

**VIDEOCONFERENCING AS STRATEGIC MANAGEMENT TOOL
IN NEW ORGANISATIONAL FORMS. THE CASE OF TELP**

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**Dissertation submitted in fulfilment of the requirements for
the degree of Magister Artium in the Faculty of Arts and
Science, School of Communication at the Potchefstroomse
Universiteit vir Christelike Hoër Onderwys**

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November 2003

Potchefstroom

ACKNOWLEDGEMENTS

I express my sincere gratitude to the following individuals and organisations for their contribution to the completion of this dissertation:

- The Eastern Cape Technikon, for allowing me to research the TELP project and for my employment, allowing for in-depth access to critical TELP information required,
- Texas Southern University, for their funding of international videoconferences and valuable insight gained into the field of new communication technology,
- Potchefstroom University academic and administrative staff for providing the necessary infrastructure,
- My supervisor, Prof. Gideon De Wet, for many comments pertaining to textual clarification as well as his research guidance,
- Mr. Andrew Christoffels (Vice Principal: Academic) and Dr. Chris van Wyk (Director: Staff and Academic Development), Faith Sigaba (South African TELP co-ordinator) and Irene Harvey (Curriculum Development) at the Eastern Cape Technikon for their insight into the various relationships that exist between TELP individuals,
- Daniel Davis, Jennifer Jolivet, Claudette Ligons and all the other individuals from Texas Southern University for their contributions, guidance and assistance,
- Visiting Fullbright Professor in South Africa (2002 & 2003) Barbra Tedrow for her insight into distinctly American linkages projects,
- Dr. Jacques Posthumus (Dean: Faculty of Business Sciences), Dr. Adele Moodly (HOD: Communication and Languages) for her language corrections and colleagues from the Department of Communication and Languages,
- My parents, Duncan and Santie, for their support and scientific insight, as well as support offered by other members of my close family, my wife Bianca and daughter Celeste.

Abstract

Videoconferencing as strategic management tool in new organisational forms. The case of TELP.

This study examines new organisational environments and all the environmental variables that are involved in the adoption and implementation of new communication technology. This includes structures within the organisation, as well as social communication networks. Social communication networks determine the levels of measurement of processes associated with managerial practises and policies regarding videoconferencing implementation.

Videoconferencing as a communication management tool should take into account the numerous applications that videoconferencing hold, but should at the same time consider all the implications for management. Communication managers should show a level of sensitivity on interpersonal relationship establishment and maintenance using a videoconferencing system. Aspects that should be attended to include alteration of verbal and non-verbal communication processes, the establishment of virtual relationships and how it impacts on the social communication network.

The study utilises focus group research, social network analysis and descriptive statistics in the investigation of manifestation of above-mentioned variables in the Tertiary Education Linkages Project (TELP), which is a linkage project between the Eastern Cape Technikon and Texas Southern University. The study utilises triangulation for establishment of acceptable levels of reliability and validity.

The analysis of data revealed that videoconferencing facilitates organisational communication networks on the precondition that communication networks and the communication environment are well managed. The nature of social networks reveals that it will always be in existence where human interaction is

present, however, communication management strategies are indeed required to ensure that the quality of information disseminated over the social network contribute to sound managerial outcomes. It was furthermore established that communication management policies do not necessarily affect individuals' experience of videoconferencing, however, as a communication management tool, videoconferencing must be guided by effective communication management policies and practises for the group to be effective.

Opsomming

Videokonferensies as strategiese bestuursimplement in nuwe organisatoriese vorms. Die geval van TELP.

Hierdie studie bestudeer die faktore wat 'n rol speel in die aanpassing van nuwe kommunikasietegnologie, en hoe dit geïmplementeer word binne moderne organisatoriese kontekste. Dit sluit in strukture binne die organisasie sowel as sosiale kommunikasienetwerk sisteme. Prosesse wat gewoonlik gekoppel word met bestuurspraktyke en riglyne, word gemeet aan die sosiale netwerk sisteme wat bestaan tussen rolspelers, spesifiek binne die verband van videokonferensiestelsel implementering.

Videokonferensiestelsels kan op vele maniere gebruik word, maar dit is belangrik dat daar kennis geneem word van die implikasies vir bestuurspraktyke. Bestuurders wat gebruik maak van videokonferensiestelsels as kommunikasieinstrument moet bedag wees op die daarstel van interpersoonlike verhoudinge en hoe hierdie verhoudinge in stand gehou behoort te word. Faktore wat in ag geneem moet word sluit in hoe verbale en nie-verbale kommunikasie verander, hoe virtuele verhoudings ontstaan, en die invloed wat dit het op sosiale kommunikasienetwerksisteme.

Die studie maak gebruik van fokusgroep navorsing, sosiale netwerk analise en beskrywende statistiek in die ondersoek en neerlegging van bogenoemde veranderlikes in die "Tertiary Education Linkages Project (TELP)", wat 'n samewerkingsprojek is tussen die Eastern Cape Technikon en Texas Southern University. Die studie verifieer geldigheid en betroubaarheid deur triangulering.

Die resultate van die data dui daarop dat videokonferensies slegs 'n bydrae lewer tot organisatoriese netwerke wanneer kommunikasienetwerke, sowel as die kommunikasieomgewing goed bestuur word. Sosiale netwerke is die natuurlike gevolg van menslike kommunikasie, en

kommunikasiebestuurstrategieë is belangrik indien 'n bestuurder wil verseker dat die kwaliteit van inligting binne so 'n netwerk bydra tot goeie bestuursuitkomste. Die studie het verder vasgestel dat bestuursriglyne vir kommunikasie nie noodwendig die individu se ervaring van 'n videokonferensie beïnvloed nie, maar dat dit as 'n bestuursinstrument deur effektiewe kommunikasiebestuur riglyne en praktyke gerig word.

Table of Contents

	Page
CHAPTER 1: INTRODUCTION AND ORIENTATION.....	1
1.1 INTRODUCTION.....	1
1.2 PROBLEM STATEMENT AND BACKGROUND.....	2
1.3 AIM(S) OF THE STUDY	5
1.4 CENTRAL THEORETICAL STATEMENT(S)	5
1.5 METHODS OF RESEARCH.....	6
1.5.1 <i>Literature study</i>	7
1.5.2 <i>Qualitative focus groups</i>	8
1.5.3 <i>Quantitative questionnaires</i>	9
1.6 KEY TERMS.....	10
1.7 CHAPTER DEMARCATION	11
1.8 CONCLUSION	13
CHAPTER 2: NEW ORGANISATIONAL FORMATS, ENVIRONMENTS AND SOCIAL COMMUNICATION NETWORKS.....	14
2.1 INTRODUCTION.....	14
2.2 NEW ORGANISATIONAL ENVIRONMENTS AND NEW ORGANISATIONAL FORMATS	15
2.2.1 <i>Centralisation / decentralisation of organisational forms</i>	18
2.2.2 <i>Organisational identification, globalisation and the information society</i>	19
2.2.2.1 Organisational identification.....	20
2.2.2.2 Globalisation.....	22
2.2.2.3 The information society.....	24
2.2.3 <i>Internal environmental changes in new organisational contexts</i>	26
2.2.3.1 Formal structures of organisation and communication	28
2.2.3.2 Informal structure and communication.....	32
2.2.3.3 Organisational culture and identity.....	34
2.2.4 <i>New organisational forms and the new economy</i>	36

Table of Contents (Continued)

2.3 SOCIAL COMMUNICATION NETWORKS	36
2.3.1 <i>Hierarchical levels, degree of hierarchy and centralisation of social networks</i>	43
2.4 CONCLUSION	47
CHAPTER 3: VIDEOCONFERENCING AS A NEW COMMUNICATION MEDIUM AND MANAGEMENT TOOL: APPLICATIONS AND CHALLENGES	49
3.1 INTRODUCTION.....	49
3.2 VIDEOCONFERENCING IN NEW ORGANISATIONAL FORMS	50
3.2.1 <i>Videoconferencing and management policies</i>	53
3.2.2 <i>Videoconferencing applications</i>	57
3.2.3 <i>Implications for videoconferencing management</i>	61
3.2.3.1 Group decision support systems (GDSS's).....	62
3.2.3.2 Videoconferencing implications for verbal communication processes	64
3.2.3.3 Videoconferencing systems and the implications for the non-verbal communication process	73
3.2.3.4 Communicative characteristics of videoconferencing as a GDSS	78
3.2.4 <i>Managing communication in working relationships using videoconferencing systems</i>	79
3.2.4.1 Videoconferencing as communication medium and social communication networks	82
3.3 CONCLUSION	84
CHAPTER 4: RESEARCH METHODOLOGY	86
4.1 INTRODUCTION.....	86
4.2 METHODOLOGICAL ORIENTATION FOR THIS RESEARCH	87
4.3 RESEARCH DESIGN	89
4.3.1 <i>The research problem</i>	89

Table of Contents (Continued)

4.3.2 Research questions.....	89
4.3.3 Research aims	90
4.3.4 Central theoretical statements.....	91
4.4 THE RESEARCH DESIGN PROCESS.....	91
4.4.1 TELP: Research domain at the Eastern Cape Technikon.....	92
4.4.2 Pilot Study.....	94
4.4.3 Steps in refining the research design and application	96
4.5 RESEARCH METHODS USED IN THIS STUDY.....	98
4.5.1 Focus groups as research method.....	98
4.5.2 Questionnaires as research method.....	99
4.6 DATA ANALYSIS METHODS USED	101
4.6.1 Video recording of focus groups.....	101
4.6.2 Questionnaires: data analysis methods.....	103
4.7 RELIABILITY OF THE RESEARCH.....	112
4.8 DATA PRESENTATION AND PRIVACY ISSUES.....	113
4.9 CONCLUSION	114
CHAPTER 5: DATA PRESENTATION, ANALYSIS AND FINDINGS OF THE RESEARCH	115
5.1 INTRODUCTION.....	115
5.2 DATA PRESENTATION	116
5.3 DEMOGRAPHICS.....	117
5.4 PRIVACY ISSUES AND INDIVIDUAL IDENTIFICATION	118
5.5 FOCUS GROUPS: DATA ANALYSIS AND OBSERVATIONS	119
5.6 LIKERT – SCALE DATA ANALYSIS	121
5.6.1 General overview	121
5.6.2 Management and videoconferencing	125
5.6.3 Management site and videoconferencing.....	128
5.6.4 The quality of communication and videoconferencing.....	130
5.6.5 Videoconferencing and the efficiency of videoconferencing communication.....	134

Table of Contents (Continued)

5.6.6	<i>Videoconferencing and length of use</i>	135
5.6.7	<i>General overview of findings: Likert – scale data</i>	138
5.7	NETWORK ANALYSIS DATA: DISCUSSION	140
5.7.1	<i>Individual level of analysis</i>	142
5.7.1.1	Average point in/point out degree centrality scores	143
5.7.1.2	Betweenness and centrality	147
5.7.1.3	Closeness and centrality	151
5.7.1.4	General overview of findings: Individual level of analysis	155
5.7.2	<i>Clique level of analysis</i>	156
5.7.2.1	TELP Management: Clique level of analysis	157
5.7.2.2	Critical Friends Group	160
5.7.2.3	General overview of findings: Clique level of analysis	162
5.7.3	<i>System level of analysis</i>	163
5.7.3.1	General overview of findings: System level of analysis	165
5.8	INTEGRATED FINDINGS AND OBSERVATIONS	167
5.8.1	<i>Likert – scale analysis: an integrated overview</i>	167
5.8.1.1	Quality of communication practises	168
5.8.1.2	Communication management performance	169
5.8.1.3	Output/efficiency of communication practises	170
5.8.2	<i>Network Data Analysis: An integrated overview</i>	170
5.8.2.1	Individual level of analysis	171
5.8.2.2	Clique and system level of analysis	173
5.9	CONCLUSION	175
CHAPTER 6: DISCUSSION OF FINDINGS, SYNTHESIS DEVELOPMENT, RECOMMENDATIONS, SHORTCOMINGS AND CONCLUSIONS		177
6.1	INTRODUCTION	177
6.2	DISCUSSION OF FINDINGS	178
6.2.1	<i>Research problem, research questions and research aims</i>	179
6.2.1.1	Research question 1.2.1 and Research aim 1.3.1	179
6.2.1.2	Research question 1.2.2 and Research aim 1.3.2	180

Table of Contents (Continued)

6.2.1.3 Research question 1.2.3 and Research aim 1.3.3.....	182
6.2.1.4 Research question 1.2.4 and Research aim 1.3.4.....	183
6.2.1.5 Research question 1.2.5 and Research aim 1.3.5.....	184
6.2.2 <i>Central theoretical statements</i>	185
6.3 THE SIGNIFICANCE OF THE RESEARCH FOR STRATEGIC COMMUNICATION MANAGEMENT	187
6.4 SHORTCOMINGS.....	189
6.5 ADVANTAGES.....	190
6.6 RECOMMENDATIONS.....	190
6.7 RECOMMENDATIONS FOR FURTHER RESEARCH	192
6.8 CONCLUSION	193
BIBLIOGRAPHY.....	195
ANNEXURES.....	I
ANNEXURE 1: MODERATOR GUIDE	I
ANNEXURE 2: STRUCTURED QUESTIONNAIRE.....	IV
ANNEXURE 3: NETWORK ANALYSIS DATA.....	IX
ANNEXURE 3.1: <i>INDIVIDUAL LEVEL OF ANALYSIS</i>	IX
ANNEXURE 3.2: <i>CLIQUE AND SYSTEM LEVEL OF ANALYSIS</i>	X
ANNEXURE 4: DESCRIPTIVE STATISTICS	XI
ANNEXURE 4.1: <i>DEMOGRAPHIC DATA</i>	XI
ANNEXURE 4.2: <i>LIKERT – SCALE DATA</i>	XII
ANNEXURE 4.3: <i>CROSS TABULATIONS</i>	XVII
ANNEXURE 4.4: <i>RELIABILITY STATISTICS</i>	LIII

List of Tables

	Page
Table 1 Features of GDSS types.....	63
Table 2 Symmetrical data matrix.....	110
Table 3 Symmetrical matrix with relations between X1 and X2 as well as X3 and X2.....	111
Table 4 Demographic data – gender, age and home language	117
Table 5 Likert – scale analysis: elementary descriptive data.....	122
Table 6 Differences in perception regarding videoconferencing management policies between management and the critical friends group (questions C3, C4, C8.1 and C8.2)	126
Table 7 Differences in perception regarding videoconferencing management policies at different sites (questions C3, C4, C8.1 and C8.2)	128
Table 8 Differences in perception regarding quality of communication between management and the critical friends group (questions C2, C5).....	131
Table 9 Differences in perception regarding quality of communication in different length of use categories (questions C2 and C5).....	132
Table 10 Differences in perception regarding efficiency of videoconferencing between management and the critical friends group (questions C1 and C6)	134
Table 11 Differences in perception regarding efficiency of videoconferencing in different length of use categories (questions C1 and C6).....	136
Table 12 Average point in/point out degree centrality	143
Table 13 Summary - average point in / point out degree.....	146
Table 14 Betweenness.....	147

List of Tables (Continued)

Table 15 Summary - betweenness.....	150
Table 16 Closeness and centrality	151
Table 17 Summary - closeness.....	153
Table 18 TELP management - Clique level of analysis.....	157
Table 19 TELP Critical friends - Clique level of analysis	160
Table 20 Clique reconstruction through structural equivalence for TELP management	166
Table 21 Clique reconstruction through structural equivalence for the TELP critical friends group	166

List of Figures

	Page
Figure 1 A communication model for videoconferencing.....	66
Figure 2 The videoconferencing communication process	68
Figure 3 Directional representation of relationships perceived by X ₁ and X ₃	104
Figure 4 Difference in perception regarding videoconferencing management policies between management and the critical friends group (questions C3, C4, C8.1 and C8.2)	127
Figure 5 Difference in perception regarding videoconferencing management policies at different sites (questions C3, C4, C8.1 and C8.2)	129
Figure 6 Difference of perception regarding quality of communication between management and the critical friends group (questions C2 and C5).....	131
Figure 7 Differences in perception regarding quality of communication in different length of use categories (questions C2 and C5).....	133
Figure 8 Differences in perception regarding efficiency of videoconferencing between management and the critical friends group (questions C1 and C6)	135
Figure 9 Differences in perception regarding efficiency of videoconferencing in different length of use categories (questions C1 and C6).....	136
Figure 10 Comparative matrix density scores between TELP management and the TELP critical friends Group.....	163
Figure 11 Centrality variables - closeness, betweenness and point degree scores for TELP individual actors.....	165
Figure 12 Qualitative sociogramme reconstruction on the perceived network role of different players based on individual level of analysis	171

List of Figures (Continued)

Figure 13 Qualitative clique reconstruction based on TELP management through block modelling	173
Figure 14 Qualitative clique reconstruction based on TELP critical friends variable through block modelling	174

CHAPTER 1: INTRODUCTION AND ORIENTATION

1.1 Introduction

Videoconferencing at the Tertiary Education Linkages Project (TELP) is a practice associated with organisational change in the context of global network organisations. Various authors (Bangermann, 1997:2, Steele, 1998:2, Verwey *et al.*, 2002:171) have attributed globalisation and change to new communication technology and thus to new organisational formats. Authors (Holsapple *et al.*, 1996:422, Herndon, 1997:121, Simpson, 1999:47, Heintze & Bretschneider, 2000:801) describe the processes induced by new communication technology in organisations as an increase in the speed of communication, a decrease in cost and the ability of geographically dispersed individuals to interact meaningfully (Monge & Fulk, 1999:84).

TELP, with Texas Southern University (TSU) is a partnership project between the Eastern Cape Technikon (ECT), South Africa and Texas Southern University, United States of America. The four-year linkage project, coming to an end in 2002, focussed on three key aspects (not the research aims of this dissertation) with all Faculties at the ECT(Hill, 1999:2):

- Developing research capacity with distinctive research output,
- Upgrading staff qualifications and skills,
- Curriculum and instructional development.

Whilst the ECT is seeking to extend the project and negotiations are currently underway, videoconferencing has played a significant role in acting as a strategic communication management tool between TSU and the ECT.

The research focus of this dissertation is to demonstrate how videoconferencing as a communication medium can be applied and supported as a strategic communication management tool through the analysis of the existing social communication networks that are prevalent in the organisation.

Videoconferencing is being used in the TELP linkage project in various ways, making it ideal for analysis (Ligons & Harvey, 2001:4):

- Designing instructional outcomes/objectives
- Individualised instructional strategies
- Assessment (entry level, pre- and post assessment)
- Establishing collaborative friend groups (CFG's) which assists members in mastering different components in the process

1.2 Problem statement and background

Organisations have been organising themselves to cope with different patterns of information flow (Gates, 1999:11-12). Such organisations use the strategic advantages of videoconferencing and other new communication technologies to link themselves to "a digital nervous system" of communication and information flow in the organisation which leads to new organisational forms and accompanying management challenges.

'Organisational form' is a term that describes organisational structures in organisations. Past organisational structures "were developed to simplify and minimise communication needs in a day in which interchange of facts and ideas was very expensive". New organisational structures, "linking themselves to the digital nervous system" of the organisation, demand extensive communication (Rockhart, 1998:417-418) which is made possible through new communication technologies like videoconferencing.

New organisational forms have subsequently emerged (Monge & Fulk, 1999:83, Fulk & Boyd, 1991:409-412). These new forms are dependent on social networks and their properties that exist within the organisation (Contractor & Eisenberg, 1990:143). Communication networks are identified by asking "who communicates with whom?" (Stephenson, 1998:54, De Wet, 1995:14). The strength of the network determines the "indigenous organisational strength" (Schulz, 1998:591), which is dependent on the strength of relationships (Stephenson, 1998:58).

Dynamic social communication networks emerge due to communication technology. New forms of organisations, referred to as virtual organisations, global network organisations (Sproull & Kiesler, 1999:12) or federal organisations (Rockhart, 1996:2, Rockhart, 1998:417) are impossible to create without a sophisticated communication and information infrastructure (Child in Monge and Fulk, 1999:84, Mowshowitz, 1997:380, Rockhart, 1998:417).

These changes in modern organisations, induced by highly sophisticated communication and information infrastructures, are *inter alia* described in theoretical ways such as the process of adaptive structuration (Contractor *et al.*, 1996:456), symbolic interaction, media richness theory and social influence theory (Fulk, 1993:921). Changes in communication are achieved through the application of new communication technologies, which influence organisational structures and processes. New organisational forms are influenced by these technologies, which cause changes in structuration patterns. (Stephenson, 1998:54, Burt & Taylor, 2000:141).

Videoconferencing has been described as the most interactive communication medium of all new communication technologies (Fish *et al.*, 1993:55, Diamond & Roberts, 1996:4). Communication research concerning new communication technology, organisational communication and communication management has been described against the backdrop of social learning theory, behavioural patterning, social information processing theory, symbolic

interactionism and pragmatism (Fulk, 1993:921, DeSanctis & Fulk, 1999:3, Yates and Orlikowski, 1992:299). Others have focussed on the "social construction of communication technology" (Fulk *et al.*, 1995:267). Many studies have been with "a lack of theoretical infrastructure" (Fulk & Boyd, 1991:407), "technologically deterministic" (Markus & Robey, 1988:583) and "structured" (Yates & Orlikowski, 1992:299). Not many studies (Monge *et al.*, 1998:411) have used social network analysis to determine how communication patterns are influenced by new communication technology. The use of communication network analysis techniques becomes a core part of corporate renewal that can aid project management, innovation and performance appraisal (Stephenson, 1998:57).

The problem to be researched in this study could be formulated as follows:

What do selected social communication network properties and practices in the application of videoconferencing reveal (contribute) as a strategic communication management tool in a new organisational context at TELP?

Research questions to be investigated are listed as follows:

- 1.2.1 Which properties of selected communication networks at TELP is revealed with regards to individual, clique and network participation using videoconferencing compared to theoretical foundations on videoconferencing and social networks in new organisational forms?
- 1.2.2 In what way do selected communication network properties at TELP influence the quality of communication practises and communication management performance?
- 1.2.3 Which practices and policies that are being applied by TELP management regulate videoconferencing communication as management practice with reference to social network practices?
- 1.2.4 What are the perceptions of communication network members of TELP's management of its communication policies and practices and to what extent does it influence the output of the social network?

- 1.2.5 What is the perceived effectiveness of TELP's management of the quality of communication within the respective social networks in relation to key management issues?

1.3 Aim(s) of the study

The aims of the study are as follows:

- 1.3.1 To empirically determine what the properties of selected communication networks at TELP reveal with regard to individual, clique and network participation using videoconferencing compared to theoretical foundations on videoconferencing and social networks in new organisational formats,
- 1.3.2 To analyse selected communication network properties at TELP and how it influences the quality of communication practises and communication management performance at TELP,
- 1.3.3 To identify and analyse practices and policies that are being applied by TELP management that regulate communication as management practice within reference to social network practices,
- 1.3.4 To determine the perceptions of TELP management's enforcement of its videoconferencing communication policies and practices and to determine to what extent it influences the output of the social network,
- 1.3.5 To determine the perceived effectiveness of TELP's management of the quality of communication within the respective social networks as per key management issues.

1.4 Central theoretical statement(s)

- 1.4.1 **Proposition 1:** Videoconferencing facilitates organisational communication networks (social networks and thus communication management strategies are necessary to ensure that the quality of information disseminated over the social network contributes to sound managerial outcomes).

1.4.2 Proposition 2: Communication management policies and practises affect individuals' experiences of videoconferencing (as a communication management tool) and in turn influences the effectiveness of the videoconferencing system as a group decision support system.

1.4.3 Proposition 3: Managerial videoconferencing policies and practices as a communication tool should incorporate social network identification as well as the maintenance of the social network structures through individual, clique and network participation.

1.5 Methods of research

The methods for research include a through literature study in order to establish the latest research findings on the research topic. Secondly, qualitative focus group methodologies using videoconferencing as a communication medium will be utilised to determine the variables for the quantitative questionnaire phase, which will be self - administered using e-mail.

Empirically, the study will utilise well-established methods of research in the social sciences, which are strengthened by triangulation (sampling, focus groups and questionnaires) in order to ensure greater reliability of the research process, findings, analyses and interpretation of data. Various authors (Mouton, 1996:156-157, Manheim & Rich, 1995:421, Mouton & Marais, 1985:91) have supported triangulation for increasing validity and reliability of research data. The study will therefore use both qualitative (focus group) and quantitative (network analysis) research methods in a multi – step approach.

Validity could be increased by a multi-step methodological approach, which is to be precluded by a pilot study at a large organisation that has chosen to

remain anonymous in the dissertation for strategic reasons. They are only prepared to reveal their identity to the adjudicators and Potchefstroom academic staff. The primary study is to be executed at the East London campus of the ECT. Its videoconferencing facilities allow for research interaction with participants of TELP, internationally connected via videoconferencing. The same methodological steps will be taken at TELP as first tested in the pilot study.

1.5.1 Literature study

Continuing research on this field of study has shown an array of topics originating from new communication technology, like videoconferencing, organisational structure, network methodology and theories on globalisation.

The study:

(1) examines current communication trends in organisations against the backdrop of theories on the globalised information society (Wiesenfield *et al.*, 1998:2, Lee & Grover, 2000:187),

(2) Reviews current research trends on videoconferencing in groups in past studies (Fish *et al.*, 1993:48, Kydd & Ferry, 1994:369 and Morrison & Sheng, 1992:93) and modern trends: communication relationships (Kahai & Cooper, 1999:165), communication networks (Monge *et al.*, 1998:411), information overload (Grise & Gallupe, 2000:157) and organisational benefit (Boiney, 1998:327),

(3) Reviews current communication strategies and management of videoconferencing policies and practises to enhance effectiveness of videoconferencing (Grise & Gallupe, 2000:157, McGarvey, 1997:24),

(4) Examines modern trends in communication network analysis and focus group research (Stephenson, 1998:54 and DeSanctis & Fulk, 1999:5).

1.5.2 Qualitative focus groups

The first step in sampling includes the identification of respondents appropriate for the study through interviews with various role-players to determine those respondents that are the most frequent users of the system. This is done in accordance with the assistance of the project - coordinator. Secondly, a select group of most involved individuals allowing for adequate focus group size will be chosen from the original list. Thirdly, communications are to be categorised into communication categories (e.g. management, operational, etc.) identified by the videoconference scheduler at TELP following the necessary briefing by the researcher.

The opinion of the respondents with regard to utilisation per communication category is compared to results of the above quantitative identification of utilisation per category. This ensures application of both quantitative and qualitative techniques to determine actual videoconferencing usage.

The number of categories identified (see above) determines the number of focus groups. These focus groups are therefore identified on percentage utilisation which is representative of videoconferencing system usage. Following focus group identification per communication category (key management topics), a maximum of four to ten individuals, representative of each category, are identified for the purpose of focus group research. These individuals are chosen by frequency of videoconferences held. Existing lists of scheduled videoconferences are analysed and one most representative of each category is identified for research purposes. This ensures that the composition of the group is representative of actual users in a social setting familiar to the respondents. This method of categorisation is preferable to other methods like demography, management levels or any other used in social research. A suitable individual at TELP, in touch with group dynamics, assists the researcher to moderate the focus group in order to enhance the validity of the process. The focus groups are VCR recorded and the videotapes analysed for the purpose of variable identification essential to the

next step, quantitative analysis.

The results obtained from the qualitative focus groups ensure that:

- (1) The entire sample of the population of videoconferencing users is correct for the purposes of the study,
- (2) The key management topics of social network determinants are identified,
- (3) Any other variable deserving more attention than originally intended, is identified and included in the measuring instrument.

1.5.3 Quantitative questionnaires

The positional approach to network sampling (Monge & Contractor, 1988:123 - 126) will be followed. Theoretically, the "position" of the sample is based on all individuals that have a relationship due to the use and application of a videoconferencing system. The sampling process therefore identifies all members within TELP that utilises videoconferencing on a frequent basis. The TELP videoconferencing manager, Irene Harvey, identified a list of 20 employees **who utilise videoconferencing on a frequent basis** in terms of the sampling method. The list with the names of participants are administered to participants, and comments regarding names that should participate in the study were forwarded to the researcher for inclusion.

Once the questionnaires were constructed, trained researchers (TELP staff responsible for co-ordination of videoconferencing in every centre ensuring that questionnaires are completed) were e-mailed copies for distribution to the respondents. The TELP staff responsible for co-ordination in every centre were given a week to complete and submit the questionnaires. The analysis included qualitatively plotting the structure of the network through Centrality and CONCOR (programs in the UCINET package) (De Wet, 1991:157, De Wet, 1995:160).

This study followed a process approach and is a description of existing social network(s) and their communication networks. Recognition is given to the fact that social group dynamics change over time. This study attempted to overcome the time variable in this regard by not examining any form of explicit effects but rather tendencies in social group dynamics (Glassman & Weick *in* Daniels *et al.*, 1997:124).

1.6 Key terms

Videoconferencing, Communication Management, Globalisation, Virtual Organisations, Social Networks, Strategic Management

These terms are defined as follows:

- **Videoconferencing:** Refers to the real-time and typically interactive transmission of images and sound (usually in digital format) between two or more sites (Coetzee, 2001:1). It has been described by Hoffman (2002:3) as “technology allowing meetings to take place in cyberspace and participants around the world may be included”.
- **Communication Management:** The term communication management implies the necessary actions required to manage the communication process(es), practises and policies in the organisation. This term has been defined by Ströh and Jaatinen (2001:149) as the overall planning, execution and evaluation of an organisation’s communication.
- **Globalisation:** The diffusion of world-wide communication, cultures and a single world economy, as described by Naisbitt *in* Guirdham (1996:4) as “*The spread of self – rule will characterise the decade in front of us. Along the way, it will become overwhelmingly apparent that the idea of countries and borders is important symbolically and culturally, but not too relevant in a single world economy dominated by communication*”
- **Virtual Organisation:** The term focuses on the necessity for a strong technology platform required for the organisations to operate, whereby individuals are geographically dispersed. The term is defined by Verwey *et*

al. (2002:171) as “a type of organisation that consists of temporary networks of independent companies ... linked by information technology to share skills, costs and access to one another’s markets”. It should be noted that these organisations consists of virtual teams, defined as “groups of people who collaborate closely even though they may or may not be separated by space, time and organisational barriers” (Jennings in Verwey et al., 2002:171)

- **Social Networks:** Social networks is based on the notion that individual behaviours are embedded within networks of interpersonal relations (Granovetter in Pappas & Woolridge, 2002:2), and has been formally defined by Corman and Scott (in Daniels et al., 1997:113), as “a structure of perceived communication relationships. It is a kind of latent knowledge that guides members’ manifest communication behaviour. We believe that members’ reports of communication reflect this knowledge and not their recollections of specific communication episodes”. This incorporates the term “communication network” that is defined by Berry (1998:520) as the structure of channels in the organisation through which information is passed.
- **Strategic Management:** Strategic management refers to the “the direction that the organisation chooses to follow in order to fulfil its mission” as described by Bennet in Oliver (2001:2).

1.7 Chapter demarcation

The study includes the following chapters:

Chapter 2: New organisational formats, environments and social communication networks

The significance of new organisational environments, their dependency on new communication technology and on relationships formed within the organisation, will be discussed. The manifestation of relationships in organisations against the background of social networks, social network

theory and the manifestation of social networks in organisations is also examined.

