondents. Consequently, the actual accessible sample of participants was significantly lower. The following formula was used (De Vaus 2002).

$$\text{Response rate} = \frac{\text{Number returned}}{\text{N in sample} - (\text{ineligible} + \text{unreachable})} * 100$$

Eight contractors included in the sample size were ineligible respondents. Unreachable respondents were those that had left the organisation, or had other work commitments, these represented eighty from the sample. The reduced sample size of one hundred and twenty six gave a return rate of 47.6%, which was considerably higher and reflected more accurately the number of people that were accessible and agreeable to partake in the study.

$$\frac{60}{214 - (8+80)} * 100 = 47.6\%$$

A minimum of three respondents per team was necessary to ensure representation. One participant from each team represented a project manager or team leader role. This facilitated access to information concerning the number of team members, their locations, project duration, scope, budget, and project

deliverables. This also ensured validity of the data gathered by comparing team member responses.

5.4 Data Gathering Techniques

Studies carried out in the area of socialisation theory (set out in section 3.7) have used both the cross sectional and longitudinal survey approaches. Since the development of the measures of socialisation tactics, the predominant research approach employed in this area was the survey. In line with this approach, research in the IS domain utilised surveys as the most common quantitative method (set out in section 2.6). The majority of studies carried out investigating virtual teams used online surveys (section 2.6). Due to the virtual nature of the teams targeted in this study it was necessary to administer the survey online. The alternatives were face-to-face interviews with participants no matter where they were located or telephone interviews across time zones. Neither of those options was suitable nor practical for this study.

5.4.1 Online Data Collection

The decision to administer the survey using the Internet allowed the researcher to gain access to a larger sample than interview or postal surveys offered. Contacting professional people in different time zones could be problematic. This study looked at ISD teams that had completed the ISD project; hence the team purpose was no longer operational. Consequently many team members moved on to other projects and were harder to access. An online survey improved the possibility of gaining access. Where possible the team leader requested original team members to complete the survey online in their own time. In some cases the link between the team leader and former team members

had lapsed. Consequently the sample size reduced as some respondents were ineligible or inaccessible as detailed in section 5.3.4.

It was possible to tailor the survey questions to the respondent, thus personalising the experience (Joinson and Reips 2007). Dynamic linking of questions reduced the time a respondent spent reading instructions and questions that were not relevant. Restrictions on the answers available for a given question ensured the numbers of spoiled answers were kept to a minimum. The enforcement of mandatory questions was simple and reliable. Context sensitive help defined by the research assisted the respondent throughout the survey. The virtual team's familiarity with electronic communication negated any potential computer literacy problems.

The self administration of the survey by the participants also catered for work commitments, time zones and availability of team members at a given time. ISD professionals worked to tight deadlines under budget constraints, therefore self administration provided them with the option to complete the questionnaire in their own time. Analysis was also supported through the provision of the data in a pre-coded format along with reports and cross tabulation. The following section introduces the research instrument and provides details on each section of the survey.

5.4.2 Research Instrument

The choice of a cross-sectional design using an Internet survey took into consideration the context of the study, the accessibility of the population, the need to describe current practices of virtual ISD teams, and the testing of new theory. The research instrument was structured according to the propositions and theoretical framework detailed in chapter four. A questionnaire introduction page detailed the purpose of the research and importance of participation. The

following briefly describes the three main sections contained in the questionnaire.

Section one of the instrument addressed the context and background necessary to frame the research and provide differentiating variables for accurate analysis. This section also allowed the participant to become familiar with the question structures and to get comfortable with the online survey environment. Some of the questions contained in this section were available to team leaders or project managers only. These questions pertained to the industry sector, the ISD project name and description, team size, number of locations, number of team members at each location, duration of project, completion of project in terms of time and budget, the use and adherence to a quality standard, and whether the project was considered a success. This was to ensure that the information was sought from the most appropriate person in relation to the project in general. It was envisaged that some members of a virtual team would not have the ability to answer these questions as they were outside the scope of their job role. Team leaders and project managers however would have the capacity to answer these questions. The online tool directed participants to the questions appropriate for their job category.

Section two gathered data on the information systems development process and the use of methodologies by virtual ISD teams. All respondents were asked these questions regardless of role or position held.

Section three gathered data on the use of socialisation tactics by virtual ISD teams. All respondents were asked these questions regardless of role or position held.

The following section provides greater detail on the measures used by the online survey.

5.4.3 Measurements

The propositions set out in chapter four determined the variables measured by the survey. This section describes the methods used to measure each of those variables. For some variables pre-existing validated measures were used to enhance method rigour. The purpose of this study was to investigate virtual ISD teams in practice. Therefore, all variables in this study were gathered and analysed at a team level. Individual contextual-level variables such as individual satisfaction, performance and commitment were outside the scope of this study. This ensured that the investigation would concentrate on the team as the unit of analysis. Team level variables could be difficult to measure directly through observation particularly in the case of virtual teams. The researcher relied upon individual self reported responses to the survey questions. Those responses were then aggregated into team-level measures through averages (Short, Piccoli, Powell and Ives 2005). Independent variables measured the use of socialisation tactics, and ISD methodologies by the virtual ISD teams. The dependent variable measured ISD success. Non-comparative scales were used in all sections of the questionnaire to measure one item at a time. Likert scales were used to measure the degree of agreement on a 1 (strongly disagree) to 7 (strongly agree) scale, or the degree of influence on a 1 (significantly) to 7 (insignificantly) scale. These scales measured the socialisation tactics in place and the use of methodologies by the virtual ISD team. Single-item scales were avoided where possible as reliability of such scales was poor (Lucas 1991). The following sections detail the questions and underlying theory behind the survey.

5.4.3.1 ISD Methodology Use

It was of great importance to clearly represent the use of systems development methods in the survey in order to avoid conceptual problems. The literature set out in sections 2.2.3 and 2.6 informed the development of the scale. Six items

were generated to measure the use of ISD methodology. Each facet of methodology usage was included in the scale. Research showed that bespoke methodologies represented a large percentage of development. The scale contained three levels of bespoke methodology usage. The three levels allowed for a bespoke methodology that was based on zero, one or more existing methodologies. The non use of a methodology was also included in the item list as research showed that some project teams did not use a methodology during development. The final item allowed for any other situation that the respondent deemed not to fit into the previous five items.

-
1. Commercial/Third party systems development methodology (e.g. SSADM)
 2. Internally developed systems development methodology based on one commercial methodology. (e.g. SSADM adapted)
 3. Internally developed systems development methodology based on more than one commercial methodology. (e.g. SSADM & RUP adapted)
 4. Internally developed systems development methodology not based on any commercial methodology. (Unique to your organisation)
 5. No formal methodology was used. (No method followed during development)
 6. Other
-

Table 2: Methodology Measurement

The research framework in chapter four categorised methodology usage into FSDM and bespoke. Items one through four reflected this categorisation. Items five and six allowed for exceptions. The following definition of a commercial systems development methodology or FSDM was provided to the participants. “A Commercial methodology is one which has been created and packaged by an external author. Examples include, SSADM, Agile Methods, SSM, and RUP”.

A set of four questions in the survey related to the use of multiple methodologies (Appendix A, questions 38-41). These questions were informed by studies described in sections 2.2.3 and 2.6. Findings showed ISD methods were not rigorously followed. Findings also showed that ISD methodologies served varying purposes to the project team. The questions in the methodology usage section sought to discover the use of methodologies, how they were used, and the support they provided (Appendix A, questions 42-48). Section 4.3 theorised that methodologies could support the establishment of social links. Several questions in the survey asked respondents to rate the support provided by their methodology in relation to; the development process, collaboration, formal communication, and informal communication. Likert scales were used to help the participant in their answer by providing a range of answers from which they selected one. The scales also provided the ability to quantifiably measure and compare answers. For consistency and ease of completion, all Likert scales in this section used a five point scale. Open ended questions sought insights and examples from the participant; thus enriching the understanding of methodology usage in virtual ISD teams.

5.4.3.2 Socialisation Tactics

The second section in the survey related to the use of socialisation tactics by the virtual ISD team. These socialisation tactics were categorised based on Van Maanen and Schein's (1979) organisational socialisation model (section 3.3). Jones (1986) then developed a thirty item scale for measurement of the socialisation tactics. Each socialisation category contained six questions with associated Likert scales. For example the first category of collective versus individual tactics contained questions such as "In the last six months, I have been extensively involved with other new recruits in common, job related training activities" and "Most of my training has been carried out apart from other

newcomers”. The questionnaire respondent answered each question using a 7-part Likert scale ranging from (1) strongly disagree to (7) strongly agree. A high score (>4) in any tactic category indicated the use of institutional tactics as described in section 3.3. A low score (<4) indicated the use of individual tactics.

Section 3.7 described studies where modifications to the questions as regards terminology and context were necessary. The phraseology of each question was developed with organisational newcomers in mind. It was necessary to modify the context of some questions to reflect the virtual team environment. The members of a new virtual ISD team could all be considered newcomers. However the term ‘newcomer’ as used by Jones (1986) throughout the questions could lead to confusion for those with years of experience on other teams. To prevent confusion the term “newcomer” was replaced with the term “team member” recognising that each team member in a new virtual team partakes in socialisation.

Studies described in section 2.5 found that virtual teams behaved differently to co-located teams. The questions to measure socialisation tactics related specifically to interactions and experiences with colleagues. The pilot study showed that those interactions and experiences varied depending on whether the colleague was local or distanced. It was therefore necessary to identify questions that could be answered differently if posed in relation to local team members as opposed to distanced team members. The pilot study provided feedback helped to identify those questions. Pilot study respondents found it difficult to answer some socialisation questions in relation to all team members. The survey was altered based on this feedback. Four of the categories were affected by this change; collective vs. individual, formal vs. informal, serial vs. disjunctive, and investiture vs. divestiture. Within each of these categories three questions were posed in relation firstly to local team members and then in relation to distanced team members. This study examined what socialisation tactics were in place

within virtual ISD teams and investigated if tactics varied in relation to local and distance team members.

A concern of some researchers using Jones's scale (1986) was the validity of the questions when a shortened version of the scale from thirty to twenty four had been used. The complete scale considered every facet of the domain for each tactic, consequently removing some of these facets resulted in an incomplete picture of each domain. The complete thirty item scale was used in this study to ensure validity and accuracy of the data gathered (Appendix A, questions 49-103).

Included in this section of the questionnaire were some open-ended questions to collect qualitative data. This type of data provided further contextual information. All of these qualitative questions related to team socialisation, for example one question asked "Please describe how your project team celebrated milestones, detailing whether both local and distanced team members were included in the celebration".

5.4.3.3 ISD Success

ISD success attracted much research with key studies concentrating on methods of measuring and identifying successful projects. As described in section 2.6.3, many studies focused on descriptive and subjective indicators of success. For the purposes of this study, success was measured in economic and functional terms, determined by the project manager upon completion of the project. In addition, each virtual ISD team member rated the project success on a 7-part Likert scale which provided a team perspective of success. The Standish group's widely cited research defines a successful project as one that was completed on time, within budget and delivered the expected functionality (sections 2.4 and 2.6.3). This

established measurement of success was based on twenty years of experience in assessing ISD failure. Similar metrics were also used to measure the success of ISD projects described in section 2.6.3. Those included project cost relative to budget, project completion time relative to schedule, and the completed and installed system functionality relative to the original project scope. Success dimensions such as end-user satisfaction and user-friendliness were outside the scope of this study and would of required access to the customer or user.

5.4.3.4 Virtual Context

Literature in sections 2.5.3-2.5.5 detailed the importance of communication, collaboration, coordination and cohesion for virtual SD teams. To ensure clarity of questions and reduce spoiled answers, the meanings of the terms collaboration and coordination were defined clearly in the online survey. It was considered that respondents could have difficulty differentiating between the two terms. Consequently one question was posed in relation to collaboration only. Questions relating to the coordination of activities were asked in other ways. For example: “On average, how frequently did you physically meet as an entire project team?”, and “Throughout the project, were you aware of the correct team member to contact at the distanced site(s) to answer your question?” The survey posed questions concerning the team’s ability to communicate and collaborate together. Respondents were also asked to rate the teams cohesiveness. These questions addressed the social aspects of ISD as discussed in section 2.3. An impression of a team’s ability to communicate and collaborate was of primary interest.

Investigation of virtual teams required consideration for factors such as organisational structure, number of team locations, size of virtual team, history, and experience of virtual team members. Also included were questions relevant to position, experience and length of service in ISD and in virtual teams. These

factors may influence the significance of the relationship between socialisation tactics, methodology use and ISD success.

The research instrument is included in appendix A, the visual format and layout of questions differ slightly from what the respondents received due to the questionnaire being administered using the Internet.

5.4.4 Pilot Study

A pilot study tested the survey instrument in relation to design, layout and wording. The pilot sample comprised of a small selection of ISD virtual team members who completed the questionnaire and provided feedback to the researcher. This feedback helped to modify and adjust the questionnaire to improve understanding and accuracy of the data gathering. A number of changes were made to the questionnaire as a result of the pilot study. Several questions devised by Jones (1986) used to measure the socialisation tactics were found difficult to answer as participants of the pilot study found it was possible to have two answers, one for team member located at the same site as the participant and another for those located elsewhere. For example, “Much of my time is spent with my colleagues” may be answered strongly agree in relation to local team members and strongly disagree in relation to distanced team members. For this reason and based on the feedback from the pilot study, those questions that could be answered in relation to both local and distanced team members were subsequently asked in that manner.

Clarity and understanding of questions by the participants was a priority in regards the pilot study. All feedback was considered and incorporated into the survey where appropriate. The following section details the logistics of administering the survey along with ensuring validity and reliability of data gathered.

5.4.5 Survey Administration

The literature in chapters two and three laid the foundation for the survey questions. Administration of the survey took into consideration the context of the study, the reliability and validity of the data gathered and the accessibility of the sample frame.

The administration of the survey took place over a seven month period using a subscription based online tool provided by www.questionpro.com. Further contact with participants took place using telephone and electronic mail. Confidentiality was assured at all times and for most of the participating virtual ISD teams was essential for the purposes of involvement. All participants completed the survey in relation to a completed ISD project. This meant that all participants were since working on new projects and had existing work commitments. Extension of the online survey subscription was necessary, a number of team members were working on current projects at go-live or implementation stages resulting in delays in completing the survey. All of these issues were inherent in a study that surveyed organisational teams rather than experimental methods that constructed a team to survey.

Every step was taken to facilitate each respondent in completion of the survey. The online tool prevented a participant from starting the survey and returning to it later in the day or the following day. This was a significant negative aspect of the tool. Several online tools were assessed for appropriateness and value for money. This logistical restriction was enforced by the online survey provider and thus not resolvable by the researcher. A work around was devised in the instance where a respondent answered part of the questionnaire and was then timed out and could not rejoin. A copy of the questionnaire was then forwarded to the

respondent via email. The questions already answered by the respondent were removed. This continued the self administration philosophy of the study.

Only those participants invited to complete the survey received the URL in order to access the survey. As each respondent answered the questions the researcher looked at the data in real time. The researcher ensured authenticity through the IP address of the participant and in most cases direct contact was made with the individual once they completed the survey. This contact was to thank them for their participation, clarify answers or to validate data. In some cases further information was necessary to ensure understanding of acronyms, professional phrases or team specific practices. This information was received either through electronic mail or telephone.

Clear instructions preceded the survey ensuring all participants were aware of the importance of their input as well as the voluntary nature of the study. Throughout the survey instructions and tips supported the participant in answering the survey as accurately as possible. In only one instance an individual clearly chose to provide the same answer for thirty questions of Likert scales. This data record was consequently not used in the findings or analysis. At any stage during the survey the participant could retreat through the questions to change their answers. The original data along with the changed answers was available to the researcher. In no instance was the change a significant one, in most it was simply a change to a qualitative answer.

Participants completed the survey once. This was ensured through the cross checking of IP addresses and the direct contact made with each individual subsequent to completion of the survey. The online survey tool provided real time access to the data as it was entered by the participants. The following section describes the methods used to ensure the validity of the data gathered.

5.4.6 Data Validity

Data validity was an extremely important part of the research method (Robson, 2002; De Vaus, 2002; Lucas, 1991). To ensure validity of data a summary document detailing project specific information was produced for each team involved. This document was sent to the team members along with a request for confirmation of content or feedback of changes required. In all cases the project manager replied with feedback or confirmation that the summary was accurate and representative of the project team. In some cases other team members also replied with confirmation and feedback. Some follow up interviews with team leaders were conducted. These occurred where project descriptions, geographic dispersion and team size were unclear. A selection of summary documents can be seen in section 6.2 with the remaining contained in appendix B.

Validation was also provided through Jones' (1986) scales. Reverse rated questions were used to ensure answers were consistent. For example in the category of Serial versus Disjunctive the first question stated "I am gaining a clearer understanding of my role in this project team from observing my senior colleagues" rated from Strongly Disagree =1 to Strongly Agree = 7. A later question in the same category stated "I have little or no access to people who have previously performed my role in this project team" rated in the same way but the scores upon collection were reversed. Therefore a participant answering one to the first statement should answer seven to the latter thus validating their answers.

Validity of data was also ensured through the self reporting of a minimum of three team members as multiple data sources (Lucas 1991). Access to project documentation was not feasible primarily because all projects were completed and therefore ownership of the documentation had passed on to the information system recipients. Confidentiality was cited several times as a concern by the

virtual ISD teams involved therefore the researcher chose to narrow the request for information to the administration of the survey.

5.5 Data Analysis Techniques

The survey, available in appendix A incorporated both quantitative and qualitative data gathering. As discussed in section 5.4.3 measures used both nominal and ordinal data. The analysis of the data required the researcher to utilise both quantitative and qualitative methods.

5.5.1 Quantitative Data Analysis

All nominal data gathered was subject to the constraints of a non-random sample. This meant that statistical parametric and non-parametric tests such as correlation and regression could not be carried out on the data set in order to generalise to the wider population. All statistical tests assumed that a random sample had been generated. Due to access restrictions a random sample was not possible for this study.

Frequency tables displayed the occurrences of a variable in a row and column layout. This type of statistical display helped to describe the variables. Histograms, bar charts and pie charts were the graphical displays used to correspond with frequency tables. They could be easily understood by a variety of audiences.

Descriptive statistics represented an important aspect of a set of data using a single number. The two most commonly used aspects were central tendency and variability. Central tendency referred to a number that represented the distribution of a variable. The most obvious being the arithmetic mean. The mean

could be imprecise when used on its own. Variability measures demonstrated the variance of values from the mean. That was whether the values were grouped close to the mean or dispersed. Standard deviation was one such variability measure. Standard deviation reported the dispersion from the mean, where 68% of cases fell within one standard deviation from the mean and 95% of cases fell within two standard deviations. Descriptive statistics were applied to one or more variables, thus allowing some comparison between variables using means and standard deviation measurements.

Cross-tabulation provided two-way and multi-way tables that illustrated two or more variables in relation to each other. This method could provide some insight into the existence of relationship between variables. A table presented the data in rows and column, each cell displaying the count and % of occurrences for the variable combinations. Row and column totals were given at the end of the row and column. This was a useful way of highlighting potential relationships between variables. Frequency distributions, graphical displays, descriptive statistics, and cross-tabulation were primarily used to present and analyse the data in this study.

5.5.2 Qualitative Data Analysis

Content analysis was a method used to analyse documents. It could also be applied to the analysis of open ended questions from a survey (Robson 2002). It was a quasi-statistical method that quantified the data in a document. Reliability and validity of content analysis was a concern. However in this study the content analysed was self reported through the research instrument and validated through a summary report. A phrase was identified as the recording unit for this study. In some cases the actual phrase was not contained in the data but interpretation and inference on the part of the researcher was acceptable. For example, “ensuring

same standards” infers “consistency”. This was known as latent content which should be kept to a minimum to ensure reliability of results.

The data was then coded into manageable categories. These categories were exhaustive and mutually exclusive. The natural division of the research instrument into sections allowed for this division to follow through in the categories. Three main headings were methodology usage, socialisation tactics and virtual teams. Within each of these headings categories emerged that corresponded to the open ended questions in the survey. Phrases for each category were identified and measured for existence and frequency within each project team involved in the study. A level of generalisation was allowed where the occurrence of an incomplete phrase was counted. For example question MU2 asked “Who chose the methodology to be used?” Answers of “manager”, “senior management”, “management”, “organisation”, and “project manager” were taken to be all part of the management category. Rules for coding ensured categories were clear and mutually exclusive to the researcher thus reducing the number of errors. The results of content analysis are presented in the following chapter.

5.6 Conclusion

It was clear that a cross-sectional design using an online survey was appropriate to this study. This decision was based on the needs of the propositions, the research context, the capabilities of the researcher, and the philosophical beliefs of the researcher (Mingers 2001). The limitations of the approach chosen were considered in the design of the research instrument. Qualitative data complimented quantitative data in all sections of the survey. Both types of questions existed in the research instrument thus addressing the need for context in relation to the phenomenon.

The following chapter presents the data gathered using the research instrument. The data is presented in the four key areas; the process of ISD, socialisation tactics, virtual ISD, and virtual ISD success.

CHAPTER 6 FINDINGS

6.1 Introduction

This chapter sets out the data gathered by the survey. Three key areas were addressed, namely; the use of ISD methodologies, socialisation tactics and ISD success. Background information provided a backdrop to the research context. Contained in the following section are excerpts from the summary reports sent to each team for verification. The complete reports are contained in appendix B.

6.2 Background

The fifteen teams presented in Table 6-1 were from European and American organisations. A pre-existing seven item scale set out in section 2.6 was used to categorise the industry sectors. The majority of organisations represented the software and manufacturing sectors. Five of the six teams in the consultative/software sector were indigenous to Ireland. Twelve teams came from large organisations of more than two hundred and fifty employees. The remaining three teams came from small to medium sized software development organisations.

	Industry Sector				Total
US & EU	Service Communications	Consultant Software	Construction Manufacturing Distribution	Finance Insurance Real estate	
US	1	1	4	2	8
EU	0	5	1	1	7
Total	1	6	5	3	15

Table 6-1: American versus European Organisations

In order to accurately reflect virtual ISD teams the study targeted multiple job categories. As described in section 2.5 programmers, systems analysts, business analysts, project managers, senior IT management and chief information officers were considered to be involved in systems development. The categories used in the survey were business/system analyst, project manager/team leader, software development, testing/quality assurance, operations/technical support and other. These incorporated the existing list and included the important roles of testing/quality assurance and operations/technical support. These additional roles in theory were somewhat periphery to the development of an information system but in practice were ultimately involved in the overall process of testing, implementation and conformance to quality standards. By adding these roles to the list the survey could identify if these roles were in fact involved in the systems development. Of the sixty respondents, nineteen held a project management or team leader role, sixteen were software developers, fourteen analysts, seven testers and the remaining four held other roles such as operations and technical support. Table 6-2 shows that the roles of project manager, analyst and software development characterised 81.7% of the sample.

Job Category	Frequency	Percent	Cumulative Percent
Business/Systems Analyst	14	23.3	23.3
Project Management Team Leader	19	31.7	55.0
Operations/Tech Support	2	3.3	58.3
Software Development	16	26.7	85.0
Testing/Quality Assurance	7	11.7	96.7
Other	2	3.3	100.0
Total	60	100.0	

Table 6-2: Job Category

The study successfully captured a broad range of professional experience in information systems development. Table 6-3 shows that a third of the participants possessed less than five years experience, nearly 42% had five to fifteen years experience and the remaining 25% more than fifteen years experience.

Years of ISD Experience	Frequency	Percent	Cumulative Percent
Less than 1yr	2	3.3	3.3
1-3 yrs	9	15.0	18.3
3-5 yrs	9	15.0	33.3
5-15 yrs	25	41.7	75.0
15+ yrs	15	25.0	100.0
Total	60	100.0	

Table 6-3: ISD Experience

Section 2.5 described how ubiquitous virtual team development was relatively new to the information systems field. The level of virtual team experience found by the study reflected this fact. Table 6-4 shows nearly 70% of the participants had less than five years virtual team experience, 25% in the five to fifteen year category with the remaining 7% having more than fifteen years experience.

Years of Virtual Team Experience	Frequency	Percent	Cumulative Percent
Less than 1 yr	13	21.7	21.7
1-3 yrs	18	30.0	51.7
3-5 yrs	10	16.7	68.3
5-15 yrs	15	25.0	93.3
15+ yrs	4	6.7	100.0
Total	60	100.0	

Table 6-4: Virtual Team Experience

Of the forty respondents that had more than five years experience in ISD, almost sixty percent of them had less than five years experience in virtual teams. Almost all of those with less than five years ISD experience also indicated that they had less than five years virtual team experience. A small number of respondents indicated that they had more experience working in virtual teams than in ISD. Each of these respondents worked in a technical support capacity. Technical support roles historically were known to use technology to solve problems remotely. Consequently, experience of the virtual team environment was common in technical support roles. Table 6-5 sets out the data gathered on the ISD and Virtual work experience of the respondents.

Years of ISD Experience	Years of Virtual Team Experience		Total
	<=5 year	>5 years	
<= 5 years	18	2	20
> 5 years	23	17	40
Total	41	19	60

Table 6-5: Virtual Team experience versus ISD Experience

This study focused primarily on the quantifiable, objective measures of success described in section 2.6.3. Team leader or project manager participants answered questions relating to the schedule, budget and the functional requirements identified at the beginning of the project. One additional subjective measure then asked all participants to rate the success of the overall project using a seven part Likert scale. The aggregated teams scores showed that seven teams indicated highly successful and one as highly unsuccessful. Using the Standish group's success research (section 2.4) eight projects were successful and seven were challenged. A successful project was shown in blue and a challenged project was shown in black (Table 6-6). The combination of objective and subjective

measures represented both the individual perspective of each team member and the overall financial and functional perspective of the project manager. Table 6-6 presented the four measures of success included in the research instrument and the type of ISD methodology in use for each team (section 5.4.3.3). The table was ranked using the team aggregated mean score and then the on time, on budget, on scope measures.

Team	ISD Methodology	Aggregated Mean Success	Standard Deviation	On Time	On Budget	On Scope
5	Bespoke (1 FSDM)	7.0	.00	Yes	Yes	Yes
13	Bespoke no FSDM	7.0	.00	Yes	Yes	Yes
12	None	7.0	.00	No	No	Yes
4	Bespoke (1 FSDM)	6.75	.50	Yes	Yes	Yes
9	Bespoke no FSDM	6.75	.50	Yes	Yes	Yes
6	Bespoke no FSDM	6.66	.58	Yes	Yes	No
11	Bespoke no FSDM	6.5	.58	Yes	Yes	Yes
8	Bespoke (>1 FSDM)	6.5	.53	Yes	Yes	Yes
1	Bespoke no FSDM	6.33	.58	Yes	No	No
15	Bespoke (1 FSDM)	6.25	.96	No	Yes	Yes
14	Bespoke no FSDM	6.0	.82	Yes	Yes	Yes
7	Bespoke no FSDM	6.0	1.41	No	Yes	Yes
3	Bespoke no FSDM	5.66	1.86	Yes	Yes	Yes
2	None	4.66	.58	No	No	No
10	Bespoke (>1 FSDM)	4.67	2.31	No	No	No

Table 6-6: Measures of Success

Key: 1: Very unsuccessful 4:Neutral 5: Partially successful
2: Mostly unsuccessful 6: Mostly successful
3: Partially unsuccessful 7: Very successful

66% of the teams surveyed completed their project on time, 74% within budget, and 74% within the original project scope. 53% of participating teams met their

budget, schedule and original scope. Three of the four teams over budget also extended the original scope of their project. Participants indicated that scope creep was a key reason for extension of the schedule and the budget.

Teams 3 and 10 showed a large standard deviation in the score for overall success. This indicated that the respondents did not agree with each other. Team 10 did not meet their budget, schedule or requirements. The project manager rated the project as unsuccessful (2 out of 7) and the other two respondents rated the project successful (6 out of 7). Team 3 had six respondents five of whom scored the project highly in relation to success. The project manager scored the project very low despite the project meeting the budget, scope and timeline. The reason for this score was not clear from the data. The subjective rating of projects success was used to provide the team perspective (5.4.3.3). However individual responses may not always be in line with the overall team perspective, thus skewing the results.

The survey gathered data on the type of ISD project each virtual team had completed. Based on the data gathered, three project types emerged.

New development

Customisation

Implementation/customisation

The creation of a new system was termed "new development". Five teams fell into this category. All of these teams came from software development companies. The teams' duration of development varied from six to twenty four months. Customisation involved the customisation of an existing system. Four project teams fell into this category. Customisations varied in duration from three to fifteen months. One of the teams worked on customising a commercial proprietary system and three worked on internally developed systems. The remaining six teams fell into the implementation/customisation category. The

teams' duration ranged from five to twenty months. The proprietary systems encountered in this category included SAP, HR Direct, Enterprise Learning Management System (ELMS), Automated Customer Account Transfer Service (ACATS), and RevenueOffice.