Chapter 3: Videoconferencing as a new communication medium and management tool: Applications and challenges

Videoconferencing per se has many facets, some of which, although slightly out of the scope of this dissertation, cannot be ignored due to their manifestation in the communication process. Videoconferencing has an effect on the communication process due to delays in the reception of visual and (sometimes) auditory cues, and the manifestation of this will be discussed, as well as its effect on larger groups, such as small group and organisational communication. Furthermore the management of videoconferencing within a large organisation is examined.

Chapter 4: Research methodology

This chapter examines the research design, research aim and research methods to be implemented in chapter 5, and therefore overviews qualitative studies using electronic meeting groups as well as contemporary social and network analysis methods.

Chapter 5: Data presentation, analysis and findings of the research

The chapter proposes a communication network analysis of all staff at TELP that utilises videoconferencing on a regular basis. The study proposes to improve the efficiency of the network in relation to satisfaction levels with regard to certain management issues, ultimately resulting in a more economical and efficient communication system, through individual, clique and system analysis as well as empirical data through descriptive and inferential statistics.

Chapter 6: Discussion of findings, synthesis development, recommendations, shortcomings and conclusions

This chapter overviews the findings of the study, and places it in context to social network research and videoconferencing in new organisational environments. The chapter furthermore makes recommendations for further research.

1.8 Conclusion

The existence of social communication networks are undergoing rapid change in their nature and construction due to the processes induced by new communication technology, and as at TELP, strategic management of these communication tools leads to improved communication in both quality and quantity.

New organisational environments and their dependency on new communication technology, as well as their dependency on relationships formed within the organisation, forms the central theme of the following chapter. The manifestation of relationships in organisations against the background of social networks, social network theory and the manifestation of social networks in organisations forms another central theme.

Chapter two examines these new organisational formats and environments as well as providing an overview of contemporary social network theory.

CHAPTER 2: NEW ORGANISATIONAL FORMATS, ENVIRONMENTS AND SOCIAL COMMUNICATION NETWORKS

2.1 Introduction

Organisations do not function in isolation from the rest of the world. The world itself is in a state of constant change partially due to the communication induced by globalisation and the information society. Various authors (Bangermann, 1997:2, Steele, 1998:2) have attributed globalisation to the strength of new communication technology. Likewise, authors (Holsapple *et al.*, 1996:422, Herndon, 1997:121, Simpson, 1999:47, Heintze & Bretschneider, 2000:801) have described various manifestations of new communication technology on existing communication structures, formal and informal, within organisations.

The most significant changes induced by new communication technology in organisations have been described as an increase in the speed and effectiveness of communication, a decrease in the cost of communication and the ability of dispersed individuals to interact (Monge & Fulk, 1999:84). Against this background, a thorough examination of new communication technologies is required to gain an understanding of the implications for an organisation.

New organisational environments have subsequently emerged (Fulk & Boyd, 1991:409-412, Monge & Fulk, 1999:83). It should however be noted that these new organisational environments, although aided by new communication technology and shaped by other organisational variables, are wholly dependent on the social communication networks that exist within the organisation (Contractor & Eisenberg, 1990:143) that ultimately has an influence on the way in which the actors within these social networks interact.

New communication networks could emerge due to the presence of new communication technology, and subsequently virtual organisations are highly

dependent on new communication technologies for their survival (Mowshowitz, 1997:380, Rockhart, 1998:417).

The management of social communication networks emerging from new communication technology is an essential exercise, to ensure that both costs and expenditure on implementation of technologies are curtailed and that perceived performance outcome benefits resulting from workgroups can be realised.

This chapter will therefore give an overview of theoretical notions associated with new organisational environments, social communication networks, and the management of these variables to ensure that the organisation benefits from the social interaction induced by new communication technology.

The chapter therefore addresses central theoretical proposition 1, which states that *“videoconferencing facilitates organisational communication networks (social networks and thus communication management strategies are necessary to ensure that the quality of information disseminated over the social network contribute to sound managerial outcomes)”*.

2.2 New organisational environments and new organisational formats

New organisational environments are the basis and origin of new organisational forms, whilst new organisational forms use videoconferencing as one of many multiplex communication tools. Application of these communication tools, resulting in social communication networks, does not resemble interaction patterns traditionally assigned to organisations before the advent of new communication technology.

By new organisational environments the factors giving rise to changes in organisational communication are discussed and the resultant new organisational environments are briefly mentioned.

Recognition should be given to the fact that organisations by nature have forever been changing, and that the relationship between new communication technology and organisational change should be examined, to determine the change that it has on interaction patterns within the organisation.

Organisational change is described in various ways, including the process of Structuration (Giddens, 1984:32), Symbolic Interaction and Media Richness Theory, as well as Social Influence Theory (*in Fulk et al.*, 1995:260). These theories all take into account human communication processes through accentuating the fact that through communication individuals and groups organise, and shape the manner in how organisations are structured and developed (Zmud *et al.*, 1990:440, Williams 1998:2). This draws upon the fact that changes in organisational communication (achieved through new communication technologies) in turn influence organisational structures and processes (Weick, 1979:122 , Giddens, 1984:34). It can therefore be stated that emerging organisational forms are influenced by these technologies, and in turn, lead to changes in human interaction and structuration patterns.

Since these patterns are forever changing, Yates and Orlikowski (1992:300), identified what they termed "*genres of organisational communication*", whereby a genre is defined as "*a typified communicative action invoked in response to a recurrent situation*", that is governed by "*the production, reproduction and modification*" of the directional flow of information in the organisation.

Yates and Orlikowski (1992:302) define the factors typical to changes in organisational environments as follows:

- The *recurrent situation* or socially defined need that includes the history and nature of practises in the organisation,
- *Substance* refers to social motives, themes and topics expressed in the communication,
- *Form* refers to observable physical and linguistic forms of

communication.

The culmination of these factors coupled with the complexity that could be induced by new communication technology on social communication networks have an underlying manifestation on the way in which individuals in the organisation interact. This also further induces certain suggestions of variations on quality of communication within the organisation. Hence the emergence of new organisational environments.

It is known that various factors have an influence on individuals in the process of organising, especially in new organisational environments. Some of these factors can be described as follows (Fulk *et al.*, 1995:259):

- Centralisation / decentralisation motives of the company,
- New forms of organisational identification induced by globalisation and the information society,
- Communicative characteristics of new communication technology used in new organisational formats,
- Environmental changes like globalisation and the new economy.

In addition to the above factors, consideration should be given to new organisational forms and the new economy (Conrad & Poole, 2002:175).

The factors mentioned above are discussed in the following sections.

2.2.1 Centralisation / decentralisation of organisational forms

Daniels *et al.* (1997: 181 – 183) is of the opinion that three schools of thought exists with regard to centralisation (or the lack of it) and states as follows :

- *The centralisation school believes that new communication technology places tools in the hands of organisational managers to control the organisation. These tools, resembling "Big Brother" allows senior level managers to access email systems and other necessary information technology tools enabling managers to "spy" on all lower level employees. Since the level of control is only required by one person of senior management, the traditional powers of lower level managers is removed resulting in centralisation.*
- *The decentralisation school is of the opinion that, due to the increased workload to higher level managers due to the power of new communications technology, tasks are automatically delegated to lower level managers. Since technology and the way in which people uses it is constantly growing, more and more such tasks are delegated resulting in decentralisation.*
- *The neutrality school, following Kanter's belief that people use technology for a purpose and that technology in itself cannot grow without human intervention, believes that managers apply technology as they see fit, which can either result in centralisation or decentralisation.*

The fact that new communication technology allows for remote working environments naturally lends itself to decentralisation.

DeSanctis and Fulk (1995:338) are of the opinion that new communication technology leads to mainly decentralisation (supported by many authors) and ties in with new and changing organisational forms (Williams, 1998:2). Markus and Robey (1988:584) correctly point out that "literature on information

technology and organisational change does not support reliable generalisations for various reasons ...".

The existence of the three schools of thought, empirically proven or not, should however be kept as a guideline for the interpretation and understanding of social and relational data concerning new communication technology and the existence of social communication networks.

Conrad and Poole (2002:198) concluded that organisations may centralise following the introduction of new communication technology, and stated the following: *"In organisations that tended toward centralisation, the introduction of computers led to increased centralisation, in organisations that tended towards decentralisation and empowerment, the introduction of computers increased empowerment and decentralisation"*.

The second factor (section 2.2) for discussion relating to influence on individuals in the process of organising (according to Fulk *et al.*, 1995:259) relates to how individuals identify themselves with organisations in the context of globalisation and the information society.

2.2.2 Organisational identification, globalisation and the information society

Various factors experienced at communicative level in the organisation are induced by global changes in the way individuals interact. In turn, global trends in other environments like the economy and socio-political environments influence the way society is constructed, and therefore changes the nature of communication in organisations. Each of these factors mentioned above are discussed below.

2.2.2.1 Organisational identification

Communication in organisations change due to changes in organisational culture, physical environment, communication infrastructure, etc. Videoconferencing could induce decentralised distributed communication environments that have an influence on the way in which individuals identify with the organisation.

Organisational identification has been defined as:

"... a means by which organisational members define the self in relation to the organisation. Thus, identification represents the social and psychological tie binding employees and the organisation – a tie that exists even when employees are dispersed".

(Wiesenfield *et al*, 1998:2)

The immediate implication for individuals in remote working environments as opposed to traditional working environments concerning organisational identification can be listed as follows:

- No longer can individuals associate themselves to the organisational culture defined by sociographic and demographic artefacts like clothing, style and linguistic properties.
- No longer can individuals associate themselves by traditional supervisory structures, therefore leading to a significant change in organisational structures, most commonly leading to a flattening of the traditional chain of command.

This is further described by Frederick (1992:12) as follows:

"Today, of course, communications technologies have woven parts of the world together into an electronic web. No longer is community or dialogue

restricted to a geographical place. With the advent of the fax machine, telephones, international publications, and computers, personal and professional relationships can be maintained irrespective of time and place. Communication relationships are no longer restricted to place, but are distributed through space. Today we are all members of many global 'non-place' communities".

Organisational identification, having an effect on culture, norms and behavioural patterns within the organisation, now radically transforming individual functioning within the organisation, has a significant effect on elements like cohesion, workgroups, control and effectiveness of the organisation.

The only common shared social structure is determined by the manner in which these individuals communicate and interact, therefore supporting the view that the effectiveness of communication is determined by the relevant communication tools applied in the organisation.

There is a strong correlation between the manner in which the remote working individual identifies him/her self with the organisation and the communication patterns of the individual. Organisational identification due to new communication technology is often the only organisational cue that can be applied by the individual for a sense of belonging.

Identification variables are therefore reliant on the level of interaction capability. The manifestation of this phenomenon has been proven by Wiesenfield *et al.* (1998:2), which determined that there is a correlation between the frequency of electronic communications and level of identification. It was concluded that stronger identification could take place by individuals in remote environments provided a very high frequency of electronic communication is prevalent, in other words, individuals would have to interact as frequently using new communication technologies as they would in normal settings, to have the same level of social interaction.

It should however be noted that these changes in identification patterns are induced by globalisation and the information society. These two factors and their interrelationship will now be discussed in turn.

2.2.2.2 Globalisation

Globalisation is significant in this study due to the communication processes that it induces on the world as a whole, and more specifically, the rise of multinational organisations, causing remote working environments to be established through new communication structures in organisations.

The speed and amount of communication globally has drastically increased over the last few years. Globalisation is but one of the forces causing these changes in communication.

Globalisation is governed by human thought processes, determined by the speed at which man can produce technological marvels to outspeed all rivals.

The speed of current and future technological change was described by Martin Bangemann, Member of the European Commission in his paper to the ITU (International Telecommunications Union) as follows (Bangemann, 1997:2):

"Technological progress is forging ahead faster than ever before in human history. It is sweeping forward in an unpredictable fashion on a wave of powerful global communication networks and ever-increasing performance and capacity".

Whilst economists recognise and theorise on globalisation, social theorists question the origins of culturally-based globalisation, and opposes the terms "Americanisation" and "Globalisation" (Steele, 1998:2). The impact of the technologically based imperialism on individuals is largely questioned,

sometimes highlighting the disparagement between first-and-third world countries.

Social theorists have predicted that globalisation will be accelerated by the development of new organisational environments (Sproull & Kiesler, 1999:12) or federal organisations (Rockhart, 1996:2 , Rockhart, 1998:417). Castell (*in* Steele, 1998:2) urges society to address the cultural and institutional effects of these rapid changes in the access to and exchange of information. Economic value in society is based on access to information. Mowshowitz (1997:383) refers to the phenomenon as "abstractification of wealth", whereby abstract wealth is based on the commoditisation of knowledge and the ability of an organisation to switch between abstract and concrete wealth. Castell (*in* Steele, 1998:2) argues that new organisational environments will lead to "*extreme flexibility of work patterns and the individualisation of labour*", which culminates in fragmented societies, based not on monetary difference, but "*a struggle between diverse capitalists and the miscellaneous working classes is subsumed into the more fundamental opposition between the bare logic of capital flows and the cultural values of human experience*".

The broader context of globalisation, therefore, is often blamed for various global socio-economic influences on the human race with often negative effects, to cite the slowdown in .com companies during 2001, combined with the effects of global trade declining in the as an economic example. The disintegration of traditional country boundaries, ("*The USA is only a few powerful mouse clicks away..*") combined with the knowledge of the human race allowing for this change in realism, is all brought about by new communication technology and its effect on new organisational environments.

Weeks and Lessing (2001:1) point out that opportunities are created for South Africa by globalisation, and list a few such as economic integration, access to international markets, as well as an exchange of information and technology.

Whilst globalisation is described as the phenomenon of change in speed and

transmission of information, the information society is the social result that manifests in society due to globalisation.

2.2.2.3 The information society

Globalisation as a change agent causes changes in society, showing an ever-increasing need for ease of access to information and instantaneous global communication through a variety of media.

For the first half of the 19th century, Europe was primarily an agriculture-dominated economy and society, which was shortly followed by the Industrial Revolution. In the 1970's, the rising ascendancy of computerised telecommunications led many social theorists proclaiming the dawning of a new age. The age was variously called the post – industrial society, the information revolution, the communications age or mediacracy, the electronics evolution and the information economy (Franco *et al.*, 1995:12).

The information society is defined by Dick (2002:23) as follows:

“The information industry is usually associated with all information-related goods and services produced in an economy, and its definition in Library and Information Science (LIS) is that it involves broadly all information activities”.

Keenan (*in* Dick, 2002:23) elaborates on the definition, and states that *“these would include education, publishing, media, hardware and software producers, information providers, libraries and information centres”.*

The Information Society is defined by the Information Society Commission of Ireland (1998:2) as *“a society in which economic and cultural life is critically dependent on information and communication technologies and where people get the full benefits of that technology at work, at home and at play”.*

Everyday manifestations of these technologies range from ATMs for cash withdrawal and other banking transactions, to mobile phones, faxes, television information services, the Internet, audio and videoconferencing – as a matter of fact, in reference to all new technologies facilitating communication on a global scale that contributes to increasing of speed of communication.

The economic processes induced by both globalisation and the information society have lead to various economic and social strategies for the advancement of specific areas of the world. Various programmes have been put in place by the United Nations to stimulate the establishment of the information society world-wide.

The information society is strongly supported by European Union countries through development projects and initiatives within their own countries. In the United Kingdom, for example, the information society initiative was set up by the UK government in February 1996 to help British small businesses exploit the business benefits of information and communication technologies (ICT) - a major driver of competitiveness (Broadhead, 2000:4). The initiative resulted in "telecentres" and "telecottages" established all over the United Kingdom, which offer services like videoconferencing, training, and so forth to businesses who promote teleworking as an employment strategy.

South African studies on focussing on the information society in South Africa (Dick, 2002:23, Higgs, 2002:38, Lelliott *et al.*, 2001:1, Meyer, 2002:93, Weeks & Lessing, 2001:1) show the significance of the information society for South Africa:

- The role of the information industry in Mbeki's African Renaissance,
- Education for sustainable development,
- Information as a resource for rural development,
- Business practice in a digital economy,
- On - line education.

During 2001 President Mbeki established the National Advisory Council and the Presidential National Commission on the Information Society and Development (GCIS, 2002:1) which had its second meeting during 2002. It is the aim of the Council to *"establish and bring together all stakeholders to share ideas on how the ICT sector can be harnessed to contribute to sustainable development"*.

In the same manner, meetings were held to address the liability of ICASA with regards to a development strategy as mandated by the Electronic Communication and Transactions Act (GCIS, 2002:1).

President Mbeki has been praised for his efforts establishing an information infrastructure (De Jager & Nassimbeni, 1998:1), including programmes for distance education and rural connectivity through a satellite communication company known as WorldSpace (Flemming, 1998:1). Business practises in a digital economy was further regularised through the introduction of the Electronic Communication and Transactions Act (GCIS, 2002:1).

Whilst the previous section dealt with the various factors that have an influence of the process of organising in organisations in new organisational environments, the next section will deal with factors inherent to the videoconferencing system itself that could influence the process of communication in the organisation.

2.2.3 Internal environmental changes in new organisational contexts

Organisations in new organisational environments were defined by Ahuja and Carley, (1998:3) as *"geographically distributed organisations whose members are bound by a long – term common interest or goal, and who communicate and co-ordinate their work through information technology"*.

Descriptive names for this type of organisation include global network organisations (Monge *et al.*, 1998:422), adhocracy (Rockhart, 1996:2) and virtual organisations (Wiesenfield *et al.*, 1998:2). Heydebrand (*in* Fulk, 1993:923) describes the generic features of these organisations as follows:

"general, simplified profile of the typical post-industrial organisation... small or located in sub-units of larger organisations, its object is typically service or information, if not automated production, its technology is computerised, its division of labour is informal and flexible, its managerial structure is functionally decentralised, eclectic and participative..."

The nature of new organisational environments is described by Hedlund (*in* Fulk, 1993:927):

"...whereas yesterday's organisation reflected the metaphor of a tree, with a common trunk of communication linking progressively smaller branches up to a peak representing top management control, today's organisation is more like a nervous system: a multi - centred entity with governance and operations managed differently at different centres ..."

Taking the above into consideration, one should consider the following changes in communication technology as identified by Fulk & DeSanctis (1995:337), that shape new organisational environments *in a specific way* since the ability to communicate shapes *the way of organising* within an organisation:

- Increase in the speed of communication,
- Dramatic reduction of cost of communication,
- Rise in communication bandwidth,
- Vastly expanded connectivity,
- Integration of communication with computing technologies.

These factors allow for the formation of new strategic alliances that were never seen in the past, and furthermore allow for communication variables to play a significant role in the perceived output emerging from workgroups that are geographically dispersed.

2.2.3.1 Formal structures of organisation and communication

The breakthrough in the study of organisational structure was made by Chester Barnard (Luthans, 2001:107), with his definition of a formal organisation, which was defined as a system of consciously co-ordinated activities of two or more persons.

Formal structures of organisation have been referred to as the “bureaucratic form” (Luthans, 2001:107), and two classical forms of bureaucratic organisation are those of markets and hierarchies (Arnold *et al.*, 1998:4, DeSanctis & Fulk, 1999:5). In general, formal communication in organisations moves through structured organisational channels (Berry, 1998:379), normally represented by an organisational chart or organogram (Frost *et al.*, 1997:154). Bureaucratic organisations, also referred to as the “industrialised form”, are said to be large, multinational, have centralised control and are often production-line orientated (Winter & Taylor, 1999:104).

Early studies on formal patterns of communication and information flow in the organisation by Bavelas (Furnham, 1997:445), referred to as the organisations formal communication network (Berry, 1998:381), resulted in centralised and decentralised patterns of information and communication flow.

Centralised patterns of information and communication flow (more superior at simple tasks and allows faster flow of information) (Furnham, 1997:445) are referred to as the wheel, the y - pattern and the chain.

Decentralised patterns of information and communication flow (more superior at complex tasks and are slower than centralised patterns) (Furnham,

1997:445) are referred to as the circle and the all-channels/pinwheel (Berry, 1998:382).

Other patterns have subsequently been discovered (Frost *et al.*, 1997:155) and emerged as the “fan”, the “chain fan”, and “the daisy”.

Fulk and DeSanctis (1995:338) and others (Daft & Lewin 1993:ii, Lundberg 1994, Piore 1994, Mintzberg 1983 *in* Fulk & DeSanctis 1995:340) are of the opinion that

“...there has been an evolution in organisational forms whereby managerial hierarchy and divisional structures are being replaced by decentralised, more flexible approaches to arranging and co-ordinating activities ...”

Johanson (2000:1) conducted a study on formal structure and social network analysis, which showed that “formal organisation impacts powerfully on the patterns of interaction, including affective relations”.

The study of formal structures of organisation has furthermore been influenced by the advent of new communication technology, which has been described as a “revolution” by Winter and Taylor (1999:101), which stated that changes induced since the industrial evolution are:

- flattening of the hierarchy,
- disaggregation of the functions of outsourcing,
- increased use of flexible, dynamic networks and / or partnerships,
- decentralisation of the location of work.

Verwey *et al.* (2002:170) are of the opinion that a new social architecture emerges due to the implantation of new communication technology, and this *“means that the ways in which computer-supported co-operative work systems restructure social relationships, if at all, depend on pre-existing patterns of authority, obligation and co-operation, and an organisation’s*

openness to change" (Verwey *et al.* 2002:170).

Decentralisation of the location of work has resulted in telecommuting (Hoffman, 2002:2), and further states that "companies that employ teleworkers are referred to as virtual organisations", thereby assimilating this manner of organisation of individuals into a formal structure of organisation.

Teleworking (*also* telecommuting) is a term used to describe all forms of work related to the physical absence of the individual at the organisational centre but linked by new communication technologies (Mersham, 1996:69). Pacific Bell (1997:2) defines the concept as follows:

"By definition, telecommuting is the partial or total submission of telecommunications technology for the trip to and from the primary workplace, along with the associated changes in policy, organisation, management and work structure. Simply put, it is moving the work to the workers, instead of the workers to the work".

The practise poses a potential threat for traditional social structures and interaction(s) in organisations. While it can be stated that asynchronous communication systems (e.g. e-mail) do detract from normal human interaction and leads to eventual dehumanisation and stronger individuality, videoconferencing capabilities allows for greater level of interaction and socialisation.

Telework in modern organisations can play an integral part of the functioning of any business. Italhost (1996:1) describes how teamwork using videoconferencing enhances communication through:

- Interpersonal communication (through geographically dispersed sites with the aid of a videoconferencing system),
- Data transferral (availability of data through tools like Virtual Private Networks – VPN's),

- Easier access to another data base (through inter-connectivity through videoconferencing tools),
- Whiteboarding (allowing for a shared electronic workspace between two or more remote sites during a videoconference).

Pacific Bell (1997:1) indicates that teleworking manifests in the following forms:

- working at home (individuals physically connecting to the office through data lines as opposed to travelling to work),
- satellite office (groups physically connecting to the office through data lines as supposed to travelling to work),
- neighbourhood work centre (virtual offices in a given neighbourhood allowing for access to remote working sites),
- virtual office mobile worker (worker connected from anywhere using connectivity tools such as cellular phones and palmtops).

Major problems still associated with teleworking include cost, use and transmission technology (Snell, 1995:1). Teleworking is unfortunately only for a select group of white-collar workers, since many activities require on site maintenance of various activities, like manufacturing. While blue-collar workers do not telework in general, quality managers can use videoconferencing for visual inspection of parts produced from a remote location.

The correlation between new communication technology, formal structure and organisation is reiterated by Ahuja and Carley (1998:23), who found that the environment of virtual organisations should not concern itself with decentralisation or centralisation, hierarchy or non – hierarchy, since evidence of all of the above exists within virtual organisations. The study found that the *"decoupling of authority and communication structures results in a decoupling of power and information"*, thereby stating that the environment of the organisation is equal to the most beneficial information form to that

organisation.

Modern forms of organisation include network organisations. Network organisations has been defined by Luthans (2001:117) as *“delayed, highly flexible, and controlled market mechanisms rather than administrative procedures. Firms with this new structure arrayed themselves on an industry value chain according to their core competencies, obtaining complementary resources through strategic alliances and outsourcing”*.

Since structures in virtual organisations are far more reliant on informal relationships than more formalised structures (Personnel Today, 2002:59), the dependency on informal structures will be discussed in the next section.

2.2.3.2 Informal structure and communication

Informal organisational structures, also commonly referred to as the grapevine, and reliant on the social networks that exists within the organisation, have been described by Barker and Gaut (2002:18) as the *“second layer of the organisational communication event”*. This falls outside the formal structures of communication, which are other factors of communication behaviour influencing the social and communication network, like *“different educational backgrounds, context of different relations, different genders, cultures and organisational positioning”* (Barker & Gaut, 2002: 18).

These informal structures induce a communication process often referred to as “grapevine communication”, which emerges “as a task related channel if formal networks prove to be inefficient” (Berry, 1998:384). Frost *et al.*, (1997:158) state that the formal system of communication denies people information, and when this occurs, people would develop channels of communication to circumvent these problems.

Initial research by Davis (*in* Berry, 1998:384) resulted in the identification of four grapevine patterns (as with formal communication patterns). These

patterns have been identified as the single strand pattern, the cluster pattern, the probability pattern and the gossip pattern. All of these patterns are representative of typical informal communication in an organisation.

It has been stated that upper management may deliberately use the grapevine as opposed to formal channels (Mishra *in* Berry, 1998:384), and Personnel Today (2002:1) have indicated that communication systems in certain organisational types function more efficiently if staff are kept up to date informally, especially where organisational members are geographically dispersed.

A major characteristic of these informal communication type organisations is the absence of physical presence. No longer do employees (or employers) have to be located in a physical building, no longer do employees have to drive to work, but can be situated anywhere in the world sharing a common network rather than physical space (McGarvey, 1997:24). Therefore virtual organisations are dependent on virtual teams. Virtual teams is defined by Lipnack & Stamps (1997:12) as "*a group of people who interact through interdependent tasks guided by common purpose that works across space, time, and geographical boundaries with links strengthened by webs of communication technologies*".

Haythornthwaite (2001:213) refers to these virtual teams as *computer – mediated social networks* and indicates that the existence of these teams are dependent on strong, close and multi-relational ties, and offers "*a diversity of experience available from a wider range of contacts*".

It has been stated that this phenomenon is the most significant change following the advent of new communication technologies, which, in turn, causes a significant decentralisation of work (Lucas & Baroudi, 1994:10). This refers to the phenomenon whereby organisation members work together while being spatially and temporally decoupled from one another, which has a significant effect on the way in which people communicate within, and relate

to the organisation. This change in the way people work has a far-reaching effect on the social and communication patterns which occur within an organisation, and more specifically, signifies a change in the way organisations communicate.

2.2.3.3 Organisational culture and identity

Angelopulo (1994:46) states that “the nature of each organisation is determined by culture, which comprises the values, beliefs, perceptions and behavioural norms that exist within the organisation, and not by its formal rules, authority and rational structures”.

Cultural approaches to organisational theory focuses on “*how organisational members collectively interpret the organisational world around them in order to define the importance of organisational happenings*” (Shockley - Zalabak in Barker & Gaut, 2002:176).

The term organisational culture is defined by Lawson and Shen (1998:44) by combining definitions offered by various authors (Peters & Waterman, Bower, Siehl & Martin, Deal & Kennedy, Sethia & Von Glinow, Alliere & Firsirotu and Schein in Lawson & Shen, 1998:44) as follows:

- the shared values of organisational members,
- the way we do things around here,
- familiar management tasks or practises,
- values, heroes, rites, rituals and communications - “a system of informal rules that spells out how people are to behave most of the time”
- the shared and relatively enduring pattern of basic values, beliefs and assumptions in an organisation,
- a mind set - the realm of feelings and sentiments,
- a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid, and, therefore, to be taught to

new members as the correct way to perceive, think, and feel in relation to those problems.

Luthans (2001:123) states that organisational culture consists of the following characteristics (definitions provided in brackets):

- Observed behavioural regularities (Organisational members utilising a common language, terminology and rituals related to deference and demeanour),
- Norms (Standards of behaviour),
- Dominant Values (Values that the organisation advocates and expects the participants to share),
- Philosophy (Policies that set forth the organisations guidelines about how employees and customers are to be treated),
- Rules (Strict guidelines related to the maintenance of relationships),
- Organisational Climate (Overall feeling that is conveyed by the physical layout, the way participants interact, and the way members of the organisation conduct themselves with customers or outsiders).

Since organisational culture manifests on the basis of values, beliefs etc., and not on the formal structures imposed on it, it is suggested that (Wilson *in* Arnold *et al.*, 1998:496) organisational change should not be induced by changing the organisational culture through change programmes, but by changing the formal structures thereby placing individuals in different environments, which in turn, will result in a new culture for the organisation.

Organisational culture therefore changes constantly in virtual organisations through the new environments to which individuals are constantly being subjected.

Organisational culture furthermore determines the preferred communication channels (Dutton, 1999:489), and cultural traditions can therefore strain organisational change resulting in virtual organisations. Social communication

networks are viewed as the “building blocks” of organisational culture (Luthans, 2001:126), and is a collective “artefact which is continually transformed as the organisation seeks to balance the demands for maintaining its integrity with the demands for response which it perceives in the world around it” (Guirdham, 1996:95).

Organisational culture is therefore dependent on the supporting social communication networks that support communication in the organisation.

2.2.4 New organisational forms and the new economy

The new economy, induced by the processes of globalisation and the information society (Conrad & Poole, 2002:175), is concerned with changing business practise to deal with strategic uncertainty and environmental turbulence (Weeks & Lessing, 2001:2)

These new business practises, resulting in new organisational forms (refer section 2.2), evolved due to businesses changing the industrial era focus from management techniques of key resources to management of knowledge resources essential for organisational survival in the new economy (Weeks & Lessing, 2001:2).

Management of these resources are known as knowledge management, which is defined by Conrad & Poole (2002:208) as *“the practises and procedures that organisations use to identify, catalogue, harness, and utilise organisational knowledge”*.

2.3 Social communication networks

The term "network" has been used largely in many fields of study. Information technologists describe the term "network" as a connection of computers. The term "network" in this context describes the nature of social relationships between individuals, and in many ways, people are tied to one another

through personal networks similar to the way computers are tied to one another through network cabling. The value of personal networking with others was described by a prominent businessman in the Information Executive magazine as "...invaluable, not only for my professional growth and education, but also for the many friends and business associates I have had the pleasure to acquire along the way ..." (Barnier, 2000:7).

Communication networks therefore, through applying systems – theory assumptions, largely analyzes the existing social structure between people and their subsequent communication interaction(s), thereby describing the nature of the communal communication network and the characteristics of such a network (Rogers & Argawala-Rogers, 1978:296). It is furthermore distinguished from "a group", by stating that "*it is distinct from 'group', in that it refers to a number of individuals (or other units) who persistently interact with one another in accordance with established sociometric patterns*".

The definition offered by Corman and Scott (*in Daniels et al.*, 1997:113) stresses the *perceived network* perspective:

"The network is a structure of perceived communication relationships. It is a kind of latent knowledge that guides members' manifest communication behaviour. We believe that members' reports of communication reflect this knowledge, and not their recollections of specific communication episodes".

The relative value of studying the existence of these networks in social communities is described by Rogers and Kincaid (*in De Wet*, 1991:149) by pointing out that "*the use of a communication network analysis is an attempt to identify communication structures in communities, which will assist the researcher in understanding the big picture*".

The value of studying communication networks has also been recognised by economists, specifically opting for a centralised organisational design thereby "*avoiding unnecessary duplication in communication and thus economises on*

overall communication costs" (Bolton & Dewatripont, 1994:811).

Research into virtual organisations by Ahuja and Carley, (1998:23), made the assumption that "*structural patterns of communication becomes institutionalised over time*". This is significant since a communication network investigation reveals exactly, according to their definition of a virtual organisation (refer 2.4.3) what the *nervous system* of a virtual organisation looks like according to reciprocity of communication relationships, centralisation and hierarchy.

Establishing member's reports on communication interactions using videoconferencing systems, will not only indicate the nature and structure in which they communicate, but highlight certain shortcomings of the functioning of videoconferencing within the organisation. The physical shortcomings can only be improved by better connections with a sequential price tag that is relatively easy to solve with adequate funding. The main importance of this study lies with identifying manners of altering the communication network interactions resulting in a more fruitful functionality, the identification of (possibly necessary) grapevine interaction (or lack thereof) and policy guideline structures for videoconferencing implementation and management of existing network structures.

This approach follows the warning by Glassman and Weick (*in Daniels et al.*, 1997:124) that organisational communication scientists "... *should be less concerned with traditional distinctions between formal and informal communication and more concerned about identifying and understanding the coupling characteristics of organisational communication networks ...* " .

Measuring units in communication networks are commonly referred to as *nodes* (Zack & Mckenney, 1999:257). Whilst most studies regard nodes as people, nodes have had other values like groups (Zack & Mckenney, 1999:257). Nodes are also described as "the *social units* or *actors*" to be measured. Various roleplayers, as node structures, have been identified by

Daniels *et al.*, (1997:125), Kreps (1990:223), Stephenson, (1998:57) and Stephenson, (1998:10). Various roleplayers (as defined by Daniels *et al.*, 1997:125, Kreps, 1990:223 and Stephenson, 1998:57) in such a network include the following:

- Isolates: Nodes not linked to the network,
- Opinion leaders (also referred to as hubs): Informal leaders within the network,
- Gatekeepers: Control information flow between members,
- Cosmopolites: Control information flow between the network and external environment,
- Bridges: Interconnecting clique members,
- Liaisons: Interconnecting clique members without themselves associated to a specific clique,
- Pulsetakers: A specific individual in a communication network that is an indicator to the gatekeeper on network issues.

Generally, networks are studied on three levels (Rogers & Argawala-Rogers, 1978:296, Scott, 1991:27 and De Wet, 1991:164):

- System: Level of study whereby the relative position of all the individuals or actors are examined in relation to one another,
- Clique: Subsystem whose actors interact on a more frequent basis with one another than with the rest of the total system, various such subsystems can be identified,
- Individual: Examination of the relation of a specific individual to all the other individuals in a specific clique or total network.

It can be generally accepted that through communication network analysis that the organisation as a whole must be studied. In relation to this, the sub-cluster of cliques using videoconferencing can be identified, whereafter the role of the individual within the larger network can be identified.

Furthermore, single or multiplexed examination of communication networks could occur, in which the latter tends to be more accurate as various relationships manifests differently within different communication methods for various reasons. Unfortunately, multiplex studies can be extremely cumbersome due to the number of relationships that could occur on different levels and on different communication methods. There is ultimately, as their could be an infinity of relationships, an infinity of communication methods. One such a multiplex study, conducted by Haythornthwaite (2001:211) in a computer supported distance learning class, found that *"results show how group structures associated with project teams dominated who communicated with whom, about what, and via which media over the term, and how media came to occupy their communication niches: webboard for diffuse-class wide communication, Internet Relay Chat for general communication, email primarily for intrateam communication whilst face to face had a catalytic effect"*.

This study shows the significance of conducting a multiplexed study involving new communication technology, but as already mentioned, highlights the difficulty and complexity of the process.

Examining new communication technology against the background of social and communication network theories, many authors (Rice, 1987:65, Simpson 1999:48, Kolodny, 1996:1457, Daniels *et al.*, 1997:179) believe that work patterns, organisations, work flow and work structure are influenced to a degree due to the advance of new communication technology.

Technological determinism is furthermore largely rejected by the above-mentioned authors, and the statement that humans use technology in the way they want to use it and see fit (uses and gratifications) is largely supported. It should be noted that the mere presence of new communication technology implies a greater potential for change, and in turn, implies new strategies for competitiveness amongst organisations.

It should be noted that the new organisational "paradigm" is mainly effecting those companies which fall in the high-uncertainty and dynamic environments.

It could be stated that a "higher order logic" emerges whereby the characteristics of a mechanical system is optimised that is most relevant to the social system, and subsequently new communications technology is adapted to ultimately fit the needs of the communication network.

Kolodny (1996:1458) points out that organisational design in new organisational environments is characterised by continuous organisational innovation, and that the existence of continuous adaptive strategies have proven to be most successful (Simpson, 1999:50). This results in the consensus that no institutionalised dominant organisational form exists, and that the change in the organisational form is equal to that of the perceived need for new communication technology and its inherent communicative characteristics. Such change can be centralised or decentralised, depending on the nature of management.

Computer – supported social networks (CSSN's) are emerging within organisations (Wellmann 1996:213), sometimes excluding those not wishing to belong to it, and subsequently creating an organisation for thinking in "cliques" (Anderson, 1991:506). Whilst the existence of these social networks are "rampant" among email users, other technologies like videoconferencing need to be adopted by organisations to the extent that the same implementation characteristics as email systems are present, thereby creating a further platform for social networks.

Networking theory confines itself to the existence of communication ties between workers in an organisation and not the existence of workers themselves, and we have seen that strong ties can be created through chat sites and email (Wellmann 1996:213), and nothing suggests that these ties cannot be established through videoconferencing as well.

The general notion on the development of strong ties is based on developing a bond over time through a new communication medium, whereafter more intimate ties can be sought through more interactive mediums (eg. a shift from email to videoconferencing) with physical meeting viewed as the ultimate form of commitment.

Communication networks based on new communication technology are therefore reliant on (*deduced* from Monge *et al.*, 1998:411-436):

1. Physical connectivity which in turn establishes,
2. Social connectivity, which in turn establishes,
3. Communalities, which over time leads to,
4. Confidence, trust and organisational values, which *in* time leads to,
5. Key collaborators and the existence of cliques within such a network, characterised by,
6. Heterogeneity due to physical displacement of network members, relating to,
7. Task interdependence rather than geographic dispersion, in turn economising the technology as it becomes cheaper, thereby increasing
8. Centrality and density of the network, which in turn creates greater information sharing, which over time,
9. Will follow the nature of human implementation of new technology, which leads to epidemic acceleration of the technology and the network.

It can therefore be deduced that new working environments are ultimately dependant on physical connectivity. Without physical connectivity, the large overall amount of social connectivity and all of its process acquired through communication patterns cannot be established.

It is within this that the great paradox lies: developed countries and communities will continue to create their own “virtually connected social world”, whilst the developing world will remain underfoot. However, as far as

organisations and their multi-faceted contributions are concerned, they will continue to exist on the basis of virtually socially connected networks on a multiplex level, whilst single level, face- to - face communication will remain as the communication medium for developing countries.

The existence of social networks in an organisation should not be confused with the hierarchy in the organisation. There is however a correlation between hierarchies and degree of hierarchy with social networks – should a central person in the hierarchy not have a significant standing in the social network, leadership abilities are greatly reduced. The next section will therefore examine hierarchical levels, degree of hierarchy and centralisation in social networks.

2.3.1 Hierarchical levels, degree of hierarchy and centralisation of social networks

This section examines hierarchical levels, also defined by social network theorists as betweenness, as well as centrality that describes the social distance within a network. Furthermore a distinction is made between global and local centrality, as well as the correlation between hierarchical levels, degree of hierarchy and social networks.

Hierarchical levels have been defined by Hummon and Fararo (1995:5) as the number of members an individual "has to go through" to obtain information from another. In organisations it is known that often these people are on different managerial levels, which in turn shapes *how* the information is structured. The structuring of the information is determined by *how* these individuals perceive the information should be received, determined by relative seniority and "red tape" associated with that information. Individuals would normally attribute the relative amount of "red tape" to information in relation to the level of profitability (in the broad sense) or danger that the possession of such information poses.

This phenomenon of "going through another" to obtain information in organisations, has been defined by traditional sociologists as betweenness and is described by De Wet (1991:174) as "the position that a respondent occupies in a network that would allow control over the flow of information". Betweenness has been used in various studies (Provan & Milward, 1995:1, Ibarra & Andrews, 1993:277) as one of the measures of effectiveness of a social communication network. Whilst such effectiveness is mostly determined by the environmental perception of what an effective outcome is (of a specific group), it can be stated that the higher the level of betweenness, the more alteration to information is experienced thereby reducing efficiency.

Centrality can be defined as the degree to which an individual has a short average distance to others in the network (Rogers & Kincaid, 1981:178). Scott (1991:86) distinguishes between local and global centrality, and argues that betweenness (mentioned above) is merely a measure of centrality. The distinction between local and global centrality is described as (Scott, 1991:85):

"Local centrality is concerned with the relative prominence of a focal point in its neighbourhood, whilst global centrality is concerned with the relative prominence within the whole network."

Ibarra (1993:476) points out that social network high centrality implies "a high position in status and hierarchy", and in turn, implies the level of control over access to information, or "red tape", as described earlier.

In turn, the degree of hierarchy refers to the degree to which relationships in a network are directly or indirectly reciprocal (Ahuja & Carley, 1998:7). This definition is based on the notion that *"reciprocal relationships indicate teamwork, while an abundance of unreciprocated relationships are seen in more hierarchical networks"*.

Ahuja and Carley (1998:7) brings the three terms, centrality, hierarchy and degree of hierarchy in relation to one another through three major assumptions:

1. A centralised social network does not necessarily have to be hierarchical in terms of degree or levels,
2. A network can be hierarchical in terms of reciprocity and levels but may only be low or moderate in centralisation,
3. Relationships may be reciprocal, but only indirectly which indicates a low degree of hierarchy but with moderate or high number of hierarchical levels.

It can therefore be stated that the level of centrality should be viewed as a separate entity to hierarchical levels and degree of hierarchy, but it should be noted that certain characteristics of the social network will induce an effect on the social standing of a specific individual within a given hierarchy. Therefore a person with low centrality would find it difficult to occupy a central position within a given hierarchy, and in the same manner a central person within a given social network will find it difficult to have a low hierarchical position within an organisation.

Various studies (Ahuja & Carley, 1998:1, Ahuja, *et al.*, 1999:1, Heintze & Bretschneider, 2000:801, Haythornthwaite, 2001:211) have been undertaken to determine how organisational structures, as found in virtual organisations, are influenced by new communication technology.

In a multiplex study using social network analysis across different new communication technologies in an educational setting, Haythornthwaite (2001:223) drew the following conclusions:

- Multiple types of interaction exists using multiple media in support of different goals,
- Individuals do not maintain the same relations via the same media

among members,

- Externally imposed structures affect intragroup structures.

In turn, Heintze and Bretschneider (2000:801) found that adoption of information technology affects organisational structures, communications and decision-making in the following way:

- IT has little effect on management levels and number of decision makers, and is largely determined by the external - and task environment,
- As the performance of the organisation increases following IT adoption managers attitudes towards IT is strengthened,
- Communication is not facilitated by flatter hierarchy and fewer decision makers following IT implementation. The researchers suggest that the number of decision-makers however increase due to more facilitated communication.

It is difficult to draw any major conclusions regarding hierarchy, degree of hierarchy and centralisation taking into consideration the globalised information society, since findings seem to be contradictory in nature over various studies. It does however indicate that the modern, fast changing IT environment in which many organisations find themselves today needs to adapt quickly through innovative IT communication solutions. It is furthermore evident that these organisations find their own way of adapting to the environmental and task environment through established multiplexed communication structures using different communication technology. The impression is gained however that the organisation does not function in terms of hierarchical structures, but rather on how people are linked to one another through existing multiplexed social network structures. Stephenson (1998:10) describes this as the "*invisible hierarchy*", and states that "*hierarchies show you where the power is, but often not how a company runs ... networks are the unofficial, self – organising structures that provides paths for much of the communication and knowledge ...*".

An analysis of the social network of a company will therefore be more revealing in terms of actual performance and significance of performance over a given communication channel and determination of the effect of new communication technology than an examination of hierarchy and levels of hierarchy. Interesting results could be produced once the network structure is compared to the hierarchical structure.

2.4 Conclusion

Globalisation and the information society are indicative of modern technological progress. With this, modern man brings about new cultures of alternative thought patterns, causing disparagement between first and third world countries. This furthermore has an effect on the thought patterns of isolated modern societies due to the multiplicity of modern media, thereby automatically excluding certain actors from certain media. This merely follows the trend of (over)specialisation that is now manifesting in our communication media. Organisations, too, are caught in the trap of multiplicity of communication media that change the way in which they function.

The term "new organisational environments" does not only signify a physical transformation in the place of work and interconnectivity between workers in remote working environments, but is also indicative of new ways in which people are socially connected, thereby creating an absolutely new platform for interactionary patterns. These interactionary patterns as described by various authors, although containing similarities of geographic displacement and mediated communication, are distinctively different in their outcome.

Reasons for such differences can partially be attributed to the nature of change evident in these new interactionary patterns. The nature of change is governed by inter-dependencies upon multiplex synchronous and asynchronous communication channels, which in itself, places high demand upon user-friendliness, which in turn, describes the significance of a specific

actor within a new organisational environment social network.

Against the background of organisational change and new communication technology the focus shifts to centralisation and decentralisation in terms of organisational structures, but studies show no significant support for either of the two. The mere fact that these structures relate to thinking in terms of hierarchies and levels of management (the traditional schools of thought), are indicative of the need for a modern, totally new approach to the study of new communication technology and organisational communication. By studying the paths of communication as they manifest in a communication network (multiplexed or not), the process of new technology adoption can be measured against the manifest traditional "power-chart" or "organisational chart" in the organisation. The major assumption in this is that there isn't necessarily a correlation between the relative amount of power of a specific individual in terms of the organisational chart and the significance of that individual's communication in the larger communication network.

Another communication channel, videoconferencing, subsequently emerges, and is described as the most interactive of all new communication technology. Combined with other media, it can be seen how videoconferencing can have a major effect on the way people communicate in the organisation. This furthermore implies new challenges for management which include (to name but a few) new thought patterns on calculating investment return on technology, managing the communication network and resultant interactionary patterns like teleworking and telecottages. The effects of these new patterns on communication structures can only be researched once the relative applications and challenges brought about by this new communication technology have been discussed.

This chapter introduced the reader to the formation of social structures around videoconferencing in the organisational setting. This should however be further expanded upon by examining all applications and challenges that exists for the management of successful videoconferencing.

CHAPTER 3: VIDEOCONFERENCING AS A NEW COMMUNICATION MEDIUM AND MANAGEMENT TOOL: APPLICATIONS AND CHALLENGES

3.1 Introduction

This chapter examines the manifestation of videoconferencing in new organisational formats, examines videoconferencing management policies and practises, and overviews some of the many applications for which videoconferencing could be utilised.

Irrespective of the actual application of the videoconferencing system, management would always have to consider cost constraints of actual system usage and weigh the benefits obtained through the use of a system. Videoconferencing as a group-decision support system is an area of research that has been given widespread attention, and is discussed in detail.

Videoconferencing should be viewed as part of the communication process that in turn, has an effect on the ability to manage a system effectively in a virtual organisation. The chapter therefore proposes a theoretical communication model for videoconferencing taking into account some communication theoretical concepts as well as the technical concepts involved in the video-communication transaction, as well as discussing the processes that it induces on non-verbal communication.

The importance of forging new relationships through the system is discussed, and in turn, brought into relation of the manifestation of videoconferencing in social communication networks.

This chapter therefore addresses central theoretical statements two and three, which states *that communication management policies and practises affect individuals' experiences of videoconferencing (as a communication management tool) and in turn influences the effectiveness of the*

videoconferencing system as a group decision support system, and respectively, managerial videoconferencing policies and practices as a communication tool should incorporate social network identification as well as the maintenance of the social network structures through individual, clique and network participation.

3.2 Videoconferencing in new organisational forms

Weeks and Lessing (2001:2) are of the opinion that two schools of thought regarding the digital economy exist. The first includes the rationalist school with *"its underlying principles of scientific management"* and the second *"based on the philosophy of organisations as webs of social interaction"*.

According to Weeks and Lessing (2001:2), the latter category, which falls within the scope of this study, include self-directed teams, participative management, knowledge management and total quality management.

New organisational forms, thereby falling within the second school of thought of Weeks and Lessing (2001:2), have the distinct characteristic that organisational members are geographically dispersed and decoupled from one another, subsequently creating "boundaryless organisations" (Powell in Monge & Fulk, 1999:83). These organisations are dependent on connectivity and communality, which have been defined by Monge and Fulk (1999:85):

- Connectivity is the ability of members of a defined public to directly communicate with each other,
- Communality is the ability of each member of the defined public to contribute to, access, and use a jointly held database.

Whilst one of the most serious constraints of new communication technology lies with the lack of acceptance with users (Dutton, 1999:486), videoconferencing, once accepted, can facilitate “more extensive communication and broader network participation” (Monge & Fulk, 1999:86), and allows for the inclusion of a larger number of organisational members within meetings (Huber *in* Monge & Fulk, 1999:86) promoting connectivity and communality.

The need for videoconferencing in new organisational formats had a slow start with the 1971 failure of AT&T launch of the videophone (Noll *in* Whittaker, 1997:4). Various studies have however been done subsequent to this failure, all of which yielded positive results which *qualifies* the need for video (Rosen, 1996:2:3 – 2:14):

- The Andersen world-wide study compared the value of non–video desktop conferencing with desktop videoconferencing and the study revealed that 75 % of those in the video group and 65 % of those in the non–video group said they would prefer video.
- The University of Michigan study took 36 groups of 3 professionals each and designed an automated post office. Half of the groups used ShrEdit, a text-editing tool without video and the other half with video. The study founded that the quality of communication without video was inferior to that of those with video, although it was concluded that video was inferior to that of face – to – face collaboration. The strongest finding rested on the conclusion that the satisfaction gained from the session was much higher with video than without.
- The Sun Microsystems Laboratories Study did not only prove that desktop videoconferencing causes a decrease in e-mail, but that collaborators preferred seeing one another since they could engage in personal contact.

According to Czeck (1995:5) the 3 main arguments for the implementation of videoconferencing are:

- videoconferencing is supposed to replace face-to-face meetings thereby decreasing travel costs,
- videoconferencing is an improvement over standard forms of electronic communication like e-mail and the telephone since video images enhance the written and spoken word,
- videoconferencing enhances the productivity of geographically – split workgroups.

Human interface design problems with videoconferencing have largely been overcome, and a competitive advantage could be gained by implementation of a system. If a company could gain a competitive advantage through decreasing travel costs or increase the overall productivity of work groups then the justification for implementation has been made. Joint ventures, (e.g. Microsoft, PictureTel and Intel for Internet videoconferencing) (Forrester Research, 1997:2) could cause videoconferencing applications to shift to that of a necessity by replacing old technology (e.g. the telephone).

The most important concept to keep in mind when engaging in theoretical notions on videoconferencing, is that it is an emerging technology.

Videoconferencing is changing in the way people do business and communicate (PictureTel, 1997:2):

- Travel savings amount to over \$ 130 000,00 per month – *Caterpillar*.
- Evidence was taken by video from a witness in Hong Kong with an estimated savings of £ 10 000,00 – *General council of the Bar, London*.
- With two-way video, students off – campus become active participants in class and can be treated as full members of the on-campus community – *Columbia University*.

Due to cost implications videoconferencing cannot be implemented without a successful management strategy for implementation and day-to-day operation of a system. Such a strategy would have to be developed in line with the organisations' vision, mission, policy, objectives, goals, aims and tactics (Oliver, 2001:3).

3.2.1 Videoconferencing and management policies

The term 'management' refers to all activities performed by senior members of the organisation with the aim of keeping quality and business flowing into and out of the organisation at an acceptable rate, and is a manifestation of legitimate power and authority in certain individuals to accomplish certain tasks (Guirdham, 1996:387). Management by videoconferencing around the world with various multinational organisation outlets, allows top management to conduct a meeting with managers in various countries to check on routine tasks, and allows for easy management should a crisis hit any specific outlet in any specific country. Research done by Kydd and Ferry (1994:374) with regards to videoconferencing and management came to the following conclusions:

- Videoconferencing should create a communication climate that would increase productivity. This seems to be a problem, since management reports indicate that employers have a greater tendency for not telling the truth when using videoconferencing as a communication medium.
- Videoconferencing is only effective under certain circumstances. The system is very effective when the users are required to concentrate on specific tasks, like the placement of engineering models. Videoconferencing proves to be ineffective in high uncertainty meetings.

With regards to the aforementioned, the following recommendations were made:

- Videoconferencing should only be used when a planned agenda to the meeting has been prepared,
- Videoconferencing is more effective when using flowing systems than freeze frame systems,
- The conference should not be allowed to last longer than two hours,
- All participants must be well prepared,
- Additional material should be prepared for the video environment,
- The amount of people per point should be restricted, as well as the number of points.

Taking both terms tele – business and tele – management into account, it can be stated that a videoconferencing system can contribute to the business by (PicturePhone, 1996:1):

- Increasing productivity and lowering production costs,
- Improving participation from all employees,
- A more efficient decision-making route,
- The faster delivery of a given product,
- a decrease in product development costs.

Major savings could be derived from videoconferencing due to a decrease in travel expenses, but it should be noted that this is not the only saving. Videoconferencing should be regarded as an investment, and if the long – term return on investment calculation for videoconferencing proves cheaper than travel, surely the case for videoconferencing is stated.

The calculation can easily be done in the following manner:

- Determine what the annual travel budget is, and determine what amount

can be saved by videoconferencing,

- Determine what a videoconferencing system would cost to connect to the most frequently travelled site,
- Determine what the maintenance cost of the system would be,
- Calculate the Return on Investment (ROI) figure of the system.

Phillips (1996:1) pointed out that more variables than just the above should be used to determine the ROI on videoconferencing, and placed a program on the Internet for ROI calculation in terms of videoconferencing investments. A few of these elements include:

- *Number of geographic locations:* The more geographic locations in a meeting, the higher the cost would be associated with an ordinary face to face meeting than a videoconference. A higher return on investment is therefore attainable if multipoint videoconferences are done,
- *Number of people that would normally travel:* The higher the travelling costs associated with an ordinary face to face meeting, the higher the return on investment associated with videoconferencing as an alternative
- *number of people involved:* The more people involved from a specific location the lower per person cost for the videoconference,
- *number of days away from the office:* Cost is incurred by not having a person in the office because a person is travelling to a remote location. Videoconferencing supersedes this expenditure,
- *cost of flight:* Since no travelling is associated with videoconferencing, flight costs is totally eliminated compared to traditional face to face videoconferencing.

Other factors included in Phillips's (1996:1) ROI calculation include the following:

- Number of branches,
- Number of meetings a month,

- average time per meeting,
- cost of employment, administration and technical backup,
- Cost of participant labour,
- number of days in hotel per person per year,
- motor rental,
- food,
- other costs,
- travel to airport,
- travel from airport,
- time in the air.

After entering all the above into the given program, the system will calculate the best system for the company, the savings per system, the savings in additional costs and the improvement in productivity. This program could be useful in terms of strategic planning, and could be found at the following home page: <http://sa.comtech.com.au/shayne/vconf7.html>

Mokhtarian (1988:287) concluded that videoconferencing influences travel patterns, that there is a decrease in travel due to videoconferencing, better time management takes place and more efficient employment strategies are used. The ITU (International Telecommunications Union) (*in* Robinson, 1996:1) came to the general conclusion that the cost of a videoconference is four times less than five people meeting weekly from different locations.

Whilst the financial argument for the use of videoconferencing systems could easily be made, it should be noted that no benefits are to be gained if no performance enhancement can be objectively observed by management. It is therefore imperative that managers in settings where videoconferencing are used frequently establish some manner of system effectiveness evaluation.

Not only do managers have to consider the financial and effectiveness considerations, but also give attention to the nature and the way which social interaction takes place for the formation of social communication networks

that can be effective and beneficial for the nature of the business. The nature of the business will determine the specific videoconferencing application.

3.2.2 Videoconferencing applications

The prefix "tele", implying the overcoming of distance as a prohibiting factor, including videoconferencing, has manifested within the broader social sphere in terms like tele - medicine, tele - education, tele - engineering etc. By examining some of these concepts, especially those relating to business, organisations should not place themselves within a distinctive category as described below, but design and implement an organisational communication strategy which is custom designed for the specific requirements of the organisation in question. This should not result in a business model applicable to the implementation of videoconferencing, which will ultimately restrict creative thought to the myriad of possibilities to 'create' a new category for each organisation. Such designed strategy should however take into account organisational communication needs, and make the reader aware of the various applications of the technology that has proven to be successful.

Videoconferencing has the capabilities for changing virtually every business communication context, and it has been stated that the need for half as much paperwork as we do today might diminish as the Coming Age of Communications are entered. It should however not be implied that the "paperless office" as described by so many authors will come into being within the near future. Many businesses, organisations and individuals rely on "hard copy" as "hard evidence". This predisposition still seems to flourish, but certain contexts of written documents may change into things like video-mail, rather than e-mail or snail mail, resulting in hard copy "*in electronic format*". It should be obvious that new settings like these should only be created new one step at a time, since organisational development and organisational change could take a long time to be widely accepted. New forms of *hard copy in electronic format* (thereby referring to acceptable electronic evidence) could lead to new forms of data warehousing like keeping videoconferencing

footage (whether it be synchronous or asynchronous) of conversations over networks in a shared common database.

By making the statement that videoconferencing is "changing business communication" the following is implied (VTEL, 1997:2):

"I need to be in six places at once. I used to live and die by the telephone, then the fax, then the computer. But now, even those are not enough. I have meetings today at 10, 2, 3 and 4 : 30. In seven different time zones. And the last thing I need is another ordinary videoconference... "

It is clear from the above statement that the trend in large multinational organisations requires more than just the ability to send faxes and e mail, but also allows for doing business with people stationed right across the world without the associated travel. Traditionally international business required lengthy travel time, huge air travel bills, accommodation costs and the absence from the office of the person in question.

This application is not only true for business, but also true for every trade and occupation that can possibly be imagined. The geologist does not have to wait for a rock sample to be shipped from a remote location for examination, a doctor doing a delicate operation can have assistance from a specialist halfway across the world, a lecture given at Harvard University can be attended from anywhere in the world, a multipoint boardroom conference with board members stationed in South Africa, Japan, USA, Mexico and the UK can be conducted, interviews with job applicants stationed all over the world can be conducted, etc.

It should be kept in mind that the implication of the above changes traditional communication settings. Whereby face – to – face meetings has the added advantage of the use of touch (using a handshake to conclude a business deal) the videoconference would require other methods of "touch", like virtual handshakes which implies *no* touching. The virtual handshake (described by

Bretz, 1983:200), *"requires both parties approaching the videoconferencing system as close as they can, extending arms as if they would for a normal handshake, and then doing so without the added touch"*.

The applications for management by videoconferencing have taken off in many industries. Basic implementation in engineering involves activities taking place at a distance (like designing the construction) *away from the site*. These actions normally have to be co-ordinated with all of the staff on site. Videoconferencing specifically has capabilities to overcome the need for an on – site engineer, and subsequently make the occupation much safer than at present. The main contribution from videoconferencing however does not lie with keeping engineers off site, but co-ordinating actions between various geographically distributed groups as well as the application of distance-education. Videoconferencing has many applications, as can be seen in these case studies:

- **ITT Automotive:** ITT is a multinational manufacturing company for automotive parts, and linked Michigan, USA (Headquarters) with Frankfurt, Germany. The need for this link resulted from research and design engineers located in both these sites, who needed to collaborate over various engineering issues, ranging from product design to troubleshooting. Videoconferencing facilities enable engineers to view not only one another, but to view three-dimensional data sets interactively. The videoconferencing network has recently been upgraded to include three sites in Germany (Frankfurt, Wemding and Bietigheim) and four in the United States (Auburn Hills, Virginia, North Carolina and Michigan) (Maher, 1994:12).
- **MATES (Multimedia Assisted Distributed Tele – Engineering Services):** The purpose of this project is to aid all engineers involved in project creation to specify, design, construct, and maintain a product with a geographically distributed team. The system makes use of various devices available, which include systems like e-mail, videoconferencing and data collaboration. It is the aim of the project to incorporate all existing collaboration tools on a multi-platform (Van den Broek, 1996:12).

Other applications include:

- Tele-banking, with Flagstar Bank in the US which has claimed a 200 – 300% increase in the amount of loans granted by simply connecting borrowers with underwriters, and subsequently reduced processing-time for the approval of loans from five weeks to one hour (Hillman, 1997:3), World Bank (1997:3) uses it for weekly meetings, external business co-ordination, marketing and public relations events as well as recruitment.
- Tele-geology, as with tele-engineering, the field of geodesy and geomatics (branch of mathematics dealing with the figure and area of large portions of the earth) requires large 3D data-sets of a specific section of the earth. Co-ordination between geologists and mathematicians in different continents is necessary not only to ensure that the data is uniform, but data collaboration regarding the results also deem necessary. A present project at the University of New Brunswick (Mayer & Paton, 1997:3) involves co-ordination between Halifax, Nova Scotia and Newfoundland.
- Tele-justice is receiving widespread attention in the United States and has recently featured in the South African arena, with Sun Microsystems sponsoring the training of over 5000 justice officials, including magistrates, prosecutors, court interpreters and clerks of the court (Sun Microsystems, 2001:1). The main objective of tele-justice via videoconferencing leans to greater security. A dangerous criminal no longer needs to be transported from the prison to court to testify. A videoconferencing link between the prison and the courthouse can be established and a "face-to-face" testimony can be achieved.
- The concept of a "virtual reference librarian" is proposed by Pagell (1996:23), and involves the Emory project, which is actively involved in the evaluation of all new communication technologies that can be applied to the concept of a virtual library. A system was installed at Emory University Libraries and linked the GBS (Goizueta Business School) and the main library, 10 km apart from one another. The main purpose of this installation was to provide students who are on campus and not close to the library with on line – support, and to make data sharing with CD ROM's available

on – campus.

- Videoconferencing has been used in collaborative architectural design by the School of Architecture of the University of British Columbia (McMillan & Tom, 1994:12) in conjunction with Washington University. The project involved approximately 50 people who viewed presentations done by various scholars from both sites.
- Non-tele-business applications include tele-medicine and tele-education, which has received wide-scale attention over the last few years, including concepts like remote endoscopic surgery (Telepresence Research Institute, 1997:2-25) and remote teaching (Threlkeld, 1985:3-232).

It can be seen that possible applications for videoconferencing are numerous. It should however be noted that these systems should not be implemented haphazardly, and management should strategise before implementation of a system for its effective application. Mintzberg *in* Oliver (2001:2) highlights that strategy implies the following:

- A plan – a consciously intended course of action
- A ploy – a specific manoeuvre intended to outwit an opponent or competitors,
- A pattern – a stream of actions,
- A position – a means of locating an organisation in a environment,
- A perspective – a integrated way of perceiving the world.

The next section will examine implications for management.

3.2.3 Implications for videoconferencing management

Management studies relating to videoconferencing have examined videoconferencing as a group decision support system or GDSS (Nepal & Petkov, 2001:1, Kelsey, 2000:2, Kelsey, 2002:37). Whilst the implications taking into consideration the existence of GDSS's are numerous, the scope of this dissertation specifically falls within the management of communication in

the organisation. Special consideration is therefore given to the implications for the management of the communication process during videoconferencing, and takes into account videoconferencing and the process of verbal communication, videoconferencing and the process of non – verbal communication and how managers should pay attention to management policies and processes during the forging of new relationships using videoconferencing systems.