Project Team	Duration	Team members	Locations	Project Type
1	7 months	4	Cork, Ireland Kilkenny, Ireland	New development
2	15 months	7	Limerick, Ireland Bracknell, U.K Montpellier, France St Petersburg, Russia	Customisation.
3	15 months	6	U.K Waterford, Ireland	Customisation.
4	9 months	4	New Jersey, U.S.A Waterford, Ireland	Implementation/ Customisation.
5	24 months	50	Dublin, Ireland London, U.K Wroclaw, Poland	New development
6	12 months	60	Dublin, Ireland Belfast, N Ireland Madrid, Spain India	New development
7	12 months	50	U.K, France, Ireland, U.S.A	Implementation/ Customisation.
8	6 months	8	Bangalore, India Dublin, Ireland	New development
9	5 months	9	Poznan, Poland Dublin, Ireland	Implementation/ Customisation.
10	24 months	28	Wroclaw, Poland Dublin, Ireland	Implementation/ Customisation.
11	12 months	9	Rochester, U.S.A Waterford, Ireland	Customisation.

Project Team	Duration	Team members	Locations	Project Type
12	15 months	10-20	New Jersey, U.S.A Waterford, Ireland	Implementation/ Customisation.
13	10 months	12	Boston, U.S.A Waterford, Ireland	Implementation/ Customisation.
14	3 months	6	Boston, U.S.A Waterford, Ireland	Customisation.
15	6 months	6	New York, Boston, San Francisco, U.S Toronto, Canada	New development

Table 6-7: Project Background

Table 6-7 showed project teams were predominately small with nine of the teams surveyed having less than ten members. The larger teams indicated that the team size fluctuated during the project depending on the stage of development. The fifteen teams existed across one or more countries. There were three teams in four countries, one team in three countries, nine teams in two countries and two teams in one country. Teams consisted of members distributed across two, three, or four locations, with the majority having no more than three locations.

All fifteen teams completed sections one and two of the survey. Consequently data was presented on all teams in relation to the background information and the use of ISD methodologies. Several respondents from teams five and six did not complete section three relating to socialisation tactics. Section three came at the end of the survey and consequently was not completed in the first sitting by those respondents. Despite following up with the respondents, completion of the survey was not possible. It was considered that work commitments led to the incomplete surveys. Therefore some data was omitted regarding teams five and six in the presentation of findings on socialisation tactics.

The following represented a selection of summaries sent to the teams for validation and feedback. Contained were examples of two new development teams (teams 1 & 8), two customisation teams (teams 2 & 14), and two implementation/customisation teams (teams 4 & 11). The remaining team summaries were contained in appendix B.

Team 1

This project involved maintaining an existing system, by adding a new Sick Pay application. The project duration was seven months and utilised developers located in Kilkenny and Cork. The project was completed on time, not within budget and did not meet the functional requirements of the original project scope. Despite this, the project was considered a success by all team members. The Kilkenny team worked closely with local team members with some contact with distanced team members. All of the Kilkenny team had worked with local people before; some had worked with the distanced team member before. During the project, there was no opportunity for local team members to meet the distanced team members for training or for other reasons. The project team as a whole (Kilkenny & Cork) did not meet physically, electronic meetings took place weekly. There was no Software Quality standard adhered to during development however a development methodology was used. This methodology was developed internally and was used to develop the specification and for reviewing project development.

Project information was stored on a local server. A formal document did not exist that guided the project team in terms of roles, responsibilities, conflict resolution etc. A local mentor programme was in place for the project team members, which was useful for resolution of issues and answering of queries. The team did not formally celebrate milestones and success.

Team 2

This project involved the development of FWT optimisation. The project took place over fifteen months across four locations in Limerick Ireland, Bracknell UK, France, Montpellier France, and St Russia, St Petersburg Russia. Approximately seven people worked on this project. The project was not completed time, in budget nor within the functional requirements scope. Overall the project was considered to be unsuccessful. The Limerick team worked predominately with distanced team members during the project. Some team members had worked with local and distanced team members prior to this project. An initial kick off meeting did not occur at the beginning of the project. The entire team never met physically in the same location. Electronic meetings took place weekly. There was no opportunity for individuals to meet distanced team members either during training or for other reasons during the project. The project followed SEI/CMM quality standard, however this standard was not met. No formal information systems development methodology was used. Informal communication took place predominately through email and online chat. This type of communication was seen to be very beneficial to the team. Team communication was reasonable however collaboration and cohesiveness during the project were not considered to be good. Project information consisting of project documentation, and source code was stored in a central place, giving access to all project team members. A formal document was used to provide information on roles, and responsibilities. No mentor programme was in place for the project team members. Neither milestones nor successes were celebrated by the project team.

Team 4

This project involved maintaining an existing SAP system, more specifically working on the Divisional Inventory and Planning module. The project duration was nine months and utilised developers located in New Jersey and Waterford. The project was completed on time, met the functional requirements and was within budget. The Waterford team worked closely with local team members

with some contact with distanced team members. Some of the Waterford team had worked with local people before; no one had worked with the distanced team members before. An initial kick off meeting occurred that involved the Waterford site only, with the Jersey site updated later via conference call. There was some opportunity for individuals to meet distanced team members either during training or for other reasons during the project. The project team as a whole (Waterford & New Jersey) rarely met physically, perhaps only once during the project, electronic meetings took place weekly. There was no Software Quality standard adhered to during development however a methodology was used. This methodology was based on a commercial methodology and was decided upon by management. Project information was stored on a local area network drive giving access to all project team members. A formal document was used to provide information on team structure, roles, responsibilities and project management details. A local mentor programme was in place for the project team members, which was deemed useful for resolution of issues and answering of queries. The team did not formally celebrate milestones and success.

Team 8

This project involved developing a Verification Engine to support and apply verification requirements to a client. The project duration was five to six months and utilised eight people located in Bangalore and Dublin. The project was a success as it was completed on time, met the functional requirements and was within budget. All team members worked equally with both local and distant team members. Half of the team members in Bangalore had previously worked with other team members (both local and distant). The same can be said for the team members in Dublin. An initial team kick off meeting did not occur at the beginning of the project. A management team meeting occurred and one person visited Bangalore to explain domain and design of project. The project team as a whole (Bangalore & Dublin) never met physically. Some members may have had the opportunity to meet on one occasion. The Dublin team met physically on a

daily basis. The entire team (Bangalore & Dublin) met electronically once a week. Informal communication between team members took place through Email, Online Chat, Telephone and through the internal website. The team considered that they worked as a cohesive team communicating and collaborating effectively throughout the project. The Software Quality standard used was an internally developed standard. The project met this standard and was deemed to be of high quality. An internally developed methodology was used during development. This methodology was based on a commercial methodology and was decided upon at an organisational or management level. At some stages during development Agile methods were also used. The use of this method was determined by the team. Microsoft SharePoint was used to store all project information, thus giving access to all team members. This store of information included documents such as functional specs, minutes of meetings, project plan, milestones etc. Team meetings were used as mechanism for team members to get to know each other. A formal document provided information on communication channels to be used, conflict resolution, roles, and responsibilities. A local mentor programme was in place for the project team members, which was deemed useful for guidance, access to knowledge, the resolution of issues and answering of queries. The team celebrated milestones and success by going out for coffee, lunch, dinner, or bowling. These celebrations were held for local members, however sometimes distanced team members may be on site and would join the celebration. .

Team 11

The PAQ automation project took place over twelve months. The project utilised developers located in Rochester, U.S.A and Waterford, Ireland. The team consisted of nine people. The project was considered to be a success as it was completed on time, met the functional requirements and was within budget. In general team members worked predominantly with local team members. Some team members had worked with each other before. A ‘kick off’ team meeting occurred at the beginning of the project when most team members met each

other. Following this the team did meet approximately seven times over the twelve months. Most members of the team met electronically once a week. Some of the team had the opportunity to meet with distanced team members for training and other purposes at some point during the project. Informal communication took place through email, and telephone. This type of communication was seen to be very beneficial to the team. The team considered in general that they worked as a cohesive team, communicating and collaborating effectively throughout the project. The project used SEI/CMM as the Software Quality standard; this was adhered to during development. The project team used an internal information systems development methodology. This ensured timelines were met, issues were resolved quickly and easily, and that the project direction, definition, scope and execution were clear to all team members. This methodology was chosen by Global Quality management. Project information was accessible through an internet site available to all members. The store included development work, schedules, testing results etc. Company wide policies and work practices exist to support employees. Formal documentation on roles and responsibilities, behaviour, and conflict resolution relate to the company as a whole. Specific behaviour guides for the project team did not exist. A local mentor program was in place for the project team members. This provided individuals access to additional technical and business domain knowledge. The mentor also boosted confidence, and provided direction and clarity. Success and milestones were celebrated at a local level by a social event. Some distanced team members were included in the celebrations if they were visiting the local site.

Team 14

This project involved the customisation of an existing insurance information system. The project took place over three months. The project utilised people located in the U.S.A. and Waterford, Ireland. The team consisted of six people. The project was considered to be a complete success as it was completed on time, within budget and met the original project scope. In general team members

worked equally with local and distant team members. Some team members had worked with each other before. A physical team meeting did not occur at the beginning of the project. The project team as a whole never met physically during the project. None of the team had the opportunity meet with distanced team members for training or other purposes during the project. Regular electronic team meetings were held at least once a week. Informal communication was not directly encouraged however team members used email, telephone, and online chat as well as meeting local team members at their desk. This type of communication was seen to be very beneficial to the team. The team members always knew whom to contact. The team considers that they communicated and collaborated reasonably well. The team was somewhat cohesive. The project used SEI/CMM as the Software Quality standard; this was adhered to during development. The project team used an internal information systems development methodology that was decided upon by senior management. This methodology provided the ability to track and control the project using one standard. The methodology supported the development process and helped collaboration and communication between team members through scheduled meetings and documentation. A network drive was used to store all project information including SEI/CMM documentation. All project team members had access to this server. No formal document existed that specifically dealt with communication practices and expected behaviour for this project. A mentor program was in place for the project team members and considered very beneficial. This provided individuals access to undocumented information, experience that helped to speed up resolution of problems. Success and milestones were not celebrated by the team.

6.3 The ISD process

The use of ISD methodologies by virtual ISD teams was central to this study. The survey posed questions concerning the use of an ISD methodology (Appendix A questions 35-36), the purpose served by the methodology (Appendix A questions 37, 40-48) and the mixing of methodologies (Appendix A questions 38-39). The number of questions directed at the respondent varied depending on their answers. For example, a negative response to mixing of methodologies led to disqualification from further questions concerning this topic. The following section presents the findings in relation to the use of methodologies by virtual ISD teams.

6.3.1 ISD Methodology Use

Many of the questions posed in this section used five-part Likert scales to gather the data. Presentation of the data was in the form of descriptive statistics showing the frequencies and means of the scales. Table 6-8 illustrated the use of ISD methodologies by the participating teams. The classification of methodologies was detailed in sections 2.2.4, 2.2.5, and 2.2.6. A total of thirteen teams or 86.7% of teams designed their own methodology (bespoke). None of the participating teams followed a single FSDM rigorously. Of those teams using a methodology, eight did not use any form of FSDM. Five teams developed their own bespoke methodology based on one or more FSDM's. Only two teams did not use an ISD methodology of any kind. No teams used the "other" category included in this question which indicated that the classification of ISD methodology was adequately covered by the survey.

Methodology Classification	Frequency	Percent	Cumulative Percent
Single FSDM	0	0.0	0.0
Bespoke based on one FSDM	3	20.0	20.0
Bespoke based on more than one FSDM	2	13.3	33.3
Bespoke not based on a FSDM	8	53.3	86.7
No ISD methodology	2	13.3	100.0
Total	15	100.0	

Table 6-8: Usage of Bespoke Systems Development Methodologies

Table 6-9 illustrated the use of a methodology by each industry sector involved in this study. Two of the six teams based in construction/manufacturing/distribution, and finance/insurance/real estate developed a bespoke methodology not based on a FSDM and two used no methodology at all.

Industry Sector	Methodology Classification				Total
	No ISD Methodology	Bespoke–		Bespoke based on no FSDM	
		1 FSDM	>1 FSDM		
Service/communications	0	0		1	1
Consultants/software house	0	2	1	5	8
Construction/manufacturing/distribution	2	1	0	2	5
Finance/insurance/real estate	0	0	1	0	1
Total	2	3	2	8	15

Table 6-9: Usage of Bespoke Systems Development Methodologies per Industry Sector

Five out of eight consultant/software house teams showed a preference towards using a bespoke methodology that did not incorporate a FSDM. Senior

management in all project teams decided on the methodology to use. Qualitative data gathered, cited senior management, global business, company headquarters, or executive management as the decision maker. Management sought consistency and conformity across an organisation by using an organisation wide ISD methodology. Twelve of the thirteen teams using a methodology were instructed to do so by management.

Team members commented on the use of a global or organisation wide ISD methodology.

“Global Consistency of information”

Team 3 member B.

“Defined entire development life cycle, ensuring same standards used in all sites.”

Team 6 member A.

“Common deployment between 2 UK sites + 3 French Sites”

Team 7 member B.

“Standard approach to development across all distributed teams that would ensure that all quality standards are met “

Team 13 member A.

All five teams engaged in new development used a bespoke ISD methodology. Of the four teams that worked on customising existing systems, one did not use an ISD methodology, and three developed bespoke methodologies. Six teams implemented and customised a proprietary system, five of whom developed a bespoke methodology; one did not use an ISD methodology.

6.3.2 ISD methodology and work processes

The respondents answered questions concerning the purpose served by the chosen methodology or methodologies in relation to the development process, collaboration amongst team members, and communication (Table 6-10). In some cases, team members chose not to respond to one or more of these questions resulting in an incomplete sample. Consequently, the following teams were not included in the table: 1, 2, 12, 13 and 15. Respondents scored questions using a five part Likert scale (see appendix A questions 42-48). The table shows the aggregate mean and standard deviation per team.

Team	ISD methodology and Work Processes							
	Development Support		Collaboration Support		Formal Communication Support		Informal Communication Support	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
3	2.83	.98	3.17	1.17	3.17	1.17	3.17	1.47
4	4.67	.58	3.67	.58	3.67	.58	3.67	.58
5	4.00	.00	4.5	.71	4.5	.71	4.5	.71
6	4.33	.58	4.00	1.00	4.33	.58	2.33	1.53
7	3.50	.58	4.00	.00	3.50	.58	3.50	.58
8	3.83	1.6	4.00	.89	4.00	.71	3.50	1.05
9	4.00	1.00	3.33	1.15	3.67	1.53	4.00	.00
10	3.67	.58	3.67	.58	3.67	.58	2.67	.58
11	4.00	.00	4.00	.00	4.00	.00	3.50	.58
14	3.33	.58	3.33	.58	3.33	.58	3.00	.00

Table 6-10: Methodology Purpose

- Key:
- 1: Very insignificantly supported by ISD methodology
 - 2: Insignificantly supported by ISD methodology
 - 3: Neutral
 - 4: Significantly supported by ISD methodology
 - 5: Very significantly supported by ISD methodology

The high standard deviations in teams 9, 8, and 3 showed disagreement amongst team members on the support provided by the ISD methodology. Figure 6-1

graphically shows the development support provided by each team's ISD methodology (based on the data in Table 6-10).

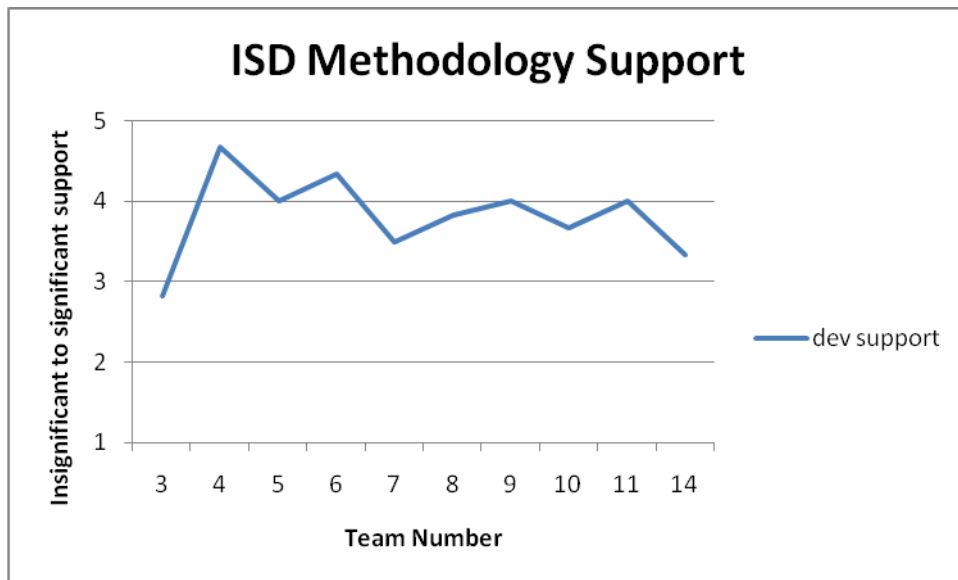


Figure 6-1: ISD Methodology support to the development process

- Key:
- 1: Very insignificantly supported by ISD methodology
 - 2: Insignificantly supported by ISD methodology
 - 3: Neutral
 - 4: Significantly supported by ISD methodology
 - 5: Very significantly supported by ISD methodology

Figure 6-1 showed team 4 scored their ISD methodology the highest aggregate mean at 4.67 (out of 5) with a low standard deviation of .58. This suggested that all team members considered the methodology supported the ISD process. The team was implementing and customising a proprietary system. The team used a bespoke methodology based on a FSDM. Respondents explained this as follows:

“[the methodology] ensured that everyone involved in the development process had access to all R&D output and functional specifications”.

Team 4 member A.

“[the methodology] structured the project into steps, provided a method of communication to project steering team and senior management, ensured sufficient documentation was completed to allow easy post-live transition to normal system support”.

Team 4 member B

“[the methodologies purpose was] to implement the project as per the charter in a structured fashion whereby everyone knew their roles”.

Team 4 member C

Figure 6-1 showed team 3 scored the lowest aggregate mean at 2.83 (out of 5) with a standard deviation of .98. One team member scored the level of development support at 1 (out of 5) skewing the aggregate mean. However, team members did comment that the methodology lacked support for the ISD process. Team three customised an existing system and utilised a bespoke methodology not based on any FSDM. Respondents explained that:

“The methodology was more from a project management perspective to guide the project and wasn't prescriptive to stages such as coding, testing etc”.

Team 3 member A

“[the methodology meant we had to] Adhere to the project timeline and specify the final QA outputs and criteria”.

Team 3 member B

Team three utilised a bespoke methodology that was more concerned with schedule and quality than with the analysis, design, development, implementation, and testing of the system. Participants said that a less structured approach applied to the ISD process.

“Very informal, almost ad hoc in nature”

Team 3 member C.

“It's ad hoc implementation forced members to communicate with each other to ascertain status', tasks etc”

Team 3 member D.

The ISD methodology used by Teams 7 and 14 provided some support to their development process (Figure 6-1). Both teams, like team 3 used a bespoke methodology not based on any FSDM. The following comments were in relation to the purpose served by the ISD methodology (Appendix A question 37).

“Common deployment between 2 UK sites + 3 French Sites”

Team 7 member B

“Common method and design across multi-national company”

Team 7 member D.

“planning and control - meet deadlines”

Team 14 member D.

“It provided one standard to follow”

Team 14 member B.

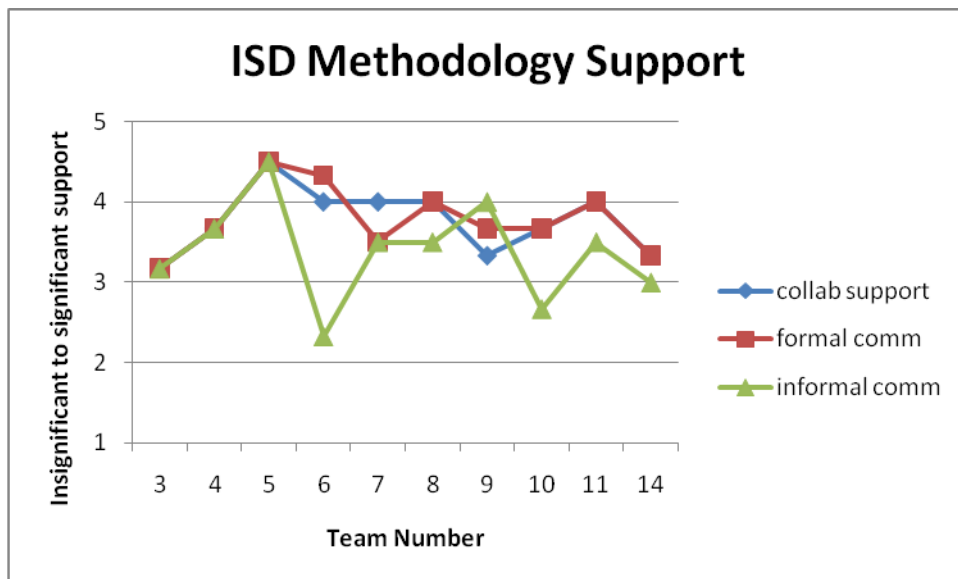


Figure 6-2: ISD Methodology support to collaboration and communication

- Key:
- 1: Very insignificantly supported by ISD methodology
 - 2: Insignificantly supported by ISD methodology
 - 3: Neutral
 - 4: Significantly supported by ISD methodology
 - 5: Very significantly supported by ISD methodology

Figure 6-2 showed teams 4 and 5 had support for collaboration and formal and informal communication through their ISD methodology. Team 5 had an aggregate mean of 4.5 and standard deviation of .71 for collaboration, informal communication and formal communication. Team five used a bespoke methodology based on a FSDM. Table 6-10 showed team five considered the methodology provided significant support in all areas. Team members explained that consistency, a common language, a set of expectations, and a set of processes allowed collaboration and communication to occur freely. By following the methodology the team were able to create documentation that was understandable and available to all independent of location. The following reflected the structured approach provided by the methodology.

“[the methodology] provided a common language and set of expectations as to who should do what and when. This allowed communication to flow much more freely”.

Team 5 member C

“There was a common language and set of processes that allowed people to understand each other and work together”.

Team 5 member C

Team 4 had an aggregate mean of 3.67 and standard deviation of .58, members considered the methodology supportive to collaboration, and communication. The following typified the collaborative support provided by the ISD methodology.

“All team members had open access to the project documentation and progress reports. This information allows everyone to influence the project “.

Team 4 member A

Through direct access to documentation, members could participate and collaborate on the creation and maintenance of the documentation.

“Minutes of meeting - people had to action tasks - Updating of management in both organisations”.

Team 4 member D

Electronic meetings were an integral part of the ISD process for team 4. They took place once a week with minutes recorded and stored as part of the project documentation. Minutes then supported communication, and coordination.

The ISD methodology used by Team 11 supported collaboration and formal communication. The team scored an aggregate mean of 4.00 and standard deviation of 0.00 for collaboration and formal communication. The team used a bespoke methodology with no FSDM. The following comments were collected.

“Methods employed allowed testers within the global team could swap notes on perceived problems and possible design issues.”

Team 11 member B.

“communication was of the utmost importance. Methodologies available to us were of significant value.”

Team 11 member D.

“Communication was ongoing throughout the project and all projects members were available for consultation”

Team 11 member A.

Table 6-10 showed that for team 3 the methodology provided little support to the collaboration and communication between team members. However, the high standard deviation indicated that team members varied in their opinion. One team member explained that the unstructured methodology forced team members to communicate more regularly to ascertain the status of tasks. The score by this team member skewed the mean response. The methodology also did not support the development process (Figure 6-1). Despite this, the project was on time, on budget, and within the original scope (Table 6-6). When asked if the project was successful (Appendix A question 15) team members disagreed. The project team scored an aggregated mean of 5.66 (out of 7) with a standard deviation of 1.86. The project manager scored the success of the project at 2 (out of 7) all other team members scored the project at either 6 or 7. The team members did not agree in relation to the support of the ISD methodology, nor the success of the project.

The aggregate scores for teams 6 and 10 showed support for formal communication but not for informal communication. However, a social website contained in Microsoft SharePoint encouraged informal communication for members of team 6. Additionally, one member commented on the support provided by the methodology in relation to informal communication and collaboration. A standard deviation of 1.53 showed disagreement amongst team members.

“The method enforced the use of certain documentation and this in turn meant that all parties had to understand and agree with the documentation. this in itself required both formal and informal communication, probably more so as one of our teams did not have English as a first language and therefore had to ask lots of questions to ensure they understood the nuances of the documentation”

Team 6 member B

“It was difficult to get our Spanish team to adhere to the approach and methodologies that we were using in Dublin and some of their documentation was not adequate. But as they saw the delivery of the software as their objective they were slow to 'spend longer' doing what they often saw as unnecessary documentation. This meant we had greater difficulty ensuring technical designs mapped to functional requirements”

Team 6 member B

A member of team 10 commented on the lack of communication support.

“the method was not particularly well followed in terms of defining a communication plan up front in the project so that hindered communication”

Team 10 member A.

Another member commented on the support for formal communication and collaboration.

“Formal meeting schedule and deadlines to be met and clarification of issues
through formal documentation of issues”

Team 10 member C.

“joint responsibility to prepare and sign-off specifications, test plans etc.
[the methodology] recommended developers co-locating with test team which
did work well on occasions.

When [the] methodology [was] strictly applied [it] did help”

Team 10 member C.

For additional support, 4 teams used some form of bug or issue tracking tool. The tool facilitated communication between members and encouraged a clearer understanding of task progression and handover. Team 9 used a tool called JIRA^b, team 15 used Bugzilla^c and teams 13 and 14 used Bugzero^d to track bugs or issues. The design of these tools made them appropriate for use by virtual teams. They provided bug tracking, issue tracking, defect tracking, and change management between distributed team members. The tools included support for project management aspects through customisable and configurable features. These four teams all remarked that the bug-tracking tool was very important and central to communications between team members. The tools reinforced collaboration and communication between team members to resolve issues.

^b www.atlassian.com/software/jira page accessed April 9th May 2008.

^c <http://www.bugzilla.org/> page accessed April 9th May 2008.

^d <http://www.websina.com/bugzero/index.html> page accessed April 9th May 2008.

“Pieces of work were passed from person to person with their comments attached in a discussion format. Any new developer could then take up the work and review all the prior conversation. The business users would attach their comments or functional [specification] if the work was large enough. Developers could then proceed with their work or direct questions back to the BSA’s [business systems analyst's] through this system. It worked independently of location”.

Team 13 member A

Documentation, sharing information, and centralised issue tracking were very important to these teams. The bespoke ISD methodologies in use provided a road map for team members to follow. The methodologies also encouraged collaboration and communication through the documentation and the availability of information. The following section describes the mixing of methodologies by the virtual ISD teams involved in this study.

6.3.3 ISD Methodology Mixing

The survey firstly asked each respondent what methodology was in use (Appendix A question 35) and secondly whether any other methodologies were in use by their project team (Appendix A question 38). Four teams showed some degree of methodology mixing during development. Team 5 used a bespoke methodology based on a FSDM. The team also used a bespoke implementation methodology. The decision to use an additional implementation methodology took place at the management level. Team 9 used a bespoke methodology not based on a FSDM. The team occasionally used UML and JIRA (issue/bug tracking tool) during development. Team 10 used a bespoke methodology based

on more than one FSDM. The team introduced Sarbanes-Oxley (SOX) controls during the later stages of the project. Team 15 used a modified agile methodology and occasionally used formal methodologies when complex features required flow diagrams and requirements analysis. The team members chose when and if to use the formal methodology.

Team 3 used a bespoke methodology based on one FSDM. They commented that no other methodologies were in use during the development. However, a team member did comment on the informal nature of their methodology.

“[the methodology was] Very informal, almost ad hoc in nature”

Team 3 member C

Another team member did comment that the methodology was more project management based rather than ISD.

“The methodology was more from a project management perspective to guide the project and wasn't prescriptive to stages such as coding, testing etc.”

Team 3 member D.

Nine out of thirteen teams or 70% indicated that they did not mix methodologies during the ISD process. However, five of the bespoke methodologies comprised of one or more methodology. Team members commented that an organisation wide ISD methodology was sometimes adapted for the site.

“Defined entire development life cycle, ensuring same standards used in all sites.

Methodology was adapted somewhat for local use”

Team 6 member A.

The participants did not provide details of the chosen methodologies. Mixing took place at the creation of the bespoke methodology rather than during the ISD process. The findings did show that in addition to an ISD methodology, software quality standards were also in use by eleven teams. Thirteen teams used an ISD methodology, of which five also used the Capability Maturity Model Integrated for Software (CMMI-SW) quality standard. Team 2 did not use an ISD methodology but did use CMMI-SW. However, the project manager commented that the project did not meet the software quality standard, its deadline, budget or original scope (Table 6-6). Team 12 did not use an ISD methodology but did use the International Standards Organisation (ISO 9000) software quality standard. The project not complete on time or within budget. The CMMI-SW and ISO quality standards required adherence to a strict documentation process (section 2.2.3). Four of the thirteen teams that used an ISD methodology also used an internally developed quality process.