3.2.3.1 Group decision support systems (GDSS's)

Group decision support systems can be described as the presentation of a system that aids and supports geographically dispersed individuals to interact and make decisions regarding certain levels of task environments (Nepal & Petkov, 2001:1).

Research conducted by Kelsey (2000:2) concluded that the use of group decision support systems tend to decrease ethnographic and other diverse influences on group behaviour. This coincided with earlier research conducted by Yellen *et al.* (1995:70) who investigated whether introverted or extroverted persons deal best with electronically supported meetings. It was established that group effectiveness = potential effectiveness – process losses + process gains. The level of extraversion/introversion was determined by using a Meyer – Briggs type indicator.

Common classification of GDSS types and their differences have remained unchanged, and still remains similar to the description offered by Beauclair and Straub (1990:215) (refer to Table 1).

Table 1 Features of GDSS types

GDSS type	Features
Interlaced conference	Non face – to – face, via computer at remote and / or local sites
Face – to – face conference	Conference room with terminals or nodes for participants
Face – to – face	Ordinary face – to- face conference
Teleconference	Conference rooms at remote sites with video and telecommunication links

Source: Beauclair and Straub (1990:215)

Reasons for this lack of change in the classification of GDSS types remains the fact that studies relating to GDSS and task-type decision-making still remains inconclusive (Kelsey, 2002:3) due to the existence of too many uncontrollable factors. Research has subsequently moved on to examining strategies for developing high – performance virtual teams (Kelsey, 2002:1).

This type of research would include the existence of social networks within the team and their formation (Pendergast & Hayne, 1999:311), as opposed to the suitability of the media used for interaction. Managers should however still continue to pay attention to the various influences that videoconferencing has on the communication process when choosing the most appropriate media for a specific type of meeting.

This discussion will further examine the videoconferencing communication process (verbal and non-verbal), and finally discuss the management of forging new relationships using videoconferencing systems.

3.2.3.2 Videoconferencing implications for verbal communication processes

Various studies into the influence of videoconferencing on the process of verbal interaction have resulted in describing the need for good quality audio and video (Patrick, 1999:12). It was generally established by Isaacs *in* Patrick (1999:14) that varying frame rates have an effect on the perceived quality by the user, and reports that:

- *video at 4 fps can be "distracting" and cause a loss of audio-video synchronization. Watson & Sasse (1996) also found that the perception of audio-video synchronization was impaired if the video frame rate was less than 5 fps. In addition, Kies et al. (1996) found that a frame rate of 1 fps (not unusual in low-bandwidth MVC situations) was very distracting. On the other hand, Tang and Isaacs (1992) examined video at 5 fps and found that users rated it acceptable.*
- *Kies et al. (1996) performed a detailed study of video quality in videoconferencing and found that various levels of video quality did not affect understanding in a distance education situation, but did affect users' satisfaction with the system. These authors recommend a video rate of 6 fps or more and a video resolution of at least 320 X 240. They also suggested that measuring performance is not enough and studies of videoconference systems must also measure satisfaction. Kies et al. (1996) also found large individual differences in the tolerance of low quality video that may be related to the users' prior experience, expectations, and other factors.*

Measurement of the effectiveness of interpersonal communication and videoconferencing revealed the following results:

- **Overt measures:** People's perception of the type of communication they should engage in certainly is different than normal face-to-face

communication. Studies have shown that people tend to be a lot more formal in their speech (Kydd & Ferry, 1994:389) when engaging in videoconferencing. The following causes were identified:

- A loss of eye contact increases uncertainty both in formal and informal communication (Noro *et al.*, 1996:1385 , Fish *et al.*, 1993:52)
- A decrease in the ability to perceive facial expressions and subsequently identify emotions (Noro *et al.*, 1996:1385)
- A warped perception of space to the extent that people feel that their privacy is invaded more than that of a normal face-to-face meeting (Fish *et al.*, 1993:53).

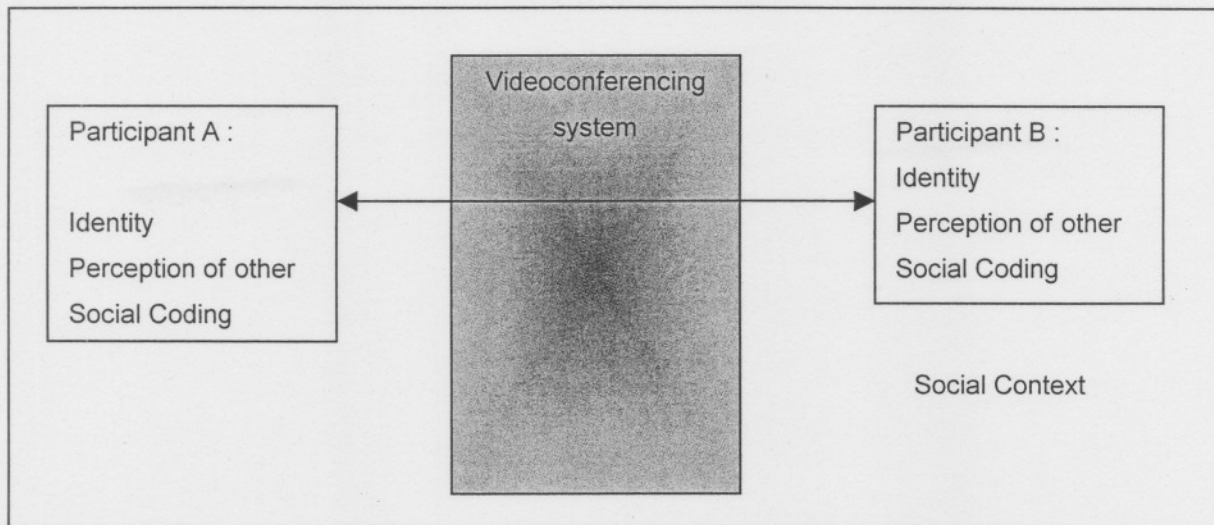
Not many authors have attempted to represent the videoconferencing communication process within a model, and those that do often only infer videoconferencing as to being a single element of larger phenomena, i.e. of computer mediated communication (CMC). Those models that do represent videoconferencing communication as a single phenomenon, fail to address the element of human communication. While all models seem to stress the importance of the new medium and how it works, none looks at the effects of human interaction with the man-made machine, and how the machine can play a part in the (mis)representation of what is considered by some as the core of human interaction, which includes elements like past experiences, gender, values, norms, etc.

The generalised media processing model as proposed by Walters (1995:26) is in fact a CMC model intended to be studied from an information sciences perspective.

The model follows the path of medium, transducer, processor, digital signal, networks, digital signal, reverse processing, transducer, medium (with element, "file", having a sub-influence on the sending processor and digital signal, and "files" and "processing" having a sub-influence on the receiving digital signal).

From a communication theory perspective the model fails to include a feedback or process approach, and is therefore inappropriate for describing human communication, much like the old Shannon and Weaver model.

Figure 1 A communication model for videoconferencing



Source: Kies, 1995:35

A model proposed by Kies (1995:35) (refer Figure 1) takes the perception of others, identity of the sender/receiver as well as social coding into account.

Whilst the model accentuates the importance of the communicators and the social context, it addresses the medium in an insufficient manner: there is no distinction made between channel, medium, noise or feedback, which is regarded as traditionally necessary components for the representation of communication interaction.

Despite this, the representation of the medium is unique in the sense that it points out the existence of one single shared workspace, which is addressed as one single videoconferencing system.

Since this presentation does not recognise more than one videoconferencing machine, communication between a single user and his own machine cannot be identified, and neither can the distinction be made between the communication between two (or more) remote machines.

The videoconferencing communication process can best be described by adapting some of the existing communication models to suit this need.

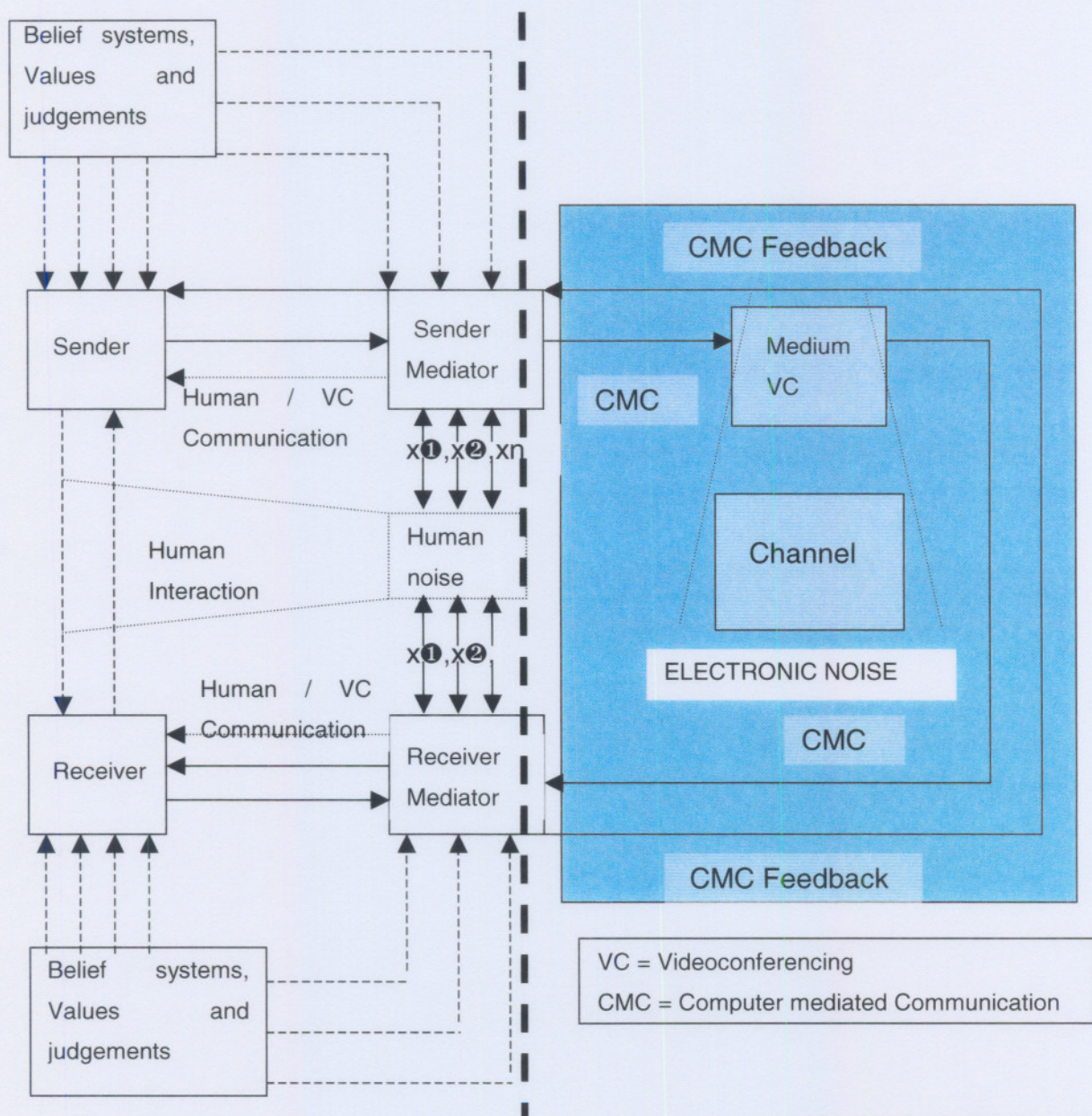
The model proposed by De Fleur (*in* McQuail & Windahl, 1981:13) has been used in the next description of Figure 2 in the following ways:

- The term sender and receiver will assume the same meaning, which refers to the encoders and decoders of the communication transaction.
- The term "noise" has been further classified into electronic and human noise (originating source of the noise relating to the term).
- "Channel" was used mainly in terms of the mass communication medium. Let this not be the case, whereby medium will refer to the method of CMC (computer mediated communication) which in this instance is videoconferencing, whereby the channel will refer to the method of transmitting data, whether it being GSTN, ISDN, VSAT etc.
- The term "message" has been omitted from the process, since message within the line process will only refer to the transmission of data on the CMC side of the model.

The theoretical notion of meaning implied by the term message is addressed by adopting the transactional model of Verdeber (1990:33):

The terms "sending channel" and "feedback channel" assumes that interaction has taken place in terms of negotiation of meaning. The term "human interaction" as used in the model, has the same meaning as "negotiation of meaning" since this is a process only engaged in by humans (disqualifying all notions of intelligent systems as well as artificial intelligence).

Figure 2 The videoconferencing communication process



Verdeber makes use of the terms culture, values, attitudes, knowledge, feelings, sex, occupation, experiences and background, thus referring to all elements that can have an effect on the way in which the communicator will convey the message. Accepting and recognising the existence of these elements, the terms belief systems, values and judgements will be used as representation.

Westley and MacLean (*in* Severin and Tankard, 1992:49) propose "A Conceptual Model for Communication Research", and use the terms X1, X2, X3, ...Xn to refer to multiple messages as produced by the environment in terms of the mass media. These terms are adapted as to refer to the number of sender and receiver mediators that will eventually have an effect on the outcome of the message and the efficiency in which the message is produced. A model for videoconferencing communication process is presented in Figure 2. The first main classification of this model is the distinction between human communication and computer mediated communication.

Human communication ties a great deal of contrasting definitions to the field, of which the definition of Theodorson & Theodorson (*in* McQuail & Windahl, 1981:3) are listed below:

"The transmission of information, ideas, attitudes or emotion from one person or group to another (or others) primarily through symbols".

The main concept within the above definition is the implication of communication between humans *without* the aid of computers (mediation), and should not be confused with that of computer mediated communication, which is distinctly defined as (Tombaugh, 1984:130):

"Computer based communication is a generic term that applies to any use of computers to transmit, receive, store, and organise information from one individual or group to another"

Mantovani, (1994:49) makes the distinction between the use of time in computer mediated communication (CMC) tools:

"People using electronic means of communication... with CMC tools ranging from distance spanning and time synchronous systems, like teleconferencing, to distance spanning and time bridging asynchronous systems, like electronic mail share some common characteristics dependent on the powers of computers ...".

This distinction between human communication and computer mediated communication in the videoconferencing communication process is indicated by the thick vertical dotted line which runs through the centre of Figure 2. The assumption is that all communication to the left of the line is human and to the right is computer mediated.

The process of CMC utilising videoconferencing is therefore described as follows:

All communication from the sender (the initiator of the communicative process) is regulated by belief systems, values and judgements and controls the communication to the extent that it has an outcome on the response from the receiver as well as the way in which the sender will formulate the message. The influence of this element is indicated by a dotted line and interconnected to both the sender and receiver of the communication process. The sender (communicator) communicates his message to the sender mediator (the camera/s of the videoconferencing system which can be either controlled by an operator/s – indicated in number by X1, X2, ..., Xn , having an effect on the noise level in terms of both CMC and human communication which in turn relays the message to the medium (the videoconferencing system, which in effect becomes the message) which consists of a complexity of videoconferencing codec's that includes data compression technology, and ultimately transmits the message through the electronic system. The medium

of this system is in itself the videoconferencing system, whereby the channel refers to the method in which the videoconferencing system translates data, joined by modem or network links, that can take place through GSTN, ISDN, TCP/IP LAN, WAN or VSAT (or whatever means used).

All noise generated by the CMC system is termed electronic noise (which has the capability of affecting all components on the CMC side of the line), which includes the inability to let the conference take place in real time, referred to as electronic distance (Abel, Heath & Luff *in* Storck & Sproul, 1995:198):

"Current technology limits some of the visual and aural cues that govern normal conversation patterns... slight delays in the compression and decompression of video signals make it difficult to briefly interrupt an ongoing stream of speech..."

It should be noted that there is a relationship between the channel and the size of the electronic noise, since it is a known fact that greater electronic distance is perceived over the GSTN or Internet than via conventional ISDN and other high bandwidth transmission lines.

The electronic signal is received by the receiver mediator (which at this end is another videoconferencing system), which in turn translates the message onto a TV or computer screen that enables the receiver to view the sender.

The communication between the two separate videoconferencing machines which places the picture of the other party on the screen is termed intervideoconferencing communication.

All video signals going out can also be viewed on the screen, which is normally placed (in a small window – termed picture-in-picture) on the bottom right-hand corner of the screen. Through this process, it can be seen that communication about the self exists between the sender and sender-mediator as well as the receiver and receiver-mediator, which explain the existence of

these two separate entities.

The concept which refers to the communication between the sender and his/her own videoconferencing system (which includes one or more operators of the videoconferencing system, if used) is termed intravideoconferencing communication.

It should be noticed that the videoconferencing system through the process of intravideoconferencing communication can detect some of the values, belief systems and judgements revealed through the process of communication, and in turn will relay these cues through to the receiver through the process of intervideoconferencing communication.

Feedback is given by the receiver and follows the same route back to the sender in terms of the man – machine system. Human feedback is implied through the term "interaction" and is self – evident.

The interaction between the two individuals refers to all communicative processes in which the CMC (represented by the videoconferencing system) that makes participation between human elements possible. Although it should be realised that no interaction would be possible without the existence of CMC, we also have to realise that CMC in itself is distinctly machine – like and cannot become part of the deeper understanding of any communication described by semiologists as the sharing of meaning. This interaction process is indicated in Figure 2 by the two vertically dotted lines that connect the boxes of the sender and receiver. These lines are dotted to indicate that the interaction takes place, but can only exist in a mediated environment that in essence will change the message.

Within this mediated environment human noise can also occur, which has an influence on the effectiveness of communication. Human noise refers to all communication factors that can prevent the accurate transmission of messages through human interaction whereby CMC does not play a role. Man

learns to overcome problems associated with electronic noise, since Estes (1971:283) states:

"...given that the sender has actually transmitted message A, the receiver may be in some uncertainty as to whether he has received A or A'', each of which resembles the true message in some respects. ... it is known, however, that a individual's perception of an uncertain event is not only influenced by the stimulus properties of the event but also by any advance expectations he may have as to the most likely event out of a set of possibilities ...".

In the same way that managers should pay specific attention to GDSS's and verbal communication processes during videoconferencing, equal attention needs to be paid to non-verbal processes during videoconferencing, which will be examined in the next section.

3.2.3.3 Videoconferencing systems and the implications for the non-verbal communication process

Videoconferencing individuals in remote settings will find, depending on the bandwidth used in the connection, that visual cues may be delayed and not fully synchronised with the audio. The communication process can therefore be distorted, and achieving mutual understanding can therefore be more difficult. Secondly the mere fact that individuals appear on a television screen (which is two-dimensional as opposed to a three-dimensional face-to-face setting) can be daunting and slightly disconcerting.

In managing communication process, communication-managers must pay attention to the influence that this distortion has on the communication process and the extent to which this affects the output of the social network utilising videoconferencing technology.

This section will discuss the impact the use of videoconferencing has on non-verbal communication against the background of a communication-theoretical

structure of non-verbal communication.

Within the framework of communication theoretical classifications of non-verbal communication (Barker & Gaut, 2002:58–75), the following comments regarding how videoconferencing influences the non-verbal communication process are made:

- **Space:** One of the most warped perceptions in terms of non-verbal communication and videoconferencing is the use of space. At first, it is difficult to have a "normal" conversation with somebody halfway across the world via video and sound due to the restrictive nature of the medium (especially desktop videoconferencing). The distance from the screen can be regarded as the conversational distance, which should relate to personal distance in the case of rollabout or boardroom systems, and intimate distance in the case of desktop videoconferencing. Since intimate distance is normally only shared with very close friends or romantic partners, the perception of personal privacy seems to be invaded. Studies have indicated that we are very aware of this perceived invasion of privacy during videoconferencing sessions, especially when making use of desktop sessions, especially if not pre-planned (Riesenbach, 1996:4). This notion of pre-planning indicates that there should not be a significant drop in the amount of ordinary audio-conferencing calls made, but less time spent making them. The "factor of apparent distance" (as identified by Bretz, 1983:181) stipulates that the distance that you are away from the screen should be equal to the distance you would have during face-to-face interaction, and this notion supports the invasion of privacy associated with desktop videoconferencing systems.
- **Chronemics:** Videoconferencing can be classified as both synchronous and asynchronous communications. Ordinary duplex (two-way) video-communication is classified as synchronous since the message is received, interpreted and answered upon as part of a continuous meeting in time. Videomail refers to the delivery of a video message (like e-mail, but with added video) and the answering upon the message whenever the

receiver has time to, in a similar fashion or through another medium. Videomail is particularly useful for multinational organisations that have significant differences in time zones between communicators. Videomail would be classified as asynchronous, since the message is delivered, but not simultaneously answered as an immediate response.

- Kinesics (body movement) and the correct use of it is very important in terms of videoconferencing, since bandwidth limitations do not always allow for smooth motion. It is advised that any fast actions or excessive use of the hands should be avoided to prevent a jerky image at the receiving end.
- Oculistics (eye movement): Since we are more aware of the person staring at us from the opposite end, and the probability is greater of having a conversation with a person from another culture, the bigger the possibility that the person you are communicating with will have a different opinion (at what time it would be appropriate to glance, stare, etc.). Another added problem is the fact that you are at times not sure if it would be appropriate just to stare at the screen or be seen doing anything else. This problem can partially be overcome by making sure that the involvement includes many visuals (e.g. videotape recordings and PowerPoint slides) as well as objects like drawings and graphs through the use of a shared whiteboard.
- Haptics (touch). This element of the non-verbal encounter should be replaced by the use of gestures, like waving when saying goodbye. Just be careful not to overdo any of these actions, since it can interfere with the kinesics of the interaction (which should be a slow and deliberate movement).
- Paralanguage (the use of voice for activities other than/in addition to language). It is important to speak slowly, clearly and at the right pitch, since visuals often are not enough and audio has to substitute for lost visual information to avoid unnecessary confusion.

According to Bretz (1983:184) there are at least four factors that determine the proximity on a television screen:

- Distance of the pickup camera from the subject,
- Focal length of the camera lens,
- Size of the display screen,
- Distance between the display screen and the viewer.

These factors, in conjunction with the above-mentioned dynamics, all have an influence on the ability of an individual to successfully communicate non-verbally with another during a videoconferencing session.

Another of the major problems still associated with cost-effective videoconferencing is bandwidth. This absence of bandwidth could cause the images transmitted to be small, low in resolution and not represent a smooth transition from one image to the next.

It should be kept in mind that this medium filters out social cues that are normally more available in face-to-face interaction (Saunders & Vaverek, 1994:445). Many researchers have indicated that the absence of necessary non-verbal cues due to video – and teleconferencing have lead to users to become depersonalised and interpersonally hostile (Kiesler *in* Walther, 1994:475).

It is known that it is an international trend for videoconferencing systems to become cheaper and subsequently produce images of lower quality (Hiemstra *in* Walther, 1994:480), and

"as bandwidth narrows from face to face interaction to computer terminal interaction, the communication is likely to be experienced as less friendly, emotional and personal, and more serious, businesslike and task orientated..."

The general conclusion can be made that communication of individuals through low-end videoconferencing is not desirable for the creation of a healthy communication climate within the organisation.

Scott (1996:555) manipulated colour breakdown, frame rate, mosaic (creation of a pixelised image) to determine the error matrix of intended versus perceived expressions in non-verbal cues. Generally the results indicate that the greater the mosaic the poorer the correct response, followed by frame rate and colour breakdown.

Scott (1996:560) proved through various tests that certain facial expressions become misperceived easier than others during videoconferencing, of which disgust was most frequently confused for anger and secondly, surprise which was most frequently confused for happiness or satisfaction. The reason for this confusion may have resulted from the similarity in facial expressions relating to these emotions, especially prevalent whilst videoconferencing at low quality video.

The following solutions are suggested for overcoming these problems:

- Only making use of high quality, high bandwidth video and audio,
- Learning effective communication skills through the continued use of the system.

Research into the use of three-dimensional images for videoconferencing applications (thereby making it more user-friendly) has been done by the Japanese (relate Noro *et al.*, 1996:1050 and Kawai & Noro, 1994:1120). A short summary of this work is given below:

"Users of videoconferencing systems are deprived of their humanity because they cannot accurately observe one another from all angles, which results in the misperception of emotions and added frustration. Through the use of a dummy head with camera lenses for eyes and microphones where human

ears would be placed, and the subsequent display of this on a monitor at the far end with the remote user wearing a headset to accommodate the perception of depth (and vice versa), the encounter will not only become virtual reality, but enhance the telepresence of the users of videoconferencing systems...".

Taking into account all of the factors that have an influence on the videoconferencing communication process, communication managers should ensure that new relationships are successfully built using the videoconferencing system with the goal of strengthening the functioning and output of the social network.

3.2.3.4 Communicative characteristics of videoconferencing as a GDSS

Studies regarding group decision support systems using computer conferencing suggest that equality of member participation is greater using the facility but that such groups engage in less communication, have more difficulty in achieving consensus and require more time arriving at decisions (Aiken *et al.*, 1996:73).

It is furthermore stated by Daniels *et al.* (1997:188) that the use of new communication technology creates a "paradox" since "organisations are faced on the one hand with the need to acquire, distribute and process large quantities of information and that individuals have been expressing the need for more face – to – face contact, thereby creating a backlash ...".

Fulk *et al.* (1995:259) points out that various cognitive elements exist in the social construction of communication technology. If the view that organisation in essence is a human activity, that merely employs elements like new communication technology and new organisational forms, then the following elements (as indicated by Fulk *et al.*, 1995:260) will determine the nature of new organisational forms:

- Structuration: Groups using new communication technology select specific features of the technology for interactional use and therefore shape the effects of that technology within the group. Furthermore group norms, rules and patterns of interaction influence which features are selected, and a reciprocal relationship emerges between the group and the technology.
- Symbolic interaction and Media Richness Theory: The mere choice of preferred new communication technology creates symbolic communication behaviour and creates meta-messages. The choice of the media lends itself to formal authority, competency or legitimacy.
- Social influence: Media evaluations and uses are socially constructed due to the fact that feedback about the use of the selected media, whether it be overt, covert or through non – verbal communication, have an effect on the way in which managers will select new communication technology for future interaction.

3.2.4 Managing communication in working relationships using videoconferencing systems

Managing relationships formed using videoconferencing systems should take into account verbal and non-verbal communication processes during the videoconference, socialisation acts, current organisational communication trends and general conduct to maintain during the videoconferencing interaction.

Communication in organisations includes a complex array of intertwined interchanged informal socialisation acts of communication as well as formal and informal channels for communication to take place. A basic requirement for interacting in this array of communication networks requires a shared medium, whether it is face-to-face communications, telephone, meetings, collaborative e-mail or videoconferencing. It can be hypothesised that a tendency exists in organisations to make use of computer mediated communication (Rice, 1987:80), which includes elements like whiteboarding and videoconferencing. This new medium excludes certain people from the organisational communication processes, for various reasons, of which the basic need for a common network and the tendency to avoid modern technology are most commonly to blame. Verwey *et al.* (2002:170) are of the opinion that a new social architecture emerges due to the implantation of new communication technology, and this "*means that the ways in which computer-supported co-operative work systems restructure social relationships, if at all, depend on pre-existing patterns of authority, obligation and co-operation, and an organisation's openness to change*" (Verwey *et al.*, 2002:170).

Buckingham (1997:1) is of the opinion that the structure of organisations is preparing itself for the total electronic onslaught, which will lead to

"unorganisation, which is all about how new technologies such as the Internet and electronic agents facilitate the downstructuring of business organisations into collapsible corporations and enable technological capitalism in which individualism can participate in and benefit from free markets..."

This process of unorganisation is similar to the decrease in formal hierarchical structures and increase in informal networks, resulting in more decentralised and remote communication dependent on computer mediated communication systems (Pendergast & Hayne, 1999:312). The organisation is therefore more reliant on computer mediated communication systems, and general management policies and practises should be established to ensure proper conduct during videoconferencing sessions (Webster, 1998:1).

Various authors (Cooke, 2001:1, Gunderman *et al.*, 1999:1 and Webster, 1998:2) have provided guidelines for proper conduct during videoconferencing sessions. Cooke (2001:1) has suggested the following checklist:

- Will the videoconference be held point-to-point (between two locations) or multipoint (between three or more locations)?
- What will the bandwidth speed of the videoconference be?
- Ensure that all participants will have adequate visibility and will be covered by cameras and microphones.
- What support equipment will be needed?
- What time will the videoconference occur? Many international videoconferences occur at odd hours of the day and night.
- Provide all participants with the conference agenda, including the date, time and a complete list of participants.
- Provide participants with instructions or a contingency plan in the event of technical difficulties.
- Consider using a facilitator to ensure full participation.
- Build in time for audience interaction.
- Advise participants not to wear flashy clothing or jewellery.
- Distribute a contact sheet of participants and locations to all involved.
- What type of equipment are remote sites using?
- What are the ISDN numbers for the remote site or sites?
- Set up a test call a few days in advance to ensure compatibility between local and remote sites and systems.
- Be sure video equipment is on and working 30 minutes before the meeting is scheduled to begin.
- Adjust camera angles. Ideally, no more than 10 percent of the picture should be above the participants' heads. Close curtains and blinds to reduce glare.
- Introduce participants at all locations, and state the agenda before beginning.
- Follow the agenda to maximize time- and cost-efficiency.

- Advise participants to address one another by name to avoid confusion during interaction.
- To reduce background noise, put participants in a "listen-only" mode when they are not speaking.
- Present information in short segments for better audience retention.
- Utilize colorful visual aids.
- International connections might have slight delays in response time.
- Distribute conference minutes to all participants.
- Make audio- or videotapes of the event available to participants or those who could not attend.

Section 3.2.3 examined management considerations (especially communication managers) for videoconferencing. Once management is aware of all of these factors, the system should be managed as a communication medium in social communication networks.

3.2.4.1 Videoconferencing as communication medium and social communication networks

Social connectivity (the ability of members of a defined public to directly communicate with each other) as defined by Monge and Fulk (1999:85) in new organisational environments is dependent on new communication technology (like videoconferencing) for the formation of social communication networks.

Social communication networks in new organisation environments are more radial in nature (the amount of individuals that can be part of a network), more weak ties can be initiated and geographically distributed individuals can become part of a social network otherwise inaccessible to them (Monge & Fulk, 1999:89).

According to Zack and McKenny (1999:249-250) research in application of new communication technology like videoconferencing follows the technological imperative (like task, technology and functional structure), and ignores the social network perspective.

The social network perspective takes into account patterns of interaction, and videoconferencing facilitates patterns of interaction for individuals in geographically dispersed locations.

It is necessary for managers in virtual organisational settings to “redesign business processes” and, through the creation of virtual organisations, “form strategic alliances and partnerships that will enable them to focus on core competencies while expanding organisational capabilities” (Applegate, 1999:33).

Videoconferencing has in many ways proven to contribute towards achieving this aim, and social communication networks and the network analysis perspective “have helped us understand how social structure constrains and shapes actions of designer, implementer, innovator and users of CMC systems” (Rice, 1994:181).

According to Rice (1994:181), the social network analysis perspective and CMC systems such as videoconferencing show the following characteristics under circumstances of adoption of new technology:

- Greater density or centrality facilitates social construction of reality and shared resources leading to similar adoption and usage patterns,
- Critical mass is a important influence on adoption and evaluation of CMC systems.

Once videoconferencing has been adopted in social networks, Arabie and Wind (1994:265) stress the importance of managing the process:

- developing and implementing a communication program to mobilise the members
- creation of an organisational architecture for facilitating relationships
- managing the relationships

Overall, videoconferencing is an essential communication tool that facilitates the formation of social communication networks and needs to be managed on a daily basis to ensure efficiency and achievement of organisational goals.

3.3 Conclusion

Modern businesses are dependent on ease of access of information, globalisation, localisation and the membership of social communication networks which must manifest locally and globally.

While this modern tool, videoconferencing, facilitating communication is available, it should be seen as a management instrument for achieving certain organisational goals through the management of the process of relationship formation in virtual and geographically dispersed organisations.

Applications range from education, health and a multitude of business applications, which mainly saves costs through elimination of the need to travel and the immediacy it allows for an individual to be in several places world - wide at the same time.

Management of videoconferencing as a group decision support system must take task and other factors into account when assessing the appropriateness for the use of videoconferencing as a communication medium.

It should furthermore be noted that the verbal and non-verbal constraints induced by the system will have a significant effect on the ability for individuals to communicate meaningfully, and that a careful assessment of both human design factors and technical requirements be made before the implementation of a videoconferencing system.

The ultimate goal is to forge new relationships between organisational members in geographically dispersed locations, which in turn, will lead to greater efficiency, a wider network and a general increase in network density and member participation.

Videoconferencing in social communication networks will help managers achieve their goal in becoming more local but at the same time more global, and is an indispensable tool for virtual organisations. The next chapter will overview how a system is currently being applied between two continents, Africa and North America, in a "Tertiary Education Linkages Project", otherwise known as TELP.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

Whilst the previous chapter discussed videoconferencing as a new communication medium through examination of applications and challenges, chapter four will initiate the research process on investigation of the research problem: videoconferencing as strategic management tool in new organisational forms – the case of TELP.

The chapter is initiated through a discussion on methodological considerations associated with the research process. This includes a methodological orientation of the research process, followed by a section on research design. The research design includes the problem statement for TELP, research questions, research aims and central theoretical statements, which is followed by a background research orientation for TELP, a discussion on a pilot study, as well as a step by step explanation of all of the procedures followed during the research process.

The research methods employed include a discussion of the focus groups and questionnaires used in the study. The discussion on data analysis describes what and how it was done for both focus group data as well as questionnaire data. The discussion is concluded with a discussion on methods used to ensure reliability, which included the process of triangulation, a pilot study and a reliability analysis using the correlation procedure, simple statistics and Cronbach coefficient alpha.

4.2 Methodological Orientation for this research

Epistemologically a variety of research techniques can be applied to a particular research problem, of which the major distinction is made between qualitative and quantitative research methodologies (Greenbaum, 1998:4). It is the task of the researcher to evaluate the research aim and employ the most appropriate orientation to achieve the desired research objectives, and ideally the research question should dictate the methodology used, taking into account the major advantages and disadvantages of each respective methodology (Furnham, 1997:30).

Qualitative research is defined as “an inquiry that seeks to understand the world within the total context of what creates meaning out of people’s lived experiences” (Musiwa, 2000:1). McBride and Schostak, (2001:1) view qualitative research as using the phenomenological research paradigm, largely associated with research in behavioural studies attempting to answer the ‘why’ question in research.

Quantitative research methodologies are described as “using numbers as data to describe events or establish relationships between events, commonly known as positivism” (Bloland, 2002:3).

This approach, using both quantitative and qualitative methodologies, is preferable for the following reasons:

- Attitudes concerning the research problem can be identified before quantitative measurement can take place,
- Variables can be identified qualitatively and measured quantitatively,
- Respondents could, through the qualitative process beforehand, become more accepting of the quantitative process before quantitative measurement. This is extremely important since network analysis does not allow for substitution,
- It allows the researcher to become familiar with the social network

structure before actual construction of the network analysis section of the questionnaire,

- Qualitative results could set the basis for quantitative interpretation of results.

Qualitatively, focus group discussions were held. As the first step in the research process, the purpose of the focus groups discussions was:

- To identify qualitatively the broad variables present in the TELP videoconferencing set-up. This included identifying the purpose of videoconferencing in the organisation, general feeling towards the use of the system, management variables such as quality of communication as well as management policies and practises at TELP,
- To identify the key management variables required for network analysis.

The above were required for the quantitative phase, the questionnaire, which consisted of demographics, network analysis and Likert scale questions. The purpose of the questionnaire was:

- To identify the demographic characteristics of the participants,
- To determine the nature and structure of the social network for measurement of required network variables,
- To measure the attitudes, perceived management policies and practises as well as the quality of communication through Likert – scale questions.

Overall this approach brings advantages associated with both quantitative and qualitative research methodologies.

The next section will examine research design through a number of steps, starting with examination of the problem statement, research questions, research aims and central theoretical statements.

4.3 Research Design

In order to understand the research design for this study, it remains important to state the research problem statement, research aims and central theoretical statements. This research procedure is done through the design process, and includes a step by step explanation of the steps followed. This section furthermore examines methods of data collection, data analysis and measures taken to ensure reliability in the study.

4.3.1 The research problem

The research problem that has been investigated in this study is as follows:

What do selected social communication network properties and practices in the application of videoconferencing reveal (contribute) as a strategic communication management tool in a new organisational context at TELP?

4.3.2 Research questions

Research questions investigated were as follows:

- 1.2.1 Which properties of selected communication networks at TELP is revealed with regards to individual, clique and network participation using videoconferencing compared to theoretical foundations on videoconferencing and social networks in new organisational forms?
- 1.2.2 In what way do selected communication network properties at TELP influence the quality of communication practises and communication management performance at TELP?
- 1.2.3 Which practices and policies that are being applied by TELP management regulate videoconferencing communication as management practice, with reference to social network practices?
- 1.2.4 What are the perceptions of communication network members of TELP's management of its communication policies and practices and

to what extent does it influence the output of the social network?

- 1.2.5 What is the perceived effectiveness of TELP's management of the quality of communication within the respective social networks in relation to the key management issues?

4.3.3 Research aims

The aims of the study were as follows:

- 1.3.1 To empirically determine what the properties of selected communication networks at TELP reveal with regard to individual, clique and network participation using videoconferencing, compared to theoretical foundations on videoconferencing and social networks in new organisational formats,
- 1.3.2 To analyse selected communication network properties at TELP and how this influences the quality of communication practises and communication management performance at TELP,
- 1.3.3 To identify and analyse practices and policies that are being applied by TELP management that regulate communication as management practice with reference to social network practices,
- 1.3.4 To determine the perceptions of TELP management's enforcement of its videoconferencing communication policies and practices and to determine to what extent it influences the output of the social network,
- 1.3.5 To determine the perceived effectiveness of TELP's management of the quality of communication within the respective social networks as per key management issues.

4.3.4 Central theoretical statements

The central theoretical statements applicable to this study were the following:

- 1.4.1 **Proposition 1:** Videoconferencing facilitates organisational communication networks (social networks and thus communication management strategies are necessary to ensure that the quality of information disseminated over the social network contributes to sound managerial outcomes).
- 1.4.2 **Proposition 2:** Communication management policies and practises affect individuals' experiences of videoconferencing (as a communication management tool) and in turn influence the effectiveness of the videoconferencing system as a group decision support system.
- 1.4.3 **Proposition 3:** Managerial videoconferencing policies and practices as a communication tool should incorporate social network identification as well as the maintenance of the social network structures through individual, clique and network participation.

4.4 The research design process

The research design process included a discussion on the research domain, TELP at ECT, the pilot study, the steps followed during the research process, the methods of data collection, how the data was analysed, as well as steps taken to ensure reliability during the research process.

4.4.1 TELP: Research domain at the Eastern Cape Technikon

The Eastern Cape Technikon (ECT) is the youngest Technikon in South Africa and is located in one of the poorest and largest provinces in South Africa. The institution has grown from being a branch of the Engineering Faculty of the University of the Transkei to being a multi-campus institution with campuses in Butterworth, East London, Queenstown and Umtata (Ligons & Harvey, 2002:2). In 2000 the Institution had a student enrolment of approximately 4000 students over the four campuses (Anon, 2002:1). This figure has grown to 7000 in 2002 (Harvey, 2002:1). In 2001 the Technikon acquired two teacher training colleges in Umtata with a student complement of 1500 (Ligons & Harvey, 2002:2). Currently the Institution is facing a merger process with Border Technikon and Unitra (Mjoli, 2003:1).

The institution currently offers SERTEC (Certification Council for Technikon Education) – approved programmes in the Faculties of Applied Technology, Business Sciences and Engineering. TELP (Tertiary Education Linkages Project) has as its main vision the continued development of academic staff at the ECT through a linkage project with Texas Southern University.

In terms of the TELP project, the Technikon has committed itself to strive towards the following (Ligons & Harvey, 2002:2):

- Academic excellence through creating highly competent skilled staff for non-academic and academic activities,
- Quality assurance as a benchmark for excellent performance through high levels of productivity, academic and non-academic effectiveness and efficiency,
- Teamwork among all the divisions of the institution and mutual support as a mechanism to realise the Institution's vision,
- Survival as a Higher Education Institution in a competitive and challenging environment.

The purpose of the TELP project is to create sustained support by (Ligons & Harvey, 2002:2):

- Conducting videoconferencing sessions and/or sessions facilitated by local facilitators in:
 - Designing instructional outcomes/objectives
 - Individualised instructional strategies
 - Assessment (entry level, pre- and post assessment),
- Teaching teams of 5 – 7 members per team to become a part of the critical friend's group (CFG). The purpose of this group is to reduce teacher isolation as the transition is made from teacher – centred to learner-centred classrooms. The CFG act as peer supporters and evaluators to assist each member in the team in mastering the different components in the process.

Teams of five to seven educators were taught during videoconferencing sessions how to become peer supporters and evaluators to each other (CFG). The aim of this activity was to support and teach academic staff as they move from being participants in learning to being facilitators of learning.

In the process of the TELP project (which has been running for five years) various groups/cliques have evolved, some on a physical level and some on an electronic level. More specifically, it has been stated that the cliques that developed on electronic level, resulting in the CFG, has been so dependent on videoconferencing that no benefit would have been realised if it wasn't for the use of a videoconferencing system.

It should furthermore be noted that it has become increasingly important to manage the quality of communication, as well as the communication management practises and policies as the Technikon, specifically using videoconferencing as a communication medium. Without successful management policies and practises in place, the videoconferencing system could become obsolete to the TELP project.

4.4.2 Pilot Study

Before engaging in the research process at TELP, it was necessary to evaluate the research method in a similar environment beforehand. This was necessary since the process of identifying variables for the quantitative phase as well as the ability to overcome the null substitution rate for network analysis had to be evaluated. The pilot study was conducted for a large multinational organisation based in South Africa that has more than 30 000 employees. The organisation requested to remain anonymous due to the sensitivity associated with the data. The pilot study was held with a group that consisted of twenty individuals that were situated in five sites.

The proposed research process included the following steps:

Step 1: Determination of an adequate research sample for the quantitative phase (refer step 4), which was done by discussions with a central person in the social communication network (e.g. the videoconferencing scheduler). The sample should include all individuals that utilise the videoconferencing system on a regular basis, necessary to maintain the social communication network utilising the videoconferencing system. This sample, as identified with the videoconferencing scheduler, was tested by circulating the list of names to all the identified participants. The purpose of this was to identify the opinion of the participants whether all the participants that qualify were identified, and furthermore, to prime the individuals to the research project so that all questions that arose as a result of the research could be dealt with beforehand.

Step 2: The identification of variables pertaining to the quantitative research process. This was done by a qualitative phase. The qualitative phase utilised focus groups, generally consisting of four to six individuals. The focus group sessions were video-recorded for the purpose of analysis. Suitable focus group participants were identified during the earlier discussion (see step 2)

with the videoconferencing scheduler. It was established that various reasons could be used for the inclusion or exclusion of a specific individual from the focus group discussion. It emerged that representatives from each department could easily be identified on the basis of their importance in the social network through the number of hours spent communicating, utilising the videoconferencing system. It was also clear that there was a correlation between relative seniority and the number of hours spent utilising the videoconferencing system. The general rule was that the more senior the individual, the more hours spent utilising the videoconferencing system, the more central to the social communication network and the more "qualified" the individual would be for inclusion. This qualification, by choosing one individual per department, resulted in the desired number of participants.

Step 3: The construction and distribution of a quantitative questionnaire to the individuals identified during step 2. The construction of the quantitative questionnaire was solely possible due the precluded step 2, the qualitative focus groups.

In the process the reliability and validity of the above steps were evaluated with actual data collected. The following observations in the pilot study with regards to the research process were significant in terms of the later study for TELP:

The focus group was held with respondents from individuals in three sites. Whilst the primary function of the focus group was to establish the variables present for the quantitative stage, it was established and predetermined that the researcher should spend time with the videoconferencing co-ordinator. This enabled the researcher to establish these major variables and check the correctness of the moderator guide before the actual videoconferencing focus group. Five key management variables were identified and were clearly definable. Whilst respondents to the focus group research were pre-briefed by the videoconferencing co-ordinators at the respective sites, it was established that increased validity can be achieved by having the network co-ordinator

(and departmental head) e-mail respondents before the actual focus groups took place.

Due to the geographic location of the respective individuals, self-administered questionnaires were preferable, and were made available via e-mail. It was discovered early on during the research phase that this procedure was not acceptable for the following reasons:

- **Lack of willingness to complete the questionnaire:** Respondents were slow and despondent to complete the questionnaire. It was established that the respondents preferred face - to - face contact.
- **Level of difficulty of the questionnaire:** Despite precise planning and pre-testing of respondents, it was found that the social matrix was not well understood and not all of the individuals produced accurate data.
- **Data reliability:** The above two problems were identified after having received eight out of the twenty questionnaires. It was decided at this point that the researcher should interview the respondents in a face-to-face setting (only questionnaires from respondents in Johannesburg were still outstanding) using the set questionnaire. During this process, it was established that observer-reliability is increased if the researcher was filling in and explaining the questionnaire to the respondent.

Despite these perceived problems, the study's reliability statistics were high with Cronbach Coefficient Alpha scores ranging between 0.800051 (raw) and 0.817258 (standarised).

4.4.3 Steps in refining the research design and application

Following the pilot study, the steps mentioned previously were refined with reference to the actual research in the following ways:

Step 1: The identification of an organisation that utilises videoconferencing on a regular basis, resulting in the formation of social networks and relationships

between geographically distributed participants. TELP was chosen.

Step 2: Determination of an adequate research sample for the quantitative phase (refer step 4), which was done by discussions with a central person in the social communication network (e.g. the videoconferencing scheduler). The sample should include all individuals that utilises the videoconferencing system on a regular basis, necessary to maintain the social communication network utilising the videoconferencing system. This sample, as identified with the videoconferencing scheduler, was tested by circulating the list of names to all of the identified participants. The purpose of this was to identify the opinion of the participants whether all the participants that qualify were identified, and furthermore, to prime the individuals to the research so that all questions and issues that arose as a result of the research could be dealt with beforehand.

Step 3: The identification of variables pertaining to the quantitative research process beforehand. This was done by a qualitative phase. The qualitative phase utilised focus groups, generally consisting of four to six individuals. Suitable focus group participants were identified during the earlier discussion (see step 2) with a person central to the social communication network (e.g. videoconferencing scheduler). Focus group sessions were video-recorded for the purpose of analysis. It was established during the pilot study that various reasons could be used for the inclusion or exclusion of a specific individual from the focus group discussion. In the pilot study it emerged that representatives from each department could easily be identified on the basis of their importance in the social network through the number of hours spent communicating, utilising the videoconferencing system. It was also clear that there was a correlation between relative seniority and the number of hours spent utilising the videoconferencing system. The general rule was that the more senior the individual, the more hours spent utilising the videoconferencing system, the more central to the social communication network and the more "qualified" for inclusion. This qualification, as with the pilot study, resulted in the desired number of participants.

Step 4: The construction and distribution of a quantitative questionnaire to the individuals identified during step 2. The questionnaire consisted of demographic variables, network data and descriptive data collected through Likert – type questions. The construction of the quantitative questionnaire was solely possible due the precluded step 3, the qualitative focus groups. The questionnaires were filled utilising personal interviews with the respondents by the researcher in East London. A suitable individual (research experience at Doctoral level) with ample research experience duplicated the process at Texas Southern University since the researcher was unable to travel due to financial constraints.

4.5 Research methods used in this study

Research methods included focus group discussions and a quantitative questionnaire that included demographic, social network matrixes as well as Likert – scale type questions.

4.5.1 Focus groups as research method

A face-to-face focus group was held in South Africa and video – recorded (for analysis purposes), whilst an interactive videoconference focus group was held by the researcher in South Africa with the group at Texas Southern University. (Refer to appendix 1 for the moderator guide). The practice of video–recording focus groups for later analysis is said to make the work of the researcher easier (Mwanga & Mugashe, 1998:707), whilst the use of videoconferencing for focus groups can be dated back as early as 1994 (Heather, 1994:6).

Focus groups are defined by Nucifora (2000:66) as *“a round-table discussion session, typically involving four to ten individuals who are recruited to come to a central research facility for two hours or so, where they discuss a topic of interest, led by a moderator or facilitator who guides the discussion into predetermined areas.”*

Baker (1994:189) furthermore indicates that focus groups are an appropriate means for assisting in identification of variables for questionnaires. The major reasons for resistance to using videoconferencing in focus groups are listed by Nucifora (2000:66) as:

- Lack of awareness of the technology itself
- A research community that is traditionally slow in embracing new methodologies

Further studies utilising videoconferencing technology for focus groups were conducted by Jarvis (2002:4) who states that the popularity of videoconferencing usage for focus groups has grown dramatically the last few years, whilst Nucifora (2000:66) states that it is currently “one of the most reliable and most heavily used research tools”. Jarvis (2002:5) furthermore states that in the future netstreaming will become more frequently used than videoconferencing due to savings in cost.

Greenbaum (1998:90) recommends that pre- and post- group videobriefings be held and that communication during the session using other mediums like the telephone be utilised.

4.5.2 Questionnaires as research method

The questionnaires consisted of three major sections (refer to annexure 2):

- Demographic section
- Network analysis section
- Likert – scale type question section

The construction of the quantitative questionnaire was solely possible due to the qualitative focus groups, which provided information required for the construction of the questionnaires. The questionnaires were filled utilising personal interviews with the respondents by the researcher in East London. A

suitable individual (research experience at Doctoral level) with ample research experience duplicated the process (following a suitable briefing) at Texas Southern University since the researcher was unable to travel due to financial constraints.

Arnold *et al.* (1998:56) reiterate the fact that some questionnaires need to be filled in by the researcher in person for various reasons. In this specific instance it was due to the following reasons already established during the pilot study:

- Personal face-to-face contact by a person known to the respondent due to the sensitivity of information required,
- Difficulties associated with filling in the social network data matrix correctly. Having two researchers fill in these sections also improved inter-coder reliability,
- A scheduled interview results in an outcome, whereas a e-mailed questionnaire, due to low perceived priority, could lie on a person's desk for a long while before it is filled in, if ever.

Questionnaires filled in during personal interviews (also referred to as a structured interview, *cf.* Arnold *et al.*, 1998:56) are said to have the following advantages (Greenbaum, 1998:5):

- A participant is inhibited from talking in a group due to a competitive situation. Some companies prohibit their employees from participating in focus groups but allow them to be interviewed in a one-on-one session for this reason,
- The product category is highly complex, and additional time is needed to ensure that the participant understands the question,
- A one-on-one may provide significantly more in-depth information than is possible with other forms of research because concentrated time is spent on the topic with each participant.

Since the information collected concerned was highly sensitive in nature and the researchers were known to the respondents in a working capacity, this method of data collection seemed most appropriate for achieving the specific research aims.

Demographic data were in the format of seven questions pertaining to physical location, name, surname, gender, age, home language and length of use. For ease of use the questions pertaining to gender, age, home language and length of use were distributed in categories established during the pilot study.

Network analysis data was collected through social matrixes (refer sec 4.6). The concept of social matrixes was explained and respondents were asked to consider all of the possible relations. The existence of a significant tie was indicated with a "1" and no tie with a "0".

Respondents were simply read the Likert – scale type questions and asked for a response ranging between "strongly agree", "agree", "neutral", "disagree" and "strongly disagree". For the purposes of validity respondents were shown the filled-in questionnaire afterwards for their approval.

4.6 Data analysis methods used

Data analysis includes a discussion on focus group analysis of video-recorded data and various methods employed to analyse the data in the questionnaire.

4.6.1 Video recording of focus groups

The practise of audio- and video-recording of focus groups has been well documented (Buseh & McElmurry, 2002:176). Gordon and Langmaid (*in* Catterall & Maclaran, 1997:2) describe two methods of analysing video-recorded information. One of these methods suggests categorising segments of information under themes and headings identified prior to conducting focus

groups. These categories and headings should be identified in conjunction with the client (in the case of market research) or with an opinion leader on the subject.

Focus groups held were therefore video-recorded for the purpose of analysis. The video-recordings were played back and analysed through observation of both verbal and non-verbal data.

Before engaging in the focus group analyses, a meeting was held with the videoconferencing scheduler for the development of categories (as described by Catterall & Maclaran, 1997:2) for the analysis of information gathered.

These categories were as follows:

- Verbal reactions to the questions posed,
- Non - verbal reactions to the questions posed,
- General social communication network functioning utilising the videoconferencing system,
- Identification of key-management variables required for the quantitative phase of the research,
- The effect of the videoconferencing system itself on the communication process.

Following the above-mentioned steps, general notes were compiled (as described by Catterall & Maclaran, 1997:2) for the purpose of writing interpretative thoughts on the subject. The observations were therefore aimed at:

- Determination of the general feeling exhibited by participants with regards to the quality of communication practises and communication management performance,
- Determination of the communication policies and practises applied by management to regulate videoconferencing communication practises with

reference to social network practises,

- Gaining an understanding of the perceptions of communication network members of the organisations policies and practises applied by management and the extent to which it has an influence on the output of the social network,
- The identification of key management issues required to answer the research question pertaining to the perceived effectiveness of management of the quality of communication within the respective social networks as per key management issue.

During the focus group sessions it emerged clearly that a distinction should be made between TELP Management and the Critical Friends Group (CFG – refer section 4.4.1) throughout all levels of analysis (focus groups, questionnaires and network analysis) methods. This enabled the researcher to distinguish between management (and the perception they have of themselves as well as the CFG) and the rest of the group (and the perception they have of themselves as well as the CFG). This furthermore enabled a level of analysis for cross-comparison purposes, especially where perceptions regarding organisational policies and practises are relevant.

4.6.2 Questionnaires: data analysis methods

Questionnaires consisted of the following sections (refer annexure 2):

- Demographic section for identification of descriptive statistics,
- Network analysis section for analysis with UCINET with reference to system, clique and individual level of analysis,
- Likert – scale type questions section for the purposes of frequency tables and cross – tabulations.

Analysis of these three sets of data will now be discussed in turn:

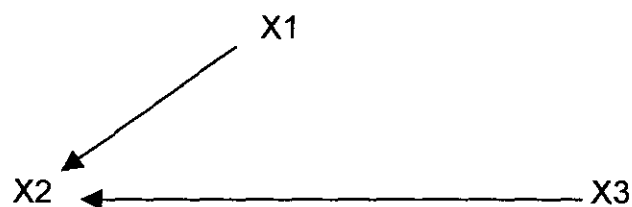
The demographic data Demographic data included physical location, gender, age, home language and length of use. The data collected was furthermore cross – tabulated with data collected from the Likert – scale type questions.

The network analysis data, collected in the format of social matrixes, was entered into a microcomputer program called UCINET. The purpose of entering the data into a computer program like UCINET is described below:

Relationships can be displayed visually through sociograms, or socio - network diagrams, which display graphically the relationships that exist between social network members (Parker *et al.*, 2001:27). Such relationships can be illustrated qualitatively by drawing the relationships between the individuals by hand, based on the results of the centrality variables obtained (De Wet, 1991:182), or quantitatively using a computer program that uses the data directly obtained through a social network analyses program (e.g. UCINET), such as Krackplot (Haythornwaite, 2001:218).

These drawings visually illustrate these relationships and vary naturally through the multivariate conditions in which they exist. (Refer to Figure 3).

Figure 3 Directional representation of relationships perceived by X_1 and X_3



Once the social matrixes were entered into UCINET, the program was used to analyse data on three levels:

- Individual level of analysis,
- Clique level of analysis,
- System level of analysis.

On an individual level, social network analysis allows us to understand relationships between people. It highlights the central individuals in a network, those playing important information - brokering roles or acting as boundary spanners and the peripheral, unused members (Parker *et al.*, 2001:25).

Various variables exist that could be used to identify these individuals on a specific social network. In this study an analysis of centrality variables was done.

Centrality examines the overall patterns of relations in the network (Durrington *et al.*, 2000:16), and high centrality would mean that an actor of a network would have a large number of connections with individuals in their immediate environment (Scott, 1991:37).

Centrality is further defined as (MacEvoy and Freeman, 1987:49):

“Centrality calculates a whole set of graph – theory based properties of actors, actor pairs, and networks, including measures of actor distance, degree, betweenness and closeness, and network indices of density and centrality”

Centrality, at the individual level of analysis, can be measured through the following variables (Freeman 1979:120):

- Point in/Point out degree are derived from the term degree, simply referring to the number of employees an individual is directly connected with, with point in or point out acting as an indicator of the direction of connectedness (Freeman *in* Burkhardt & Brass, 1990:113, Ahuja *et al.*, 1999,18, Scott, 1991:86). Degree is calculated by selecting the number of times an individual is nominated by fellow employees on the matrix in a specific direction, i.e. in or out, in referring to the number of times others have nominated the individual, and out the number of times the individual have nominated others. Individual point in/out scores can be approximated to calculate the average point in/out score, in other words, an individual with a point out score of 16 and point in score of 14 would have an average point/out score of 15 ($=16+14/2$). This results in a single score that makes the different scores between the actors comparable.
- Betweenness is used to measure the prevalence of structural holes or to indicate unconnected social groups (Mehra *in* Pappas & Wooldridge, 2002:2). Betweenness is defined by De Wet (1995:8) as "*the control of information flow within a network*", and in terms of the description from Scott (1991:90), it is "... *betweenness proportion of a point Y for a particular set of points X and Z is defined as the proportion of geodesics connecting that pair that pass through Y, it measures the extent to which Y is between X and Z...*". Mathematically betweenness, is a function of pair-dependency (Freeman, 1980:587), and calculates the sum of the ordered and unordered pairs (Freeman, 1980:591).
- Closeness examines how near an individual is to others in the social network (Durrington *et al.*, 2000:19), or strong social connectivity (Pappas & Wooldridge, 2002:2). Knoke and Kulinski (*in* Pappas & Wooldridge, 2002:2) further defines closeness as "... *that typifies actors' involvement in the social network and is expressed in terms of network density, distance and social proximity*". On an individual level of analysis the closeness score reflects distance and proximity, and, over and above

considering the structural relationships that it has with betweenness, was defined by De Wet (1995:9) as the degree of independence an actor has in relation to all other actors. Burkhardt and Brass (1990:113) state that the *“the closeness measure of centrality accounts for both direct and indirect links and conceptually represents ease of access to others”* and De Wet (1991:160) points out that the lower the closeness score the *“more independent an actor, and potentially speaking, the more efficiently communication messages can be transmitted to another actor”*. It was furthermore added by Ibarra and Andrews (1993:287), that *“this formulation assumes that centralisation is increased positively by connections to others who are highly central and assigns the highest level of centrality to the actors with the closest relations (that is, direct or short indirect links) with many central actors...”*. It should be noted that the closeness measure, as with betweenness, is a function of pair-dependency (Freeman, 1980:591). It should however be noted that closeness calculates the number of intermediate points connecting a geodesic, as opposed to betweenness which is merely the sum of the ordered and unordered pairs (Freeman, 1980:591).

On the second level, clique level of analysis, Rogers and Kincaid (in De Wet, 1991:115) regard a clique as a subsystem, who interact with one another more frequently than others in a communication system. This definition is added to by Burt (in Contractor & Eisenberg, 1990:153) as *“the structural equivalence of a clique is the extent to which a group of members share a similar pattern of communication with others in the network”*.

Clique level of analysis implies the identification and reconstruction of cliques using the CONCOR (Convergence of iterated relations) program provided in the UCINET package. Cliques were identified using block and matrix densities.

Density has been defined by Haythornwaite (2001:219) as *“the number of pairs connected relative to the maximum possible connections”*.

Where block values revealed a value greater than the calculated matrix density then the existence of a strong and significant tie can be assumed (De Wet, 1995:9). Groups of individuals revealing a similar score in specific strong ties are identified as cliques, also known as block modelling.

The third level of analysis, system level of analysis takes place *ipso facto* clique level of analysis. Once all the significant cliques within a network have been revealed through using matrix and clique density, the "image" of the system emerges and all the possible relations between the different network members would have been revealed, studied and the system as a whole examined.

Network data was collected in the form of social matrixes. The use of social networks for analysis purposes is discussed below:

Social networks, derived from social matrixes, is based on the notion that individual behaviours are embedded within networks of interpersonal relations (Granovetter *in* Pappas & Woolridge, 2002:2), and has been formally defined by Corman and Scott (*in* Daniels *et al.*, 1997:113), stressing the *perceived network perspective* as:

"The network is a structure of perceived communication relationships. It is a kind of latent knowledge that guides members' manifest communication behaviour. We believe that members' reports of communication reflect this knowledge, and not their recollections of specific communication episodes"

Mathematically Doreian (2001:81) defines it as:

"The most straightforward definition of a social network is $G=(V,R)$ where V is a set of social actors and R is a social relation defined over the elements of V . Each element of R is a pair of elements from V with R subset $V \times V$, the Cartesian product of V with itself. Put differently, for $i,j \in V$, iRj means

(i,j) epsilon R. The relational ties are binary (0,1) or have magnitude."

Both information and systems theory supply the conceptual underpinning for using networks as the basic units of analysis to define and explain patterns of information flow in the organisation (Heath & Bryant, 1992:239). The tradition of viewing organisations as systems has a long intellectual history (Katz & Kahn 1966:11), and has recently been categorised as "complex systems theory" (Morel & Ramanujam, 1999:278). It was stated by Morel and Ramanujam (1999:278) that social network analysis are "compelling for studying complex systems theory in organisations" due to the fact that it can illustrate "self - organisation" and compare it to hierarchical organisation in the organisation.

Social matrixes are required for quantitative measuring of social networks. A social matrix is described by Scott (1991:39) as:

"At its simplest, a data matrix comprises a table of figures, a pattern of rows and columns, drawn on paper. ... Whatever the physical form taken, the logical structure of a data matrix is that of a table. In variable analysis, attribute data can be organised in a case-by-variable matrix. Each case studied is represented by a row in the matrix, whilst the column refers to the variables on which their attributes are measured..."

Kretschmer (2002:476) mathematically states that *"if all the possible relations are recorded from the point of view of every individual person (with X) to all the other persons (with Y) then a symmetrical matrix of Z_{xy} is obtained."*

Refer to Table 2 for an illustration of a symmetrical data matrix.