6.3.4 Team Experience in relation to ISD methodology

As described in section 6.2, 33% of the participants had less than five years experience in ISD, with 67% having more than five years experience. Conversely, 68% of participants had less than five years experience in virtual teams, and 32% having more than five years experience. Table 6-11 presents the data for each team in relation to the type of ISD methodology in use ranked by years of ISD experience.

Team	ISD years of experience	Virtual Team years of experience	ISD Methodology
1	4.67	3	Bespoke no FSDM
4	4.5	1.25	Bespoke (1 FSDM)
7	4.5	3.5	Bespoke no FSDM
2	4.33	4	No ISD Methodology
6	4.33	2.67	Bespoke no FSDM
14	4.25	3.75	Bespoke no FSDM
15	4.25	2.5	Bespoke (1 FSDM)
10	4	1.33	Bespoke (>1 FSDM)
11	4	3.5	Bespoke no FSDM
9	3.75	1	Bespoke no FSDM
13	3.67	4	Bespoke no FSDM
8	3.25	2.75	Bespoke (>1 FSDM)
3	2.67	2.33	Bespoke no FSDM
5	2.25	2.25	Bespoke (1 FSDM)
12	2.33	2.33	No ISD Methodology

Table 6-11 ISD Experience & Virtual Team Experience vs. ISD Methodology

Key: 1: <1 year experience 3: 3-5 years experience 4: 5-15 years experience
2: 1-3 years experience 5: >15 years experience

Figure 6-3 presents a graph of the relationship between years of ISD experience and the type of ISD methodology. Teams 1, 2, 4, 6, 7, 14 and 15 all had significant ISD experience (more than five years). Team 2 did not use an ISD methodology. Teams 1, 4, 6, 7, 14 and 15 all used a bespoke methodology based on one or no FSDM. The greater the collective years of experience the less reliance on FSDM methodologies. Teams 1, 4 and 7 had the most collective years of experience in ISD. Teams 1 and 7 both developed a bespoke ISD methodology that did not incorporate a FSDM. Both teams also had between three and five years virtual team experience. Team 4 developed a bespoke ISD methodology based on one FSDM. Team 4 had less than three year's virtual team experience. Two of the three teams (4, 6, and 15) with more than five years ISD

experience and less than three years virtual team experience used a bespoke methodology which incorporated a FSDM. Three of the four (1, 2, 7, and 14) teams with more than five years ISD experience and more than three years virtual team experience used a bespoke methodology with no FSDM incorporated.

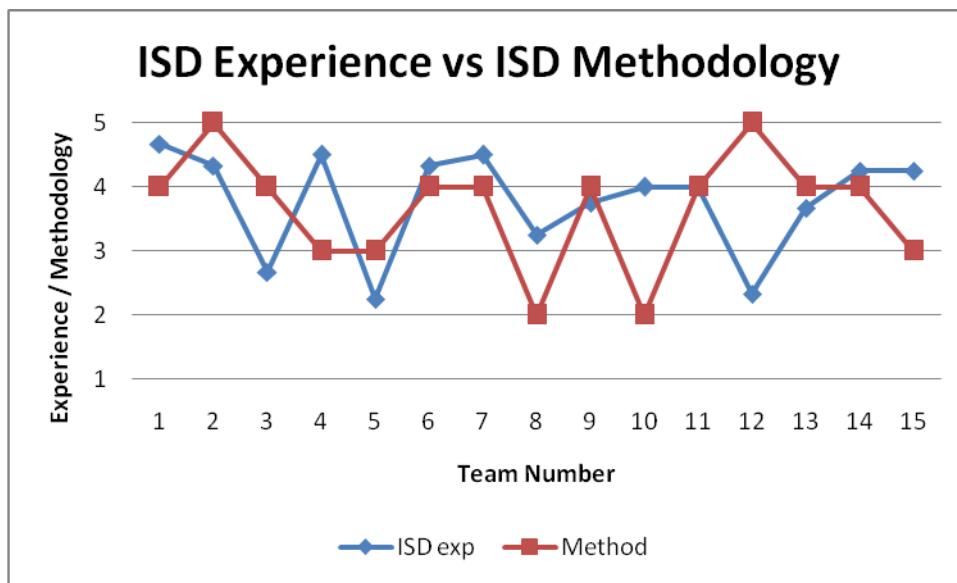


Figure 6-3: ISD Experience vs. ISD Methodology

Years of Experience Key:

- | | | |
|-------------------------|-------------------------|--------------------------|
| 1: <1 year experience | 3: 3-5 years experience | 4: 5-15 years experience |
| 2: 1-3 years experience | | 5: >15 years experience |

ISD Methodology Key:

- | | | |
|----------------------|---------------------|-----------------------|
| 1: FSDM | 3: Bespoke (1 FSDM) | 4: Bespoke (No FSDM) |
| 2: Bespoke (>1 FSDM) | | 5: No ISD Methodology |

Teams 2 and 13 had between five and fifteen years experience in ISD and virtual teams. Team 2 chose not to use an ISD methodology. Team 13 created a bespoke methodology not based on an FSDM. Team 2 was not successful in its project and team 13 was highly successful (Table 6-6).

Teams 3, 5, and 12 had the least collective years of experience in ISD. Team 3 developed a bespoke ISD methodology that did not incorporate an FSDM. Team 5 developed a bespoke ISD methodology that incorporated one FSDM. Team 12 did not use an ISD methodology at all. All three teams had less than three year’s virtual team experience.

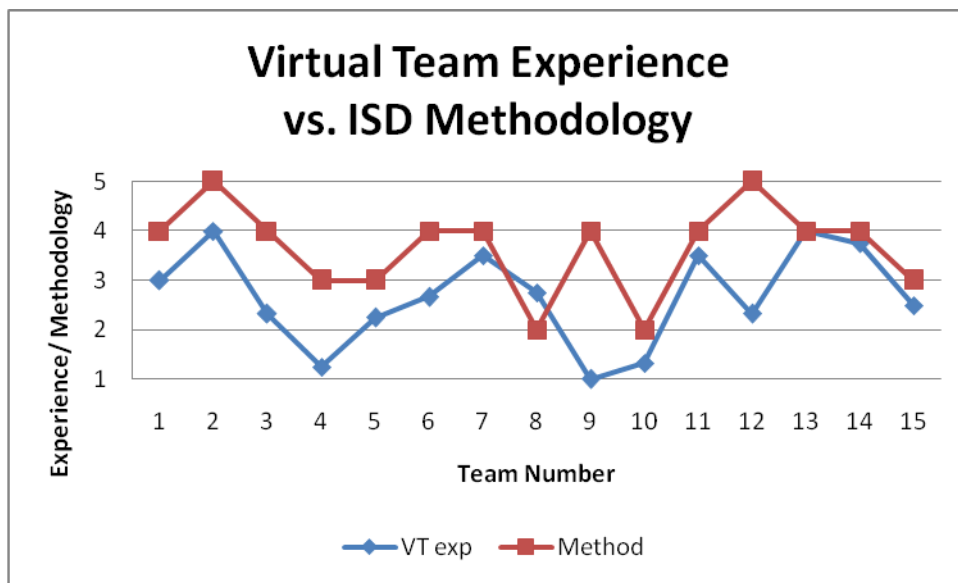


Figure 6-4: Virtual Team Experience vs. ISD Methodology

Years of Experience Key:

- | | | |
|-------------------------|-------------------------|--------------------------|
| 1: <1 year experience | 3: 3-5 years experience | 4: 5-15 years experience |
| 2: 1-3 years experience | | 5: >15 years experience |

ISD Methodology Key:

- | | | |
|----------------------|---------------------|-----------------------|
| 1: FSDM | 3: Bespoke (1 FSDM) | 4: Bespoke (No FSDM) |
| 2: Bespoke (>1 FSDM) | | 5: No ISD Methodology |

Table 6-11 also showed the years of virtual team experience. Teams 4, 9 and 10 had the least collective virtual team experience. Each of these teams developed a bespoke methodology, two of whom incorporated one or more FSDM’s. Teams 2, 13, and 14 had the greatest collective virtual team experience. Team 2 used no ISD methodology. Teams 13 and 14 developed a bespoke ISD methodology that

did not incorporate an FSDM. Figure 6-4 presents the relationship between the collective years of virtual team experience and the type of an ISD methodology.

6.4 Socialisation Tactics

This section presents the findings gathered by the survey on socialisation tactics. The aggregation of respondent scores allowed for team analysis. As described in section 5.4.3.2 respondents answered some questions in relation to local and then in relation to distanced team members. To present the findings in a coherent format this section was divided into six parts, one for each proposition based on a category of tactics. Where appropriate, categories contained comparisons between local and distanced scores. All respondents had equal opportunity to complete this section of the survey. However despite encouragement, the majority of members in team five did not. Consequently, scores relating to team five were omitted.

Socialisation was theorised at the team level however it was necessary to measure it through individual perceptions at the individual level. To prevent false levels the degree of perceptual agreement was measured using the rwg(j) index (James et al, 1984). A scale is considered appropriate for aggregation at the higher level (e.g. the team level) when the median rwg(j) among all teams is greater than .70 (Piccolli et al 2004). The median for each set of local socialisation tactics are contained in Table 6-12. The median among all teams was .68 or greater, the individual scores were therefore aggregated to generate team level indicators.

Collective vs. Individual	Formal vs. Informal	Serial vs. Disjunctive	Investiture vs. Divestiture	Sequential vs. Random	Fixed vs. Variable
0.68	0.71	0.81	0.91	0.81	0.73

Table 6-12: Median rwg(j) Local Socialisation Tactics

The median for each set of distanced socialisation tactics are contained in Table 6-13. A score of .69 was considered a moderate skew of results, with .39 a large skew. So there was obvious dissension amongst distributed teams in relation the use of collective/individual and serial/disjunctive tactics. All responses were aggregated to the team level. However those with a *rwg(j)* of below .70 were investigated further at the individual level.

Collective vs. Individual	Formal vs. Informal	Serial vs. Disjunctive	Investiture vs. Divestiture	Sequential vs. Random	Fixed vs. Variable
0.51	0.68	0.57	0.86	0.81	0.73

Table 6-13: Median *rwg(j)* Distanced Socialisation Tactics

6.4.1 Collective vs. Individual

Each participant answered questions (Likert scale of 1 to 7) relating to their socialisation experiences (Appendix A, questions 49-103). Those scores were then aggregated. Mean and standard deviation scores for collective vs. individual tactics were presented in Table 6-14. Nine teams scored a mean higher than 4.0 (out of 7) with four teams scoring higher than 5.00 which indicated the preferred use of collective tactics in relation to local team members. The remaining five teams scored less than 4.00 indicating the use of individual tactics. Collective tactics involved spending time with colleagues for example through training, induction courses and meetings. Six teams indicated collective tactics in relation to distanced team members (section 3.5.1). None of the teams scored higher than 4.77 for collective tactics in relation to distance team members. Eight teams scored less than 4.00 in relation to distanced team members. With scores as low as 2.87, these teams preferred the use of individual tactics in relation to distance team members. Individual tactics allowed the individual to experience socialisation separately from other team members (section 3.5.1). The findings showed that collective tactics were more evident in relation to local team

members than towards distanced team members. However section 6.4 showed that the median rwg(j) for collective vs. individual tactics did indicate some dissension between team members on the use of this set of tactics.

Collective tactics included spending time with colleagues. This study found that 45% of respondents shared job related training experiences with distanced colleagues. 57% agreed that distanced colleagues were influential in helping to understand their job requirements. Conversely, 72% shared experiences with local colleagues and 78% considered local colleagues influential to their understanding of their job requirements. These figures accurately reflected the lower scores for individual tactics in relation to distanced team members and the higher scores for collective tactics in relation to local team members.

Team Number	Aggregated Mean in relation to Local team members	Standard Deviation in relation to Local team members	Aggregated Mean in relation to Distanced team members	Standard Deviation in relation to Local team members
1	4.27	1.30	3.33	2.08
2	3.73	.31	2.87	1.68
3	4.37	.81	3.43	1.06
4	3.80	.72	3.47	.50
6	4.80	1.60	3.27	.99
7	3.60	1.68	4.20	1.17
8	5.37	.66	4.77	1.07
9	4.75	1.61	3.55	1.58
10	3.73	.61	2.87	1.40
11	4.85	.50	4.05	1.26
12	5.27	.46	4.67	.70
13	5.40	1.31	4.53	1.86
14	5.55	.64	4.45	.68
15	3.60	.97	3.80	.71

Table 6-14 Collective vs Individual Tactics

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
2: Mostly disagree 6: Mostly agree
3: Partially disagree 7: Strongly agree

In contrast to all other teams, 7 and 15 scored collective tactics higher in relation to distanced team members. Team 7 was a highly distributed team. Multiple sites resulted in few members located together thus fewer local team members. Consequently, those members that responded indicated stronger collective socialisation tactics with distributed team members. Team 15 scored similarly and was highly distributed with few members located together.

Not all teams agreed on the type of tactics in use. In relation to local tactics the standard deviations showed that teams 6, 7 and 9 disagreed. Two members of team six experienced similar levels of collective tactics. Those two members were located together. The third team member travelled between three locations and experienced higher levels of collective tactics. The difference in the team member scores resulted in a large standard deviation (see Table 6-14). Similarly team 7 showed disagreement. Those team members that travelled between several sites experienced collective tactics in relation to distanced team members. They experienced more individual tactics in relation to local team members. This was possibly because they did not spend a significant amount of time at one local site.

All 14 teams used a central store of project information. This provided a means for equal access to project related information for all team members regardless of location. In many cases, the store existed on a network drive on the organisations intranet. Alternatively, several teams used commercial tools such as www.sharepoint.com, www.projectplace.com, www.confluence.com or www.eproject.com. These tools facilitated the sharing of information amongst team members. Each of these tools provided support for collaboration and communication between team members in the form of online meeting spaces, team workspaces, project calendars, notifications, announcements, and document version control.

“All project data was stored on SharePoint and CC Harvest. SharePoint based in (Europe, Middle East and Australasia) EMEA and CC Harvest in the US.”

Team 2 member A

“Confluence, contains all information about each part of project”

Team 9 member B

“All the activities and documents related to project were stored on a SharePoint to which all the team members had access.”

Team 9 member E

“Located in an easily accessible intranet site. Stored development work, schedules, testing results.”

Team 12 member B

One team used the collaboration tool for both project related information and for team member information such as news and photos.

“Microsoft SharePoint website. Physically located in Madrid, available at all sites over web. Core document repository, also contact lists, project news, photos”

Team 5 member E

Team	Size	Duration (months)	No. of Locations	Team Kick off meeting	Team Electronic Meeting
14	4	3	2	No	Weekly
1	4	7	2	No	Weekly
15	6	6	4	No	Weekly
3	6	15	2	Yes	Weekly
2	7	15	4	Yes	Weekly
8	8	6	2	No	Weekly
9	9	5	2	Yes	Monthly
11	9	12	2	Yes	Weekly
4	4	9	2	No	Weekly
13	12	10	2	No	Weekly
12	20	15	2	No	Weekly
10	28	24	2	No	Monthly
7	50	12	4	Yes	Monthly
5	50	16	3	No	Never
6	60	12	4	No	Never

Table 6-15: Collective Tactics

Table 6-15 ranked teams based on team size and duration. It showed that a common collective tactic used by the teams was a meeting. Ten of the fifteen teams met electronically as an entire team on a weekly basis. All of those teams consisted of less than 20 members and existed across no more than 3 locations. Those teams that met monthly were larger in composition with an average of 42 team members. Daily issue meetings and in some cases weekly status meetings for relevant team members occurred over the life of the project. Team members considered meetings an integral part of the ISD process that facilitated communication.

“Formal daily, weekly, and milestone tollgate meetings allied to daily informal communications”

Team 7 member A

“Telephone used above email, sometimes language barrier meant team members preferred to use email, telephone encouraged as primary means followed by email”

Team 6 member C

“Daily Issues meetings - meant one was constantly discussing points that needed resolving, by email, meetings etc”

Team 7 member B

“

Only five teams met at one location for a ‘kick-off’ meeting at the beginning of the project (Table 6-15). A “kick off” meeting took place face-to-face at one location. Sections 2.4.1, 2.5.1.4 and 2.5.4.2 indicated that an initial face-to-face meeting could be of great importance to virtual teams. Four of the teams that had a “kick off” meeting had less than ten members. One team had fifty members; however it was understood that only the team leaders and management met on that occasion. One team exchanged team members during the ISD project, another team had on site visits for those team members that were not familiar with distanced team members.

6.4.2 Formal vs. Informal

Table 6-16 shows the formal vs. informal aggregate mean and standard deviation scores for each team. Three teams used formal tactics in relation to local team members (scored higher than 4.00 out of 7.00). The remaining eleven teams all used informal tactics in relation to local team members (scored lower than 4.00 out of 7.00). Twelve teams showed an increase in their aggregate mean score,

which indicated an increase in formality towards distanced team members. Six teams scored higher than 4.00 in relation to distanced team members.

Team Number	Aggregated Mean in relation to local team members	Aggregated Standard Deviation local team members	Aggregated Mean in relation to distanced team members	Aggregated Standard Deviation Distanced team members
1	2.87	1.62	3.53	1.22
2	2.93	0.46	3.13	0.76
3	3.13	0.55	3.83	0.73
4	3.67	0.42	3.73	0.31
6	4.13	0.61	4.8	0.72
7	4.3	0.81	4.1	1.23
8	4.4	1.5	4.63	1.21
9	3.1	0.81	3.4	0.49
10	3.27	1.96	3.47	1.1
11	3.9	1.05	4.15	1.11
12	3.27	0.42	4.33	0.46
13	3.47	1.3	4.53	1.21
14	3.3	0.84	3.7	0.77
15	2.85	0.53	2.85	0.53

Table 6-16 Formal vs. Informal

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
 2: Mostly disagree 6: Mostly agree
 3: Partially disagree 7: Strongly agree

The survey gathered data on the formal tactic of team training (see appendix A questions 60-69). The qualitative data gathered indicated that few teams had opportunities for members to train with distanced team members. Respondents from four teams had no opportunity to train with any distanced team members. All members from two teams indicated they did have the opportunity to train with some or all of their distanced team members. A minority of members in nine teams had the opportunity to train with some or all of their distanced team members.

Some teams used formal occasions for members to get know each other.

“Formal team building events”

Team 7 member A

“On boarding document”

Team 7 member B

“Conference calls and online chat area were used for
people to get to know each other”

Team 3 member D

In other cases, team members used informal methods to communicate.

“The team made email addresses and contact numbers freely available and at meetings we often said 'we'll take that offline' after this meeting leaving you free to contact individuals at your leisure. An open communication environment was encouraged.”

Team 5 member A

“Follow up of issues outside of formal channels encouraged, such as daily
incident meetings”

Team 10 member C

“The nature of the work meant I needed to deal with developers on a one to one
basis, be that via email or over the telephone.”

Team 8 member A

The aggregate scores showed the use of informal tactics in relation to local team members, and more formal tactics in relation to distanced team members. However fourteen teams indicated some use of formal socialisation

documentation. The most common being a document detailing team member roles and responsibilities. There was however disagreement in the existence of this documentation. One member on teams 2, 8, 9, 10, 11, 12, and 15 said there were no formal documents that contained socialisation information. On team 14, three out of the four team members (including the project manager) said no document existed. The remaining team member was aware of a member roles document. On team 3, four out of the six team members (not including the project manager) said no document existed. The project manager was aware of documents containing team behaviour, conflict resolution, and member responsibilities information. The other team member was aware of the member responsibilities document only.

Formal documents contained information specific to each project. The socialisation information that was contained in the documents related to roles, responsibilities, conflict resolution, and communication norms.

Participants described the contents of the formal documents:

“There is a specific Roles and Responsibilities document that outlines each team members role and contact details. The other document outlines expected response times between the sites during the phases of the project.”

Team 2 member B

“Conflict resolution manual is available”

Team 3 member F

“Role and responsibilities were clearly defined and communicated. Communication channels and escalation matrix were defined and all team members were made aware thru docs and also during meetings”

Team 8 member B

Team 10 showed disagreement in the use of formal tactics in relation to local team members. Three team members completed the survey. One team member experienced very informal tactics whereas the other two members experienced formal tactics. These team members were in the same location. The project manager and business analyst experienced similar formal tactics; however the software developer experienced informal tactics.

Team 15 used informal tactics for both local and distanced team members (see Table 6-16). Electronic meetings were used to discuss project related issues. However, the qualitative data indicated poor use of agenda's and a lack of formality to meetings.

“We could have had more frequent conference calls and better status updates.
Better identification of roles and resolution of issues may have helped.”

Team 15 member B

“[we needed] more clear definition of each members role and responsibilities.
Explicit agendas during conference calls”

Team 15 member A

“[we needed] enforced weekly update calls!”

Team 15 member C

Frequent use of informal communication such as Skype, instant messaging, ad-hoc conference calls and electronic mail did ensure constant communication. No physical meetings took place between any of the team members. The project manager encouraged team members to give time for social interaction in phone calls. However, two of the four team members said they would have liked more formality.

Team 8 used formal tactics for local and distanced team members (see Table 6-16). The team's use of formal tactics included the use of an internal website. This provided access to project and team socialisation information. Formal documents contained project details, meeting minutes, schedules and project specifications. The entire team formally met electronically once a week. Local team members met physically at their own locations.

Teams 6 and 10 commented on cultural difficulties in the form of a language barrier. Team 6 was located in Ireland, Spain and India, team 10 was located in Ireland and Poland. Misunderstandings occurred and decisions were delayed. Formal tactics that could relieve cultural differences were in evidence in some teams. Team 9 had a policy of exchanging local and distanced team members. Team 7 used team building events, at which familiarity and identification of differences could occur. Teams 9, 11, and 13 all had a document containing code of conduct and expected behaviour information.

6.4.3 Serial vs. Disjunctive

Table 6-17 presented the aggregated mean and standard deviation scores for serial vs. disjunctive socialisation tactics. Nine of the fourteen teams scored higher than 4.00 (out of 7) which indicated serial tactics were in use in relation to local team members. Seven of the fourteen teams scored higher than 4.00 (out of 7) in relation to distanced team members. The data did show that distanced team members encountered serial tactics to a lesser extent than their local counterparts. For each team the aggregated mean score for serial tactics in relation to distanced team members was slightly lower than in relation to local team members. There was some disagreement in the use of serial tactics with distanced team members. The median $rwg(j)$ was below .70 (Table 6-13) indicating a skewed team aggregation score. Team members in 2, 9, and 13 did not agree on the use of serial tactics in relation to distance team members. Serial tactics as described in

section 3.5.3 concerned the influence and importance of colleagues. Two members in team 2 considered distanced team members influential to their job. The third team member did not consider that to be the case. The third team member was the project manager. Similarly the project managers in teams 9 and 13 did not consider distanced colleagues influential to their job. In all cases the difference in the project manager's score resulted in a high standard deviation.

Team	Aggregated Mean in relation to local team members	Aggregated Std Deviation local team members	Aggregated Mean in relation to distanced team members	Aggregated Std Deviation distanced team members
1	5.60	.40	4.53	.46
2	3.53	1.14	3.40	1.71
3	3.90	1.04	3.63	.63
4	3.87	.76	2.93	.95
6	6.13	.23	5.20	.72
7	4.35	1.47	4.55	.90
8	4.74	1.53	4.83	1.22
9	4.90	1.61	4.00	1.54
10	3.80	1.31	3.73	1.33
11	5.45	.30	5.05	.75
12	4.60	.40	3.87	.61
13	5.40	1.20	4.73	1.67
14	5.15	1.10	5.05	.66
15	2.85	.19	2.90	.26

Table 6-17: Serial vs. Disjunctive

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
2: Mostly disagree 6: Mostly agree
3: Partially disagree 7: Strongly agree

Seven of the fourteen project managers experienced a somewhat increased level of serial tactics over their team members. Those project managers scored higher in relation to serial tactics than their team members.

Thirteen teams engaged in mentoring programmes of some description. Six teams utilised mentors that were located at a distance. The remaining seven teams allocated local mentors to some or all team members. Those members

provided with a mentor found them to be a positive source of expertise and knowledge.

A project leader with more than five years ISD and virtual team experience made the following comment.

"Guidance and experience as well as cultural benefits".

Team 2 member A

A business analyst with more than fifteen years ISD experience and three years virtual team experience made the following comment.

"Gave directions on project scope and addressed the political issues caused by the changes needed by the project."

Team 4 member D

A software developer with more than fifteen years ISD and virtual team experience made the following comment.

"She [mentor] was so open it was great to have someone to ask questions to. You could ask her even the most basic question and she would not mind at all."

Team 5 member D

Despite extensive experience this team member found a mentor to be very helpful and supportive.

A software developer with more than five years ISD experience and less than three years virtual team experience made the following comment.

"I was able to ask questions of someone who had real working knowledge".

Team 14 member D

A business analyst with less than three years ISD and virtual team experience made the following comment.

"[I could] Talk through problems and issues as they become apparent. Problem solve and brain storm".

Team 12 member B

Across all fourteen teams, nineteen individuals indicated no mentor was available to them. The project manager on team 4 had a mentor but the remaining 5 team members did not. 73% of those team members with no mentor had five or more years of experience working in ISD. Those team members with a mentor varied significantly in experience and job category with 46% of them having less than five year's experience in ISD.

Team fifteen was the only team that did not use a mentoring programme. The team members did not know each other prior to the project and they were all located in different places. The project leader acted as a stand-in mentor but no formal mentoring program was in place for each team member.

6.4.4 Investiture vs. Divestiture

Investiture tactics indicated to a new recruit whether their personality, skills, and attitudes were accepted by the organisation. Table 6-18 presented the aggregate mean and standard deviation scores for this category of tactics. Data from team 6 was not included as an insufficient number of team members answered the relevant questions. All thirteen teams who provided responses used investiture tactics (each aggregate score was higher than 4.00 out of 7). Questions included "team members have gone out of their way to help me adjust to this project team", and "I feel that experienced team members have held me at a distance until I conform to their expectations". Both of these questions were asked in

relation to local team members and in relation to distanced team members. The findings showed that local and distanced team members were treated the same in this category of tactics. Marginal differences existed in the aggregate scores in relation to local and distanced team members. Of the thirteen teams, only one team member scored below 4.00 on the question “I feel that my skills and abilities are very important in this project team” (Appendix A question 85).

Team Number	Aggregate Mean in relation to local team members	Aggregate Standard Deviation in relation to local team members	Aggregated d Mean in relation to distanced team members	Aggregated Standard Deviation in relation to distanced team members
1	5.73	.31	5.53	.46
2	4.73	.99	4.67	1.29
3	5.13	.65	5.03	.59
4	5.80	.87	5.60	1.31
7	5.00	.91	5.15	.82
8	5.85	.82	5.70	.73
9	5.25	1.25	5.10	1.31
10	5.87	.61	5.60	.60
11	6.05	.66	6.00	.67
12	6.40	.69	6.27	.76
13	6.40	.87	5.93	1.51
14	5.30	.58	4.95	.66
15	5.60	1.33	5.55	1.42

Table 6-18: Investiture vs. Divestiture

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
2: Mostly disagree 6: Mostly agree
3: Partially disagree 7: Strongly agree

Investiture tactics encouraged team commitment and shared understanding by accepting and supporting the team members skills, attitudes and personalities (section 3.5.4). A demonstration of that acceptance and support was thought to be in the form of celebrations of milestones and successes. Eight teams celebrated milestones and successes during the project life cycle. Five of the eight teams had celebrations that involved only local team members.

“Christmas party, phase completion events, go-live celebrations. Each event happened separately at each site, although there was some x-fertilisation at times”

Team 6 member A

“Team coffee outings. Only local team members included”

Team 8 member B

“Social event after work with local team, going out”

Team 9 member A

In some cases, the celebrations involved invited distanced team members or those who were on site at the time of the celebration.

“Distance team members only from the deployed site (not from India). Dinners and individual bonuses”

Team 7 member A

“Local and distanced teams celebrated successful validation with a BBQ and night out.”

Team 11 member B

The most common celebrations were for phase completion, and go live or rollout of a project. The events varied from a coffee outing, drinks and dinner, to champagne. In addition, several teams honoured individual members with excellence awards in the form of monetary vouchers.

6.4.5 Sequential vs. Random

This category of tactics posed questions relating to each individual without differentiating between local and distanced team members. Table 6-19 showed the aggregated team scores for sequential vs. random tactics. Seven teams scored higher than 4.00 (out of 7) indicating the use of sequential tactics. Sequential tactics meant that team members progressed from one role to the next in a sequential manner. Individuals would know the details of those job roles and functions (section 3.5.5). Of those seven teams, six also used formal socialisation documents containing information on team member roles and responsibilities (section 6.4.2).