Table 2 Symmetrical data matrix

	X_1	X_2	X_3
X_1	-		
X_2		-	
X_3			-

Firstly it should be realised that it is accepted that an actor cannot have a relationship with him/herself, therefore X_1 will never be equal to X_1 . Before explaining all of the possible arising relationships from such a data matrix, it should be noted that all relationships are considered reciprocal. In other words, X_1 may perceive that a strong relationship exists with X_2 (=1), whilst X_2 may not perceive that he/she has a strong relationship with X_1 (=0). If X_1 is viewed as an actor keeping in mind all of the possible reciprocated relationships, all the possible relationships with X_n are as follows:

- X_1 and X_2
- X_1 and X_3

and reciprocal:

- X_2 and X_1
- X_2 and X_1

and reciprocal:

- X_3 and X_1
- X_3 and X_2

As an example, presuppose that there are only relationships between X_1 and X_2 as well as X_3 and X_2 , non - reciprocated. If the social matrix is plotted whereby 1=relationship and 0=no relationship, the example illustrated is

reflected in Table 3:

Table 3 Symmetrical matrix with relations between X1 and X2 as well as X3 and X2

	X ₁	X ₂	X ₃
X ₁	-	0	0
X ₂	1	-	1
X ₃	0	0	-

These matrixes can be extended to have X_n number of relationships.

The specific social matrixes used for the collection of data are displayed in annexure 2.

Note that it was deemed necessary by the videoconferencing scheduler to assign abbreviations to the names of individuals since the privacy of individuals should be respected.

Likert – scale data analysis type questions included the analysis of ordinary frequency tables (describing mean, median, standard deviation, minimum and maximum). These frequency tables were also cross-tabulated by site, age, gender and length of use. Percentage frequency distribution bar charts were used to display the results of selected questions for visual interpretation of central tendencies.

Whilst cross-tabulations do not give the same analysis of multivariate situations as factorial design (Trochum, 2002:2), it does allow the researcher to examine the effect of two variables. In this way various variables could be examined, allowing for the identification of dependent and independent variables.

Cross-tabulations have been proven to be essential in studies which combine qualitative and quantitative techniques in social network settings (Bengsston-Tops & Hansson, 2001:67), which increase validity and reliability of the study through comparison and cross-referencing the data with network analysis data.

4.7 Reliability of the research

The combination of quantitative and qualitative research methods, as with this study, has been defined as triangulation. The process of triangulation in the social sciences has been described as early as 1966 (Webb *in* Jankowski & Wester, 1993:62):

“ If no single measurement class is perfect, neither is any scientifically useless ... for the most fertile research for validity comes from a combined series of different measures, each with its idiosyncratic weakness, each pointed to a single hypotheses ...”

This research project utilises a combination of qualitative and quantitative methodologies that can be cross – referenced to determine internal validity and construction, as well as a pilot study that tested the research design before actual measurement in the research domain.

Fielding and Schrier (2001:2) cite Denzin (*cf* 1970) as the first sociological scientist to introduce the term triangulation, whilst Kelle (*in* Fielding & Schrier, 2001:2) stated that the term has one of three meanings:

- triangulation as the mutual validation of results obtained on the basis of different methods (the validity model),
- triangulation as a means toward obtaining a larger, more complete picture of the phenomenon under study (the complementarity model), and

- triangulation in its original trigonometrical sense, indicating that a combination of methods is necessary in order to gain any (not necessarily a fuller) picture of the relevant phenomenon (the trigonometry model).

The specific application for this research therefore lies with Kelller's models (2) and (3), whereby a more complete and fuller picture is gained, and both qualitative (focus groups) and quantitative (questionnaire) methods are employed to gain understanding of the results obtained.

Reliability was strengthened through the processes of triangulation of qualitative and quantitative data as well as the use of a pilot study that refined the necessary steps taken during the research process.

Quantitative data collected was tested with reliability statistics which included the correlation procedure, simple statistics and Cronbach's coefficient alpha (SPSS, 2002: 2). Cronbach's coefficient alpha returned a score of 0.807092 (raw) and 0.816689 (standardised). Construct validity (SPSS, 2002: 2) was tested with the SPSS factor procedure with final communality estimates, an orthogonal transformation matrix as well as the rotated factor pattern (refer annexure 4.4 for detailed analysis). All of the above-mentioned procedures returned results well within acceptable levels.

4.8 Data presentation and privacy issues

Due to the sensitive nature of network analysis data, individual's names' were assigned different abbreviations, like A1, A2, etc. This protects the privacy of the specific individuals involved, within reasonable limits, where possible. For the purposes of analyses a short description was given for each specific position occupied in TELP. These descriptions were presented in section 5.4.

4.9 Conclusion

The manifestation of a social network through videoconferencing has taken place at the ECT through the collaboration efforts with Texas Southern University. These collaboration efforts are of the utmost importance, since the region is the most underdeveloped and impoverished in South Africa. Lecturers and academic staff require international exposure as part of their development, and due to the cost implications of international exposure, are most often denied these privileges.

Videoconferencing as a medium of communication, although not entirely comparable to a face-to-face setting, allows for academic staff to obtain the needed international exposure that is required.

The social network which has manifested itself through videoconferencing as communication medium, can best be analysed through social network analysis methods, which will indicate how the network is structured and how the communication patterns have manifested. These communication patterns can be measured and cross-referenced against other variables like age and geographic location, and furthermore, descriptive statistics can be used to analyse Likert - scale data dealing with management of the videoconferencing system and social network type questions.

Reliability of statistical data can be tested through reliability statistics such as the Alpha-Cronbach coefficient and confidence intervals. Social network analysis data can be enhanced through comparison with empirical data, and triangulatory methods in data collection (qualitative focus groups and quantitative questionnaires) further enhances both validity and reliability. The next chapter will include an analysis of the data and findings of the study.

CHAPTER 5: DATA PRESENTATION, ANALYSIS AND FINDINGS OF THE RESEARCH

5.1 Introduction

Following an overview of research methodology applied in chapter four, chapter five presents the data on the analysis in a variety of ways. Data is presented by making a clear distinction between demographic data, focus groups, Likert – scale type data and network analysis data. Network analysis data was analysed with UCINET version 3.1. Network analysis data is reported in the three levels, individual, clique and systems level of analysis.

Individual level of analysis contains an overview of the results obtained from centrality variables, including average point in/out, betweenness and closeness. Clique level of analysis consists of block modelling through structural equivalence through examining block and matrix densities. System level of analysis examines the TELP programme as an intact system through examination of matrix density scores obtained by both TELP management and the TELP critical friends group (refer section 4.4.1, Chapter 4).

The presentation of the data is followed by findings and observations. The discussion pertaining to findings only takes into account the data presented in the Likert – scale type questions and the network analysis data, since all other forms of data collection was done for the sole purpose of construction of the questionnaire which contained demographic data, Likert – scale type questions and network analysis data.

5.2 Data Presentation

Data is presented in the following order:

- Firstly, demographic data is displayed in ordinary tables easily identifiable with general characteristics being easily identifiable to the reader. This is followed by a short discussion on the results obtained. Detailed analysis of further demographic data is attached as annexure 4.1.
- Secondly, a short discussion follows on the assignment of abbreviations to individuals names in order to accommodate privacy issues.
- Thirdly, major qualitative observations obtained from focus groups are displayed in the form of a discussion.
- Fourthly, results obtained from descriptive statistics using Likert – scale type questions are displayed. This is done through analysing results obtained for every question by analysing frequency tables and cross-tabulations of selected sets of data. This is followed by a discussion on results obtained for different data sets. Further detailed analysis, resulting in the discussion pertaining to this chapter of Likert - scale data is attached as annexure 4.2, cross-tabulations as annexure 4.3, and reliability statistics, including Cronbach Coefficient Alpha, the rotated factor pattern and communality estimates as annexure 4.4.
- Fifthly, network analysis data is displayed. This is done by analysing data on individual, clique and systems level. Detailed network analysis data is attached as annexure 3, with annexure 3.1 containing individual level of analysis data and 3.2 containing clique and system level of analysis data.

5.3 Demographics

Demographic information was obtained through Section A in the questionnaire (refer to annexure 2 for the questionnaire). Data on gender, age and home language was obtained. Results from the above - mentioned variables are presented in Table 4.

Table 4 Demographic data – gender, age and home language

Gender	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Female	9	45	9	45
Male	11	55	20	100
Age	Frequency	Percent	Cumulative Frequency	Cumulative Percent
25-34	5	25	5	25
35-49	10	50	15	75
50-59	4	20	19	95
60+	1	5	20	100
Language	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Afrikaans	3	15	3	15
English	11	55	14	70
Other	6	30	20	100

If Table 4 is examined, it should be noted that the distribution between males and females are fairly equal (45% females and 55% males), whilst the majority of the respondents (50%) fell within the 35 – 49 age category. This is followed by the age category 25 – 34 (25%), 50 – 59 (20%) and lastly by the 60+ category (5%). The majority of respondents described English as their home language (55%), Afrikaans (15%) and other (30%). The majority of the

“other” category included Xhosa-speaking people, due to the geographical location of the Eastern Cape Technikon.

Further detailed analysis of demographic data is included as annexure 4.1.

5.4 Privacy issues and individual identification

Due to the sensitive nature of network analysis data, individual's names' are assigned different abbreviations like A1, A2, etc. This protects the privacy of the specific individuals involved, within reasonable limits, where possible. It is however required, for the purposes of analyses, that a short description be given of the position that a specific individual occupies within TELP. These individuals are therefore listed as follows:

- The TSU (Texas Southern University) group: The TSU group consists of six individuals, headed by a Dean of the faculty (hereafter referred to as TSU management) and a TELP videoconferencing co-ordinator. The other four individuals represents the TSU critical friends group (Individuals A1-6),
- Visiting Professor in South Africa based at the ECT (Individual B1),
- TELP co-ordinator in South Africa (Individual C1),
- TELP Management in South Africa, consisting of the Vice Principal of the ECT and the Director of Research (Individuals D1 and D2),
- TELP trainers at the ECT, including one from a neighbouring partner technikon (Individuals E1, E2 and E3),
- Receivers of TELP Training at the ECT (Individuals F1- F7).

It should be noted that the TELP trainers and the receivers of TELP training are commonly referred to as the critical friends group, or CFG. All the other individuals are referred to as TELP management.

5.5 Focus groups: data analysis and observations

Two focus groups were held on 7 June and 26 June 2002 respectively. Focus groups were video-recorded for the purposes of analyses. (Refer to annexure 1 for a copy of the moderator guide, videotapes available from the author by request). The focus group held on the 7th June was with respondents from the ECT in a face-to-face setting and on the 26th with respondents at TSU in a videoconferencing setting. The basic reasoning for holding the ECT focus group first was based on the fact that it is more difficult to conduct a focus group across continents using videoconferencing, and that the ECT session would act as a preliminary session for the TSU session.

It was decided during the interview with the TELP co-ordinator in South Africa, that the focus groups should not consist of more than four respondents due to operational constraints introduced by the videoconferencing system, and furthermore, that four individuals, within the ECT and TSU settings of the focus groups, would be representative of the groups mentioned above.

The ECT focus group was the first to be administered and consisted of the following individuals:

- B1, Visiting Professor in South Africa,
- E1, TELP Trainer in South Africa,
- F1, Receiver of TELP training,
- The videoconferencing co-ordinator in South Africa.

Whilst it was agreed with the ECT TELP co-ordinator that the videoconferencing co-ordinator in South Africa should not be included in the network analysis (since the co-ordinator performs no communicative function in terms of the TELP project), it was decided that the person should be included in the focus group discussion since valuable input in terms of videoconferencing usage by the TELP group could be given.

It was felt that individual B1, who had been interacting closely with individuals D1 and D2 (management) would be most suitable since the person could represent both ECT management and Texas Southern University management views within the local group. The individuals F1 and E1 were chosen by chance from their respective groups to represent TELP training and receiving of training respectively.

The TSU focus group consisted of the TELP videoconferencing co-ordinator and three other members of the critical friends group (refer to section 4.4.1 for explanation of members belonging to this group). The TELP videoconferencing co-ordinator did not only contribute to the actual discussion, but also co-ordinated and prepared the group at TSU.

Following analysis of the video material, major qualitative observations from the ECT focus group included the following:

- That the key management variables are not clearly definable due to different perceptions with regards to TELP's role. The only clearly definable difference, not stated by participants but observed by the researcher, is that a major difference exists between those members belonging to TELP management and TELP critical friends. The TELP critical friends group seemed to be inclusive of the critical friends group at TSU and ECT trainers and receivers of training,
- The group felt that, although there are no restrictions placed on their communication from management, especially with regard to the fact that the videoconferencing system was a new addition as communication tool, they were not actively aware of *any communication policies and practises* from management, since management is not clearly visible in the application of the system overall, even outside of the TELP setting.

Following analysis of the video material, major qualitative observations from the TSU focus group included the following:

- As with the ECT group, the group found it difficult to define key management variables. It was however noticeable that this specific group seemed more confident (non-verbal and verbal observational variables) than the ECT group, especially where probing questions with regard to the role of Texas Southern University management were concerned.
- It was stated unequivocally by the group that TELP management places no restrictions on communication activities using the videoconferencing system, and that the system management is dependent on the fact that Texas Southern University *“is on the forefront in the world on developing new communication technology”*, and that the output of the group, subsequently, is of the best in the world.

5.6 Likert – scale data analysis

This section will provide a general overview of the results obtained from Likert-scale data analysis. Likert-scale data is presented through elementary descriptive statistical results, cumulative frequency scores and cross comparisons. For further detailed analysis refer to annexure 4.2 and 4.3.

5.6.1 General overview

Table 5 refers to results obtained from Likert-scale questions of the questionnaire (Section “C” - refer annexure 4.2) and contain results from questions C1 – C8.2 on the scale from 1 to 5 (1= strongly disagree, 5 = strongly agree).

The results from Table 5 are displayed below:

Table 5 Likert – scale analysis: elementary descriptive data

Variable	N	Mean	Std Dev	Sum	Min.	Max.
<i>Compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities</i>						
C1	20	3.15	1.18	63	1	5
<i>The videoconferencing system creates new relationships between participants</i>						
C2	20	4	0.72	80	2	5
<i>A strong, clear management policy regarding videoconferencing utilisation exists</i>						
C3	20	2.45	0.94	49	1	4
<i>Management will always investigate using the videoconferencing system when a request for flying is made</i>						
C4	20	3.05	1.39	61	1	5
<i>Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives</i>						
C5	20	3.70	0.65	74	2	4
<i>Workgroups that emerge during videoconferencing improve the quality of communication in the organisation</i>						
C6	20	3.80	0.83	76	2	5

Table 5 Likert – scale analysis: elementary descriptive data (continued)

Variable	N	Mean	Std Dev	Sum	Min.	Max.
<i>Employees can utilise videoconferencing systems cost – effectively</i>						
C7	20	3.05	0.99	61	2	5
<i>TELP management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme:</i>						
<i>8.1 TELP project management</i>						
C8.1	20	3.45	1.09	69	2	5
<i>8.2 TELP training / Critical Friends Group</i>						
C8.2	20	4	0.79	80	2	5

(1=Strongly Agree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

If the results from Table 5 are examined, the following observations can be made:

1. The following questions yielded a “disagree” or “strongly disagree” response:

C3 A strong, clear management policy regarding videoconferencing utilisation exists (mean = 2,45)

2. The following questions yielded a “neutral” response:

C1 Compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities (mean = 3,15)

C4 Management will always investigate the probability of using the videoconferencing system if a request for flying is made (mean = 3,05)

C7 Employees using videoconferencing know how many people must be present for the videoconference to be cost – effective (mean = 3,05)

3. The following questions yielded an “agree” or “strongly agree” response:

C2 The videoconferencing system creates new relationships between participants (mean = 4,0)

C5 Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives (mean = 3,7)

C6 Workgroups that emerge during videoconferencing improve the quality of communication in the organisation (mean = 3,8)

C8 TELP management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme:

C8.1 TELP project management (mean = 3,45)

C8.2 TELP training / Critical Friends Group (mean = 4,0)

The major observations regarding this analysis are as follows:

- No strong clearly defined management policy regarding videoconferencing utilisation exists,
- Respondents are ambivalent towards issues concerning the sharing of information and cost – effectiveness of the system as an alternative to flying,
- Respondents clearly showed a positive response towards videoconferencing and the forging of new relationships, workgroup effectiveness, improving the quality of communication in the organisation and ensuring maximum output of the TELP programme,
- The key management issues revealed a positive response, with TELP training yielding a higher score than TELP project management.

5.6.2 Management and videoconferencing

The management type questions, C3, C4, C8.1 and C8.2, yielded the following results:

- C3 A strong, clear management policy regarding videoconferencing utilisation exists (mean = 2,45)*
- C4 Management will always investigate the probability of using the videoconferencing system when a request for flying to a remote location is made (mean = 3,05)*
- C8 TELP management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme:*
 - C8_1 TELP project management (mean = 3,45)*
 - C8_2 TELP training / Critical Friends Group (mean = 4,0)*

Investigations from the above revealed that individuals identified for the study could easily be classified as “management” or “critical friends group”. It could further be expected that individuals from management would have a different opinion of their own management policies and practises than those individuals being managed (the critical friends group). The average responses from the management group for the management type questions (C3,C4, C8.1 and C8.2) were therefore plotted separately from those who are being managed (critical friends group) in order to observe the difference between management perceptions and those being managed. These results are displayed in Table 6.

Table 6 Differences in perception regarding videoconferencing management policies between management and the critical friends group (questions C3, C4, C8.1 and C8.2)

Responses: Management only					
Question number	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C3	3	3	4	2	0
C4	2	3	2	2	3
C8.1	0	2	2	4	4
C8.2	0	0	1	6	5
Responses: Critical friends group only					
C3	1	2	5	0	0
C4	1	2	2	2	1
C8.1	0	3	3	2	0
C8.2	0	1	2	5	0
Cumulative frequency scores					
Management	0.10	0.16	0.18	0.29	0.25
Critical friends	0.06	0.25	0.37	0.28	0.03

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g strongly disagree) for a specific group (e.g. critical friends) by the total number of responses (e.g. 2 strongly disagree responses from the critical group out of a total of 32 responses = $2/32 = 0.06$)

The specific results of these questions, by dividing members of management and the critical friends group into two distinctive sets of data, are displayed in Figure 4.

Figure 4 Difference in perception regarding videoconferencing management policies between management and the critical friends group (questions C3, C4, C8.1 and C8.2)

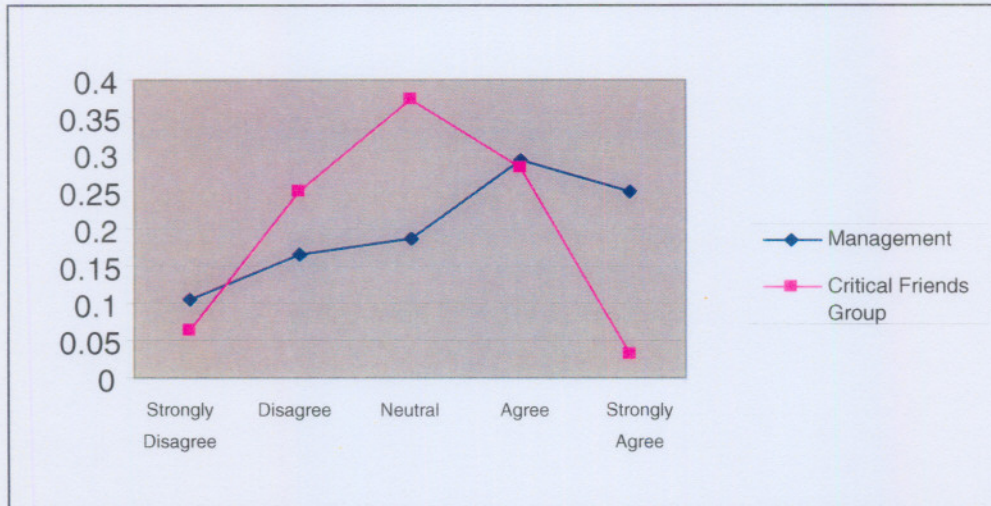


Figure 4 revealed that the management of the TELP project as opposed to the CFG showed a far more general positive orientation to the success of their:

- Management policy with regards to videoconferencing utilisation,
- Management of cost - control with regards to videoconferencing utilisation,
- Effective management of the videoconferencing system to ensure maximum output of both the TELP management and critical friends group.

5.6.3 Management site and videoconferencing

The above results can be substantiated by comparing these results to the total number of responses in each physical location (site). The total number of responses per site is displayed in Table 7.

Table 7 Differences in perception regarding videoconferencing management policies at different sites (questions C3, C4, C8.1 and C8.2)

All responses						
Site*	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
BTW	1	4	2	6	3	16
EL	2	8	10	13	3	36
QTN	0	2	1	1	0	4
USA	0	1	4	10	9	24
Cumulative frequency scores						
BTW	0.06	0.25	0.12	0.37	0.18	1
EL	0.05	0.22	0.27	0.36	0.08	1
QTN	0	0.5	0.25	0.25	0	1
USA	0	0.04	0.16	0.41	0.37	1

*(BTW = Butterworth, EL = East London, QTN = Queenstown, USA = United States of America)

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g. strongly disagree) for a specific group (e.g. Butterworth) by the total number of responses (e.g. 1 strongly disagree response from Butterworth out of a total of 16 responses = $1/16 = 0.06$)

This comparison of site to the two groups, management and critical friends, is significant due to the fact that the majority of the management individuals are located in Butterworth and the USA. It could therefore be expected that the majority of positive responses would originate from Butterworth and the USA.

This comparison furthermore indicates which management group (Butterworth or the USA) is more positive in their general response than the other. The results from table 7 are presented in Figure 5.

Figure 5 Difference in perception regarding videoconferencing management policies at different sites (questions C3, C4, C8.1 and C8.2)

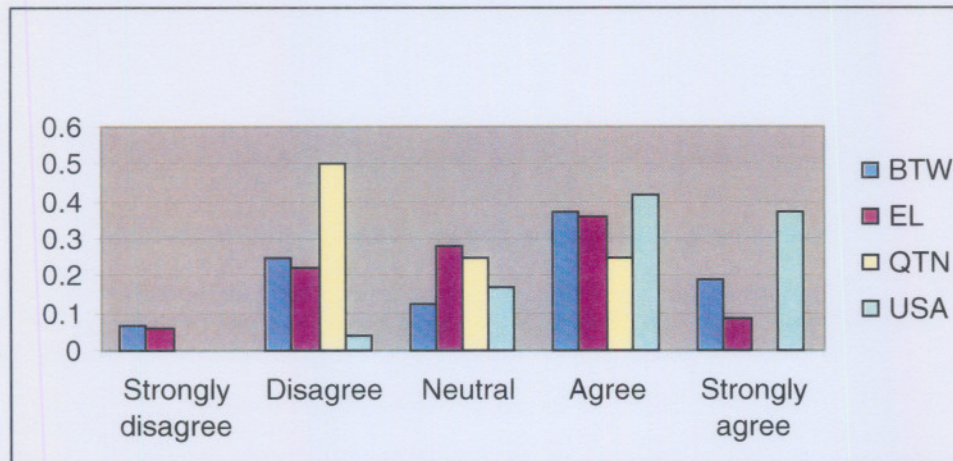


Figure 5 is a representation of results obtained from the following questions:

1. Site:

(BTW) = Butterworth, (EL) = East London, (QTN) = Queenstown,
(USA) = United States of America

2. Questions:

3. A strong, clear management policy regarding videoconferencing utilisation exists

4. Management will always investigate the probability of using the videoconferencing system when a request for flying to a remote location is made

8. TELP Management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme:

8.1 TELP project management

8.2 TELP training / Critical Friends Group

If Figure 5 is examined, the following observations can be made:

- Management members are distinctly more positive towards management policy type questions compared to ordinary critical friends group members
- That the USA yielded a more positive (strongly agree, agree and neutral) score than any other site,
- That Butterworth had the second most strongly agree scores after the USA, and in general shows that this location are the second most "positive" site,
- That East London can be rated as the third most positive site,
- That Queenstown, having no members of management, scored the least "positive" score than any other site.

Figure 5 therefore substantiates expectations and furthermore indicates that, in general, that the USA management group yields more positive responses than the Butterworth management group with reference to the current perceived videoconferencing management policy.

5.6.4 The quality of communication and videoconferencing

The quality of communication type questions can be identified as questions C2 and C5, which read as follows:

- C2 *The videoconferencing system creates new relationships between participants (mean = 4,0)*
- C5 *Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives (mean = 3,7)*

The difference in the perception of quality of communication between the management and critical friends group can be calculated by comparing the cumulative frequency scores of these two questions between these two

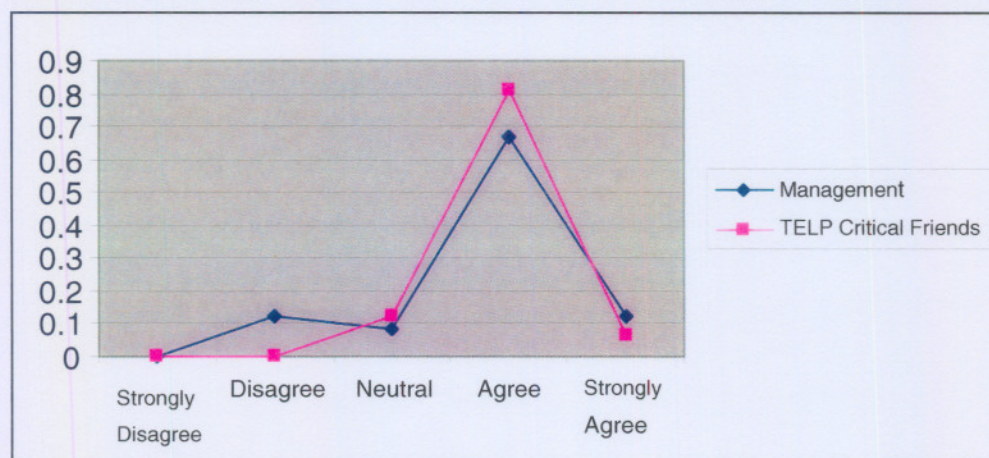
groups. The results obtained from this comparison are displayed in Table 8.

Table 8 Differences in perception regarding quality of communication between management and the critical friends group (questions C2, C5)

Responses: Management only					
Question number	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C2	0	1	1	7	3
C5	0	2	1	9	0
Responses: Critical friends group only					
C2	0	0	1	6	1
C5	0	0	1	7	0
Cumulative Frequency scores					
Management	0	0.12	0.08	0.66	0.12
Critical friends	0	0	0.12	0.81	0.06

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g. disagree) for a specific group (e.g. management) by the total number of responses (e.g. 3 disagree responses from the management group out of a total of 24 responses = $3/24 = 0.125$). The specific results of these questions are displayed in Figure 6.

Figure 6 Difference of perception regarding quality of communication between management and the critical friends group (questions C2 and



If the above results are examined, it is noticeable that similar trends are to be seen in responses from the two groups, although it is clear that the critical friends group tends to be a little bit more “positive” than the management group with a 0.1% “disagree” response. This can be explained against the backdrop of the scenario that the critical friends group experiences the videoconferencing system more “first hand” than the management group, hence the more positive response on quality of communication type questions. The above results can be substantiated by comparing these results to the total number of responses of the length of use variable. The total number of responses per length of use categories is displayed in Table 9.

Table 9 Differences in perception regarding quality of communication in different length of use categories (questions C2 and C5)

All responses						
Length of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
>6m	0	0	1	9	1	11
6m-1yr	0	2	1	4	1	8
1-2 yr	0	0	1	8	1	10
2 - 4yr	0	0	0	2	0	2
4y +	0	0	1	6	1	8
Cumulative frequency scores						
>6m	0	0	0.09	0.81	0.09	1
6m-1yr	0	0.25	0.12	0.5	0.12	1
1-2 yr	0	0	0.1	0.8	0.1	1
2 - 4yr	0	0	0	1	0	1
4y +	0	0	0.12	0.75	0.12	1

The results depicted in Table 9 are displayed in Figure 7:

Figure 7 Differences in perception regarding quality of communication in different length of use categories (questions C2 and C5)

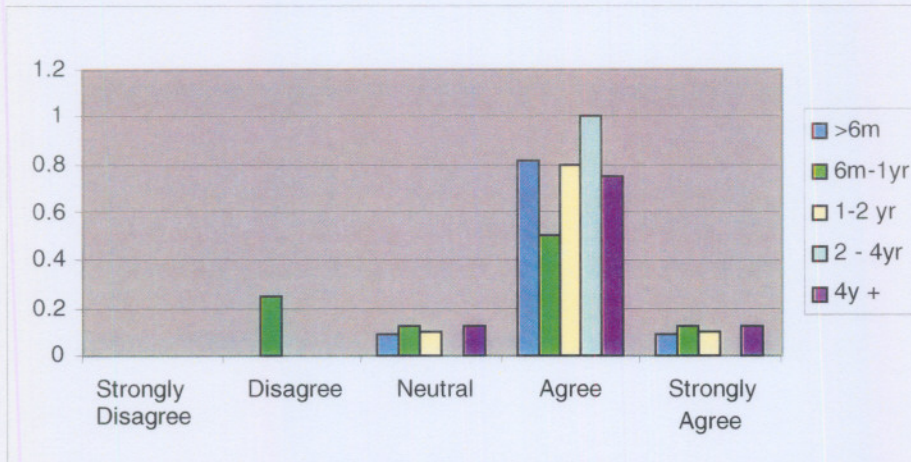


Figure 7 is a representation of results obtained from the following questions:

Quality of communication questions: questions C2 and C5:

2. *The videoconferencing system creates new relationships between participants*
5. *Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives.*

If Figure 7 is examined, it can be seen that the 4years + category showed the best distribution (peaking at "agree" with lower scores at "neutral" and "strongly agree"), whilst respondents in the 2 - 4 year category all indicated "agree". The poorest distribution was among respondents that have been using the system for 6 months - 1 year. Overall it is relatively clear that respondents were satisfied with the quality of communication produced by the videoconferencing system.

5.6.5 Videoconferencing and the efficiency of videoconferencing communication

The efficiency of videoconferencing communication - type questions can be identified as C1 and C6. These questions were as follows:

- C1 *Compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities (mean = 3,15)*
- C6 *Workgroups that emerge during videoconferencing improve the quality of communication in the organisation (mean = 3,8)*

The difference in the perception of efficiency of videoconferencing communication between the management and critical friends group can be calculated by comparing the cumulative frequency scores of these two questions between these two groups. The results obtained from this comparison are displayed in Table 10.

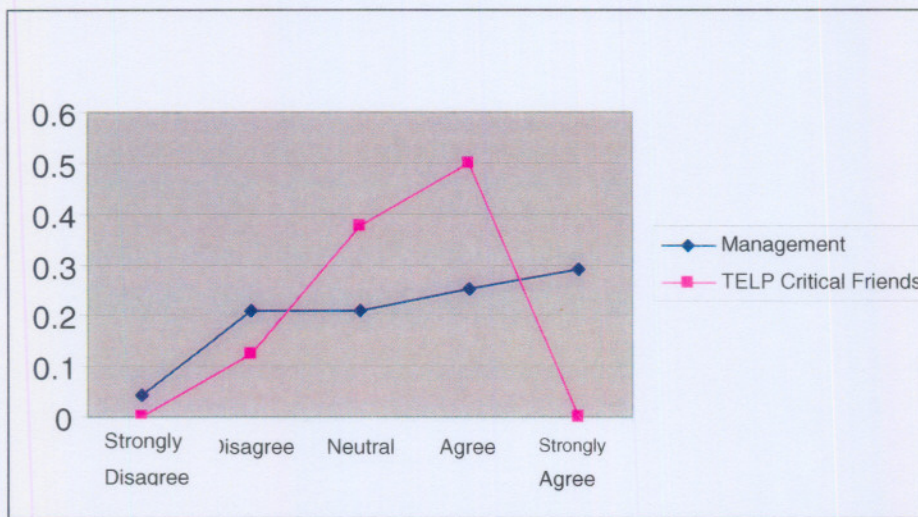
Table 10 Differences in perception regarding efficiency of videoconferencing between management and the critical friends group (questions C1 and C6)

Responses: Management only					
Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C1	1	4	1	3	3
C6	0	1	4	3	4
Responses: Critical friends group only					
C1	0	2	4	2	0
C6	0	0	2	6	0
Cumulative frequency scores					
Management	0.04	0.20	0.20	0.25	0.29
Critical friends	0	0.12	0.37	0.50	0

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g disagree) for a specific group (e.g. management) by the total number of responses (e.g. 4 disagree responses from the management group out of a total of 24 responses = $4/24 = 0.17$)

The specific results of these questions are displayed in Figure 8.

Figure 8 Differences in perception regarding efficiency of videoconferencing between management and the critical friends group (questions C1 and C6)



The only significant difference between management and the TELP Critical friends groups' results were the fact that the TELP Critical friends group showed a better normal distribution and a higher standard deviation than the management group.

5.6.6 Videoconferencing and length of use

It can be seen that, in general, the majority of the respondents tend to be neutral, agree or strongly agree with these statements. The above results can be substantiated by comparing these results to the total number of responses of the length of use variable. The total number of responses per length of use categories is displayed in Table 11.

Table 11 Differences in perception regarding efficiency of videoconferencing in different length of use categories (questions C1 and C6)

All responses						
Length of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
>6m	1	0	5	5	1	12
6m-1yr	0	4	2	1	1	8
1-2 yr	0	3	3	2	2	10
2 - 4yr	0	0	1	0	1	2
4y +	0	0	0	6	2	8
Cumulative frequency scores						
>6m	0.08	0	0.41	0.41	0.08	1
6m-1yr	0	0.50	0.25	0.12	0.12	1
1-2 yr	0	0.30	0.30	0.20	0.20	1
2 - 4yr	0	0	0.50	0	0.50	1
4y +	0	0	0	0.75	0.25	1

These results depicted in Table 11 are displayed in Figure 9.

Figure 9 Differences in perception regarding efficiency of videoconferencing in different length of use categories (questions C1 and C6)

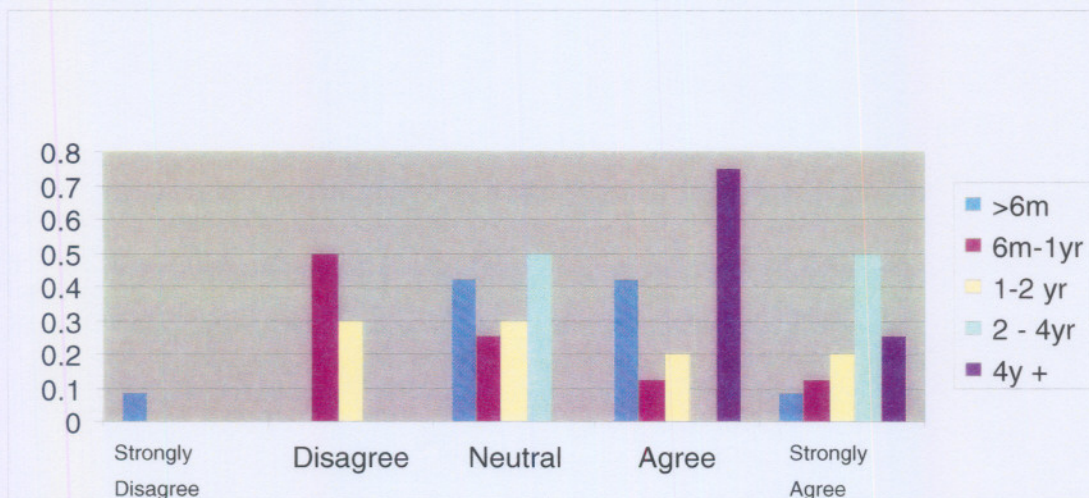


Figure 4 Difference in perception regarding videoconferencing management policies between management and the critical friends group (questions C3, C4, C8.1 and C8.2)

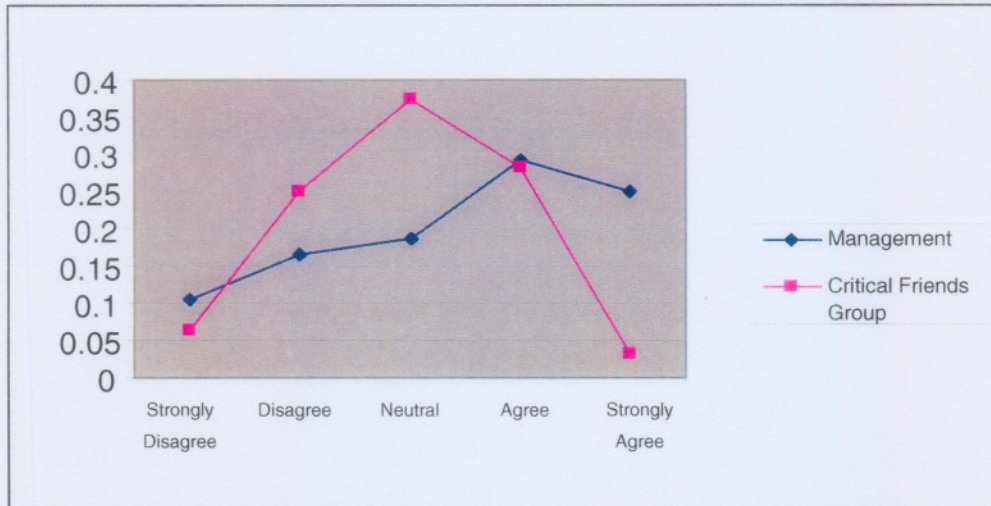


Figure 4 revealed that the management of the TELP project as opposed to the CFG showed a far more general positive orientation to the success of their:

- Management policy with regards to videoconferencing utilisation,
- Management of cost - control with regards to videoconferencing utilisation,
- Effective management of the videoconferencing system to ensure maximum output of both the TELP management and critical friends group.

5.6.3 Management site and videoconferencing

The above results can be substantiated by comparing these results to the total number of responses in each physical location (site). The total number of responses per site is displayed in Table 7.

Table 7 Differences in perception regarding videoconferencing management policies at different sites (questions C3, C4, C8.1 and C8.2)

All responses						
Site*	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
BTW	1	4	2	6	3	16
EL	2	8	10	13	3	36
QTN	0	2	1	1	0	4
USA	0	1	4	10	9	24
Cumulative frequency scores						
BTW	0.06	0.25	0.12	0.37	0.18	1
EL	0.05	0.22	0.27	0.36	0.08	1
QTN	0	0.5	0.25	0.25	0	1
USA	0	0.04	0.16	0.41	0.37	1

*(BTW = Butterworth, EL = East London, QTN = Queenstown, USA = United States of America)

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g. strongly disagree) for a specific group (e.g. Butterworth) by the total number of responses (e.g. 1 strongly disagree response from Butterworth out of a total of 16 responses = $1/16 = 0.06$)

This comparison of site to the two groups, management and critical friends, is significant due to the fact that the majority of the management individuals are located in Butterworth and the USA. It could therefore be expected that the majority of positive responses would originate from Butterworth and the USA.

This comparison furthermore indicates which management group (Butterworth or the USA) is more positive in their general response than the other. The results from table 7 are presented in Figure 5.

Figure 5 Difference in perception regarding videoconferencing management policies at different sites (questions C3, C4, C8.1 and C8.2)

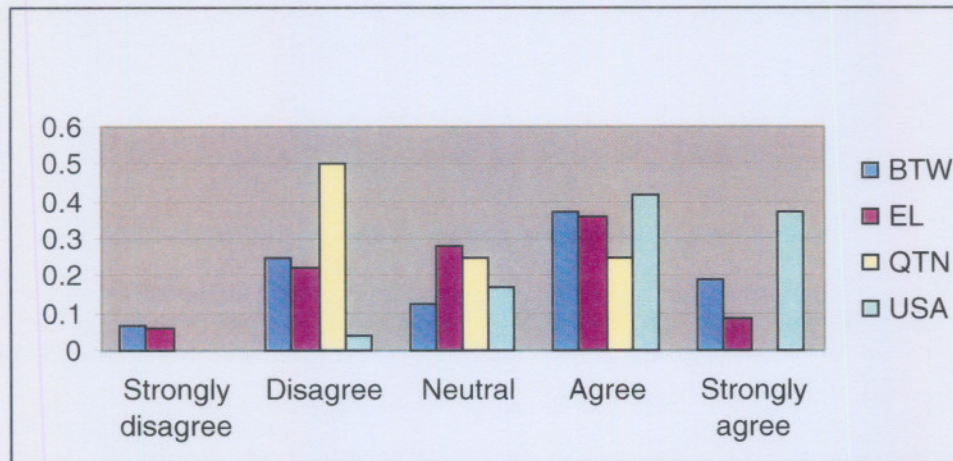


Figure 5 is a representation of results obtained from the following questions:

1. Site:

(BTW) = Butterworth, (EL) = East London, (QTN) = Queenstown,
(USA) = United States of America

2. Questions:

3. A strong, clear management policy regarding videoconferencing utilisation exists

4. Management will always investigate the probability of using the videoconferencing system when a request for flying to a remote location is made

8. TELP Management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme:

8.1 TELP project management

8.2 TELP training / Critical Friends Group

If Figure 5 is examined, the following observations can be made:

- Management members are distinctly more positive towards management policy type questions compared to ordinary critical friends group members
- That the USA yielded a more positive (strongly agree, agree and neutral) score than any other site,
- That Butterworth had the second most strongly agree scores after the USA, and in general shows that this location are the second most "positive" site,
- That East London can be rated as the third most positive site,
- That Queenstown, having no members of management, scored the least "positive" score than any other site.

Figure 5 therefore substantiates expectations and furthermore indicates that, in general, that the USA management group yields more positive responses than the Butterworth management group with reference to the current perceived videoconferencing management policy.

5.6.4 The quality of communication and videoconferencing

The quality of communication type questions can be identified as questions C2 and C5, which read as follows:

- C2 *The videoconferencing system creates new relationships between participants (mean = 4,0)*
- C5 *Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives (mean = 3,7)*

The difference in the perception of quality of communication between the management and critical friends group can be calculated by comparing the cumulative frequency scores of these two questions between these two

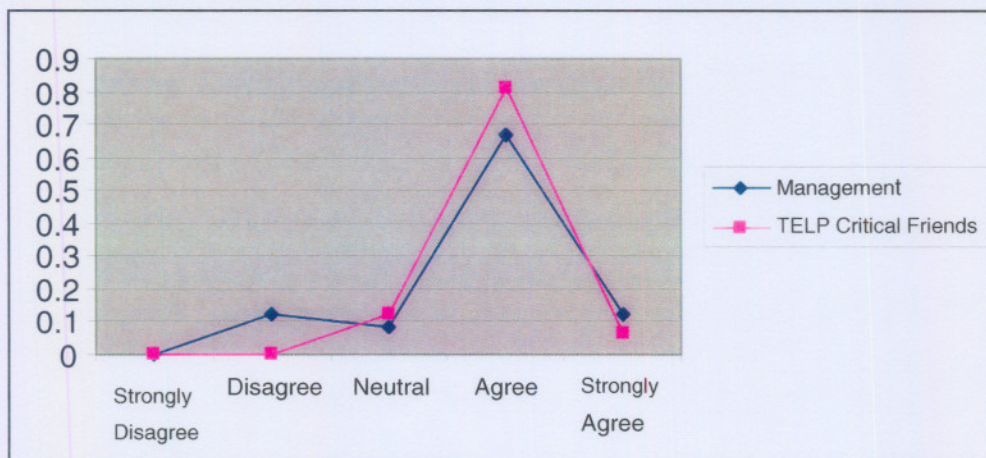
groups. The results obtained from this comparison are displayed in Table 8.

Table 8 Differences in perception regarding quality of communication between management and the critical friends group (questions C2, C5)

Responses: Management only					
Question number	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C2	0	1	1	7	3
C5	0	2	1	9	0
Responses: Critical friends group only					
C2	0	0	1	6	1
C5	0	0	1	7	0
Cumulative Frequency scores					
Management	0	0.12	0.08	0.66	0.12
Critical friends	0	0	0.12	0.81	0.06

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g. disagree) for a specific group (e.g. management) by the total number of responses (e.g. 3 disagree responses from the management group out of a total of 24 responses = $3/24 = 0.125$). The specific results of these questions are displayed in Figure 6.

Figure 6 Difference of perception regarding quality of communication between management and the critical friends group (questions C2 and



If the above results are examined, it is noticeable that similar trends are to be seen in responses from the two groups, although it is clear that the critical friends group tends to be a little bit more “positive” than the management group with a 0.1% “disagree” response. This can be explained against the backdrop of the scenario that the critical friends group experiences the videoconferencing system more “first hand” than the management group, hence the more positive response on quality of communication type questions. The above results can be substantiated by comparing these results to the total number of responses of the length of use variable. The total number of responses per length of use categories is displayed in Table 9.

Table 9 Differences in perception regarding quality of communication in different length of use categories (questions C2 and C5)

All responses						
Length of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
>6m	0	0	1	9	1	11
6m-1yr	0	2	1	4	1	8
1-2 yr	0	0	1	8	1	10
2 - 4yr	0	0	0	2	0	2
4y +	0	0	1	6	1	8
Cumulative frequency scores						
>6m	0	0	0.09	0.81	0.09	1
6m-1yr	0	0.25	0.12	0.5	0.12	1
1-2 yr	0	0	0.1	0.8	0.1	1
2 - 4yr	0	0	0	1	0	1
4y +	0	0	0.12	0.75	0.12	1

The results depicted in Table 9 are displayed in Figure 7:

Figure 7 Differences in perception regarding quality of communication in different length of use categories (questions C2 and C5)

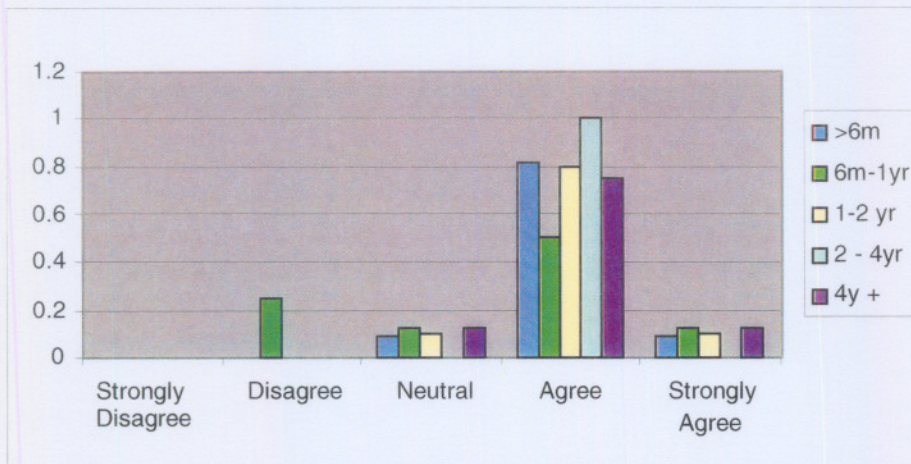


Figure 7 is a representation of results obtained from the following questions:

Quality of communication questions: questions C2 and C5:

2. *The videoconferencing system creates new relationships between participants*
5. *Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives.*

If Figure 7 is examined, it can be seen that the 4years + category showed the best distribution (peaking at "agree" with lower scores at "neutral" and "strongly agree"), whilst respondents in the 2 - 4 year category all indicated "agree". The poorest distribution was among respondents that have been using the system for 6 months - 1 year. Overall it is relatively clear that respondents were satisfied with the quality of communication produced by the videoconferencing system.

5.6.5 Videoconferencing and the efficiency of videoconferencing communication

The efficiency of videoconferencing communication - type questions can be identified as C1 and C6. These questions were as follows:

- C1 *Compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities (mean = 3,15)*
- C6 *Workgroups that emerge during videoconferencing improve the quality of communication in the organisation (mean = 3,8)*

The difference in the perception of efficiency of videoconferencing communication between the management and critical friends group can be calculated by comparing the cumulative frequency scores of these two questions between these two groups. The results obtained from this comparison are displayed in Table 10.

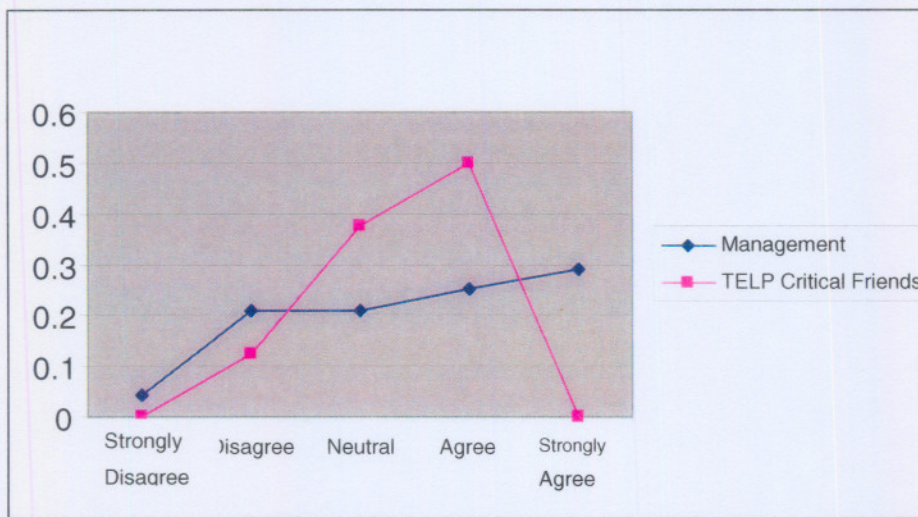
Table 10 Differences in perception regarding efficiency of videoconferencing between management and the critical friends group (questions C1 and C6)

Responses: Management only					
Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
C1	1	4	1	3	3
C6	0	1	4	3	4
Responses: Critical friends group only					
C1	0	2	4	2	0
C6	0	0	2	6	0
Cumulative frequency scores					
Management	0.04	0.20	0.20	0.25	0.29
Critical friends	0	0.12	0.37	0.50	0

The cumulative frequency scores were calculated by dividing the number of responses in a specific category (e.g disagree) for a specific group (e.g. management) by the total number of responses (e.g. 4 disagree responses from the management group out of a total of 24 responses = $4/24 = 0.17$)

The specific results of these questions are displayed in Figure 8.

Figure 8 Differences in perception regarding efficiency of videoconferencing between management and the critical friends group (questions C1 and C6)



The only significant difference between management and the TELP Critical friends groups' results were the fact that the TELP Critical friends group showed a better normal distribution and a higher standard deviation than the management group.

5.6.6 Videoconferencing and length of use

It can be seen that, in general, the majority of the respondents tend to be neutral, agree or strongly agree with these statements. The above results can be substantiated by comparing these results to the total number of responses of the length of use variable. The total number of responses per length of use categories is displayed in Table 11.

Table 11 Differences in perception regarding efficiency of videoconferencing in different length of use categories (questions C1 and C6)

All responses						
Length of use	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
>6m	1	0	5	5	1	12
6m-1yr	0	4	2	1	1	8
1-2 yr	0	3	3	2	2	10
2 - 4yr	0	0	1	0	1	2
4y +	0	0	0	6	2	8
Cumulative frequency scores						
>6m	0.08	0	0.41	0.41	0.08	1
6m-1yr	0	0.50	0.25	0.12	0.12	1
1-2 yr	0	0.30	0.30	0.20	0.20	1
2 - 4yr	0	0	0.50	0	0.50	1
4y +	0	0	0	0.75	0.25	1

These results depicted in Table 11 are displayed in Figure 9.

Figure 9 Differences in perception regarding efficiency of videoconferencing in different length of use categories (questions C1 and C6)

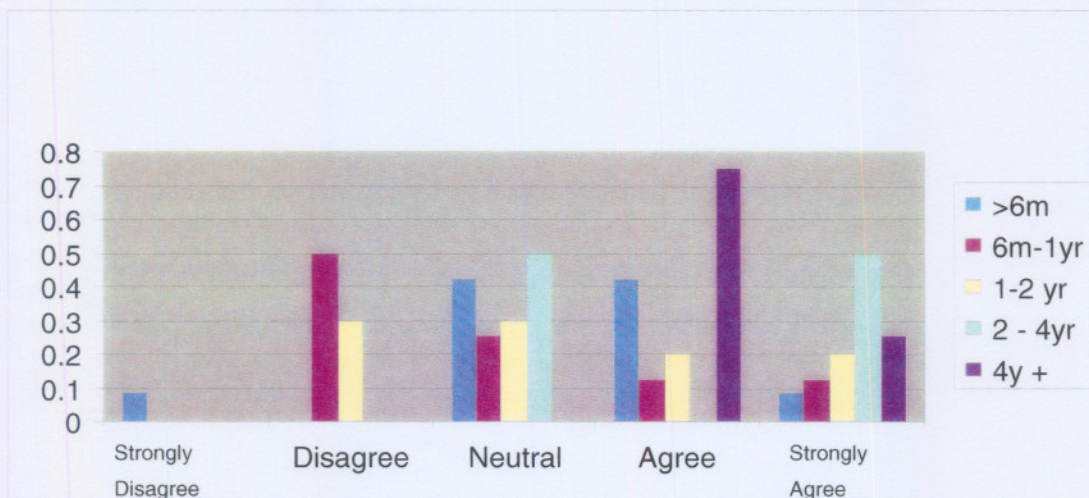


Figure 9 is a representation of results obtained from the following questions:

Efficiency type questions: Questions c1 and c6:

- 1. Compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities*
- 6. Workgroups that emerge during videoconferencing improve the quality of communication in the organisation.*

Examination of Figure 9 reveals the following:

- That respondents that have used the videoconferencing system for less than six months had the most equal normal distribution, with the majority of responses between neutral and agree
- That the most dissatisfied group are the respondents that have been using the system between six months and a year
- That the 1 - 2 year category also seem to be slightly dissatisfied, with the majority of responses being either disagree or neutral
- That the 2 - 4 year category had a equal score between neutral and strongly agree
- That the 4 year + had the most favourable response, with all of the responses in the "agree" or "strongly agree" categories

Based on the above, it can clearly be seen that the longer the length of use the more favourable the respondents are in terms of efficiency - based questions.

5.6.7 General overview of findings: Likert – scale data

Likert - scale type data, pertaining to this section demonstrated the following:

- No strong clearly defined management policy regarding videoconferencing utilisation exist.
- Respondents are ambivalent towards issues concerning the sharing of information, cost – effectiveness of the system and as an alternative to flying
- Respondents clearly showed a positive response towards videoconferencing and the forging of new relationships, workgroup effectiveness, improving the quality of communication in the organisation and ensuring maximum output of the TELP programme.
- A clear distinction can be made between the results of the management and critical friends group respectively. Further investigation into this revealed that management, in general, had a much more positive orientation with regards to:
 - Management policy with regard to videoconferencing utilisation
 - Management of cost effectiveness with regard to videoconferencing utilisation
 - Effective management of the videoconferencing system to ensure maximum output of both the TELP management and critical friends group
- That the investigation into management site and videoconferencing revealed that those sites where management is based, had a more positive orientation towards the effectiveness of management than those sites where management is not based. The TSU campus therefore yielded the highest positive score and Queenstown, hosting no members of TELP management, the lowest.
- The investigation into the quality of communication and videoconferencing revealed that the critical friends group showed a slightly higher positive orientation than management. This is due to the fact that the group experience videoconferencing more first-hand than the management

group. Cross comparison with the length of use variable showed a better normal distribution amongst categories of individuals that have been using the system for a long time as opposed to categories of individuals that have been using the system for a relatively short period of time.

- The investigation into videoconferencing and the efficiency of communication revealed that management had a far more positive orientation than the critical friends group. The critical friends group had a normal distribution curve as opposed to management, which did not. These results were compared with the length of time variable, which, as with the quality of communication and videoconferencing, revealed a better normal distribution amongst categories of individuals who have been using the system for a long time as opposed to categories of individuals who have been using the system for a relatively short period of time.
- The key management issues revealed a positive response, with TELP training yielding a higher score than TELP project management.

5.7 Network analysis data: discussion

Network data was obtained through the use of a structured questionnaire through personal interviews (Refer appendix 2 for questionnaire). It was decided to utilise personal interviews due to the fact that it was established during the pilot study that the matrix form for asking network-related questions, although the most reliable in terms of establishing network data, are rather complicated to be completed correctly even by well-educated individuals. It was furthermore established during the pilot-study that greater conformity of data and internal reliability is achieved if the data is all collected by the same researcher as opposed to different researchers, as discussed in the previous chapter. Due to the geographic location of the individuals concerned, two researchers were utilised for this purpose.

The questionnaire data was collected over a period of two months (July and August 2002) and results analysed using UCINET version 3.1. More specifically, the network data was analysed using the Centrality and CONCOR subsets supplied with the package.

This section on network analysis is related to the following research questions:

- 1.1 which examines the properties of selected communication networks, including centrality, clique formation and density on individual, clique and system level for the purposes of cross comparison with theoretical foundations on videoconferencing,
- 1.2 which examines how selected communication network properties influence quality of communication practises and communication management performance at TELP,
- 1.3 which examines practises and policies applied by TELP management to regulate videoconferencing communication as management practise with reference to social network practises.

The data presentation in this section is structured in the following way:

- Firstly, individual level of analysis. The centrality variables, as displayed in annexure 3.1, including average point in/out, betweenness and closeness are examined systematically, and the data is discussed making a clear distinction between the different levels of individuals in the organisation as discussed in section 5.2.2 (i.e. TELP management ECT, TELP management TSU and TELP CFG (which combines trainers and receivers of training)).
- Secondly, clique level of analysis. The cliques are identified using block and matrix densities, as displayed in annexure 3.2. As with individual level of analysis, the data is discussed making a clear distinction between the different levels of individuals in the organisation as discussed in section 5.2.2 (i.e. TELP management and TELP CFG) (which combines trainers and receivers of training).
- Thirdly, system level of analysis by comparing matrix density scores between the TELP management and CFG.

In addition, it is also important to note the following:

Individual level of analysis makes the distinction between TELP management ECT, TELP management TSU and TELP CFG since this section of analysis needs to be compared with theoretical notions on videoconferencing (research question 1.1).

For the purpose of clique and system level of analysis, the TELP management ECT and TELP management TSU are combined. This therefore leaves the distinction between TELP management and CFG. This is done in accordance with research questions 1.2 and 1.3, which require that a clear distinction be made between management and individuals being managed.

5.7.1 Individual level of analysis

Individual level of analysis was done by utilising the GRAPH package on the UCINET package by determination of centrality. Centrality has been defined by MacEvoy and Freeman (1987:49) as:

“Centrality calculates a whole set of graph – theory based properties of actors, actor pairs, and networks, including measures of actor distance, degree, betweenness and closeness, and network indices of density and centrality”.

The following centrality indicators were calculated:

- Average: Point in/Point out degree,
- Betweenness,
- Closeness.

Point in/Point out degree are derived from referring to the amount of employees an individual is directly connected with, with point in or point out acting as an indicator of the direction of connectedness (Freeman *in* Burkhardt & Brass, 1990:113, Ahuja *et al.*, 1999,18, Scott, 1991:86). Point in/point out degree is calculated by selecting the amount of times an individual is nominated by fellow employees on the matrix and dividing it by n , which refers to the number of questionnaires completed.

Individual point in/out degree scores were approximated to calculate the average point in/out degree score. This resulted in a single score that made the different scores between the actors comparable.

Betweenness has been defined as *“the control of information flow within a network”* (De Wet, 1995:8), and in terms of the description from Scott (1991:90), it is *“... betweenness proportion of a point Y for a particular set of points X and Z is defined as the proportion of geodesics connecting that pair that pass through Y, it measures the extent to which Y is between X and Z...”*.

Freeman (1980:591) illustrates that *“both betweenness- and closeness-based measures of point centrality are determined by the same structural elements of a communication network...while the betweenness-based measure depends upon a points potential for control of communications, the closeness-based measure depends on its independence of such potential control by others...”*

Closeness, over and above considering the structural relationships that it has with betweenness, was defined by De Wet (1995:9) as the degree of independence an actor has in relation to all other actors. Burkhardt and Brass (1990:113) state that *“the closeness measure of centrality accounts for both direct and indirect links and conceptually represents ease of access to others”* and De Wet (1991:160) points out that the lower the closeness score the *“more independent an actor, and potentially speaking, the more efficiently communication messages can be transmitted to another actor”*.

It was furthermore added by Ibarra and Andrews (1993:287), that *“this formulation assumes that centralisation is increased positively by connections to others who are highly central and assigns the highest level of centrality to the actors with the closest relations (that is, direct or short indirect links) with many central actors...”*

5.7.1.1 Average point in/point out degree centrality scores

The average point in/point out degree scores, classified in manageable categories, is represented in Table 12.

Table 12 Average point in/point out degree centrality

Average point in / point out degree	Individual positioning								
13>	A2	A3	A4	A6	B1	C1	D2	E1	E2
10-13	A1	D1	F1	F2	E3				
5-10	A5	F3	F4	F5	F6	F7			

The discussion of the average point in/point out degree scores focuses on TELP management with references to: Texas Southern University (TSU), Eastern Cape Technikon (ECT) and the critical friends group.

TELP Management – Texas Southern University (TSU)

The TELP management – TSU members can be identified in Table 12 as individuals A2, A3, A4, A6, B1, A1 and A5.

Pappas and Wooldridge (2002:4) discovered through network analysis of 95 mid-level managers that, the more bridging relationships a manager has, the more varied the information that they control. It is by this general principle, that it could be expected (although not always manifest in practise) that the more senior the level of management, the higher the frequency of communication. It can therefore be stated that it would be correct to note that individuals A2, A3, A4, B1 and A6 scored satisfactorily (13>) in terms of their respective levels, and that the frequency of communication plays a significant role.

Individual A1 is the most senior management member of the Texas Southern University group. The data suggests, compounded by other qualitative evidence, that this individual is protected by other members from the group and is shielded and reduced to a figurehead of the project.

Individual A5 was only appointed fairly recently and has not been exposed to actors at the ECT, which explains the relatively low score.

TELP Management – Eastern Cape Technikon (ECT)

The TELP management team at the ECT can be identified as individuals C1, D1 and D2.

Individual C1 is the TELP co-ordinator at the ECT, and, as expected, is clearly

the network hub between the two institutions. It should be noted that individual C1 also had the highest score overall in terms of average point in / point out.

Individual D2 also scored within the 13> category.

Individual D1, as with the case of individual A1, is the most senior member of the ECT management team, and had a very similar score as individual A1. It seems as if there is a definite trend for average point in/point out scores on top level management from the respective countries to place these individuals together. The mere fact that these two individuals were not in the highest score bracket, shows that a level of "shielding" is evident and that these individuals, although instrumental in keeping the project afloat, are less involved on grassroots level than some other individuals.

TELP Critical Friends Group

The TELP critical friends group we can subdivide into the TELP trainers and receivers of TELP training. TELP trainers can be identified as individuals E1 – E3 and receivers of TELP training as individuals F1 – F6.

Individuals E1 and E2 yielded a similar score as expected. Individual E3 scored slightly lower than the two counterparts due to the fact that, although the individual is a TELP trainer, the individual is not a TELP trainer at the ECT but at a neighbouring Technikon. It was however decided to include this individual in the study due to the fact that this individual would have a future role to play at ECT TELP training. Individuals F3 – F7 all fell within the same category, 5-10, as expected. Individuals F1 and F2 scored slightly higher for the following reasons:

- Individual F1 used to be a TELP trainer but was relegated to another Department, Student Development
- Individual F2 has been earmarked for training to become a TELP trainer, but has not yet played the role that individuals E1 and E2 have been

playing.