Team Number	Aggregated Mean	Aggregated Std Deviation
1	4.27	1.01
2	3.53	.95
3	3.87	1.10
4	4.40	.53
7	4.55	.38
8	5.48	1.30
9	3.75	1.31
10	3.73	1.50
11	5.50	.62
12	3.27	1.15
13	5.47	.95
14	4.40	1.17
15	3.60	.54

Table 6-19: Sequential vs. Random

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
 2: Mostly disagree 6: Mostly agree
 3: Partially disagree 7: Strongly agree

The documents mentioned in section 6.4.2 contained details of the roles and responsibilities of team members. Despite teams 1, 10, and 14 not using those formal documents they still scored 4.27, 3.73 and 4.40 for sequential tactics. Seven teams had standard deviations greater than 1.00, indicating some disagreement in the use of this tactic. Teams 8 and 11 scored the highest for sequential tactics. Team 8 also used formal socialisation documents (section 6.4.2) and identified expertise at project initiation. All team members on both

teams 8 and 11 always knew whom to contact for expertise during the project. Teams 2 and 12 scored the lowest for sequential vs. random tactics, indicating that they used random tactics. However, team 12 had a large standard deviation indicating some disagreement on the use of this set of tactics. Team 15 also scored low (3.60) with a low standard deviation (.58). Teams 2 and 15 used formal socialisation documents detailing team member roles. Team 15 did identify expertise at the project initiation stage. Half of team 15 sometimes didn't know whom to contact for expertise and half always knew. All members in team 2 sometimes didn't know whom to contact for expertise.

The survey asked each team member whether identification of individual skills and expertise occurred at the beginning of the project. According to the project managers, four teams explicitly identified individual expertise and skills within the project team. This practice informed all team members of who had specific skills. All of those teams also used roles and responsibilities documents. Two of the remaining teams were aware of the expertise in the team due to prior experience with those team members and access to a mentor.

“I had worked with some members previously and so was very aware of their
skill sets”
Team 9 member C

“through experience, mentor”
Team 10 member A

Of the four teams that explicitly identified individual expertise, all members of only two teams always knew whom to contact during the project. The other two teams had some members who were sometimes unsure of whom to contact for expertise. Team 2 did not identify skills, and all team members had problems knowing whom to contact for expertise during the project. Team 3 also did not

identify skills, however all but one team member knew whom to contact for expertise during the project.

Respondents commented the following in relation to the identification of knowledge and expertise within a team.

“Responsibilities were outlined at the beginning of the project”

Team 11 member A

“The job titles and departments and previous projects that each project team member belonged to made their expertise identifiable”

Team 3 member C.

“Asked local mentor and other distance contacts who I should approach for certain issues”

Team 14 member B

It was also evident that team members were chosen for the job based on prior experience and area of expertise.

“People were picked based on previous work completed that formed a basis for the new project”

Team 1 member A.

“picking the team members with the knowledge that would be required to complete the project.”

Team 4 member D.

“I was known for my expertise of a particular system”

Team 13 member A.

Sequential tactics informed the individuals of the job roles and functions in the team. The findings showed that this information existed both explicitly in documents and implicitly through experience and access to a mentor. Despite this information, team members continued to have difficulty in knowing whom to contact during a project for specific expertise.

6.4.6 Fixed vs. Variable

This category of tactics posed questions relating to all team members without differentiating between local and distanced. This set of tactics related to the timescales associated to role progression in the project teams. Table 6-20 showed the aggregated team means and standard deviations. Eight of the thirteen teams scored higher than 4.00 (out of 7) indicating the use of fixed socialisation tactics.

Team Number	Aggregated Mean	Aggregated Std Deviation
1	4.20	1.59
2	3.60	.72
3	3.63	.90
4	4.20	.72
7	4.45	.34
8	4.65	1.02
9	4.20	.86
10	3.93	1.17
11	4.90	.74
12	3.60	1.06
13	4.20	.69
14	4.20	.43
15	3.25	.60

Table 6-20: Fixed vs. Variable

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
 2: Mostly disagree 6: Mostly agree
 3: Partially disagree 7: Strongly agree

6.4.7 Socialisation Tactics Strategy

Jones (1986) classified socialisation tactics so that the type and level of tactic in use by each team determined the overall strategy employed (section 3.3.1.1). The findings in sections 6.4.1 through 6.4.6 showed use of collective tactics in relation to local team members, electronic meetings, a shared digital work space, some training, informal tactics, informal communication, some formal socialisation documents, formalised tactics in relation to distanced team members, serial tactics, mentors, investiture tactics and a fixed sequential approach to job roles. In summary, the collective, serial, sequential, investiture and fixed socialisation tactics were all popular. Each of these categories formed an institutionalised socialisation strategy. Trends emerged in the data that showed a preference for institutionalised tactics.

One category of tactics that contradicted Jones' (1986) classification was the use of formal vs. informal tactics. The findings in section 6.4.2 showed that teams used informal tactics. However there was also evidence of formal socialisation documents. The formal vs. informal tactics questions related specifically to training opportunities (Appendix A, questions 60-70). Few team members across all teams had the opportunity to train with other team members (section 6.4.2). Virtual ISD teams were constrained by budget and time (sections 2.2 and 2.5.1). Training was not an integral part of the project for the virtual ISD teams in this study. Expertise and prior experience determined team member selection (section 6.4.5) reducing the need for training during the project.

Virtual team members experienced socialisation tactics in relation to local and distanced team members. The research instrument measured socialisation tactics in relation to local and in relation to distanced team members (section 5.4.3.2). Table 6-21 presented the team aggregate scores for each socialisation category in relation to local team members only. In the last column, the table included a team socialisation strategy mean score indicating an institutionalised or individualised

team strategy. Missing data led to the exclusion of teams 5 and 6 from this table. Scores that were below 4.00 (out of 7) demonstrated an individualised approach to socialisation; scores above 4.00 (out of 7) indicated an institutionalised approach. Eleven teams showed use of an institutionalised socialisation strategy with local team members. The final row presented a mean score per socialisation tactic. The data showed across all teams the average scores were 4.59 for collective, 3.52 for informal, 4.62 for serial, 5.59 for investiture, 4.47 for sequential, and 4.20 for fixed. In general, an institutionalised set of tactics were in use.

Shown in red, teams 2 and 15 had the lowest socialisation aggregate mean scores. Team 2 scored 3.68, team 15 scored 3.62. These teams used an individualised socialisation strategy as their scores were below 4.00. Team 2 indicated a preference for investiture (institutionalised) and informal, disjunctive, individual, random and variable (individualised) tactics. The team existed across four locations and in as many countries. No initial meeting took place and team members never met physically during the project life cycle. Only one team member had a mentor and no celebrations of successes or milestones occurred.

Team		Aggregate Score for Collective vs. Individual	Aggregate Score for Formal vs. Informal	Aggregate Score for Serial vs. Disjunctive	Aggregate Score for Investiture vs. Divestiture	Aggregate Score for Sequential vs. Random	Aggregate Score for Fixed vs. Variable	Team Socialisation Strategy Mean
1	Mean	4.27	2.87	5.60	5.73	4.27	4.20	4.49
	Std. Dev	1.30	1.62	.40	.30	1.00	1.59	.89
2	Mean	3.73	2.93	3.53	4.73	3.53	3.60	3.68
	Std. Dev	.30	.46	1.14	.99	.94	.72	.58
3	Mean	4.37	3.13	3.90	5.13	3.87	3.63	4.00
	Std. Dev	.81	.55	1.04	.65	1.10	.90	.53
4	Mean	3.80	3.67	3.87	5.80	4.40	4.20	4.29
	Std. Dev	.72	.42	.76	.87	.53	.72	.31
7	Mean	3.60	4.30	4.35	5.00	4.55	4.45	4.37
	Std. Dev	1.68	.81	1.47	.91	.38	.34	.52
8	Mean	5.37	4.40	4.74	5.85	5.47	4.65	5.10
	Std. Dev	.66	1.50	1.53	.82	1.29	1.02	.47
9	Mean	4.75	3.10	4.90	5.25	3.75	4.20	4.32
	Std. Dev	1.61	.81	1.61	1.25	1.31	.86	.89
10	Mean	3.73	3.27	3.80	5.87	3.73	3.93	4.05
	Std. Dev	.61	1.96	1.31	.61	1.50	1.17	.77
11	Mean	4.85	3.90	5.45	6.05	5.50	4.90	5.11
	Std. Dev	.50	1.05	.30	.67	.62	.74	.39
12	Mean	5.27	3.27	4.60	6.41	3.27	3.60	4.40
	Std. Dev	.46	.42	.40	.70	1.15	1.06	.49
13	Mean	5.40	3.47	5.40	6.40	5.45	4.20	5.05
	Std. Dev	1.31	1.3	1.20	.87	.94	.69	.81
14	Mean	5.55	3.30	5.15	5.30	4.40	4.20	4.65
	Std. Dev	.64	.84	1.10	.58	1.17	.43	.68
15	Mean	3.60	2.85	2.85	5.60	3.60	3.25	3.62
	Std. Dev	.97	.52	.19	1.33	.54	.60	.41
Socialisation Tactic Mean	Mean	4.59	3.52	4.62	5.59	4.47	4.20	
	Std. Dev	0.95	0.89	0.90	0.71	0.93	0.82	

Table 6-21: Local Socialisation Tactics across Teams

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
2: Mostly disagree 6: Mostly agree
3: Partially disagree 7: Strongly agree

Team 15 had six team members across four locations with no physical meetings during the project life cycle. Individual, informal, disjunctive, random and variable tactics were all in use and associated with individualised tactics. The only institutionalised tactic in use was investiture tactics. The use of sequential and informal tactics was clear through the following comments.

"More clear definition [was needed] of each members role and responsibilities.
Explicit agendas during conference calls rather than meandering chat"
Team 15 member A

"We could have had more frequent conference calls and better status updates,
however all team members were part time, so coordinating schedules was
sometimes difficult."
Team 15 member B

"There were some tensions between team members. Better identification of roles
and resolution of issues may have helped."
Team 15 member B

Table 6-21 showed teams 11 and 8 (in blue) scored the highest socialisation aggregate means. Team 11 scored 5.11 and team 8 scored 5.10. These teams used institutionalised tactics in the form of collective experiences, formal socialisation documents, mentoring, role clarity and recognition of existing expertise. Team 11 comprised of members located in the United States and Ireland. The team met physically at the beginning of the project and approximately seven times over the twelve month duration of the project. Informal and formal communication occurred through teleconferences and email. An intranet site provided access to

project documentation, company policies and work practices. Formal socialisation documentation detailed roles, responsibilities, expected behaviour and conflict resolution steps.

“There are various business standards for which compliance is necessary. Work instructions, SOP’s and local and global policies”.

Team 11 member C.

A local mentor programme supported the team members and offered significant benefits to the team.

“Confidence to perform the task required of me”.

Team 11 member C.

“Guidance and experience as well as cultural benefits”.

Team 11 member B.

Success and milestones resulted in a celebration involving local team members and on some occasions, all team members.

“We had a barbeque when phase 1 was achieved”.

Team 11 member C.

“Local and distanced teams celebrated successful validation”.

Team 11 member B.

Team 8 comprised of members located in India and Ireland working together for six months. No physical meetings took place at the beginning or during the life of the project. Formal socialisation documents identified team member roles and responsibilities. Identification of expertise in the team occurred at project

initiation. Regular teleconference calls, email and online chat facilitated informal and formal communications.

“The nature of the work meant I needed to deal with developers on a one to one basis, be that via email or over the telephone”.

Team 8 member A

A central repository provided a store for project related documentation.

“The information was located on SharePoint, for which all team members have access. The following information was stored on SharePoint: Project milestone document, project status, team member information, minutes of meetings, specifications, new updates, design documents and review comments”.

Team 8 member H

Team outings and informal meetings helped team members to get to know each other. As can be seen from the statements below, a mentor programme provided technical and operational support and guidance to all job roles and levels of experience.

“[mentor provided] guidance in making decisions”.

Team 8 member B

“[mentor provided] knowledge on the project and framework which we are using”.

Team 8 member D

Figure 6-5 provides a diagrammatic view of the team’s socialisation aggregate means.

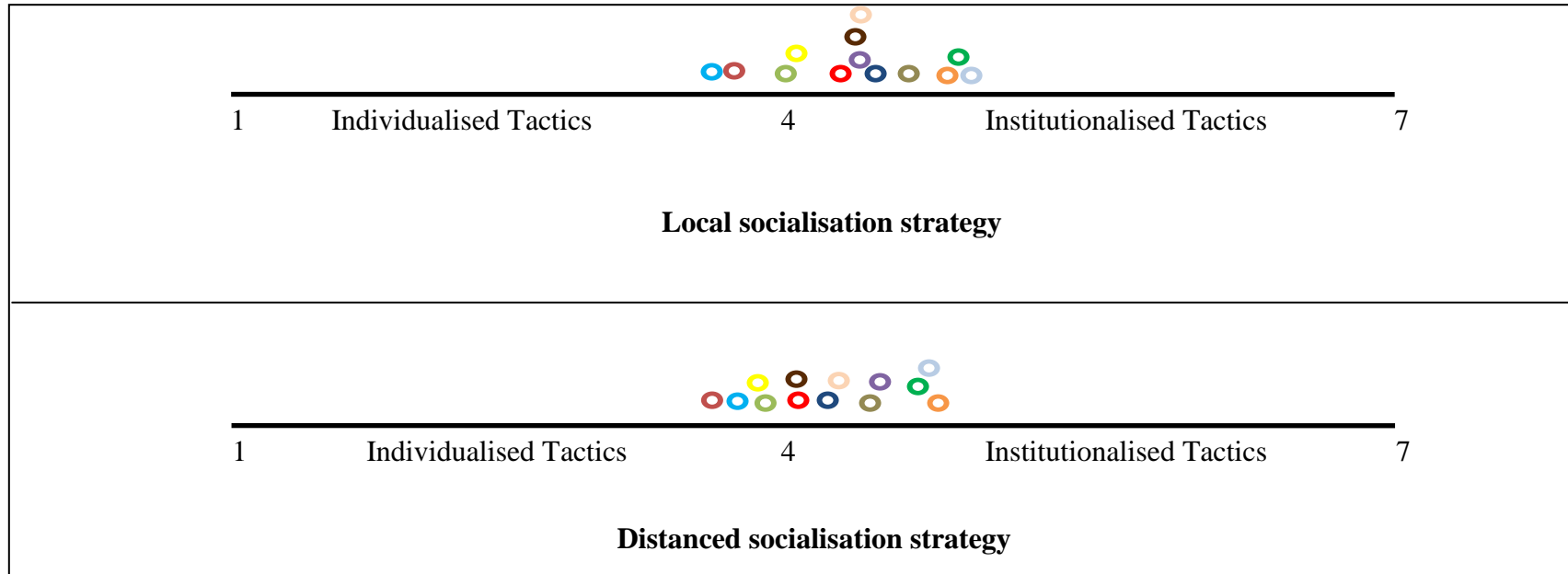
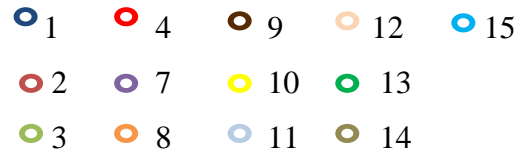


Figure 6-5 Local versus Distanced Socialisation Strategy

Key: Team.



Key: Team socialisation aggregate means

1-4 Individualised tactics 4-7 Institutionalised tactics

Table 6-22 presented the team aggregate scores for each socialisation tactic in relation to distanced team members. In the last column, the table included a team socialisation strategy mean score indicating an institutionalised or individualised team strategy. Missing data led to the exclusion of teams 5 and 6 from this table. Scores that were below 4.00 (out of 7) demonstrated an individualised approach to socialisation; scores above 4.00 (out of 7) indicated an institutionalised approach. (see Figure 6-5 for a diagram of this data). Nine teams showed use of an institutionalised socialisation strategy with distanced team members. The final row presented a mean score per socialisation tactic. The average scores per socialisation tactic were 3.83 for individual, 3.90 for informal, 4.22 for serial, 5.41 for investiture, 4.45 for sequential, and 4.22 for fixed. Each of these scored reduced slightly from the data shown in Table 6-21.

Team		Aggregate Score for Collective vs. Individual	Aggregate Score for Formal vs. Informal	Aggregate Score for Serial vs. Disjunctive	Aggregate Score for Investiture vs. Divestiture	Aggregate Score for Sequential vs. Random	Aggregate Score for Fixed vs. Variable	Team Socialisation Strategy Mean
1	Mean	3.33	3.53	4.53	5.53	4.27	4.20	4.23
	Std. Dev	2.08	1.22	.46	.46	1.01	1.59	1.14
2	Mean	2.87	3.13	3.40	4.67	3.53	3.60	3.53
	Std. Dev	1.68	.76	1.71	1.29	.94	.72	1.18
3	Mean	3.43	3.83	3.63	5.03	3.87	3.63	3.90
	Std. Dev	1.06	.73	.63	.59	1.10	.90	.84
4	Mean	3.47	3.73	2.93	5.60	4.40	4.20	4.06
	Std. Dev	.50	.31	.95	1.31	.53	.72	.72
7	Mean	4.20	4.10	4.55	5.15	4.55	4.45	4.50
	Std. Dev	1.17	1.23	.90	.82	.38	.34	.81
8	Mean	4.77	4.63	4.83	5.70	5.47	4.65	5.01
	Std. Dev	1.07	1.21	1.22	.73	1.30	1.02	1.09
9	Mean	3.55	3.40	4.00	5.10	3.75	4.20	4.00
	Std. Dev	1.58	.49	1.54	1.31	1.31	.86	1.18
10	Mean	2.87	3.47	3.73	5.60	3.73	3.93	3.89
	Std. Dev	1.40	1.10	1.33	.60	1.50	1.17	1.18
11	Mean	4.05	4.15	5.05	6.00	5.50	4.90	4.94
	Std. Dev	1.26	1.11	.75	.67	.62	.74	.86
12	Mean	4.67	4.33	3.87	6.27	3.27	3.60	4.34
	Std. Dev	.70	.46	.61	.76	1.15	1.06	.79
13	Mean	4.53	4.53	4.73	5.93	5.47	4.20	4.90
	Std. Dev	1.86	1.21	1.67	1.51	.94	.69	1.31
14	Mean	4.45	3.70	5.05	4.95	4.40	4.20	4.46
	Std. Dev	.68	.77	.66	.66	1.17	.43	.73
15	Mean	3.80	2.85	2.90	5.55	3.60	3.25	3.66
	Std. Dev	.71	.53	.26	1.42	.54	.60	.68
Socialisation Tactics Mean	Mean	3.83	3.90	4.22	5.41	4.45	4.22	
	Std. Dev	1.17	.80	0.98	0.86	.93	.81	

Table 6-22 Distanced Socialisation Tactics across Teams

Key: 1: Strongly disagree 4: Neutral 5: Partially agree
 2: Mostly disagree 6: Mostly agree
 3: Partially disagree 7: Strongly agree

Teams 2 and 15 remained the lowest scoring teams at 3.53 and 3.66 respectively (shown in red). Teams 11 and 8 also remained as the highest scoring teams with 4.94 and 5.01 respectively (shown in blue). As presented in sections 6.4.1 to 6.4.6, few significant differences existed in how teams socialised with local and distanced team members.

6.5 Virtual ISD

As described in section 2.5.2 there were significant implications when working virtually, misinterpretation, a lack of mutual understanding, cultural differences, and low social presence to name a few. The following section reports on the data gathered in relation to the social integration and interactions of the virtual ISD teams in this study.

6.5.1 Communication, Cohesion and Collaboration

Team members self assessed the quality of communication, collaboration and cohesion in their project team (Table 6-23 and Appendix A questions 32-34). The correlations were positive and quite large; 0.72 between communication and collaboration, 0.61 between communication and cohesion, and 0.79 between collaboration and cohesion. These figures indicated that respondents were consistent in their answers across all three measures. Table 6-23 contained the aggregated mean and standard deviation scores per team. The highest scores are shown in blue and the lowest scores shown in red.

Team	Aggregated Communication Mean	Aggregated Std Dev	Aggregated Collaboration Mean	Aggregated Std Dev	Aggregated Cohesion Mean	Aggregated Standard Deviation
1	3.67	0.58	3.67	0.58	3.67	0.58
2	4.00	0.00	3.33	1.15	3.33	1.15
3	4.00	0.00	3.83	0.41	3.67	0.82
4	4.33	0.58	4.00	0.00	3.67	0.58
5	4.75	0.50	4.50	0.58	4.50	0.58
6	4.00	0.00	3.67	0.58	3.67	1.15
7	3.75	0.50	4.00	0.00	3.50	0.58
8	4.50	0.53	4.50	0.53	4.38	0.52
9	4.00	0.00	3.75	0.50	4.00	0.82
10	2.67	1.53	3.33	0.58	3.33	0.58
11	4.00	0.00	4.00	0.00	4.00	0.82
12	4.33	0.58	4.67	0.58	4.67	0.58
13	4.67	0.58	4.00	1.00	4.33	0.58
14	2.75	1.50	3.25	0.96	3.25	0.96
15	3.00	1.41	3.00	1.41	2.75	0.96

Table 6-23: Communication, Collaboration and Cohesion per Team

Key: Project team communicated/collaborated/cohesive

1: Strongly disagree

3: Neutral

4: Agree

2: Disagree

5: Strongly agree

Communication, collaboration and cohesion were measured using a 5 part Likert scale (1 strongly disagree to 5 strongly agree) (see section 5.4.3.4). Section 2.5.2 detailed the difficulties encountered by virtual teams and sections 2.5.3 through 2.5.5 described the importance of communication cohesion and collaboration to virtual ISD teams. Measures of communication, collaboration and cohesion provided an insight to the social integration of each team in the virtual environment.

Socialisation tactics were measured using a 7 part Likert scales (1 strongly disagree to 7 strongly agree) (see section 5.4.3.2). Section 2.6.2 highlighted the importance of social interactions during the ISD process. Section 3.3.1.2 detailed the benefits gained using socialisation tactics in the organisational and work group context. Sections 3.5 applied the socialisation theory to the virtual ISD team context demonstrating the potential benefits and appropriate uses. Data presented in sections 6.4.1 to 6.4.6 showed team's preferred institutionalised tactics to individualised tactics. The following figures (Figure 6-6 and Figure 6-7) depicted the data shown in Table 6-21, Table 6-22, and Table 6-23.

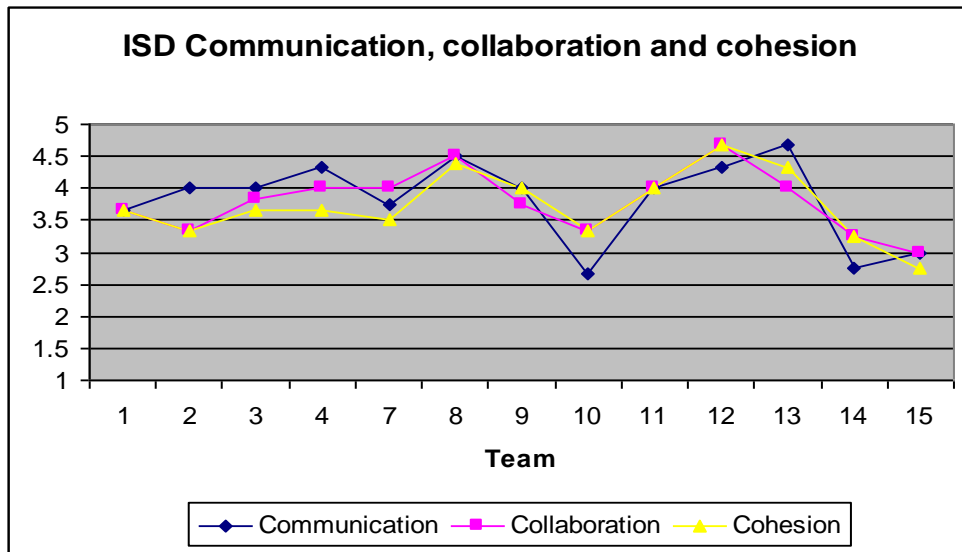


Figure 6-6: Team Communication, Collaboration and Cohesion

Key: Project team communicated/collaborated/cohesive

1: Strongly disagree

3: Neutral

4: Agree

2: Disagree

5: Strongly disagree

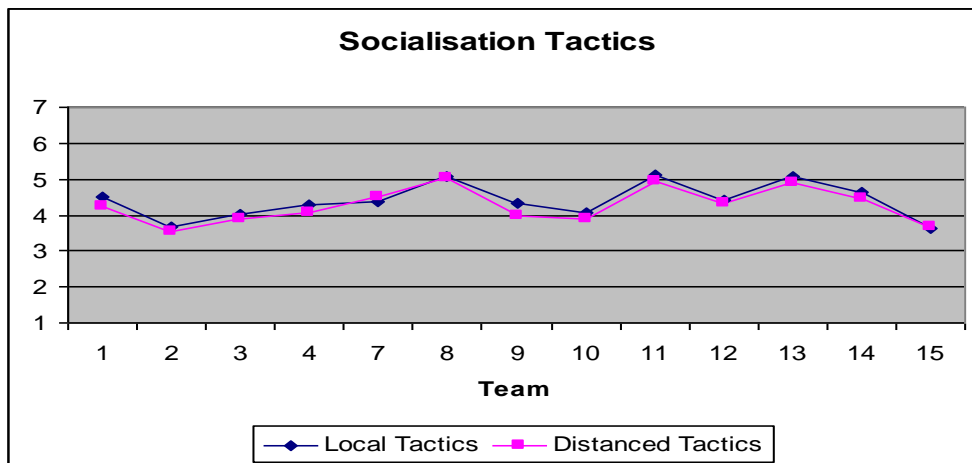


Figure 6-7: Team Socialisation Tactics

Key:

4-7: Institutionalised tactics

1-4: Individualised tactics

Figure 6-6 showed team 8 scored their team's communication, collaboration and cohesion the highest (4.50, 4.50 and 4.38 respectively). Figure 6-7 showed team 8 also scored the highest for institutionalised tactics (Table 6-21 and Table 6-22). The team completed the project in six months, with members in two locations (India & Ireland). Four of the team members had worked with some local and distanced team members on a prior occasion. No physical meeting at project initiation took place with all team members. Local team members physically met daily, the entire team met electronically on a weekly basis and a shared work space existed.

“Met with local team daily/Never met with distanced team”

Team 8 member B.

“Internal SharePoint site, contains Functional Specs, Milestones general
Team/Project Information”

Team 8 member B.

The team used various media for communication and collaboration purposes.

“email, online chat and telephone”

Team 8 member C.

“Company Windows Messenger, email, phone, internal website, the nature of the work meant I needed to deal with developers on a one to one basis, be that via email or over the telephone.”

Team 8 member B.

The team used formal socialisation tactics to exchange project and some socialisation information (section 6.4.2).

“Team Meetings each week. One on one conversations.”

Team 8 member D.

“roles and responsibilities were clearly defined and communicated.
Communication channels and escalation matrix were defined and all team
members were made aware thru docs and also during meetings”

Team 8 member C.

There was a mentor programme in place (section 6.4.3), team member skills were identified during project initiation and all team members knew who to contact for expertise during the project (section 6.4.5).

Figure 6-6 showed team 12 scored 4.33, 4.67, and 4.67 for communication, collaboration and cohesion respectively (Table 6-23). Figure 6-7 showed team 12 scored reasonably high for socialisation tactics, indicating use of an institutionalised strategy (Table 6-21 and Table 6-22). The team worked for fifteen months with team members in the U.S.A and Ireland. All team members had no prior history of working together. No physical meeting took place at project initiation, electronic meetings were held weekly (section 6.4.1). Formal socialisation documents provided team roles and responsibilities, and ground rules. Informal communication methods were also in evidence.

“email, phone, 'quick question' emails, web-computer based conferencing”

Team 12 member B

“[informal communication] was encouraged through all forms of
communication. Most times, valuable info comes from this”

Team 12 member C

A mentor programme was in place and found beneficial (section 6.4.3).

“Talk through problems and issues as they became apparent.”

Team 12 member A.

Team member skills were not identified at project initiation but all team members knew whom to contact for specific skills or expertise during the project. Celebrations occurred locally, with a follow up celebration when the project manager visited the site at a later date.

“Local - the local project team went out for lunch together after the first area of the project went live. This was good to boost morale. Distant - I met them for lunch after the project completed when I was on my next trip to the US.”

Team 12 member B.

Figure 6-6 showed team 11 scored 4.00 across communication, collaboration and cohesion with a zero standard deviation showing total consensus of the four respondents (Table 6-23). Figure 6-7 showed team 11 also scored high for socialisation tactics which indicated the use of an institutionalised strategy (Table 6-21 and Table 6-22). The team worked for twelve months across two locations (U.S.A and Ireland). Physical meetings took place at project initiation and during the twelve month project. All respondents had worked with some local and distanced team members on a prior occasion. The team met electronically on a weekly basis. These collective encounters demonstrated the use of collective tactics (Table 6-14). Informal communication was encouraged through email, and telephone.

Formal socialisation documentation contained behavioural policies and standard operating procedures.

“HR directives on personnel behaviour within global manufacturing.”

Team 11 member B.

“There are various business standards for which compliance is necessary. Work instructions, SOP's and Local and Global policies.”

Team 11 member C.

A mentor programme was experienced by all team members and found beneficial regardless of years of experience.

“Guidance and experience as well as cultural benefits.”

Team 11 member B (5-15 years ISD and virtual team experience).

“Clarity for certain issues and direction at times”

Team 11 member A (3-5 years ISD, 5-15 years virtual team experience).

“Confidence to perform the task required of me.”

Team member C (5-15 years ISD, 1-3 years virtual team experience).

Figure 6-6 showed team 13 scored 4.67, 4, and 4.33 for communication, collaboration and cohesion (Table 6-23). Figure 6-7 showed team 13 also scored high for socialisation tactics indicating an institutionalised strategy (Table 6-21 and Table 6-22). The team worked together for ten months across two locations (U.S.A and Ireland). One of the respondents had the opportunity to work with local and distanced team members on a prior occasion. A physical meeting did not occur at project initiation; only one respondent had worked with the local and distanced team members on a prior occasion. The team met electronically on a weekly basis and used email and telephone for informal communication (Table 6-14).

“Team members only really got to know each other through regular meetings and phone calls were maintained in a very relaxed informal environment.”

Team 13 member A

Project related information was stored in a central area accessible by all team members. Formal companywide socialisation documents detailing codes of conduct, job descriptions and job roles.

“[socialisation information] has been set in companywide policies that are not specific to any one project. They were not altered for this project in particular. Meeting guidelines would be strict about agendas being required beforehand and that all members would have read any notes/ documentation attached.”

Team 13 member A.

A mentor programme was in place for all team members (Table 6-17).

“Gives more confidence especially if solution may cause conflict with other remote team members. It’s also good to have backup in meetings, puts more weight behind proposed solutions and any queries that others may have. “

Team 13 member A

“Enabled me to ask anything that I didn't fully understand myself.”

Team 13 member C.

Figure 6-6 showed that teams 2, 10, 14, and 15 scored low on communication, collaboration and cohesion. Figure 6-7 showed teams 2, 10 and 15 employed an individualised socialisation strategy; team 14 used an institutionalised socialisation strategy. Team 2 worked for fifteen months across four locations (Ireland, UK, France, and Russia) with a team size of seven. No physical meeting took place at project initiation, electronic meetings occurred weekly, and there were no opportunities for physical meetings. Two of the respondents had worked with some local and distanced team members on a prior occasion. Formal socialisation documentation contained team member roles and responsibilities. Respondents did not always know whom to contact on the team for expertise. A mentor programme was available to one respondent only. That team member had equal years of experience to the other respondents. There were no celebrations of milestones or successes. The team scored reasonably high for communication (4.00) however the respondents did not rate their collaboration or cohesion high

(3.33). Team 10 worked for twenty four months across two locations (Poland and Ireland) with a team size of twenty eight. Language issues were cited as a cause of delays and misunderstandings. Only one of the respondents was assigned a mentor and no formal socialisation documents existed. None of the respondents worked with team members on a prior occasion. There was little evidence of a team initiative to socialise with distanced team members as no initial physical meeting took place and electronic meeting took place monthly. Team 15 worked for six months across four locations (New York, Boston, San Francisco U.S.A, and Canada) with a team size of six. Three of the respondents had worked with some local and distanced team members on a prior occasion. No physical meetings took place at project initiation or during the project. Weekly electronic meetings and extensive use of informal communication media such as instant messaging, teleconference calls, and emails kept the team in touch. The respondents scored their team low for cohesion (2.75) and low for communication and collaboration (3.00). Respondents suggested areas for improvement and commented on the virtual ISD experience.

“We could have had more frequent conference calls and better status updates, however all team members were part time, so coordinating schedules was sometimes difficult.”
Team 15 member B.

“More clear definition of each members role and responsibilities. Explicit agendas during conference calls“
Team 15 member A.

“There were some tensions between team members. Better identification of roles and resolution of issues may have helped.”
Team 15 member B.

“it was tougher than being in the same office, but worked quite well. “

Team 15 member D.

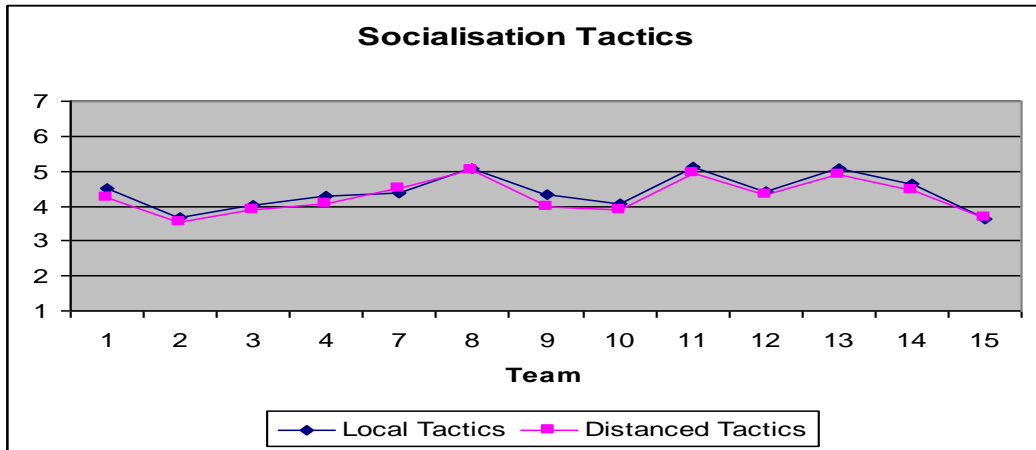
“issues more difficult to iron out from a remote site”

Team 15 member C.

Team 14 despite using institutionalised socialisation tactics (Figure 6-7) scored low for communication, collaboration and cohesion (Figure 6-6). The team worked for three months across two locations (Ireland and U.S.A) with 6 team members. Three of the four respondents had worked with local team members on a prior occasion. There were no physical meetings only weekly electronic meetings and informal emails, telephone calls and online chat. No formal socialisation documentation existed. All team members knew whom to contact for expertise. A mentor programme was in place for all team members. The team scored 2.75 for their communication and 3.25 for collaboration and cohesion.

6.6 Virtual ISD Success

This study sought to discover if successful virtual ISD teams used an ISD methodology and institutionalised socialisation tactics. Section 6.3 presented the findings on the use of ISD methodologies by the participating teams. Section 6.4.7 presented the findings on the type of socialisation strategy used by the teams. Table 6-6 showed the success measures for each team. Figure 6-8 presents the relationship between the use of ISD methodologies and the aggregate success rating for each project team.



Key:

4-7: Institutionalised tactics

1-4: Individualised tactics

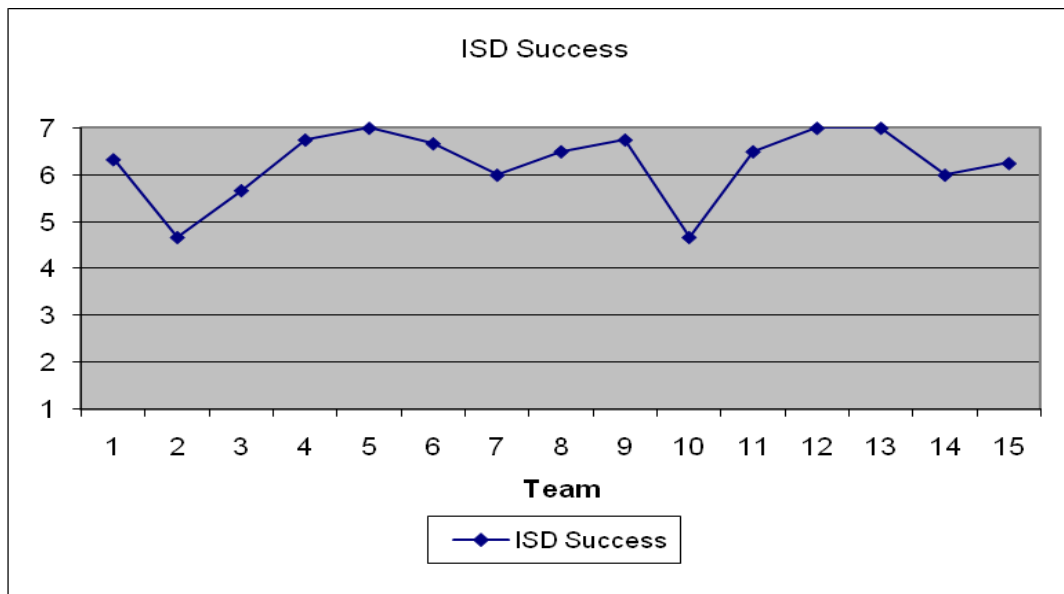


Figure 6-8: Socialisation Strategy vs. ISD Success

Key:

1: Very unsuccessful

4: Neutral

5: Partially successful

2: Mostly unsuccessful

6: Mostly successful

3: Partially unsuccessful

7: Very successful

Table 6-6 showed team 4 completed their project on time, within budget and with all the specified features operational. Figure 6-8 showed the team members also scored the success of the project high 6.75. The bespoke methodology (based on one FSDM), supported the development process (Figure 6-1), collaboration, and both formal and informal communication (Figure 6-2). Figure 6-8 showed the team implemented an institutionalised socialisation strategy for local and distanced team members (Table 6-21 and Table 6-22). The team scored reasonably high for team collaboration, communication and cohesion (Table 6-23).

Table 6-6 showed team 11 also completed their project on time, within budget and with all the specified features operational. The team members scored the success of the project high at 6.50 (out of 7). The bespoke methodology (no FSDM), supported the development process (Figure 6-1), collaboration, formal communication and to a lesser extent informal communication (Figure 6-2). Figure 6-8 showed a highly institutionalised socialisation strategy was in use (Table 6-21 and Table 6-22). The team also scored high for team collaboration, communication and cohesion (Table 6-23).

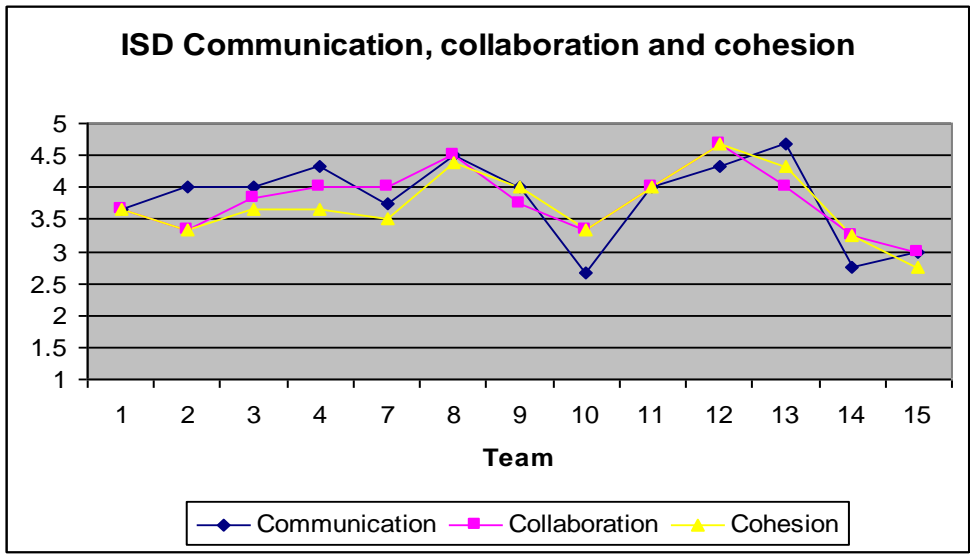
Table 6-6 showed team 10 did not complete their project on time, in budget or on scope. Their bespoke methodology (based on more than one FSDM) provided some support for the development process (Figure 6-1), collaboration and formal communication (Figure 6-2), but poor support for informal communication (Figure 6-2). Figure 6-8 showed the team used an individualised socialisation strategy (Table 6-21 and Table 6-22), and scored low for team collaboration, communication and cohesion (Table 6-23).

Table 6-6 showed that team 2 did not complete their project on time, in budget or on scope. The team did not use a methodology to support their ISD project. Figure 6-8 showed the team used an individualised socialisation strategy (Table

6-21 and Table 6-22), and scored low for team collaboration, and cohesion (Table 6-23).

Figure 6-8 made a direct comparison between a team's socialisation strategy and a team's aggregate perception of success. Team 4 used an institutionalised strategy and was more successful than team 10 who used an individualised strategy. Team 2 used an individualised strategy and was not as successful as team 11 who used an institutionalised strategy. The lines appeared similar, indicating a possible link between the type of socialisation strategy in place and the overall success of the ISD team.

To further investigate the success of the participating project teams Figure 6-9 compared the measures for communication, collaboration and cohesion with success.



Key: Project team communicated/collaborated/cohesive

1: Strongly disagree

3: Neutral

4: Agree

2: Disagree

5: Strongly disagree

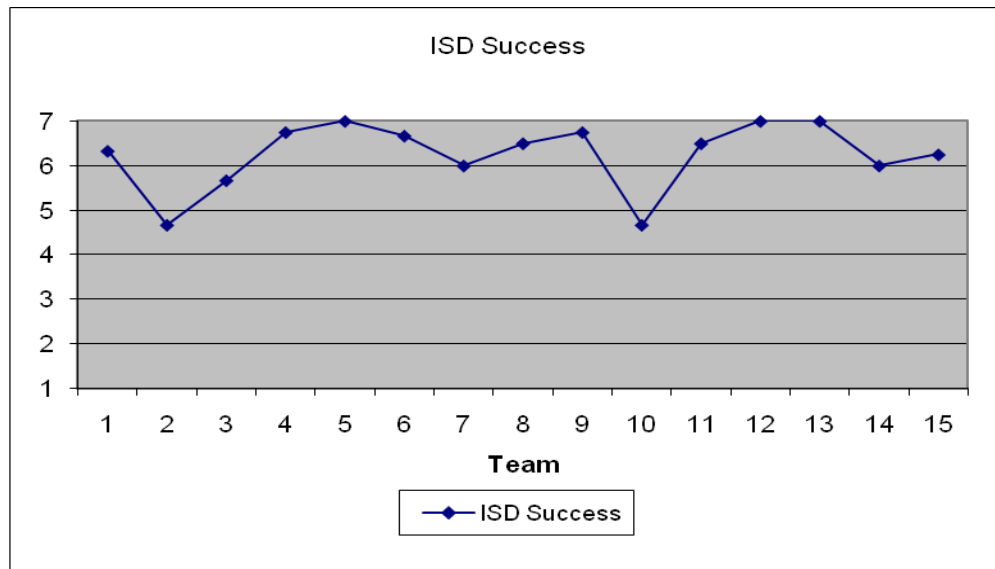


Figure 6-9: Team Communication, Collaboration & Cohesion vs. ISD Success

Key: 1: Very unsuccessful

4: Neutral

5: Partially successful

2: Mostly unsuccessful

6: Mostly successful

3: Partially successful

7: Very successful

Figure 6-9 showed that all teams showed some relationship between their level of success and the quality of their communication, collaboration and cohesion. Those successful teams showed high scores particularly for communication and collaboration. Section 6.5.1 described the relationship between the socialisation strategy and a team's communication, cohesion and collaboration scores. The indication was that where an institutionalised strategy was in place the teams also scored high for communication, cohesion and collaboration.

The most successful teams showed a preference to institutionalised socialisation tactics and the use of a bespoke methodology. The successful teams also showed high scores in relation to team communication, collaboration and cohesion and in the support their ISD methodology provided. The least successful teams used an individualised socialisation strategy. One of the unsuccessful teams used a bespoke methodology and the other used no methodology. Both teams scored low for team communication, collaboration and cohesion.

6.7 Summary

This concludes the presentation of the data gathered during this study. The following summarise the key findings from each dimension of the conceptual framework (Figure 4-1).

6.7.1 ISD Process

The virtual ISD teams involved in this study created and used bespoke ISD methodologies. No team followed a FSDM; the preference was to use a companywide bespoke methodology. Senior management determined the bespoke methodology in use. The virtual ISD teams did not have authorship of the methodology in use. Ad-hoc ISD methodology mixing did not occur, some

mixing did occur at the create of the bespoke methodology. Five teams created a bespoke methodology based on one or more FSDM's.

The bespoke ISD methodologies in use provided a consistent and common process that supported development across the virtual ISD team. The level of experience in the team members did not appear to significantly influence the type of ISD methodology in use.

6.7.2 Virtual Socialisation

The virtual ISD teams used institutionalised socialisation tactics. Mentor programmes, formal documentation, clear roles and responsibilities, recognition of the skills and expertise in a team, and frequent electronic meetings formed the basis of the institutionalised socialisation tactics in use. Some differences existed to how local and distanced team members were socialised. Collective tactics were in evidence for local team members, with individualised tactics in place for distanced team members.

6.7.3 Virtual ISD Success

Virtual ISD success was thought to comprise of process success in terms of budget, schedule, and functionality and social success in terms of team communication, collaboration and cohesion. The findings did not show a clear relationship between process success and the use of an ISD methodology. However, teams with high scores for institutionalised socialisation tactics did showed high scores for team communication, collaboration and cohesion.

The following chapter forms a discussion based on the propositions described in chapter four. The discussion chapter synthesises the findings with the literature in chapters 2 and 3.

CHAPTER 7 Discussion

7.1 Introduction

This study focused on the phenomenon of ISD methodology and socialisation tactics usage by virtual information systems development teams. An investigation using empirical methods gathered data on the use of ISD methodologies and socialisation tactics by virtual information systems teams. This chapter interprets the findings in light of the theory proposed in chapter four. The first section discusses the background information provided by the participants. The second section discusses the use of ISD methodologies. The third discusses the use of socialisation tactics. The third section discusses the virtual context and its implications, and the final section looks at virtual ISD success.

7.2 Background

Non-probability purposive sampling gathered a breadth of respondents from varying industries and countries. Fitzgerald's (1998) study described in sections 2.2.3 and 2.6 found a similar industry sector distribution to that presented in Table 6-1. All teams varied in size, number of locations, and experience regardless of the type of organisation, industry or location. The data gathered succeeded in representing a broad range of virtual ISD teams.

The study gathered data from a variety of job categories and a breadth of years of experience in ISD and virtual teams. In most cases, those respondents with less than 5 years ISD experience also had less than 5 years virtual team experience.

All those new to ISD appeared to conduct at least some of their work as part of a virtual team. Conversely, those with more than 5 years ISD experience rarely had the same level of virtual team experience. The last ten years showed an increase in the use of virtual teams and this fact was reflected in the data (Table 6-5).

7.3 The Process of ISD

A primary purpose of this research was to investigate the use of ISD methodologies by virtual ISD teams. The findings in section 6.3 presented the ISD methodology data from the teams involved in this study. The following section interprets the data with reference to the literature presented in chapter two. Discussion of new insights and the links between the literature and practice follows. Mirroring section 6.3, this section divided into four areas, the use of a methodology, the methodology and work processes, the mixing of ISD methodologies, and the collective years of experience in relation to an ISD methodology.

7.3.1 ISD Methodology Usage

The findings in section 6.3.1 showed that thirteen out of fifteen teams used an ISD methodology. This represented 87% of the sample. A high figure when compared to studies of co-located teams; Russo et al (1996) found 64% and Chatzoglou & Macaulay (1996) found 53% (section 2.2.4). This study found that an ISD methodology played an important role in the development process for virtual ISD teams. The findings in Table 6-8 showed that none of the participating teams followed a FSDM rigorously. The preference was to create a bespoke methodology. Proposition 1.1 posed the following:

P1.1 A virtual ISD team will show evidence of a single ISD methodology in use.

Teams used an ISD methodology determined by management at a senior and often corporate level (6.3.1, Table 6-8). That decision ensured that all sites of a project team followed a common, standard methodology. None of the teams surveyed followed a FSDM. Eight teams developed bespoke methodologies with no reference to any FSDM. Five teams used bespoke methodologies that incorporated at least one FSDM. This demonstrated that FSDM's had a role in virtual ISD teams. The bespoke methodology incorporated elements of the FSDM, rather than following the FSDM systematically and totally. These findings supported the literature in section 2.2.4 whereby FSDM's were not rigorously followed (Ovaska 2005; Nandhakumar and Avison 1999). Rather they were resources for use, and not seen as prescriptive methods.

Table 6-9 presented findings on the use of methodologies per industry. The data showed of the six teams from outside of the I.T industry two used no methodology, and two used a bespoke not based on an FSDM. Fitzgerald et al (2003) theorised that in practice there was a lack of knowledge regarding FSDM's (section 2.2.5). Some knowledge existed in teams from the I.T industry. Three out of nine teams used bespoke methodologies incorporating one or more FSDM's. This finding was in line with Chatzoglou and Macaulay (1996) study where 70% of software houses or consultancy companies used a methodology and only 34% of projects in other industries used a methodology (section 2.2.6). The findings in section 6.3.1 also indicated that the type of development project could influence the type of ISD methodology in use. Three of the five teams that incorporated a FSDM in their bespoke methodology created brand new information systems. Six of the ten teams customising existing systems used a bespoke methodology with no FSDM incorporated. The findings indicated that the virtual ISD teams involved in this study firstly chose to use bespoke methodologies. Secondly, the composition of the bespoke methodology appeared

to have some relation to the type of project. The majority of those teams that created a new information system incorporated elements from an FSDM. The majority of those teams that customised information systems developed their own unique methodology. Customisation involved existing systems, usually with shorter time frames and smaller project teams. FSDM's managed the creation of new, large scale, complex systems (section 2.2.6). The findings indicated that FSDM's were not appropriate where customisation of existing systems took place.

Studies mentioned in section 2.2.6 that investigated co-located teams found 40% of teams engaged in customisations. This study found ten of the fifteen teams or 63% engaged in customisations (Table 6-7). The majority of projects involved some customisation either to a new or existing information system. The increase in customisation projects could explain the move towards bespoke methodologies. However, it was not clear whether the increase in customisation projects was attributable to the virtual nature of the study or to a change in trends that emerged over the last decade. Further investigation of the type of projects undertaken, and the type of methodology in use is necessary for comparative purposes.

This study supported proposition 1.1, thirteen teams used a single, well specified methodology. The use of an ISD methodology was the preference of the virtual ISD teams in this study. The following section addresses the findings and related propositions concerning the structure provided by an ISD methodology to a virtual ISD team.

7.3.2 ISD Methodology and Work Processes

The literature presented in sections 2.5.1.3, 2.5.1.4, 2.5.2.3 and 2.5.5.2 suggested that a structured approach with greater management of team members could lead to more effective virtual teams. Section 4.3 theorised that the use of an ISD methodology could provide structure to the development process. Proposition 1.5 posed the following:

P1.5 Where proposition 1.1 is shown to be true, the chosen ISD methodology will be used to structure the ISD process.

The consistent use of documents throughout the development process placed rigour and structure on the exchange of information, the interactions between team members, and the coordination of tasks. Documentation provided clear specifications of process and product. Distribution of team members across countries could result in language and cultural barriers (section 2.5.2.3) misunderstandings (section 2.5.2.1), poor mutual understanding (section 2.5.2.2), and problems with social interactions in general (section 2.5.2.5). Team members stated that the methodology helped ‘reach agreement’, ‘clarity of definition, scope and execution’, ‘accuracy’, and ‘sharing information’.

The findings presented in section 6.3.2 showed the support provided by a methodology in terms of development, collaboration, and communication (Table 6-10). Team 4 scored the highest for development process support. The team used a bespoke methodology, which incorporated a FSDM. Members commented that the methodology provided structure, steps to follow, access to information, a method for communicating and a set of required documents. Team 4 also scored reasonably high (3.67 out of 5) for support of collaboration, formal and informal communication. Member comments showed that progress reports and documentation helped collaboration and communication between participants. Formal meetings were an effective means of communicating and

sharing information. Team 4 effectively communicated and collaborated (Table 6-23 and Figure 6-6). This team was one of the most successful (Table 6-6). The findings highlighted the importance of documentation and information sharing to the communicating and collaborating of a virtual ISD team.

Team 3 scored the lowest for support provided by their ISD methodology. Team members commented that the methodology lacked support for the ISD process (section 6.3.2). The methodology concentrated on project management to the neglect of ISD requirements, analysis, design, implementation and testing. The team used a bespoke methodology that did not incorporate any FSDM. Team 3 did not score their methodology high in support for collaboration, and communication (Table 6-10). A member did comment that the informal, ad-hoc approach forced communication to occur. There was some disagreement amongst team members regarding the support provided by the methodology. Despite the low scores and comments; the project was completed on time, within budget and on scope (Table 6-6). Teams 3 and 4 worked on customisations with members located in two sites. Team 4 comprised four members for nine months compared to team 3 having six members for fifteen months. Over the longer time frame, with greater team numbers, team 3 members desired an ISD focused methodology that would provide greater support. Team 3 scored marginally lower for team collaboration and communication (Figure 6-6). However, both teams were ultimately successful in terms of their deliverable.

Team 5 scored the highest for collaborative and communication support (Figure 6-2). A bespoke methodology based on one FSDM provided a common language and process. In the multi-site context, team members had equal access to understandable documentation independent of location. The methodology also scored reasonably high for development support (4.00 out of 5). The team was very successful and rated their communication, collaboration and cohesion high (Table 6-23).

Teams 6 and 10 found their methodology did not support informal communication. Members of team 6 disagreed on this support (standard deviation of 1.53 shown in Table 6-10). Team 6 had the opportunity to use a social website, and one member commented that the creation of documentation forced formal and informal communication. A member also commented that not all team members saw the benefit of documentation. Poor quality documentation hindered the ISD process. The team did not score particularly high for collaboration and cohesion (Table 6-23). The project completed on time, within budget but did not meet the original scope of requirements (Table 6-6). Team 10 formally communicated using meetings, deadlines, issue resolution, and the joint responsibility of document creation. A team member commented that the lack of a communication plan hindered the project.

The qualitative data included in section 6.3.2 provided some insight to the use of an ISD methodology. Eight statements included the term ‘documentation’ or ‘specification’. Five statements mentioned ‘common method’, ‘one standard’, ‘common language’. Two statements included ‘structure’ with a further three mentioning ‘deadline’, ‘timeline’. Other statements mentioned ‘process’, ‘control’, ‘expectations’, ‘project management’, ‘plan’, and ‘access’. Project management, communication, quality control, timelines, version control, and the creation of documentation were primary concerns. These findings supported the literature in sections 2.5.1.3, 2.5.1.4, and 2.5.2.3 indicating that clarity of work processes, constant exchange of information, structured management and appropriate behaviour controls could produce more effective virtual teams. These positive comments supported proposition 1.5 finding ISD methodologies provided structure. Negative comments in team 3 concerned the lack of structure and thus reinforced the need for structure.

The methodologies used by teams 4, 5, 9 and 11 scored the highest for their support to development, (Figure 6-1) collaboration, and communication (Figure 6-2). They also scored high for team collaboration, communication and cohesion

(Figure 6-6). Teams 4 and 5 used a bespoke methodology based on one FSDM, teams 9 and 11 used a bespoke with no FSDM incorporated. These teams were the most successful teams (Table 6-6).

The methods used by teams 3, 7, and 14 scored the lowest for development support (Figure 6-1). The methods scored equally low for collaboration and communication support (Figure 6-2). However teams 3 and 7 scored reasonably high for team collaboration, communication and cohesion (Figure 6-6). Team 7 was not completed on time, teams 3 and 14 were both successful in terms of time, budget, and scope (Table 6-6).

A direct link between the support provided by a methodology in terms of development, collaboration and communication and the success of the project was not conclusive. Team 3 was successful despite their methodology lacking development support (Figure 6-1 and Table 6-6). This finding supported the theory that the ISD process alone did not determine the success of a project. An ISD methodology supported the purposive-rational function (section 2.4) through development support (Figure 6-1). In teams 4 and 5 it was evident that the ISD methodology provided support for the development process and for team collaboration and communication (Figure 6-1 and Table 6-6). Teams 4 and 5 showed a higher success rate than team 10 who did not have that support (Figure 6-2, Table 6-6). This study theorised that the socialisation tactics in use by a virtual ISD team would serve the communicative function of ISD (section 2.4) without which success was not guaranteed.

The findings in section 6.3.2 also reported the use of collaboration support tools. These tools facilitated distributed communication and collaboration in a structured manner. The tracking of issues and tasks allowed the efficient hand over of work and the ability to monitor progress over time. All respondents that used these tools stated they were invaluable and central for communication between team members.

The following section details the research question and propositions relevant to the mixing of methodologies by virtual ISD teams.

7.3.3 ISD Methodology Mixing

It was argued that a FSDM did not address the complex social process that was ISD (section 2.2.4). A lack of interaction during design led to a narrow interpretation of the system. Section 2.2.5 showed that mixing of methodologies during development would lead to a pluralist approach. Co-located teams pragmatically mixed methods to suit the problem context and development needs. Mixing methodologies during development required continuous negotiation, interpretation, and intervention. Virtual team literature showed the importance of clear work processes (section 2.5.1.3), structured management (section 2.5.1.4), common methodologies and terminologies (section 2.5.2.3) and having the time to develop interpersonal relationships necessary for the exchange of complex, ambiguous information (sections 2.5.3.1, 2.5.4.1, and 2.5.4.2). This study proposed that virtual ISD teams would not engage in mixing methodologies due to complexity involved in attempting to mix methods in the virtual ISD context (section 4.3).

P1.2 A virtual ISD team will not engage in the mixing of ISD methodologies during a development project.

The findings in section 6.3.3 showed that some mixing of methodologies did occur. Four of the thirteen teams stated that they mixed methodologies during development. However there did not appear to be continuous ad-hoc mixing throughout the development process. Each team used an ISD methodology and then occasionally used an additional technique as needed. One team used an

additional methodology for the implementation phase of the project, another team occasionally used UML and bug tracking software, another team used Sarbanes Oxley (SOX) quality controls, and lastly a team used some formal methods where necessary. These teams did pick and choose a technique or tool appropriate to the situation but extensive mixing over the duration of the project was not evident.

Despite team 3 stating that mixing did not occur, they described their methodology as ad-hoc and informal. One team member commented that the methodology focused on project management rather than ISD management. The methodology supported project management aspects of planning, timelines, and quality and not the requirements gathering, analysis, design stages. Team members stated that the method did not support development process, nor did it support collaboration and communication. However the project was on time, on budget and on scope. The management of the project was formally addressed in the methodology. The ISD process was ad-hoc and informal. Team members did not indicate that other methodologies were in use or that mixing occurred as a result of the lack of ISD support. This was an example of a bespoke methodology that did not incorporate a FSDM.

There was evidence that multiple methodologies formed the basis of a bespoke methodology. Five bespoke methodologies incorporated at least one FSDM. For all but one team, the creation of the bespoke methodology occurred at the organisational level. Twelve of the thirteen teams using a methodology applied a corporate wide bespoke methodology to their ISD projects (section 6.3.1). In some sense the use of an organisation wide methodology reverted to the notion that one size fits all. The limited mixing in five teams indicated the need for some adjustment to a corporate wide methodology. The findings showed that for virtual ISD teams a single bespoke methodology determined by management was the preference.

As well as mixing ISD methodologies, the literature revealed the pressures to use software process improvement models (sections 2.2.1 and 2.2.3). The survey asked whether a software quality standard was used by each virtual ISD project team (Appendix A, questions 10 & 11). Section 6.3.3 showed that quality standards were evident in the majority of teams. The purpose of the quality standard appeared to be as a further support mechanism to place structure or control on the process. The standards placed significant emphasis on documentation, formal processes and controls. Five of the thirteen teams that used ISD methodologies used CMMI, and four used an internally developed quality assurance method. It was not clear from the findings whether the quality standard was considered part of the bespoke ISD methodology in place or as a separate process. Of the two teams that did not use an ISD methodology, one used CMMI and one used ISO9000. Both of those teams were not successful.

This study partially supported proposition 1.2. The majority of teams did not engage in the ad-hoc mixing of methodologies during the development process. The mixing that did occur was limited to one other method or tool. Mixing was evident in the creation of a bespoke methodology. Of the teams using an ISD methodology, the majority also used a software quality standard to place further structure and control on the process.

7.3.4 Team Experience in relation to ISD Methodology

Section 2.2.5 linked the level of experience held by ISD professionals to the ways in which ISD methodologies are used. Those with just a few years of experience tended to rely on FSDM's, conversely those with many years of experience developed their own bespoke ISD methodology and adapted FSDM's to suit their needs. Propositions 1.3 and 1.4 suggested that in the virtual ISD team context a similar phenomenon would exist.

P1.3 Virtual ISD teams with inexperienced members will use a FSDM.

P1.4 Virtual ISD teams with experienced members will use a bespoke methodology.

The years of ISD experience were proportionally greater than the years of virtual team experience (section 6.3.4). Ubiquitous virtual ISD teams were a recent phenomenon (section 2.5.1). The findings showed that the team with the least collective years of ISD experience did not use an ISD methodology at all. Other teams with less than three years of ISD experience did use a bespoke methodology; some with a FSDM incorporated, and some without. As the findings varied it was not clear that a direct relationship existed between the years of ISD experience and the type of ISD methodology in use (Figure 6-3). A stronger relationship appeared to exist between the years of virtual team experience and the use of an ISD methodology (Figure 6-4). Those teams with little virtual team experience appeared to incorporate at least one FSDM methodology into their bespoke ISD methodology. Teams with both ISD and virtual team experience (five or more years) preferred to use a bespoke methodology with no FSDM incorporated. Teams with significant ISD experience but lacked virtual team experience (less than three years) preferred to use a bespoke methodology that did incorporate a FSDM. An additional determinant was that management made the decision on the methodology used (section 6.3.1). Therefore, a conclusive relationship between experience and methodology was not evident in the findings. Some teams that lacked years of virtual team experience did use a FSDM in their bespoke methodology. Propositions 1.3 and 1.4 were not fully supported by the findings of this study.

The following section addresses research question two and the associated propositions regarding the use of socialisation strategies by virtual ISD teams.

7.4 Socialisation Tactics

Socialisation tactics could be classified according to six categories (section 3.3). Each category of tactic will be discussed in relation to the findings in section 6.4 and the proposed theory in section 4.4.

7.4.1 Collective vs. individual

Literature presented in sections 2.5.1.3, 2.5.1.4, 2.5.1.5 and 2.5.2.3 suggested the need for structure and control of work processes in virtual teams. Section 3.5 described the benefits and use of socialisation tactics to the virtual ISD context. Section 4.4.1 theorised that a set of institutionalised tactics (collective, formal, serial, investiture, fixed, sequential) would improve social integration and interaction between virtual team members. The following proposition concerned the use of collective tactics.

P2.1. Virtual ISD teams use collective tactics over individual tactics.

The findings described in section 6.4.1 showed that nine teams used collective tactics in relation to local team members. Traditionally, collective tactics required physical presence, for example face to face meetings, training, and induction courses. The findings supported this fact, as collective tactics were most popular for teams with some members located together. Two teams that were highly distributed indicated significant use of collective tactics with distanced team members. This indicated that where collective physical meetings could not take place between local team members, then collective tactics occurred across a distance. An example of a collective tactic in the virtual context was the use of a central store of project information and in some cases a tool to support collaboration and communication between virtual team members (section 6.4.1). Collective tactics usually consisted of a face-to-face meeting, or

training. Table 6-15 showed only five teams held a face-to-face kick off meeting. Only 45% of respondents had the opportunity to train with distanced team members. Qualitative data in section 6.4.1 showed that this central store provided a means for equal access to project related information for all team members regardless of location. In some cases it also provided a place to share contextual information about team members. The availability of the shared space encouraged the collective sharing of work even though this sharing did not take place physically. It also helped the virtual team to create a history of work that could be referred to in subsequent projects. Some of the teams used commercial tools that offered storage, communication, task tracking etc. Social information processing theory supported the use of group support systems as they helped to establish relational affiliation between users (section 2.5.4.1). Media richness theory described in section 2.5.3.3 supported the use of electronic tools as they provided the choice of different types of communication media. For example, notice boards, electronic mail, discussion boards, and online chat. Qualitative findings in section 6.4.1 showed how the use of electronic communication also helped with the language barrier. Section 2.5.2.3 described how using asynchronous communication could alleviate the pressure on non-native speakers.

Social presence theory as described in section 2.5.3.1 proposed the idea that for effective communication a degree of social presence must exist between the communicating parties. Without physical presence, social presence can be very difficult to establish. However, the evidence gathered here suggested that sharing of experiences through collective tactics helped to establish social presence between the team members. A common collective tactic used by the participating teams was a meeting (see Table 6-15). These meetings took place physically and electronically at the beginning and throughout the life of each project. The majority of teams held weekly electronic meetings, for the purpose of raising issues, distributing work assignments and to generally ‘touch base’ with the entire team. Those teams that did not meet electronically or met on a monthly

basis were larger in composition with an average of 42 team members. For those large teams, an electronic meeting of all team members would be cumbersome and take up a significant amount of time. These larger teams subdivided and held weekly meetings as appropriate to their subdivision. It appeared that for the most part the weekly or monthly electronic meeting was a common mechanism for keeping in touch with all team members (section 6.4.1).

Interestingly only five of the fifteen teams met at one location for a face-to-face ‘kick off’ meeting at the beginning of the project. This finding was contrary to the literature which highlighted the importance of face-to-face meetings for cultural familiarity (2.5.2.3), increased social presence (2.5.3.1), informal encounters (2.5.3.2) media richness (2.5.3.3), team cohesion (2.5.4), mutual understanding (2.5.4.2) and transactive memory (2.5.5.1). Theory suggested that making direct contact early on and throughout the project was important. ISD existed in a highly competitive environment influenced significantly by costs and time constraints (sections 2.2 and 2.5.1). This may have impacted on the amount of travel included in project budgets. Despite the lack of direct contact, those teams appeared to manage communication at a distance. Particularly teams 2, 6 and 7 which were spread across four locations. Each of these teams scored their communication reasonable high (Table 6-23). This finding supported the theory of social information processing described in section 2.5.4.1. Over time, team members could learn to communicate and form interpersonal relations across a distance. Teams 5 and 6 did not meet electronically as an entire team, nor did they have a kick off meeting. However Table 6-23 showed that these teams scored aggregate means of 4.75 and 4.00 (out of 5) when asked if the team communicated effectively during the project. Teams 2, 3, and 11 all had kick off meetings and weekly electronic meetings. Each of these teams scored an aggregate mean of 4.00 (out of 5) when asked if the team communicated effectively during the project.

Section 3.2 showed the important role played by colleagues. They were found to be one of the most important influencers on one's ability to do a job. ISD involved interdependent work which required a lot of interaction (section 2.4.2). IT was also shown in section 2.5.1.1 that ISD professionals spent a significant amount of time working with others. The socialisation measures devised by Van Maanen & Schein's (1979) relating to collective vs. individual tactics asked participants to rate a colleagues influence on their understanding of their role (Appendix A). From those measures, this study found local and distanced colleagues were influential. 78% of participants considered local colleagues influential to their understanding of their job requirements (section 6.4.1). 57% of participants considered distanced colleagues influential. Regardless of location, colleagues were influential. This indicated a sense of unity and team despite being located separately. 11 of the 15 teams scored 3.50 (out of 5) or higher when asked if they worked as a cohesive team (Table 6-23).

Proposition 2.1 was somewhat supported by the data gathered in this study. Collective tactics were in use in relation to local team members. Electronic meetings and the use of a shared work space for document storage and collaboration were evident. A collective bond appeared to exist where all colleagues were influential regardless of location. However it was also the finding that individual tactics were used in relation to distanced team members.

7.4.2 Formal vs. informal

Formal tactics presented a way to place structure and formality on the socialisation of a virtual team. Proposition 2.2 expected to find evidence of the use of formal tactics by virtual ISD teams.

P2.2. Virtual ISD teams use formal tactics over informal tactics.

Table 6-16 showed that informal tactics were used in relation to local team members and more formal tactics in relation to distanced team members. Formal tactics as described in section 3.5.2 often involved induction or training sessions. Despite the data showing that formal tactics were used in relation to distanced team members, the findings in section 6.4.2 also showed few teams had the opportunity to train with distanced team members. Only two teams allowed all team members the opportunity to train with their distanced team members. Team 7 used team building exercises to encourage familiarity and cohesion. Four teams had no training with distanced team members. The majority of team members in the remaining nine teams experienced informal training, on the job. Despite the data showing that informal tactics were used in relation to local team members, the findings in section 6.4.2 also showed that project teams used formal documentation and meetings. The documents were primarily project specific, created in accordance to the ISD methodology rather than being virtual team socialisation documents. The formal socialisation documentation used by fourteen teams contained the roles and responsibilities of team members. In some cases teams had documents on conflict resolution, team behaviour and communication response times. These formal documents did not appear to contain much or any normative information relating to team members such as location, experience, individual descriptions, photographs, time zones or other work related contextual differences.

This study found that project leaders and managers were more aware of the existence of formal socialisation documents (section 6.4.2). Few team members knew of socialisation specific documents such as conflict resolution, communication channels, response times etc. In some cases it was found that team members had no knowledge of such documents. Socialisation documents were not made explicitly available or obvious to all team members. All team members were aware of project specific technical and functional documents but socialisation documents were not considered a high priority. However the literature suggested that the normative information contained in those documents

could be valuable for providing context and meaning when communicating with someone located at a distance. In sections 2.5.2.2, 2.5.2.3 and 2.5.3.1 research on virtual teams highlighted the importance of exchanging normative and contextual information in order to reduce cultural differences, the occurrence of misattribution and increase social presence. Despite this theory, few teams formally encouraged members to become familiar with each other. In some teams this appeared to happen naturally without instruction using conference calls, electronic mail, telephone, and online chatting facilities (section 6.4.2).

Section 7.3 already showed that ISD methodologies provided support and structure to the virtual ISD team. The findings in section 6.4.2 suggested that teams attempted to create and use formal socialisation documents, however their existence was not well publicised.

Section 2.5.3.2 described how exchanging information at informal encounters could lead to improved coordination. Section 2.2 and 2.4.1 detailed how the exchange of information, ideas and solutions was vital to the ISD process. Section 4.4.2 described how individualised socialisation strategies encouraged informal information seeking. It was clear from the findings that informal socialisation took place in many of the teams involved in this study. Instant messaging, electronic mail, and telephone were used for informal interactions (section 6.4.2). In most teams, informal socialisation did not emerge as a conscious decision by the team; it was more of a happenstance. This was in support of socialisation theory whereby informal tactics were not prescribed or planned (section 3.5.2). Therefore, it may be theorised that a conscious decision to encourage the use of informal interactions would have an even greater effect on the familiarisation of the team members.

Team 10 showed dissension in the reporting of formal vs. informal socialisation within the team. Two members experienced formal tactics and the third informal tactics. Socialisation theory stated that the individual was an active participant in

the socialisation process. Therefore individual experiences may well differ across a team. Team 10 was not a successful team (Figure 6-6) and rated its communication, collaboration and cohesion poor (Figure 6-7).

Team 15 used the most informal tactics of all teams and yet it was the most distributed. There were no physical meetings, and team members did their respective pieces of work independently. The project began with the use of conference calls but moved on to the use of Bugzilla, an issue and bug tracking tool. This reduced further the only auditory contact between the distanced team members. This team worked in a different manner to all of the other teams involved in the study. Their method was organic and evolutionary; consequently, the findings associated to this team often differed to all other teams. However, team members did indicate that there was a need for more formality in the communication process (section 6.4.2). Team 15 was located across the United States in three locations. The new development project had six team members working part time for six months. Figure 6-7 showed team 15 scored their communication, collaboration and cohesion low at 3.00, 3.00, and 2.75 respectively (out of 5). This indicated that the informal approach to virtual ISD teams was not the most appropriate in that case.

Team 8 used formal tactics for both distanced and local team members (see Table 6-16). The team used an internal website, some formal socialisation documents and frequent electronic meetings. Table 6-6 showed team 8 had a very successful project. Team 8 was located in India and Ireland. The new development project had eight team members working full time for six months. Figure 6-7 showed team 8 scored their communication, collaboration and cohesion high at 4.5 (out of 5). The formal approach was appropriate for this virtual ISD team.

Sections 2.5.2.3, 2.5.4.2 detailed the difficulties of cultural differences and the importance of familiarity and mutual understanding in virtual team. One team

ensured cross cultural relations through an exchange programme. Three other teams detailed the behaviours and conduct expected of team members. One team used team building events. These formal socialisation tactics all contributed towards establishing familiarity and mutual understanding (section 2.5.4.2).

The use of formal or informal tactics by virtual ISD teams was not straightforward. Formal electronic meetings were common. Some teams used formal socialisation documents, however many did not know of their existence, and little normative information was stored. The data also showed informal encounters were important however they were not encouraged by many of the teams. Van Maanen and Schein's (1979) division of formal and informal tactics did not appear to be appropriate in the virtual ISD context. Consequently, proposition 2.2 was not supported by the study's findings.

7.4.3 Serial vs. disjunctive

Section 3.5.3 suggested that serial tactics would be used to provide some support and structure to virtual ISD. Serial tactics usually involved the use of a mentor to support a newcomer.

P2.3. Virtual ISD teams use serial tactics over disjunctive tactics.

The findings showed that serial tactics were evident for both local and distanced team members in ten of the fourteen teams. There was some disagreement in the use of serial tactics in relation to distanced team members. However, this was explained by the project manager results which skewed the aggregated team mean. Project managers in teams 2, 9 and 13 did not consider distanced team members to be influential in their job role. Project managers experienced higher levels of serial tactics than did other team members. This indicated that perhaps

the role of project manager required formalised support in the form of a mentor. Section 2.5.1.2 described research that found effective leaders had mentoring abilities. Perhaps the mentoring experienced by the project leaders taught them how to mentor their team members. Section 6.4.2 reported that the project manager for team 3 was one of two team members aware of formal socialisation documents. Section 6.4.3 reported that the same project manager was the only team member that had a mentor. The project manager was exposed to more socialisation experiences than the other team members. Despite this the team rated their communication, collaboration and cohesion high at 4.33, 4.00, and 3.67 (out of 5) respectively (Table 6-23). The existence of a good leader was shown to be of great importance to the success of a virtual team (section 2.5.1.2).

Serial tactics helped individuals by providing direct access to the experience of colleagues. The participating teams used both local and distanced team members for this purpose. Section 6.4.3 showed that all but one team used a mentor programme and in many cases, a mentor's location was separate to the individual. Location was not a barrier to serial socialisation in the virtual context. Section 6.4.1 reported on the importance of spending time with colleagues. The findings showed that regardless of location colleagues were important to team members. Collective and serial tactics were appropriate in the virtual context.

All participants who were assigned a mentor rated the experience as beneficial. The qualitative data in section 6.4.3 found that the opportunity to ask questions, and seek guidance was a clear benefit of having a mentor. In some teams the mentor was a colleague located elsewhere. Findings showed a distant mentor also offered cultural and political experience. This supported the theory that mutual understanding and familiarity were of great importance where cultural differences existed (sections 2.5.2.2 and 2.5.2.3). The use of a mentor program also supported the theory of transactive memory presented in section 2.5.5.1. ISD teams required a significant distribution of technical, business, quality and legal knowledge throughout the team. By assigning mentors to each team member a

network of links emerged that provided all team members access to expertise and help when needed.

Section 2.5.3 presented literature on the theories of virtual team communication. Familiarisation and social presence influenced the ability to communicate electronically. Qualitative data gathered in this study indicated that the use of a mentor assisted familiarisation with business procedures, encouraged question asking, and provided access to a knowledge source familiar with the business and problem domain (section 6.4.3). The mentor programmes used by the participating teams supported team members regardless of location, position or experience. This could indicate the complexity and diversity of virtual ISD. Each ISD project differs from the previous, therefore each project held a degree of unknown and opportunities to learn from others. Mentoring in the context of the virtual ISD team appeared to be an effective method of socialisation. Consequently proposition 2.3 was supported by this study.

7.4.4 Investiture vs. divestiture

Investiture tactics indicated acceptance by the organisation of the newcomer's skills, beliefs and expertise (section 3.5.4). Information systems development was a highly skilled profession; project teams usually had a diverse membership (section 2.5.1).

P2.4. Virtual ISD teams use investiture tactics over divestiture tactics.

The aggregated mean data in Table 6-18 showed that all 13 teams used investiture tactics. The scores indicated that all teams experienced support and acceptance of their skills, attitudes and personalities. Only one team member out of the thirteen teams did not experience that support and acceptance. Team

members in all teams scored high for investiture tactics in relation to local and distanced team members. No bias or preference to location was evident. Similar to the findings in sections 6.4.1 and 6.4.3 investiture tactics were appropriate for the virtual context as both local and distanced team members were treated and valued equally.

IT professionals were highly skilled, working in interdisciplinary environments (section 2.5.1). The literature in section 3.5.4 showed previous research on IT professionals that found investiture tactics had direct positive effects on role adjustment and organisational attachment. Section 3.5.4 also highlighted the importance of team ownership, and goal setting for interdependent work with a shared purpose. This study found celebrations of project milestones and successes were a demonstration of the team's acceptance and support of member skills, attitudes and personalities. It was also an appropriate way of recognising the achievement of goals.

Recognition of effort and goal achievement through celebrations was a practical demonstration of investiture tactics (section 3.5.4). These celebrations provided a positive message of support and acceptance of the team's work. Findings in section 6.4.4 showed that those celebrations occurred separately at local and distanced sites. Few teams met as a whole at the beginning of a project (Table 6-15), similarly few teams met as a whole for celebrations.

Section 2.5.4 presented literature on cohesive teams. Cohesion required sociable and personal interaction between members. The celebration of milestones and successes provided an opportunity for team members to interact in a social context. Five teams had no celebration or recognition of effort. Each of those teams rated their team cohesion between 2.75 and 3.67 (out of 5) (Table 6-23). Five teams had celebrations that involved only local team members. In those instances investiture socialisation were localised. Those teams rated their team cohesion between 3.33 and 4.67 (out of 5) (Table 6-23). Team 8 included any

distanced team members that were on site at the time of the celebration. Teams 7, and 11 all had celebrations at the rollout or complete stage of the project. Those celebrations involved local and distanced team members. Teams 7, 8, and 11 rated their team cohesion between 3.50 and 4.38 (out of 5) (Table 6-23). There was some cohesive benefits to these celebrations however it was not clear whether those that celebrated with distanced and local team members were more cohesive than those that celebrated locally.

Proposition 2.4 was supported by this study as Table 6-18 showed all thirteen teams used investiture tactics. Only one member of the thirteen teams felt their skills and abilities were not very important to the project team. Teams demonstrated their support by having celebrations. These provided opportunities to socialise and recognise a team's goal achievement.

7.4.5 Sequential vs. Random

Section 3.5.5 described sequential tactics as a sequence of steps through which newcomer's progressed. Sequential tactics helped to clarify the roles and the progression of those roles in a work setting. The following was proposed:

P2.5. Virtual ISD teams use sequential tactics over random tactics.

Seven teams showed use of sequential tactics (Table 6-19). Roles and job functions were known and team members progressed through those roles (section 6.4.5). Six of the seven teams using sequential tactics also used formal socialisation documents that detailed roles and responsibilities. Four of those teams also explicitly identified expertise within the team at the beginning of the project. Some of the other teams that did not have a high score for sequential tactics accessed role information through mentors (section 6.4.5). Teams 1 and

14 did not use formal socialisation documents, nor did they explicitly identify expertise at the project initiation, team members were chosen for their expertise in the area. Teams 1 and 14 scored high at 4.27 and 4.40 for sequential tactics (Table 6-19) indicating that all team members had an awareness of roles and job functions.

Sections 2.4.2, 2.5.1.4 and 2.5.5.1, described research highlighting the importance of social integration, the clarification of roles, easy access to expert assistance and the establishment of a transactive memory system. Teams 8 and 11 scored the highest for sequential tactics. They also scored high for communication, collaboration and cohesion (Table 6-23). All team members on both teams 8 and 11 always knew whom to contact for expertise during the project. Teams 2 and 15 used random tactics. They scored poorly for collaboration and cohesion (Table 6-23). Half of team 15 sometimes didn't know whom to contact for expertise and half always knew. All members in team 2 sometimes didn't know whom to contact for expertise.

Table 6-19 showed that seven out of 13 teams used sequential socialisation tactics. The findings partially supported proposition 2.5. Sequential tactics appeared to provide some support to awareness of expertise in a team, and social integration in terms of collaboration and cohesion.

7.4.6 Fixed vs. variable

Fixed tactics informed the individuals of the timescale applied to role progression. Literature showed the importance of fixed tactics to building trust and cohesiveness in teams (section 3.5.6). Proposition ten suggested that fixed tactics would be used by virtual ISD teams.

P1.6 Virtual ISD teams use fixed tactics over variable tactics.

Eight out of thirteen teams used fixed tactics. The literature showed that where sequential tactics were in use, fixed tactics were closely related (section 3.5.6). The findings of this study supported this fact. All seven teams that used sequential tactics (Table 6-19) also used fixed tactics. Clarity of roles was important to virtual teams (section 2.5.1.4) and the interdependent nature of ISD (section 2.4.2). It was also suggested that fixed tactics would contribute towards team cohesion (section 3.5.6). Team 12 rated their cohesiveness the highest at 4.67 (Table 6-23), this was one of the teams that used random and variable tactics which contradicted propositions 2.5 and 2.6. Team 12 did show some disagreement in the use of sequential and fixed tactics where their aggregate standard deviation was greater than 1. Teams 8, 13, 9, and 11 all rated their cohesion higher than 4.00 (Table 6-23) and all used fixed and sequential tactics, which supported propositions 2.5 and 2.6.

7.4.7 Socialisation Tactics Strategy

Few studies investigated the socialisation tactics in use by virtual ISD teams (section 3.5). A synthesis of the virtual team literature with the ISD literature indicated the need for tactics which ensured effective social integration and interactions (sections 2.4.2 and 2.5.2). Consequently, proposition two suggested that an institutionalised strategy (collective, formal, serial, investiture, sequential, fixed) was preferred over an individualised strategy (individual, informal, disjunctive, divestiture, random, variable) by virtual ISD teams (section 4.4). The aggregated mean scores in section 6.4.7 showed nine teams predominately using an institutionalised socialisation strategy and four teams using an individualised socialisation strategy. The mean scores per socialisation tactic across all teams (Table 6-21 and Table 6-22) also showed institutionalised tactics were the

preference. The study showed that the preference was to use an institutionalised strategy.

Jones (1986) classified socialisation tactics into individualised and institutionalised tactics (section 3.3.1.1) Individualised tactics reflected an informal approach to the socialisation process, allowing the new employee to evolve and integrate independently. The approach also allowed the individual active participation in their own socialisation. In contrast, institutionalised tactics indicated structure, method and control with less independent participation by the newcomer. This study supported the view that there was a need for structure and control in virtual team (sections 2.5.1.3, 2.5.1.4 and 4.4.1). The use of formal documentation, frequent meetings, mentor programs, clarity of roles and responsibilities, and the celebration of milestones and successes placed structure and a formality to the process of virtual socialisation. The outcomes of these tactics also promoted social integration and interactions amongst team members (sections 7.4.1 through 7.4.6).

It was not theorised in chapter four that a difference would emerge in the use of socialisation tactics based on location. The pilot study highlighted the potential for differences (section 5.4.3.2). The data did show that not all teams' members experienced the same tactics, particularly in relation to distanced team members. This could be explained by the theory that socialisation ultimately involved an individual's experience. The use of a set of tactics by a team did not guarantee that each team member would experience that tactic to the same degree. This was particularly true in the virtual environment. In some team's members were not aware of documentation, policies, training (section 6.4.2). Those team members that travelled frequently to several sites experienced different tactics to those located at one site (section 6.4.1). The role a team member held appeared to influence the socialisation experience in relation to serial tactics (section 6.4.3). The findings did provide an overall impression of the tactics in use by virtual ISD teams, despite some differing experiences by individuals.

The collective versus individualised category showed the greatest difference between scores in relation to local team members and scores in relation to distanced team members (section 7.4.1). All but two teams saw a reduction in the mean score for collective versus individual tactics. It appeared that the virtual ISD teams found collective tactics appropriate for local team members and a more individualised approach appropriate for distanced team members. Similarly, informal tactics applied to local team members, with more formal tactics in place for distanced team members (Table 6-16). The availability of face-to-face contact between local team members may have facilitated collective and informal socialisation tactics. The lack of physical contact with distanced team members, and in most cases the absence of an initial face-to-face meeting may account for the individual and formal tactics used.

Overall, there was some difference between the socialisation experiences by team members in relation to local and distance team members. Eleven teams applied an institutionalised strategy towards local team members, and nine teams applied an institutionalised strategy towards distanced team members (Table 6-21 and Table 6-22 in section 6.4.7). Despite this difference, the findings showed that team members were influenced by both local and distant team members (sections 6.4.1 and 6.4.3), all team members were valued highly for their skills, personality and attitudes (section 6.4.4) and six teams showed use of a distanced mentor (section 6.4.3). Literature showed that the virtual context was different to co-located teams and should be treated accordingly (section 2.5.2). Sections 2.5.1.3 and 2.5.1.4 suggested that greater management and structure was necessary where virtual teams were in use. This was reflected in the preference for institutionalised tactics by the virtual ISD teams in the study.

7.5 Virtual ISD

The majority of studies in section 3.3.1.2 investigated role adjustment outcomes of socialisation rather than social integration outcomes. The literature suggested and section 4.4 theorised that virtual ISD teams would experience greater social integration and interactions through the use of institutionalised socialisation tactics. This theory was based on virtual team literature in section 2.5.2, and in particular the application of Van Maanen and Schein's (1979) (section 3.3) socialisation theory, and Jones' (1986) classification of that socialisation theory (section 3.3.1.1). This study investigated the use of socialisation tactics by virtual teams and the social integration outcomes.

7.5.1 Communication, Collaboration and Cohesion

It was determined that measuring the communication, collaboration and cohesion of the virtual team would be indicators of the social integration and interaction outcomes (section 4.5).

The following propositions were presented in section 4.5:

P3 The use of institutionalised socialisation tactics will support social interaction and integration in virtual ISD teams.

P3.1 Where evidence is found in virtual ISD teams of institutionalised socialisation tactics, there will also be evidence of effective communication.

P3.2 Where evidence is found in virtual ISD teams of institutionalised socialisation tactics, there will also be evidence of effective collaboration.

P3.3 Where evidence is found in virtual ISD teams of institutionalised socialisation tactics, there will also be evidence of a cohesive team.

Literature in section 2.5.2.2 highlighted the difficulty of message interpretation in the virtual context. The lack of physical encounters made communication problematic. Low social presence led to impaired interpersonal relations and poor communication (section 2.5.3.1). Virtual teams comprised of multinational team members (section 2.5.2.3). Awareness of expertise in a team (section 2.5.5.1), sharing of contextual information, and cultural differences were necessary to collaborate effectively (section 2.5.5). Mutual understanding between distanced team members was imperative to forming a cohesive and effective team (sections 2.5.2.2 and 2.5.4). Over time a virtual team had the ability to form interpersonal relationships in order to be cohesive and communicate and collaborate effectively (section 2.5.4.1).

The findings in section 6.5.1 supported the theory that institutionalised socialisation would benefit a virtual ISD teams' social integration. The team aggregate scores for socialisation were compared to the aggregate scores for communication, collaboration and cohesion. Teams that scored the highest for socialisation tactics, indicating an institutionalised strategy (8, 11, and 13) also scored high for communication, collaboration and cohesion. These three teams all existed across two locations. Teams 11 and 13 had members in the U.S.A and Ireland, team 8 had members in India and Ireland. These teams worked for less than twelve months on their projects with an average of ten team members. Only team 11 met physically at the beginning of their project and all respondents had previously worked with others in the team. Four of team 8's respondents had worked previously with some local and distanced team members. One of team 13's respondents had worked with some local and distanced team members. All three teams used a mentor programme and formal socialisation documents contained team member roles and responsibilities.

Team 12 scored the highest for communication, collaboration and cohesion. The team did not score very high for socialisation, indicating a somewhat institutionalised strategy. The team worked for fifteen months across two locations (U.S.A and Ireland). Over time the team achieved social integration without the use of high scoring institutionalised tactics. Team 14 scored low for communication, collaboration and cohesion despite the use of institutionalised tactics. The team only worked on the project for three months. Over such a short time frame the use of institutionalised tactics was not enough to reach social integration.

Out of the institutionalised socialisation tactics, a mentor program was seen to be of great benefit to virtual team members (sections 6.4.3 and 6.5.1). A mentor provided the opportunity to discuss problems, resolve issues, and offered guidance, experience, expertise, and cultural knowledge. This finding supported the literature on transactive memory (section 2.5.5.1), mutual knowledge (section 2.5.4.2), social presence (section 2.5.3.1) and the need for cultural awareness (section 2.5.2.3). Formal socialisation documentation provided access to team member roles and responsibilities. These documents helped with the identification of expertise in the team (section 6.4.2 and 6.5.1). Socialisation theory (section 3.5.2 and 3.5.5) and virtual team theory (sections 2.5.1.4 and 2.5.5.1) found that clarity of roles and responsibilities was important for collaboration. The members on teams 8, 11, and 13 all knew whom to contact for expertise during their project. These teams also scored high for collaboration and cohesion. The theory of transactive memory described in section 2.5.5.1 highlighted the importance of familiarity between communicators. Some participants indicated prior knowledge of colleagues and prior collaboration experiences (teams 8 and 11). This meant familiarisation of the team skill set and abilities. This familiarity allowed access to knowledge within the team. Further investigation of the importance and affect of familiarisation and consequently the use of transactive memory would add to the findings of this study.

Teams that scored the lowest for socialisation tactics, indicating an individualised strategy (2, 10, and 15) also scored low for communication, collaboration and cohesion. Team 2 comprised of seven members who worked for fifteen months across four locations between the U.S.A and Canada. Team 15 comprised of six members who worked for six months across four locations in Europe and Russia. Team 10 had twenty eight members across Poland and Ireland and worked for twenty four months on the project. No physical meetings occurred and only one respondent from team 2 had a mentor.

The lack of institutionalised socialisation tactics meant that there were no physical meetings, fewer mentors, and team members were not always sure of whom to contact in the team for expertise. There were language issues that caused delays and misunderstandings. Clearer definition of team member roles and responsibilities was needed. Two of the teams (2 & 15) were distributed across many locations with a small team size and few opportunities to socialise. Team 10 was large at twenty eight members and was over a long duration of twenty four months. Social information processing theory presented in section 2.5.4.1 stated that given time a virtual team could develop interpersonal relationships in order to communicate and collaborate effectively. Despite this theory, team 10 did not achieve social integration.

Ten of the eleven teams using an institutionalised socialisation strategy showed good team communication, collaboration and cohesion. Both teams using individualised socialisation tactics did not perform well in terms of team communication, collaboration and cohesion. Propositions 3.1 – 3.3 were supported by this research.

7.6 Virtual ISD Success

This study targeted project teams that had completed their project. The study identified relationships between those teams that were successful and those that used ISD methodologies and socialisation tactics. The following sections discuss these relationships in an attempt to answer propositions 4, 4.1, and 4.2 (section 4.6).

P4 A successful virtual ISD team will show use of a single ISD methodology (FSDM or bespoke) and institutionalised socialisation tactics (collective, formal, serial, investiture, sequential and fixed).

P4.1 Where an ISD methodology is in use the project will succeed procedurally (budget, schedule, scope).

P4.2 Where an institutionalised socialisation strategy is in use the project will succeed socially (communication, collaboration, cohesion).

The measures of success used in this study included, schedule, budget, scope and the opinion of the team members and project manager. Eight of the fifteen teams surveyed were successful on all measures (section 6.2). That figure was considerably larger than the most recent figure of 28% presented in section 2.4. Two of the successful teams developed new information systems; the remaining six teams customised existing or newly implemented information systems. For the most part the opinions of the team members were in line with the project manager's in relation to schedule, budget and functionality. The remaining seven teams had challenged projects where the schedule, budget or functional requirements changed. Scope creep was a key reason for extension of the schedule and the budget. Despite some projects going over budget, scope or deadlines, the aggregated mean for all but two teams showed that team members rated their project a success.

All those teams that used a methodology that was not based on a FSDM found some success in terms of budget, schedule and scope. Eight teams used a bespoke methodology that did not incorporate a FSDM. Five of the eight were successful across all measures. One project was not completed on time, one project did not meet its budget or scope, and one project did not meet its original scope. Results varied for those using a bespoke methodology based on a FSDM and for those who used no methodology (section 6.6). The literature suggested that a bespoke methodology would be developed appropriate to the development situation in an organisation (section 2.2.6). This could mean that project estimates, scheduling and scope were more accurate and communication and collaboration needs were pre-established. In this study the bespoke ISD methodologies that did not incorporate a FSDM may have been designed exclusively to suit the development context and consequently achieved greater success. Those teams that incorporated a FSDM were trying to fit a pre-existing ISD methodology to their development context with less success (section 2.2.4). A clear relationship was not evident between the use of an ISD methodology and ISD success. Proposition 4.1 was therefore not supported.

Ten teams using an institutionalised socialisation strategy were found to be successful in terms of collaboration, communication and cohesion. Figure 6-6 showed the similarity between the graph for communication, collaboration and cohesion and the graph for socialisation tactics. Teams that used institutionalised socialisation tactics also scored high for team communication, collaboration and cohesion. Teams using an individualised socialisation strategy scored low for team communication, collaboration and cohesion. Where institutionalised tactics were not in use the teams lacked structured meetings, mentors, and knowledge of team members (sections 6.4.7 and 7.4.7). Team 12 contradicted this trend, they did not use significant institutionalised tactics however they rated high for team communication, collaboration and cohesion. It appeared that over time the team developed social integration without the support of institutionalised tactics. Team 14 also bucked the trend as it did use institutionalised tactics but existed as a

team for only three months. Over such a short time frame social integration was not reached through the use of those tactics. Proposition 4.2 was supported as ten out of eleven teams using institutionalised tactics were socially successful.

Section 2.2 and 2.3 described the process and social needs of ISD. Sections 2.5.1.3, 2.5.1.4, 2.5.2.3 described the importance of work process, common methodologies and control structures to virtual teams. Section 2.5.2 described the effects of virtual work and the need for excellent communication, cohesion and collaboration between virtual team members. In this study, a bespoke ISD methodology was used to structure and control the virtual ISD process. The use of socialisation tactics addressed the some of the effects of virtual work by encouraging social integration and interactions between virtual ISD team members. Nandhakumar and Avison (1999) found social encouragement through collaboration and established routines were more significant than the use of an ISD methodology (section 2.3). This study found that the use of institutionalised tactics support team communication, collaboration and cohesion. That support existed through mentors, formal socialisation documents, shared work spaces, and electronic meetings. The use of these tactics appeared to have a stronger relationship to the success of a project than did the use of an ISD methodology. However, this study cannot definitively make that statement without further investigation. As previous research had suggested, ISD project team success was more about the social aspects in terms of exchanging complex information, communicating effectively and collaborating successfully, than it was about the technical aspects of the project (section 2.4.2). This study supported that view.

7.7 Summary

The process and social needs described in sections 2.2, 2.2.2 and 2.3 were evident in this study. As suggested by the literature (section 2.5.2), these needs

were accentuated by the virtual environment. This study showed the importance of structure, documentation, communication, familiarity, and management to virtual ISD teams. ISD methodologies should no longer be laid blame to the failures of ISD. It was clearly evident that virtual ISD teams did not rigorously follow a FSDM. A definite relationship between the use of ISD methodologies and ISD success could not be established. Each organisation or project team generated their own bespoke methodology drawing on their own experiences and in some cases, the existing theory provided by FSDM's. The socialisation of the team members, both local and remote was clearly an important task of a virtual ISD team. The social success of interdependent work such as ISD hinged upon the teams ability to communicate, collaborate, and be cohesive. This study presented new insights to the use of ISD methodologies and socialisation tactics by virtual ISD teams. However many questions remained and emerged from this research. The following chapter sets out the significant findings, the contribution made by this study to the ISD domain in regards to theory, practice and research methodology. The following chapter includes directions for future research, a reflection on the research with reference to limitations and constraints of the study.

CHAPTER 8 CONCLUSION

8.1 Introduction

This research explored the use of ISD methodologies and socialisation tactics by IS professionals in virtual ISD teams. A cross-sectional survey conducted online gathered quantitative and qualitative data from virtual ISD practitioners. The data was then analysed using statistical and content analysis techniques. It sought to add to current theory by developing a model for successful virtual ISD. The model incorporated virtual team theory, ISD methodology theory and socialisation theory. The discussion in chapter seven analysed the findings against the theory presented in chapter four and the literature in chapters two and three. This final chapter summarised the contribution made by this study, outlined the limitations encountered during the study, and suggested directions for future research.

The key objectives of this research were:

1. To examine the current methodological practices in virtual ISD teams.
2. To examine the current socialisation practices in virtual ISD teams.
3. To examine the relationship between ISD methodology use, socialisation tactics and ISD success.
4. To develop a model for successful virtual ISD which incorporates both ISD methodologies and socialisation tactics.

The first three objectives were met through the administration of this study. Chapters six and seven presented the findings and subsequent analysis of the current methodological and socialisation practices by IS professionals in virtual ISD teams. This chapter addresses the last objective and describes how this study contributed to the existing literature.

8.2 Theoretical Contribution

Previous studies concentrated on the socialisation tactics in use for a newcomer's entry to an organisation. This research addressed the pressing need to understand the socialisation tactics in use by IS professionals in a virtual ISD team. Studies on the use of ISD methodologies focused on co-located teams. Little was known of the methodological practices in virtual ISD teams. Findings of this study added to the ISD, socialisation and virtual team literature in several respects.

Structured ISD methodologies aimed to standardise the ISD process into manageable components (section 2.2.1). Those methodologies concentrated on the technical or process aspects of ISD. As an alternative, socio-technical methodologies paid attention to the social aspects of ISD (section 2.2.2). The first key finding of this study indicated that the participating virtual ISD teams did not exclusively use structured or socio-technical methodologies. Teams developed bespoke methodologies. The methodologies in use aimed to support the development process and their distributed work (section 2.2.3). Co-located teams showed either little use of ISD methodologies or extensive mixing of methodologies (sections 2.2.4, 2.2.5). Virtual team theory presented in sections 2.5.1.3, 2.5.1.4, and 2.5.2.3 suggested that greater management and structure was required where team members were distributed. The findings of this study supported that theory, as thirteen of the fifteen virtual ISD teams used some form of bespoke ISD methodology. The bespoke methodologies paid great attention to project management, communication, meetings, documentation, quality, schedules and issue tracking. The qualitative comments given by the respondents indicated that the purpose of the ISD methodology was to support, structure, and control the development process (section 6.3.2). The findings in section 6.3.3 also showed that quality standards were evident in the majority of teams. The literature had also indicated the importance of quality standards (sections 2.2.1 and 2.2.3). The purpose of the quality standard appeared to be as a further support mechanism to place structure or control on the process.

The second key finding was that each team did not determine the ISD methodology to use; management made that decision. This was contrary to a study that found experienced ISD practitioners were less likely to follow a methodology rigorously. They had the experience to determine what tools and techniques were appropriate to the development situation at hand (section 2.2.5). In this study, the years of experience held by the team in relation to ISD did not appear to influence the use of an ISD methodology. There were some indications that years of virtual team experience influenced the use of an ISD methodology (section 6.3.4). This finding also contradicted research that found co-located teams members determined and mixed ISD methodologies (section 2.2.5). The virtual context required consistency across team locations regardless of experience (sections 6.3.2 and 6.3.4). The virtual ISD teams in this study appeared to have greater direction and control placed on them than did co-located teams that successfully mixed methodologies and worked in an ad-hoc fashion.

The third key finding showed few virtual ISD teams engaged in ad-hoc mixing of ISD methodologies. This finding was contrary to the pragmatic mixing of methodologies commonly found in co-located teams (section 2.2.3). However, research presented in section 2.2.5 also indicated that methodology usage and mixing could be particularly difficult where virtual teams were in use. Thirteen teams used a bespoke methodology, five of which incorporated one or more FSDM's. A type of mixing therefore was occurring but not in a pragmatic manner. This signified a shift towards the standardised approach whereby an ISD methodology could be used across an organisation. However it was not clear from the findings how much the organisation tailored the methodology to fit their type of development. Perhaps each organisation specialised in a particular type of development project (section 2.2.6). Their bespoke methodology was then created specifically for that type of development only.

The fourth key finding was that the customisation of existing and off the shelf packages was very common in the participating virtual ISD teams. This trend

was indicated in earlier research (section 2.2.6). Where the project team engaged in the customisation of an existing system the data showed it was likely that the team also employed a bespoke ISD methodology. Those teams engaged in the development of a new information system preferred the use of a bespoke ISD methodology based on a FSDM. Each of these findings was significant as little was known of the practices of virtual ISD teams in relation to ISD methodological use.

The fifth key finding showed an institutionalised socialisation strategy in place for eleven out of thirteen teams. The participating teams preferred a structured approach to socialisation. Literature in section 2.3 suggested that social structures to encourage collaboration could have a greater influence on work than an ISD methodology. This study found that socialisation tactics certainly supported team members' communication, cohesion and collaboration. Teams used formal documentation, frequent meetings, mentor programs, clear roles and responsibilities and recognition of team member skills and effort. These social structures promoted social integration and interactions amongst virtual team members. All of which could not necessarily be provided by an ISD methodology (section 2.3). Where teams used individualised socialisation tactics, problems with communication, collaboration, and cohesion occurred. These findings supported the theories of social information processing (section 2.5.4.1) transactive memory (section 2.5.5.1), mutual knowledge (section 2.5.4.2), social presence (section 2.5.3.1) and cultural awareness (section 2.5.2.3). These findings added to the existing literature on socialisation tactics as little was previously known of the tactics in use by virtual teams.

The study also discovered that for virtual teams informal communication was of great importance. Informal tactics would normally be associated with an individualised socialisation strategy. This finding was therefore contrary to Jones (1986) classification of socialisation tactics described in section 3.3.1.1. However, the finding did support virtual team research (section 2.5.3) that

recognised the importance of informal communication for the successful coordination of tasks and exchange of complex ambiguous information. The teams used a mix of electronic media; formal telephone conference calls, informal emails, informal online chat, face-to-face meetings, and group support systems. This supported the literature that encouraged a mix of communication mechanisms 2.5.3 in virtual teams.

The sixth key finding was the relationship between the use of institutionalised socialisation, ISD methodologies and virtual ISD success. Those teams that used an institutionalised socialisation strategy also indicated good communication, collaboration and cohesion between team members. A balance existed between the process oriented supports provided by the ISD methodology and the social oriented supports provided by the institutionalised socialisation tactics. Literature in section 2.3 suggested that methodologies could not provide the social supports needed for ISD. It appeared in this study that some of the social needs of virtual ISD were addressed through collective, informal, serial, investiture, sequential and fixed socialisation tactics.

The seventh and final finding showed an increase in the number of successful projects compared to recent statistics. No significant link was found between the type of methodology in use and the success of the project. This supported the view that ISD methodologies may not hold the answer or the blame for ISD failure (section 2.3). The findings did show some link between the use of institutionalised socialisation tactics and the social success of a project (section 6.6). This supported the view that social aspects of ISD may hold the key to ISD success.

Each of these key findings added to the existing knowledge of ISD and the socialisation of virtual teams. New knowledge on the use of ISD methodologies and socialisation tactics brought further insights to the virtual ISD team phenomenon. This study supported the (sections 2.5.1.3, 2.5.1.4, 2.5.2.3) theory

that greater management and control was needed by virtual teams. In contrast to findings in co-located teams (section 2.2.5), the virtual ISD teams in this study did not conduct ad-hoc mixing of ISD methodologies. This study also added to studies that found current methodologies did not sufficiently support current development environments (section 2.2.3). That support included communication and social interaction between stakeholders. The bespoke methodologies in this study provided some development, collaboration and communication support (section 6.3.2). In addition, institutionalised socialisation tactics provided significant support for virtual team communication, collaboration and cohesion.

The framework proposed in section 4.2 was modified based on the findings of the study. Figure 8-1 depicted that revised framework. The process oriented aspect to virtual ISD was addressed through the development of a bespoke methodology. The bespoke methodology either incorporated zero, one or more formal systems development methodologies. The methodology addressed process oriented aspects of ISD such as documentation, schedule, project management, quality, consistency, common language, and standardisation. Consequently the success factors met by the methodology were also process oriented; budget, schedule and functional requirements. A definitive relationship was not proven by the study hence the use of a dotted line in the framework.

The social oriented aspect to virtual ISD was addressed through socialisation tactics. The tactics were predominately institutionalised tactics that placed structure and control on the socialisation process. This led to social oriented success factors such as good communication, collaboration and a cohesive team. A clear relationship existed between the socialisation tactics used and the success of a team hence the use of a solid line.

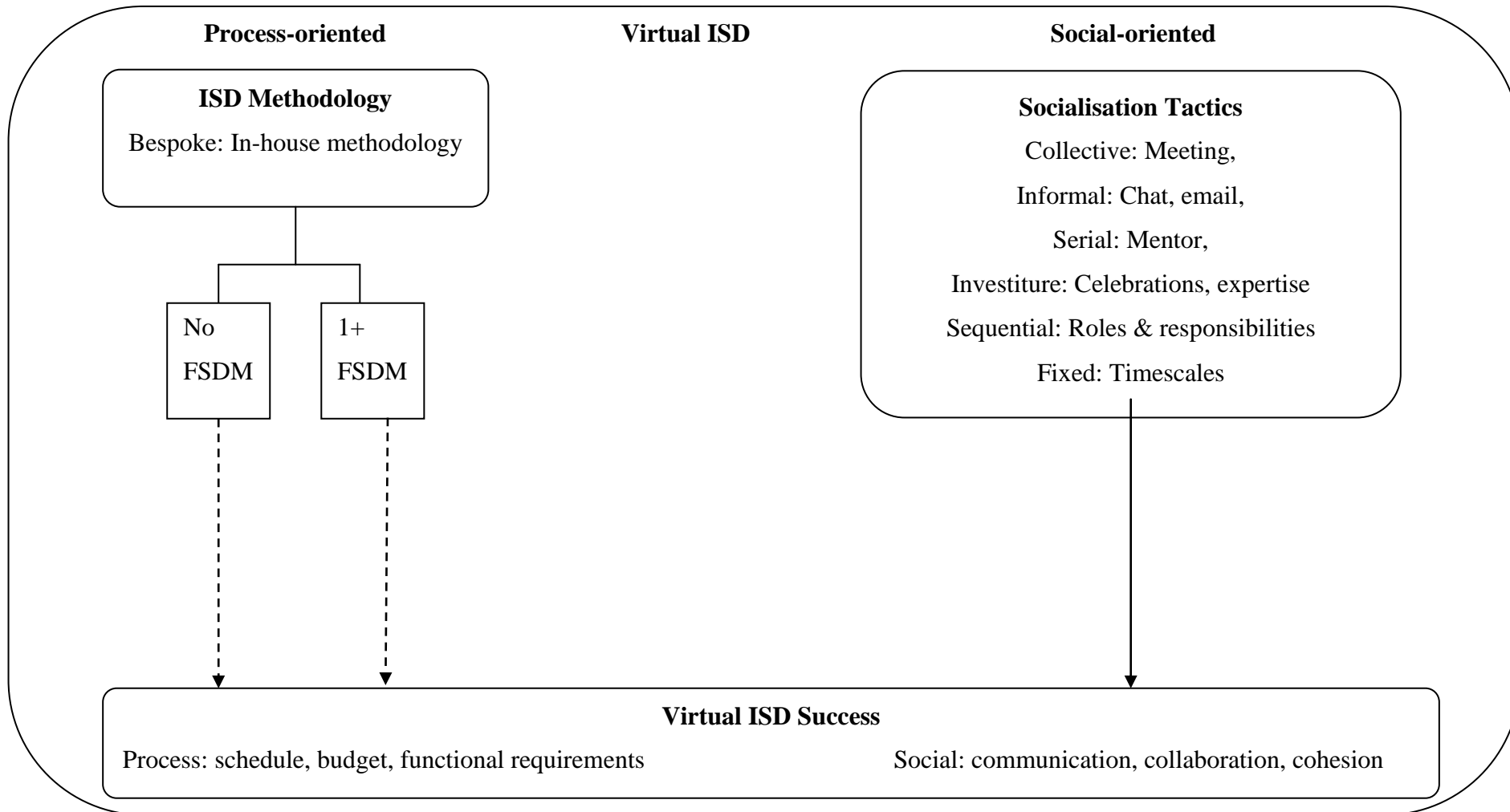


Figure 8-1: Virtual ISD Revised Framework

Building on this revised framework a model for successful virtual ISD teams was devised. The following section details the contribution this study holds in practice

8.3 Practical Contribution

The virtual ISD model (Figure 8-2) operationalized the literature set out in sections 2.2 - 2.5, and 3.5 based on the findings in chapter 6.

ISD Methodology

Tailored bespoke virtual ISD methodology.

Administers the virtual ISD process.

Standardisation of the virtual ISD process.

Knowledgeable with bespoke virtual ISD methodology

Socialisation

Together

Informal

Mentor

Expertise

T.A.S.K T.I.M.E

Figure 8-2: Virtual ISD model

The model incorporated the ISD methodological and socialisation findings of this study. The T.A.S.K of ISD in the virtual environment required greater structure and control. The T.I.M.E of virtual ISD recognised the difficulty of forming social relationships at a distance in a given time frame. Virtual ISD teams would benefit from implementing the following operations in order to benefit from the theories of information systems development (sections 2.2.1, 2.2.2 and 2.2.3), social presence (section 2.5.3.1), social information processing (section 2.5.4.1), transactive memory (section 2.5.5.1), and socialisation (section 3.3).

ISD Methodology:

- T.** Create a bespoke virtual ISD methodology appropriate to your development situation. The methodology should utilise appropriate elements of existing formal systems development methodologies.

- A.** Ensure the bespoke virtual ISD methodology administers the procedural aspects of ISD, such as project initiation, analysis, design, implementation, maintenance, project management, documentation, and quality assurance.

- S.** The bespoke virtual ISD methodology should act as a standard, consistent method through which a virtual ISD team can gather, store and disseminate information and knowledge relating to the project.

- K.** The virtual ISD team should be familiar with and understand how to use the bespoke virtual ISD methodology.

Socialisation:

T. Socialisation should occur in a collective manner where all or most team members are present. Teams should use face-to-face communication where possible. Additionally, structured electronic meetings, teleconference calls and group support systems all serve as excellent ways for team members to form interpersonal relationships. Teams should use formal project team documentation detailing membership, roles, responsibilities, skills, expertise, contact information, and any other relevant contextual information. All of this information should be easily accessible and known to all team members. This incorporates collective, sequential and fixed tactics together to create one initiative that encourages team members to form interpersonal relationships.

I. Teams should encourage the use of informal communication mechanisms such as online chat, electronic mail, telephone, and informal face-to-face encounters where possible. The use of a central repository where all project and team related information is stored and accessible by all team members.

M. Teams should implement a mentor program where all team members have a mentor to whom questions can be directed. The mentor can be at the same location or separately.

E. Teams should recognise the skills and expertise held by the ISD project team members. This can be achieved through rewards, training and celebrations.

8.4 Methodological Contribution

The results from this study were based on a diverse sample of 15 ISD project teams from several industries. This diversity meant that the results were not based only on the practices in one project team or one industry. The characteristics of the sample should extend the generalisability of the results despite the use of a non-probability sampling method.

Internet surveys grew in popularity during the past decade particularly for market research. Few ISD studies used Internet surveys as few studies investigated virtual ISD teams. The use of an Internet survey was entirely suitable for this study and very successful. Further investigation of virtual ISD teams should consider the method an appropriate one.

Many studies that investigated virtual teams used manufactured or experimental teams. This study focused on organisational teams in order to provide an accurate picture of virtual ISD in practice. This was successfully achieved using a cross sectional survey. Further investigations should endeavour to gain access to organisational ISD teams to learn from professionals in practice.

8.5 Limitations

Constraints and limitations were imposed on this study. This researcher experienced great difficulties gaining access to organisational virtual ISD teams. This limited the sample frame to non-probability sampling and consequently the generalisability of the study. The use of a cross sectional survey facilitated access to the virtual ISD teams however the lack of a time dimension had the potential to cause validity problems. The comparison of team data reduced this threat to validity. The study also relied upon self reporting which can result in common

method bias. This was evident in the measures of project success where team members disagreed on the success rating of a project (team 3, section 6.2). However, the use of additional sources of data i.e. peers and project managers likely reduced the bias. Additionally, the scales used to measure socialisation tactics were existing scales with good reliability and multiple items. Jones' (1986) scales were specifically written so as to reduce common method bias.

Despite these limitations the study gathered a significant amount of good quality data. The findings added to the existing literature by addressing gaps identified in chapter four. The following section reflects on the significance of this study.

8.6 Reflections

Many studies addressed communication and collaboration issues in the virtual team environment. However little literature investigated virtual teams in the ISD context where work was highly interdependent and involved the exchange of complex and ambiguous information. Those studies that did, concentrated on the information exchanged, distance versus time, effectiveness of computer mediated communication and techniques for coordination of work. This study's primary focus was the use of ISD methodologies and socialisation tactics to support and structure the ISD process. The findings reflected the need for greater structure and management in virtual ISD. Those teams that did not use an ISD methodology and or an institutionalised socialisation strategy experienced communication and collaboration problems. It was evident that virtual ISD teams benefited from the formalisation of the virtual ISD and socialisation processes.

The research questions posed at the beginning of this study asked the following:

1. *“To what extent do virtual ISD teams use ISD methodologies?”*
2. *“What types of socialisation tactics are currently used by virtual ISD teams?”*
4. *“Does a relationship exist between ISD methodology usage, socialisation tactics and ISD success?”*

Each of these questions has been answered through a thorough review of the literature and administration of a survey. Many more questions have consequently emerged and require further investigation. The following section looks at opportunities for future research.

8.7 Future Research

An area in the literature which was relatively unknown concerned the creation of bespoke ISD methodologies. This study could not definitively state that the use of bespoke methodologies was now the norm in ISD. The virtual nature of the study and/or the predominance of customisation projects could explain the increase. Questions arise concerning the content of a bespoke ISD methodology, the appropriateness of the methodology to the development situation, and how these methodologies are maintained and updated. Teams may continually engage in the same type of ISD project and thus a single bespoke methodology is appropriate. Some of the bespoke methodologies found in this study used a FSDM. Investigation into the selection of FSDM techniques would add to this study's findings.

Evidence suggested that software quality standards were significant in the virtual ISD process and served to further standardise the process. Further investigation into the use of these quality standards by virtual ISD is necessary. Did these

quality standards enforce rigid structures on the development process? Did these quality standards form an integral part of the bespoke ISD methodologies? In some teams, where no ISD methodology was in use there was a software quality standard. Does a software quality standard replace or support an ISD methodology?

Ad-hoc mixing of ISD methodologies was not evident in this study. Further investigation and comparison to current co-located team studies would be of benefit. Co-located teams may too be moving towards greater use of bespoke ISD methodologies.

This study focused on virtual ISD teams; consequently a comparison could only be made with previous studies of co-located teams. The number of successful projects was significantly higher than previously reported (section 2.4). The reason for the increase was unclear from the findings. Economic and functional success measures answered by each project manager were appropriate for this study. In future research, a more complete view of ISD project success incorporating IS professionals and organisational stakeholders would add depth to the relationship between ISD methodologies, socialisation tactics and ISD success. It was also not clear from the findings whether the type of development undertaken (customisation) was due to the virtual nature of the study or to a new trend in ISD. This new trend was indicated in earlier research (section 2.2.6) however it would be pertinent to investigate the type of development undertaken currently by co-located ISD teams for comparison purposes.

This study provided important insights to the use of socialisation tactics by virtual ISD teams. However as the study only gathered data at the end of a project some questions remain unanswered. A longitudinal study investigating the benefits of specific tactics at various points during a virtual ISD project would be of great interest. The appropriateness of applying the same socialisation tactics to local and distanced team members is questionable. For

example, measurement of social integration outcomes in relation to collective experiences at project initiation, informal communication and mentoring programmes throughout the project could add significantly to the future success of virtual ISD.

Section 1.2 defined an information system as a subsystem of an organisational system. The evidence in this study showed that customisations to existing systems were common. Where these information systems pre-exist in an organisation users also pre-exist. The interactions, communications and involvement of those users in the customisation of the existing information system would be of interest. The socio-technical perspective encouraged the involvement of users and other stakeholders in the development of information systems (section 2.2.2). This study focused on the use of ISD methodologies and socialisation tactics by IS professionals in virtual ISD teams. Future research investigating the socialisation of users and other stakeholders into the virtual ISD team would be of benefit to the domain.

The findings of this study are a starting point and an introduction to the practices of virtual ISD teams. Further research is needed in the area of virtual ISD.

8.8 Conclusion

An objective of this research was to explore and examine the use of ISD methodologies and socialisation tactics by virtual ISD teams. This research then sought to inform theory and practice through best practices based on the literature and findings. Virtual ISD teams do in fact operate differently to co-located ISD teams. Bespoke ISD methodologies were created, some based on existing methodologies. Ad-hoc mixing of methodologies did not occur. Teams primarily engaged in the customisation of existing information systems. As

virtual ISD teams become ubiquitous it is necessary to have a clear understanding of the pitfalls and best practices to ensure successful ISD. This study goes some way towards achieving that understanding.

People, not methodologies develop information systems. Literature in chapter two recognised the importance of the social aspects of ISD. Some authors stated that methodologies could not provide the social structures to support interpersonal relationships. This study found that for virtual ISD teams, ISD methodologies addressed the process oriented aspects and socialisation tactics addressed the social oriented aspects of virtual ISD. This research posits the view that virtual ISD teams require a structured methodology. This type of methodology draws from the functionalist approach that formalises and standardises the ISD process into manageable steps. Specifications, task assignments, status reports and checklists were common elements of a structured methodology. This structure was of great importance to the virtual ISD teams in this study. The study also found that the social aspects of virtual ISD were not ignored; however they were not necessarily incorporated into the ISD methodology. Instead they were addressed by the socialisation tactics used by each team.

This study has provided some insight to the practices of virtual ISD teams. Despite the prevalence of virtual ISD teams, this area of research is not widely investigated. The globalisation of organisations and the continued move towards development in low cost countries means that virtual ISD teams are set to remain. Without greater investigation of this area some virtual ISD teams may continue to operate without understanding of the pitfalls and best practices.

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APPENDICES

Appendix A: Survey

The survey must be completed in one sitting; it is not saved until the finish button is clicked on the last page. You are invited to participate in our survey on distributed Information Systems Development teams. It asks questions about ISD Methodologies, team dynamics, and the success of projects. It will take approximately 20 minutes to complete the questionnaire. Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for us to learn your opinions. Your survey responses will be strictly confidential and data from this research will be reported only in summary format. Your information will be coded and will remain confidential. If you have questions at any time about the survey or the procedures, you may contact Brenda Mullally at the email address specified below. Thank you very much for your time and support. Please start with the survey now by clicking on the Continue button below.

The following contact information will only be used if a follow-up is required.
The information will not be used for any other purpose or passed on to a third party.

Name

Email Address

Telephone Number

Company Name

Company Address

1. Industry Sector

1. Consultants/software house
2. Govt/public sector/education
3. Construction/manufacturing/distribution
4. Wholesale/retail trade
5. Finance/insurance/real estate
6. Service/communications
7. Other _____

2. How many Employees are there in your company?

1. 1-5
2. 6-20
3. 21-50
4. 51-100
5. 101-250
6. 250+

3. How long have you worked in Information Systems Development?

1. Less than 1 yr
2. 1-3 yrs
3. 3-5 yrs
4. 5-15 yrs
5. 15+ yrs

4. How long have you worked as part of a virtual team?

1. Less than 1 yr
2. 1-3 yrs
3. 3-5 yrs
4. 5-15 yrs
5. 15+ yrs

The following questions relate to background information concerning an ISD project you have worked on.

Please identify the official project name & description of an ISD project completed within the past 12 months that you were involved in as a member of a virtual team. (An ISD project is a significant piece of development or maintenance work. N.B. All other questions in this survey will be asked in relation to the project you identify in this question)

5. Please select the job category that closely resembles yours

1. Business/Systems Analyst
2. Project Management/Team Leader
3. Operations/Tech Support
4. Software Development
5. Testing/Quality Assurance
6. Other _____

6. What was the duration in (Months) of the completed project?

7. Was the project completed on time relative to the schedule?

1. Yes
2. No

8. Was the project completed within budget?

1. Yes
2. No
3. Other _____

9. Did the projects functionality meet the original project scope?

1. Yes
2. No
3. Other _____

10. What Software Quality Assurance standard was used by your project team during development? If a combination was used, please specify in box provided by other

1. SEI/CMM
2. IEEE
3. ISO 9000
4. None
5. Other _____

11. Did the system meet the quality standard used by your project team?

1. Yes
2. No
3. Other _____

12. For the completed project you identified, do you consider the resulting system was of a high quality?

1. Yes
2. No

13. Please state the number of members per location on your project team.
(maximum of four key locations)

	Location Name (country, city, building)	Number of Members	Team Purpose (eg testing)
Location 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location 2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location 3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. Did the project involve:

1. Developing a new system
2. Maintaining an existing system
3. Both

15. Please rate the following statement: The project identified was a success.

1. Strongly Disagree
2. Mostly Disagree
3. Partially Disagree
4. Neutral
5. Partially Agree
6. Mostly Agree
7. Strongly Agree

16. What was the hardware platform?

1. Mainframe
2. Minicomputers(servers)
3. Personal Computer
4. Other _____

17. For how many months, did you work on the completed project you have identified?

18. What was the name of the location you were based? (country, city, building)

	Local Team Members	Mostly local	Even number of local and distanced	Mostly distanced	Distanced Team Members
19. In your opinion please indicate on the following scale the team members with whom you worked the most:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20. Had you worked with some of the project team members on a prior occasion?

1. Yes
2. No

21. How many of the local team members had you worked with before?

22. How many of the distanced team members had you worked with before?

23. Did you meet with your distanced project team members at the beginning of the project?

1. Yes
2. No
3. Other _____

24. On average, how frequently did you physically meet as an entire project team? (local and distanced team members)

1. Daily
2. Weekly
3. Monthly
4. Quarterly
5. Annually
6. Less than once a year
7. Other

25. On average, how frequently did you electronically meet as an entire project team? (local and distanced team members using for example tele or videoconference)

1. Daily
2. Weekly
3. Monthly
4. Quarterly
5. Annually
6. Less than once a year
7. Other

26. Did your project team encourage informal unplanned communication between local and distanced team members? (e.g. communication through email, online chat, telephone, bulletin board, does anybody know questions etc.)

1. Yes
2. No

27. How did your project team encourage informal communication?

28. Please rate the following statement: Informal communication was beneficial to the project team.

1. Strongly Disagree
2. Mostly Disagree
3. Partially Disagree
4. Neutral
5. Partially Agree

- 6. Mostly Agree
- 7. Strongly Agree

29. Were you provided the opportunity to train with distanced team members at their location at some point during the project?

- 1. Yes, with all members
- 2. Yes, with some members
- 3. No

30. Were you provided the opportunity to spend time (not for training purposes) with distanced team members at their location during the project?

- 1. Yes, with all members
- 2. Yes, with some members
- 3. No

31. Throughout the project, were you aware of the correct team member to contact at the distanced site(s) to answer your questions?

- 1. Always
- 2. Sometimes
- 3. Never

In your opinion rate the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
32. The project team communicated effectively throughout the project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
33. The project team collaborated effectively throughout the project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
34. The project team worked as a cohesive team throughout the project.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The following set of questions relate to the development process and use of methodologies by your project team. Please answer these questions in relation to the project you identified earlier.

35. Which of the following best describes the methodology used for the project you have identified?

1. Commercial/Third party systems development methodology (e.g. Structured Systems Analysis and Design Methodology (SSADM))
2. Internally developed systems development methodology based on one commercial methodology. (e.g. SSADM adapted)
3. Internally developed systems development methodology based on more than one commercial methodology. (e.g. SSADM & RUP adapted)
4. Internally developed systems development methodology not based on any commercial methodology. (Unique to your organisation)
5. No formal methodology was used. (No method followed during development)
6. Other _____

36. Who chose the methodology to be used?

37. What purpose did the methodology serve?

	Not at all	Occasionally	Neutral	Often	Always
38. Were other methods used during the ISD project?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

39. What were those other methods?

	Very insignificantly	Insignificantly	Neutral	Significantly	Very Significantly
40. Please rate the following statement: The project team determined how the methods were used.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

41. Please explain how your project team determined the combination of methods:

	Very Insignificantly	Insignificantly	Neutral	Significantly	Very Significantly
42. To what extent did the method(s) support your development process?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

43. What support did the method(s) provide to your development process:

	Very Insignificantly	Insignificantly	Neutral	Significantly	Very Significantly
44. Please rate the following statement: The method(s) used supported Collaboration amongst team members.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

45. Please explain how the method(s) affected Collaboration:

	Very Insignificantly	Insignificantly	Neutral	Significantly	Very Significantly
46. Please rate the following statement: The method(s) supported formal project Communication amongst team members.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

47. Please rate the following statement: The method(s) supported informal Communication (not project related) amongst team members.

1. Very Insignificantly
2. Insignificantly
3. Neutral
4. Significantly
5. Very Significantly

48. Please explain how the method(s) affected communication:

The following set of questions relate to your project teams training/learning experiences. These may occur in the form of a formal training course or through project meetings. Please rate your level of agreement to the following statements in relation to the previously specified project team

Some questions must be answered in relation to local team members and then in relation to distanced team members.

49. I have been involved with local team members in common, job related training activities.

1. Strongly Disagree
2. Mostly Disagree
3. Partially Disagree
4. Neutral
5. Partially Agree
6. Mostly Agree
7. Strongly Agree

50. I have been involved with distanced team members in common, job related training activities.

1. Strongly Disagree
2. Mostly Disagree
3. Partially Disagree
4. Neutral
5. Partially Agree
6. Mostly Agree
7. Strongly Agree

51. Local team members have been instrumental in helping me to understand my job requirements.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree

4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

52. Distanced team members have been instrumental in helping me to understand my job requirements.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

53. Most of my training has been carried out apart from local team members (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

54. Most of my training has been carried out apart from distanced team members (r).

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

55. This project team puts all team members through the same set of learning experiences.

1. Strongly Disagree

2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

56. There is a sense of “being in the same boat” amongst team members in this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

57. Was there an online store of project information?

1. Yes
2. No

58. Who had access to this store of information?

1. Local team members
2. Distanced team members
3. Both

59. Please describe this store of information, indicating where it was located and what it contained.

The following set of questions relate to your knowledge of project team practices and expectations. Please rate your level of agreement to the following statements in relation to the previously specified project team .

Some questions must be answered in relation to local team members and then in relation to distanced team members.

60. During my training, I was usually physically apart from local team members.

1. Strongly Disagree

2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

61. During my training, I was usually physically apart from distanced team members.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

62. I have been very aware that I am seen as “learning the ropes” by local team members.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

63. I have been very aware that I am seen as learning the ropes by distanced team members.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

64. I did not perform any of my normal job responsibilities until I was thoroughly familiar with project team procedures and work methods.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

65. Much of my job knowledge has been acquired informally on a trial and error basis. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

66. I have been through a set of training experiences, which are specifically designed to give team members a thorough knowledge of job related skills.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

67. Did your project team have policies in place that helped team members get to know each other?

1. Yes
2. No

68. Briefly describe the policies that your project team had in place that helped team members get to know each other:

69. Does your project team have a formal document that details some or all of

the following: (tick where appropriate)

1. appropriate behaviour within the team
2. communication channels to be used
3. behaviour during collective meetings
4. expected communication response times
5. conflict resolution
6. member roles
7. member responsibilities
8. none of the above

70. Please provide some examples of the information in the formal document:

--

The following set of questions relate to your project teams mentoring practices. Please rate your level of agreement to the following statements in relation to the previously specified project team .

Some questions must be answered in relation to local team members and then in relation to distanced team members.

71. I am gaining a clearer understanding of my role in this project team from observing my local senior colleagues.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

72. I am gaining a clearer understanding of my role in this project team from observing my distanced senior colleagues.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree

6. Mostly agree
7. Strongly Agree

73. I have received little guidance from experienced local team members as to how I should perform my job. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

74. I have received little guidance from experienced distanced team members as to how I should perform my job. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

75. One of the main job responsibilities of experienced team members is advising or training newcomers.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

76. I have little or no access to people who have previously performed my role in this project team. (r).

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree

6. Mostly agree
7. Strongly Agree

77. I have been generally left alone to discover what my role should be in this project team. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

78. On the completed project you identified, did you have a mentor to whom you directed queries?

1. Yes
2. No
3. Other _____

79. Was your mentor at your location?

1. Yes
2. No

80. What benefits did you gain from having this mentor?

--

The following set of questions relate to your acceptance within the project team. Please rate your level of agreement to the following statements in relation to the previously specified project team .

Some questions must be answered in relation to local team members and then in relation to distanced team members.

81. My local team members have gone out of their way to help me adjust to this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree

4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

82. My distanced team members have gone out of their way to help me adjust to this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

83. I feel that experienced local team members have held me at a distance until I conform to their expectations. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

84. I feel that experienced distanced team members have held me at a distance until I conform to their expectations. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

85. I feel that my skills and abilities are very important in this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral

5. Partially agree
6. Mostly agree
7. Strongly Agree

86. Almost all of my team members have been supportive of me personally.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

87. I have had to change my attitudes and values to be accepted in this project team. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

88. Did your project team celebrate any milestones?

1. Yes
2. No

89. Please describe how your project team celebrated milestones detailing whether both local and distanced team members were included in the celebration.

90. Did your project team celebrate success?

1. Yes
2. No

91. Please describe how your project team celebrated success, detailing whether both local and distanced team members were included in the celebration?

The following set of questions relate to your role progression within your project team. Please rate your level of agreement to the following statements in relation to the previously specified project team (including your distanced team members).

92. There is a clear pattern in the way one role leads to another or one job assignment leads to another in this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

93. Each stage of the training process expands and builds upon the job knowledge gained during the preceding stages of the process.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

94. The movement from role to role and function to function to build up experience and a track record is very apparent in this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

95. This project team does not put newcomers through an identifiable sequence of learning experiences. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

96. The steps in the career ladder are clearly specified in this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

97. At the beginning of your project, did your team identify each members knowledge and expertise so that everyone knew to whom to direct queries?

1. Yes
2. No
3. Other

98. How did you know whom to contact for specific knowledge and expertise within your project team?

The following set of questions relate to the timing of your role progression within your project team. Please rate your level of agreement to the following statements in relation to the previously specified project team (including your distanced team members).

99. I can predict my future career path in this project team by observing other

people's experiences.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

100. I have a good knowledge of the time it will take me to go through the various stages of the training process in this project team.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

101. The way in which my progress through this project team follows a fixed timetable of events that has been clearly communicated to me.

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

102. I have little idea when to expect a new job assignment or training exercise in this project team. (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

103. Most of my knowledge of what may happen to me in the future comes

informally, through the grapevine, rather than through regular project team channels (r)

1. Strongly Disagree
2. Mostly disagree
3. Partially disagree
4. Neutral
5. Partially agree
6. Mostly agree
7. Strongly Agree

104. Please include any other information or comments you think would be helpful to this study on Distributed Information Systems Development Teams.

Thank you for completing this survey. If you have any queries please contact Brenda Mullally: bmullally@wit.ie

Appendix B: Team summaries

Team 3

This project involved developing a Ticket Tracking and Technical Support Knowledgebase. The project duration was 15 months. The project utilised developers located in UK and Waterford. Overall, the project was considered to be a success. It was completed on time, met the functional requirements and was within budget. In general team members worked equally with both local and distant team members. Two thirds of the team members had previously worked with other team members (both local and distant). An initial team kick off meeting occurred at the beginning of the project. The project team as a whole (UK & Dublin) rarely met physically during the project. The entire team met electronically once a week. A minority of the team had the opportunity to train and meet with distanced team members. Informal communication between team members took place through Email, Online Chat, and telephone. The team considers in general that they worked as a cohesive team communicating and collaborating effectively throughout the project. There was no Software Quality standard adhered to during development however a development methodology was used. This methodology was internally developed and was decided upon at an organisational or management level. The methodology ensured consistency and supported the management of the project rather than guide the design, code and testing phases. Sharepoint.com was used to store all project information, thus giving access to all team members. This store of information included documents such as project plan, design documents etc. The team in general were not aware of a formal document that provided information team behaviour, communication channels, roles, and responsibilities etc. The project management level had a mentor program. Other team members were not aware of a mentor programme applicable to them. The team did not celebrate milestones or success.

Team 5

This project involved developing a Regulatory Capital Calculation solution. The project took place over 24 months across three locations in Dublin Ireland, London U.K. and Wroclaw Poland. Approximately 50 people worked on this project. The project was completed on time, met the functional requirements and was within budget. It was considered to be a success. The Dublin team worked with both local and distanced team members during the project. There was no history of working with team members prior to this project. An initial kick off meeting occurred at the beginning of the project. There was some opportunity for individuals to meet distanced team members either during training or for other reasons during the project. Electronic meetings took place weekly. The software quality standard adhered to was SEI/CMM. The information systems development methodology was based on a commercial methodology and was decided upon by the client and Accenture management. The methodology ensured that the correct client's calculation and reporting requirements were met. If additional methodologies were needed, the team made the decisions. Informal communication took place predominately through email. This type of communication was seen to be extremely beneficial to the team. Team communication, collaboration and cohesiveness during the project were considered to be very good. Project information was stored on Sharepoint, giving access to all project team members. No policies were in place to help team members get to know each other. A formal document was used to provide information on roles, and responsibilities. A local mentor programme was in place for the project team members, which was deemed very supportive, and helpful in terms of knowledge and direction. The entire team formally celebrated both milestones and successes. This was done through a meal, drinks, a Christmas party, formal presentations. Both local and distanced team members were invited.

Team 6

This project involved the implementation of a new retail system for a large bank. The project took place over 12 months across three locations in Dublin Ireland, Belfast Northern Ireland, Madrid Spain, and India. Approximately 60 people worked on this project. The project was completed on time and was within budget. Some functional requirements were deferred and some unplanned functions were implemented. Overall the project was considered to be very successful. The Dublin team worked with both local and distanced team members during the project. Some team members had worked with other team members prior to this project. An initial kick off meeting did not occur at the beginning of the project. The entire team never met physically in the same location. There was some opportunity for individuals to meet a few distanced team members either during training or for other reasons during the project. Electronic meetings involving management took place weekly, the entire team never met electronically. The project followed an internal software quality standard based on CMM. The information systems development methodology was internally developed and not based on a commercial methodology. This decision was made by Accenture management. The methodology defined the entire development life cycle providing processes for each step in the cycle thus ensuring the same standards were used in all sites. The methodology was then adapted somewhat at a local level. No additional methodologies were used for this project. Informal communication took place predominately through email and a social website through Sharepoint. This type of communication was seen to be extremely beneficial to the team. The methodology used did not support informal communication. Team communication, collaboration and cohesiveness during the project were considered to be good. Project information was stored on Microsoft Sharepoint, giving access to all project team members. A formal document was used to provide information on roles, and responsibilities. A mentor programme was in place for the project team members. The mentor provided direction and support. The entire team formally celebrated major milestones. This was done through a meal, drinks, a Christmas party, and formal

presentations. Both local and distanced team members were invited. Lesser milestones were celebrated at a local level.

Team 7

This project involved the implementation of SAP. The project implementation took place over 8-12 months. The project utilised people located in the U.K, France, Ireland and the U.S.A. Offshore developers were located in Bangalore, India. These developers did not meet the rest of the team; know as the 'core team'. The team as a whole consisted of approximately 50 people. The project was considered to be a success, the schedule was not absolutely met, but the project did meet the functional requirements and was within budget. In general team members worked equally with local and distant team members. Some team members had worked with each other before. A 'kick off' team meeting occurred at the beginning of the project when all team members met each other. Following this the project team as a whole never met physically during the project. Some of the team had the opportunity meet with distanced team members for training and other purposes at different points during the project. Regular electronic team meetings were held. Daily issue meetings were also held and attended by the core team (consultants, site functional people, offshore manager and some SAP support team members). Informal communication was encouraged between team members; this took place through email, telephone, online chat and net meeting. This type of communication was seen to be very beneficial to the team. The team considers in general that they worked as a cohesive team, communicating and collaborating effectively throughout the project. Team building and team events facilitated team members getting to know each other. The project used ISO9000 and SEI/CMM as the Software Quality standard; these were adhered to during development. The project team used an internal information systems development methodology that was decided upon by senior management. This methodology provided a common and consistent implementation process across multiple sites. EProject was used to store all project information. All project team members had access to this site. A formal document(s) existed which contained

details on team member roles, responsibilities, communication behaviours and conflict resolution procedures. A mentor program was in place for the some project team members. This provided individuals access to additional technical and business domain knowledge. Success and milestones were celebrated at a deployment site level and at a local level. Team outings and individual bonuses recognised the achievements.

Team 9

This project involved the implementation of RevenueOffice Usage Assurance release 3.2.0 and 3.2.1. The project implementation took place over 5 months. The project utilised developers located in the Poznan, Poland and Dublin, Ireland. The team consisted of 9 people. The project was considered to be a success as it was completed on time, met the functional requirements and was within budget. In general team members worked predominantly with local team members. Some team members had worked with each other before. A ‘kick off’ team meeting occurred at the beginning of the project when all team members met each other. Following this the team did not meet at one location again. A developer from Poland spent two months in Dublin. The entire team met electronically every month. Some of the team had the opportunity to meet with distanced team members for training and other purposes at some point during the project. Informal communication took place through email, telephone, skype, JIRA and Confluence. This type of communication was seen to be very beneficial to the team. The team considers in general that they worked as a cohesive team, communicating and collaborating effectively throughout the project. Team members got to know each other at the kick off meeting. An informal policy of exchanging local and distant team members is also in place. The project used an internal quality procedure as the software quality standard; this was adhered to during development. The project team used an internal information systems development methodology that supported the project life cycle and improved performance and efficiency. This methodology was chosen by management. Additional methodologies were used to support design (UML)

and issue/bug tracking (JIRA). JIRA was used as the issue tracking system and Confluence as the collaboration system. Both available online and therefore all project team members had access to this information. A company wide behaviour policy exists, and formal documentation on roles and responsibilities for the project existed. A local mentor program was in place for the project team members. This provided individuals to additional technical and business domain knowledge. Success and milestones were celebrated at a local level by a social event.

Team 10

This project involved the implementation of HR Direct in Poland. The project took place over 24 months. The project utilised people located in Wroclaw, Poland and Dublin, Ireland. The team consisted of 28 people. The project in general was not considered to be a complete success. The project was not completed on time or within budget. The scope of the project widened partially due to the extended duration. In general team members worked equally with local and distanced colleagues. Team members had not worked with each other before and did not meet at the beginning of the project. Some had the opportunity to meet physically during the project. Electronic team meetings took place at least once a month. Daily incident meetings and weekly status meetings also took place. Informal communication took place predominately through email. This type of communication was seen to be very beneficial to the team. Team communication, collaboration and cohesiveness during the project were considered to be reasonable. Language and cultural barriers played a part in the difficulties in communicating. The project used an internal quality procedure as the software quality standard; this was adhered to during development. The project team used an internal information systems development methodology based on DSDM. This was a senior management decision. The methodology governed the standards regarding requirements definition, functional specifications, development and testing. SAP's asap methodology was also utilised. In some cases the internal methodology was overridden e.g.

documentation of requirements. A database was used as the issue tracking system, a network drive for specification documents and Lotus Notes as the collaboration system. Both available online and therefore all project team members had access to this information. A formal document existed which detailed some information concerning communication response times, behaviour and member responsibilities. A mentor program was in place for the project management; providing access to historical knowledge associated to the project. Success and milestones were celebrated at a local level by a social event.

Team 12

This project involved the implementation of Plateau's enterprise learning management system (ELMS). The project implementation took place over 15 months. The project utilised developers located in the U.S.A and Waterford. The team consisted of 10-20 people. The project was considered to be a success as it did not overrun significantly it was completed on time, and met the functional requirements . In general team members worked predominantly with local team members. Team members had not worked with each other before. An initial team kick off meeting did not occur physically at the beginning of the project, a conference call was used to begin the project. The project team as a whole never met physically during the project. The entire team met electronically once a week. Some of the team had the opportunity to meet with distanced team members for training and other purposes at some point during the project. Informal communication was encouraged between team members; this took place through email, telephone, 'quick question' emails, and web conferencing. This type of communication was seen to be very beneficial to the team. The team considers in general that they worked as a cohesive team, communicating and collaborating effectively throughout the project. The project used ISO9000 as the Software Quality standard; this was adhered to during development. The project team used no formal information systems development methodology. All project information resided in the company document management system located on a server in America. All project team members had access to this information. A

formal document(s) existed which contained details on team member roles, responsibilities and ground rules. Project details were also available regarding description, scope, budget and sponsors. A local mentor program was in place for the project team members. This was considered useful for brain storming, and the resolution of problems and issues. Success and milestones were celebrated at a local level by going for a meal together. Announcements and site wide emails were also used to recognise and publicise achievements.

Team 13

This project involved the implementation of ACATS. The project implementation took place over 10 months. The project utilised people located in the U.S.A. and Waterford, Ireland. The team consisted of 12 people. The project was considered to be a complete success as it was completed on time, within budget and met the original project scope. In general team members worked equally with local and distant team members. Some team members had worked with each other before. A physical team meeting did not occur at the beginning of the project. The project team as a whole never met physically during the project. None of the team had the opportunity meet with distanced team members for training or other purposes during the project. Regular electronic team meetings were held at least once a week. Informal communication was encouraged between team members; this took place through email, telephone, and online chat. This type of communication was seen to be very beneficial to the team. The team considers that they worked as a cohesive team, communicating and collaborating effectively throughout the project. Regular meetings and phone calls allowed team members to get to know each other. The project used SEI/CMM as the Software Quality standard; this was adhered to during development. The project team used an internal information systems development methodology that was decided upon by senior management. This methodology provided a common and consistent process across all distributed teams ensuring quality standards were met. A tool called Bugzero was used to manage bugs and enhancements. This provided a facility to support collaboration

between team members in order to solve issues. A network drive was used to store all project information inclusive of technical designs, functional designs, test files, test documentation, load files, etc. All project team members had access to this server. Company wide documents detail expected behaviour, conflict resolution, job roles and responsibilities etc. No formal document existed that specifically dealt with this project. Team members knew that meeting agendas and being aware of current documentation etc were important. A mentor program was in place for the project team members and considered very beneficial. This provided individuals access to additional technical and business domain knowledge. The mentor also acted as a guide for queries, support and backup in meetings and a confidence booster. Success and milestones were celebrated at a local level. Team lunches, star awards and vouchers recognised the achievements.

Team 15

This project involved the creation of a conference website. The project creation and implementation took place over 6 months. The project utilised people located in the New York, Boston, San Francisco, U.S.A and Toronto, Canada. The team as a whole consisted of approximately 6 people. Those located in New York predominantly worked with local team members, those located in Toronto and San Francisco worked with team members at a distant. Some team members had worked with each other before. The project was considered to be a success, the schedule was not absolutely met, but the project did meet the functional requirements and was within budget. The project team as a whole never met physically prior to or during the project. Regular electronic team meetings were held at least once a week. Informal communication was encouraged between team members; this took place through a lot of instant messaging, conference calls using Skype and emails. This type of communication was seen to be very beneficial to the team. The team considers in general that they communicated and collaborated reasonably well throughout the project. Weekly conference calls were replaced with the use of Bugzilla, a bug and issue tracking application that

supported the allocation and tracking of tasks. The team was not considered to be all that cohesive. However this may be due to the team members never having met each other, and working part time on this project. A Software Quality standard was not adhered to during development. The project team used a modified Agile methodology that emerged due to the preferences of the team rather than through a formal decision. This methodology provided a flexible and iterative development process that allowed for ad hoc development whereby features were developed on the go. Some other methodologies were used for modelling through flow diagrams and requirements analysis. A Wiki contained project information. Bugzilla contained bug and issue tracking. All project team members had access to these information stores. Success and milestones were celebrated and recognised through email only as a physical meeting was not possible.