Summary – Average point in/point out degree centrality scores

If Table 13 is examined, it can clearly be seen how the natural groupings, or cliques, which can be compared to the clique level of analysis, was evident:

Table 13 Summary - average point in / point out degree

Average: point in / point out category	Individual positioning									
	13>	A2	A3	A4	A6	B1	C1	D2	E1	E2
10-13	A1	D1	F1	F2	E3					
5-10	A5	F3	F4	F5	F6	F7				

(Reference to Table 13)

- American / TSU Team
- Top level Managers: ECT and TSU
- Management South Africa
- TELP Trainers
- Receivers of Training

Five out of the seven American / TSU individuals all scored an average point in/point out score of 13>. This can be attributed to the fact that the American/TSU team are instrumental in bringing the TELP project to South Africa, and that the future survival of the project is highly dependent on them. This is also an indication that videoconferencing places no impediment on their ability to communicate effectively. It should be noted that individual A1 had a slightly lower score, placing the individual in the 10 – 13 category. This is attributed to the individual's high position at TSU. This trend seems to be normal since the counterpart in South Africa fell within the same category. Individual A5 scored significantly lower due to the fact that the individual only very recently joined the TELP team.

TELP management in South Africa, individuals C1, D1 and D2, scored similarly, with individuals C1 and D2 falling within the same category. Individual C1 is the TELP co-ordinator in South Africa and D2, the Director of Research. Individual D1 scored slightly lower, falling into the category 10 -13 by virtue of the person's position in South Africa, falling into the same level as individual A1. Evidence seems to suggest that A1 and D1 is an isolated dyad.

TELP trainers, individuals E1 and E2 scored on the same level, 13>, as expected. TELP trainer E3 scored slightly lower due to the fact that the individual only has a future role to play at the Technikon and is currently stationed at a neighbouring Technikon.

Receivers of TELP training, individuals F3 and F3 all fell in the same category, 5 – 10, as expected. Individuals F1 and F2 scored slightly higher (10-13) for the following reasons:

- Individual F1 used to be a TELP trainer but was relegated to another Department, Student Development,
- Individual F2 has been earmarked for training to become a TELP trainer but has not quite yet played the role as individuals E1 and E2 have been playing.

5.7.1.2 Betweenness and centrality

The betweenness scores are revealed in Table 14.

Table 14 Betweenness

Betweenness scores	Individual positioning												
	C1	E1											
5>													
1-5	A2	A3	A4	A6	B1	D2							
>1	A1	A5	D1	E2	F1	F2	F3	F4	F5	E3	F6	F7	

It is significant to notice that Freeman *et al.* (1979:128-129) indicated that “... *betweenness, then seems to be the point centrality measure of choice when it comes to understanding leadership nominations...*” and “...*then seems to be the key to understanding choice as a leader*”.

It should however be cautioned that the distinction should be made between *natural* leaders (social network terms) and hierarchical leaders, with the latter as an indication of leadership appointment within an organisation and the first as a leader derived from frequency and type of communication associated with a specific individual.

The discussion of betweenness scores focuses on TELP management with references to: Texas Southern University (TSU), Eastern Cape Technikon (ECT) and the critical friends group.

TELP Management – TSU

TELP Management TSU can be identified as individuals A2, A3, A4, A6, B1, A5 and A1.

The group A2, A3, A4, B1 and A6 were grouped together and scored between 1 and 5. This is expected in terms of their natural position in the project. Individual A1 scored fairly low, but as the point in/point out variable suggested, an isolated dyad exists between A1 and D1, and once again A1 and D1 scored similarly low and in the same category. This is significant since both these individuals are the most senior level leaders in both the USA and SA respectively, and since betweenness is described as a measure of leadership, it would have been expected that this isolated dyad would have scored significantly higher.

TELP Management – ECT

TELP Management ECT is described as individuals C1, D2, and D1.

All three individuals scored in different categories for the following reasons:

- Individual C1 is the TELP co-ordinator in South Africa and had the highest betweenness level of all the respondents. This is well known and the individual is seen by all individuals in that way. The data suggests, supported by the qualitative data collected from the focus groups, that she is a natural leader and that she plays a vital role in connecting individuals between the two institutions.
- Individual D2 is the Director of Research and has frequent communication with respondents in the USA. The fact that the individual scored on the same level as other USA respondents is expected.
- Individual D1, as mentioned earlier, forms part of an isolated dyad with A1, and subsequently scored lower.

TELP Critical Friends Group

The TELP Critical Friends group can be identified as individuals E1, E2, E3 and F1 – F7.

Individual E1 scored very high, with possible reasoning being the fact that this individual is not only perceived as a TELP trainer, but as a TELP linkage research officer and furthermore has a fairly high social standing in terms of position at the Technikon as well.

It would have been expected that individual E2 would have scored higher, since this TELP trainer scored similarly to individual E3 who is a TELP trainer at a neighbouring Technikon, and is not well known. Possible explanations given by informal discussion related to management styles, and since this person is not perceived as a natural leader but more of an isolate and

betweenness is seen as a measure of leadership, the fairly low score can be expected.

Individuals F1 to F7 are all receivers of TELP training and their low respective scores placing them within the same grouping is correct and as expected.

Summary – Betweenness and centrality

Table 15 Summary - betweenness

Betweenness Score	Individual positioning													
5>	C1	E1												
1-5	A2	A3	A4	A6	B1	D2								
>1	A5	A1	D1	E2	E3	F1	F2	F3	F4	F5	F6	F7		

(Reference to Table 15)

- American / TSU Team
- Top level Managers: ECT and TSU
- Management South Africa
- TELP Trainers
- Receivers of Training

Whilst the point in/point out degree scores merely made sense in terms of hierarchical positioning, the betweenness variable is indicative of some groupings which naturally exist between individuals:

- Individual C1 is emerging as a liaison (in terms of Stephenson, 1998:57), bridge and most definitely as an opinion leader,
- Individual E1 as a gatekeeper
- Individuals A2, A3, A4, A6 and B1 as a clique
- Individual D2 as a bridge

- Individuals A5, E2 and E3 as isolates
- Individuals A1 and D1 as an isolated dyad
- Individuals F1 to F7 as a clique

The implication of identification of these network positions for individuals allows the researcher to cross – compare these qualitative assumptions with quantitative data relating to clique level of analysis. The significance of early detection therefore increases reliability through triangulation.

5.7.1.3 Closeness and centrality

The closeness measures are represented in Table 16.

Table 16 Closeness and centrality

Closeness Scores	Individual positioning										
	A1	D1	A5	E3	F1	F2	F3	F4	F5	F6	F7
25-30											
20-24	A2	A3	A4	A6	B1	D2	E1	E2			
>20	C1										

The discussion of the closeness and centrality scores focuses on TELP management with references to: Texas Southern University (TSU), Eastern Cape Technikon (ECT) and the critical friends group.

TELP Management – TSU

The TELP Management – TSU can be identified by individuals A1, A5, A2, A3, A4, A6 and B1.

The TELP Management – TSU scores, compared to the betweenness scores, showed a similar pattern, with individual A1 having the highest closeness score simply because of the isolated dyadic relationship with D1. Individual A5 once again faired poorly because the individual is not well established following a very recent appointment to the position.

Individuals A2, A3, A4, A6 and B1 all scored relatively similar in the category 20-24.

TELP Management – ECT

The TELP management – South Africa can be identified as individuals D1, D2 and C1.

As expected, individual C1, being the TELP co-ordinator in South Africa had the lowest closeness score, thereby being the individual with the lowest dependency from other actors and potentially the most efficient communicator.

Individual D2, having earlier been identified by the individual's association with the American clique A2, A3, A4, A6 and B1, as with the betweenness measure scored fairly similar to these individuals.

Individual D1 had the highest closeness score due to the individual's isolated dyadic relationship with individual A1.

TELP Critical Friends Group

The Critical Friends group can be identified by individuals E1-E3 and F1-F7. Individual E3, due to the individual's low connectedness with the Technikon being based at a neighbouring Technikon, had a high closeness score, as expected. Individuals F1 – F7, all receivers of training, had a high closeness score as expected.

Individual E1 scored as expected compared to the betweenness measure. Individual E2's result was however surprising. The individual's betweenness score was low, showing low leadership qualities and low control over the flow of information. Freeman (1980:591) indicates that both betweenness and

closeness scores are constructed from the same structural elements, and comparing betweenness and closeness scores of all the other individuals, this is evident with the betweenness score being the inverse against a different logarithm of closeness. A high closeness score is expected for this individual, which was not the case. The individual scored fairly similarly as E1, with a low closeness score. In terms of the individuals' tasks and duties, the closeness score is as expected, but does not relate to the betweenness score obtained. These types of individuals are described by Stephenson (1998:10) as *"these individuals are the most indirect links in the networks. They are not sources of information as much as interpreters: indirectly influencing how information is perceived"*.

Summary – closeness and centrality scores

Table 17 Summary - closeness

Closeness Score	Individual positioning										
25-30	A1	D1	A5	E3	F1	F2	F3	F4	F5	F6	F7
20-24	A2	A3	A4	A6	B1	D2	E1	E2			
>20	C1										

(Reference to Table 17)

- American / TSU Team
- Top level Managers: ECT and TSU
- Management South Africa
- TELP Trainers
- Receivers of Training

The TELP management – TSU scores, compared to the betweenness scores, showed a similar pattern, with individual A1 having the highest closeness score simply because of the isolated dyadic relationship with D1. Individual A5 once again faired poorly because the individual is not well established

following a very recent appointment to the position.

Individuals A2, A3, A4, A6 and B1 all scored relatively similar in the category 20-24.

As expected, individual C1, being the TELP co-ordinator in South Africa, had the lowest closeness score, thereby being the individual with the lowest dependency from other actors and potentially the most efficient communicator.

Individual D2, having earlier been identified by the individual's association with the American clique A2, A3, A4, A6 and B1, once again as with the betweenness measure, scored fairly similar to these individuals.

Individual D1 had the highest closeness score due to the individual's isolated dyadic relationship with individual A1.

Individual E3, due to the individual's low connectedness with the Technikon, and due to being based at a neighbouring technikon, had a high closeness score with low betweenness and low point in/point out degree, as expected. Individuals F1 – F7, all receivers of training, had a high closeness score as expected.

Individual E1 scored as expected compared to the betweenness measure. The individual's betweenness score was low, showing low leadership qualities and low control over the flow of information. Freeman (1980:591) indicates that both betweenness and closeness scores are constructed from the same structural elements, and comparing betweenness and closeness scores of all the other individuals, this is evident with the betweenness score being the inverse against a different logarithm of closeness. It should therefore be expected that a high closeness score should be obtained by this individual, which was not the case. The individual scored fairly similarly as E1, with a low closeness score. In terms of the individuals' tasks and duties, the closeness

score is as expected, but does not relate to the betweenness score obtained. These types of individuals are described by Stephenson (1998:10) as *“these individuals are the most indirect links in the networks. They are not sources of information as much as interpreters: indirectly influencing how information is perceived.”*

5.7.1.4 General overview of findings: Individual level of analysis

With regard to average point in/out degree the following observations were made:

- That the individuals concerned scored satisfactorily with regard to their frequency of communication in relation to their level of management.
- That the most senior level managers at TSU and ECT respectively are, as the data suggests, figureheads to the project due to lower scores than other management members. These two individuals form an isolated dyad.
- That individuals recently appointed to management scored lower than individuals in management over a longer period of time.
- That individual C1 emerged as a network hub between ECT and TSU.
- That CFG individuals in general scored lower than members of management.
- That TELP trainers yielded a similar score with a slightly lower score for the trainer based at a neighbouring technikon.

With regard to betweenness and centrality the following observations were made:

- Individual network roles are clearly identifiable, allowing for triangulating a qualitative observation in individual level of analysis with quantitative data in clique level of analysis,
- That individual level of analysis with regard to betweenness clearly confirmed the social network positions as identified with the average point in/out degree measure,

- That individual E1 plays a significant role in terms of acting as a linkage between the two Institutions,
- That significant differences in management styles between individuals E2 and E3 are clearly definable.

With regards to closeness and centrality the following observations were made:

- Individual network roles are clearly identifiable, allowing for triangulating a qualitative observation in individual level of analysis with quantitative data in clique level of analysis,
- That individual level of analysis with regard to closeness clearly confirmed the social network positions as identified with the average point in/out degree and betweenness measures,
- That individual E2, as identified with the betweenness measure having a distinct management style, revealed that the person has low leadership qualities and low control over the flow of information, but however indirectly influences the way in which information is perceived.

5.7.2 Clique level of analysis

Clique level of analysis implies the identification and reconstruction of cliques using the CONCOR (Convergence of iterated relations) program provided in the UCINET package. Cliques are identified using block and matrix densities. Where block values revealed a value greater than the calculated matrix density then the existence of a strong and significant tie can be assumed (De Wet, 1995:9). Groups of individuals revealing a similar score in specific strong ties are identified as cliques.

In terms of the key management variables identified during the focus group process, it was decided to do a clique level of analysis in terms of the following two variables:

- TELP Management
- TELP Critical Friends Group

5.7.2.1 TELP Management: Clique level of analysis

TELP management clique level of analysis grouped the following individuals together:

Table 18 TELP management - Clique level of analysis

Block	N	Split	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8
1	5	1	A1	D1	B1	D2	A2			
2	7	1	F1	F2	F3	F4	F5	F6	E3	E1
3	2	1	C1	E2						
4	6	1	A3	A4	A5	A6	F7			

Block 1 members include members A1,D1,B1,D2 and A2.

This association between these members can be declared as follows:

- Members A1 and D1 are the highest ranking individuals at the ECT and Texas Southern University respectively. This isolated dyad featured in all of the individual levels of analysis variables, and it is therefore not surprising that these two individuals were grouped together again, respectively, this isolated dyad is connected to the other members through the following associations:
- Members B1 and D2 being both senior management at the ECT,
- Member A2, being a videoconferencing co-ordinator, would mostly schedule administratively multi-national videoconferences through members B1 and D2.

Block 2 members include F1, F2, F3, F4, F5, F6, E3 and E1

- Members E1 and E3 being closely connected due to the fact that they are both TELP trainers,
- Members F1 – F6 being closely connected due to the fact that they are all receivers of TELP training.

Block 3 members include C1 and E2

- C1 has been identified in the individual level of analysis as the most central person in the total communication network, and E2 as a pulsetaker, due to the fact that E2 has a low betweenness and closeness score, whereas usually a high betweenness and low closeness score is expected. E2 in the role of a pulsetaker would be feeding an opinion leader (C1) with information, which is the cause of the effect of this associated clique.

Block 4 members include members A3, A4, A5, A6 and F7

- Members A3,A4,A5 and A6 all being closely connected since they are all of Texas Southern University origin.
- Individual F7 was a TELP trainer, but has been taken off the TELP training project and relegated to another TELP project falling outside the scope of this dissertation. In terms of the other TELP project, individual F7 works very closely with these individuals (the member has even travelled to the USA in connection with this), hence the clique connection between these individuals.

Over and above block identification of individuals, special attention needs to be paid to those individuals who were identified as “member 1” and “member 2” in the respective blocks, since it can be stated that these individuals are connected through acting as the informal leader of each respective group. On a social level this is plausible and observable within the respective groups.

Generally speaking, it can be stated that the status of these individuals are higher at the respective Institutions than other clique members.

The above observations have the following implications:

- That individual cliques are clearly identifiable
- That individual informal social network leaders can be identified and that the linkages between them can be identified

These observations are significant for the study since it allows for the clear identification of these cliques and informal social network leaders in the qualitative construction of the system sociogramme (refer section 5.8.2.2).

This shows that:

- An isolated dyad exists between the two highest ranking individuals from the two Institutions respectively,
- That multi-national videoconferences are scheduled through specific individuals,
- TELP trainers are closely connected,
- The majority of receivers of the TELP training are closely connected,
- That the most central position in the communication network has been identified and that others with significant positions, such as pulsetakers have been identified,
- Individuals from the same Institution tend to be more closely connected than individuals from different institutions.

5.7.2.2 Critical Friends Group

TELP critical friends clique group analysis grouped the following individuals together:

Table 19 TELP Critical friends - Clique level of analysis

Block	N	Split	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6
1	5	1	A1	A5	D1	D2	F7	
2	1	1	A2					
3	6	2	B1	E1	E2	F1	F2	F3
4	5	2	A4	F6	E3	F5	F4	
5	3	0	A3	A6	C1			

Block 1 members include A1,A5,D1,D2 and F7.

- The isolated dyad D1 and A1 has once again occurred within this clique, the two highest ranking individuals from the ECT and Texas Southern University respectively.
- D2 would be connected to D1 since D2, being the Director of Research at the ECT, would be at a similar management level as D1
- A5 would be connected to A1 through the fact that A5 has been an understudy to A1 for a while,
- F7 could be perceived to fall within the management clique of the Critical Friends group since this specific individual has been managing another TELP project concerning student development. It is noticeable that this specific individual did neither associate with the other F members in the TELP Management clique analysis,

Block 2 consisted of only 1 member, member A2. In terms of the Critical Friends group member A2 purely fulfils an administrative function, that of videoconferencing co-ordinator at TSU, thus explaining her isolation.

Block 3 consisted of members B1, E1, E2, F1, F2 and F3

- Member B1 is a visiting Professor from the USA and perceived to be very closely linked to the TELP project, and perceived, due to her status and association with other members, to be relatively senior in management. In this case she could easily be linked to E1 and E2 since both E1 and E2 are TELP trainers who would work closely with B1
- Member F1 is to become a TELP trainer explaining his linkage with B1, E1 and E2
- Members F1, F2 and F3 are all closely tied in the Engineering Faculty explaining the existence of this clique. In this case F1 would act as a bridge between B1, E1, E2 and F2 and F3

Block 4 consisted of members A4, E3, F4 – F6

- Members F4 – F6 are all receivers of TELP training from different faculties, hence the clique formation with low connectedness,
- Member E3 is a TELP trainer at a neighbouring Technikon and has low connectedness with the rest of the group,
- Member A4 has only recently joined the Texas Southern University team and also has a fairly low level of connectedness.

It can hence be concluded that this clique merely exists due to a low level of connectedness, and that they are linked through weak ties.

Block 5 consisted of members A3, A6 and C1

- C1 has been identified as the opinion leader in the group, with the most frequent basis of interaction. Both members A3 and A6 played vital roles in establishing the TSU connection in South Africa, hence the connection with these two members

Over and above block identification of individuals, special attention needs to

be paid to those individuals that were identified as “member 1” and “member 2” in the respective blocks, since it can be stated that these individuals are connected through acting as the informal leader of each respective group. On a social level this is plausible and observable within the respective groups. Generally speaking, it can be stated that the status of these individuals is higher at the respective institutions than other clique members.

5.7.2.3 General overview of findings: Clique level of analysis

The above observations have the following implications:

- That individual cliques are clearly identifiable
- That individual informal social network leaders can be identified and that the linkages between them can be identified

The identification of these variables lead to cross comparative functions with individual and systems level of analysis. On every level, results obtained could therefore be inferred to another, and compared with different methods of data analysis. These observations are significant for the study since it allows for the clear identification of these cliques and informal social network leaders in the qualitative construction of the system sociogramme (refer section 5.8.2.2).

These observations are significant for the study since it allows for the clear identification of these cliques and informal social network leaders in the qualitative construction of the system sociogramme (refer section 5.8.2.2).

This shows that:

- An isolated dyad exists between the two highest ranking individuals from the two institutions respectively,
- That multi-national videoconferences are scheduled through specific individuals,

- TELP trainers are closely connected,
- The majority of receivers of the TELP training are closely connected,
- That the most central position in the communication network has been identified and that others with significant positions, such as pulsetakers have been identified,
- Individuals from the same institution tend to be more closely connected than individuals from different institutions.

5.7.3 System level of analysis

System level of analysis is determined by examining all the variables existent on the individual and clique level of analysis combined with matrix density to determine the linkages composition of the TELP programme as an intact system.

Matrix density is defined as “the number of pairs connected relative to the maximum number of connections that can exist within a social network” (Haythornwaite, 2001:219).

Figure 10 Comparative matrix density scores between TELP management and the TELP critical friends Group

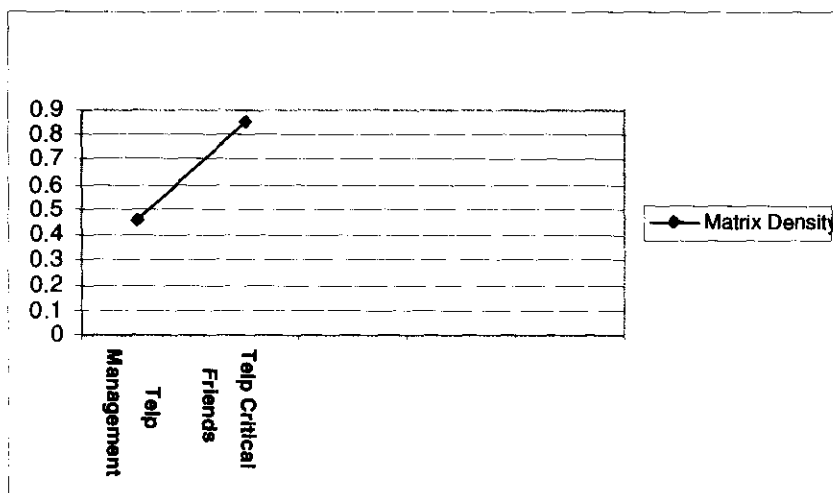


Figure 10 is a representation between the two different scores of matrix density obtained between the TELP management and TELP critical friends groups respectively. It is noticeable that the critical friends group obtained a much higher score than TELP management.

It should be noted that the actual level of density is not indicative of any significant trait except that the individuals communicate more or less with one another. Studies on network effectiveness (Provan & Milward, 1995:24) showed that perceived network control and decentralisation should be considered when examining matrix density:

"Networks integrated and co-ordinated centrally, through a single core-agency, are likely to be more effective than dense, cohesive networks integrated in a decentralised way among the organisational providers that make up the system ..."

The significance of the fact that there were differences between the relative density scores between TELP management and the TELP critical friends group should therefore be compared with relative centrality scores as well as clique density scores.

The significance of system level of analysis lies with the fact that it allows the researcher to view the individuals and cliques as a whole and comment on the functioning of the system. These observations are significant for the study since it allows for the clear identification of these cliques and informal social network leaders in the qualitative construction of the system sociogramme (refer section 5.8.2.2).

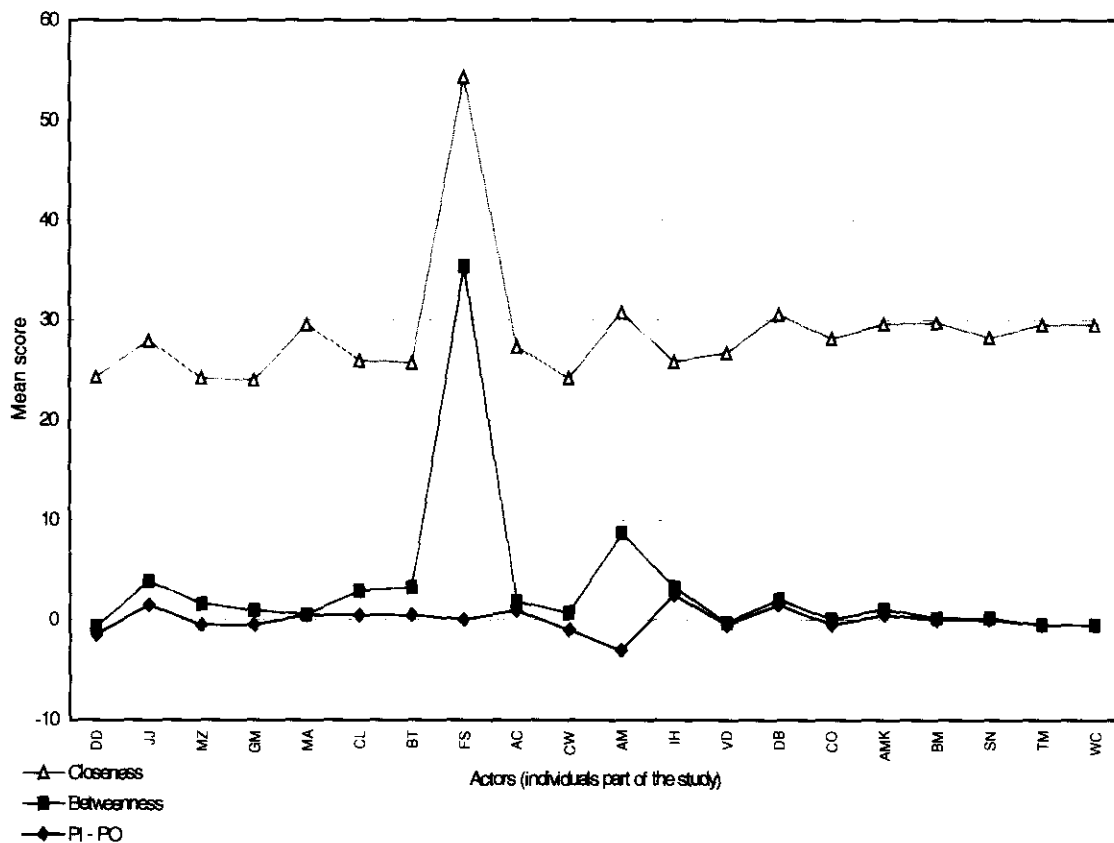
Since decentralisation patterns are evident due to the nature of the project (multi-national and multi-institutional), and that management has scored lower than the TELP critical friends group, and, as identified in section 5.7.2.3 that a very central person co-ordinates the project, the lower TELP management score is not significant. However, this is indicative that, especially TELP

management, is very reliant on a single core person. If this person were to become distanced from the project TELP will suffer tremendously in the management of the project.

5.7.3.1 General overview of findings: System level of analysis

Figure 11 is a summary graph of all of the centrality variables, closeness, betweenness and point degree, for the purposes of comparison with Figure 10 for determination of findings concerning the system level of analysis. It is relatively clear that the trends existing between the centrality variables among different actors are fairly consistent, with the only major variance being the fact that actor E2 had a low point degree score with a high betweenness score. This is due to the actor's perceived network role.

Figure 11 Centrality variables - closeness, betweenness and point degree scores for TELP individual actors



If actors are categorised in terms of similar scores (red, green and brown rectangles in Figure 11) the following groupings can be seen:

Group 1: Actors C1, F2, E2 and A5

Group 2: Actors F3, F4, F5, E3, F6 and F7

Group 3: Actors F1, E1, D2, D1, B1, A6, A4, A2 and A1

These groupings should be compared against the clique reconstruction with structural equivalence scores. Structural equivalence scores are grouped into Telp Management (Table 20) and TELP Critical friends group (Table 21):

Table 20 Clique reconstruction through structural equivalence for TELP management

Block	N	Split	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8
1	5	1	A1	D1	B1	D2	A2			
2	7	1	F1	F2	F3	F4	F5	F6	E3	E1
3	2	1	C1	E2						
4	6	1	A3	A4	A5	A6	F7			

Variances between the groupings based on the individual level of analysis and clique reconstruction groupings are based on the task-specification existent on the clique level of analysis. The significance of the matrix density scores relevant to the centrality variables is discussed in the observations pertaining to this section. The significance of this analysis lies with the fact that it allows the researcher to view the individuals and cliques as a whole and comment on the functioning of the system.

Table 21 Clique reconstruction through structural equivalence for the TELP critical friends group

Block	N	Split	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6
1	5	1	A1	A5	D1	D2	F7	
2	1	1	A2					
3	6	2	B1	E1	E2	F1	F2	F3
4	5	2	A4	F6	E3	F5	F4	
5	3	0	A3	A6	C1			

5.8 Integrated findings and observations

Findings and observations are based upon data presentation of the following:

- Likert scale – analysis
- Network analysis data

It should be noted that other precluding sections, not mentioned above, also representative of data, were applied and utilised for the construction of the Likert scale – type questions and the network analysis data. The findings and observations pertaining to the focus group research and demographic data are therefore automatically included, although not discussed separately.

5.8.1 Likert – scale analysis: an integrated overview

The major observations to be made from the Likert – scale type questions are as follows:

- A strong, clear management policy regarding videoconferencing utilisation does not exist. Respondents yielded a distinctly negative reaction to this question.
- Respondents had a neutral opinion on the following:
 - *Compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities*
 - *Management will always investigate the probability of using the videoconferencing system when a request for flying to a remote location is made*
 - *Employees using videoconferencing know how many people must be present for the videoconference to be cost – effective*

- Respondents had a positive opinion on the following:
 - *The videoconferencing system creates new relationships between participants*
 - *Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives*
 - *Workgroups that emerge during videoconferencing improve the quality of communication in the organisation*
 - *TELP management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme :*
 - *C8.1 TELP project management*
 - *C8.2 TELP training / Critical Friends Group*

Cross – tabulated results from the above are categorised as follows:

- Quality of communication practises
- Communication management performance
- Output / Efficiency of communication practises

5.8.1.1 Quality of communication practises

Quality of communication type questions referred to questions C2 and C5, which respectively stated that “videoconferencing creates new relationships between parties” and “workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group’s objectives”.

Both questions had a mean of 4 and 3.7 respectively, indicating that, in general, respondents agreed with the above-mentioned statements. It was furthermore established through cross-tabulations that respondents who have been using the system for four years or more had the best normal distribution

on these questions, showing that perceptions become more suitable the longer videoconferencing is used as a communication medium.

5.8.1.2 Communication management performance

It can clearly be seen that there are certain perceptions regarding:

- Management policy with regards to videoconferencing utilisation
- Management of cost control with regards to videoconferencing utilisation
- Effective management of the videoconferencing system to ensure the maximum output of both management and the critical friends group are clearly split and differentiated amongst members of management and the critical friends group

In general, from the comparative data between the impressions of the two groups regarding management - type questions, the impression is gained that management clearly has a far more positive outlook.

Specifically question C3, which states “a strong, clear management policy regarding videoconferencing utilisation exists” scored the lowest mean of all of the questions (mean of 2.45=disagree), which is indicative that videoconferencing is not well managed at the Institution. Question C4 had an average mean of 3.05 (neutral), whilst the results of C8.1 and C8.2, read together are significant. It is significant due to the fact that question C8.1 (asking whether TELP management has managed the videoconferencing system effectively to ensure the maximum output on 8.1 TELP project management and 8.2 TELP critical friends) scored a mean of (3.45 =neutral) whilst 8.2 scored a mean of (4.0=strongly agree). This is indicative that TELP videoconferencing communication management practises and policies are not acceptable to everyone who form part of the TELP project.

Cross - tabulations by site indicated that the USA- and Butterworth-recipients yielded more positive results than any other site regarding management-type

questions. This is due to the fact that the majority of the management-type respondents are based at these sites respectively.

5.8.1.3 Output/efficiency of communication practises

These variables were tested by questions C1 and C6 which respectively read “compared to a traditional face-to-face meeting I feel that more information is shared using videoconferencing facilities” and “workgroups that emerge during videoconferencing enhance the quality of communication in the organisation” .

Both these questions scored 3.15 and 3.8 respectively, which shows a neutral response on the issues. It should however be noted that, by isolation of the data from management-type respondents and the TELP critical friends group, it was evident that the TELP critical friends group had a far better normal distribution than the management group.

It should further be noted that the cross-tabulation with length of use showed that the longer the length of use, the more positive the respondent became.

5.8.2 Network Data Analysis: An integrated overview

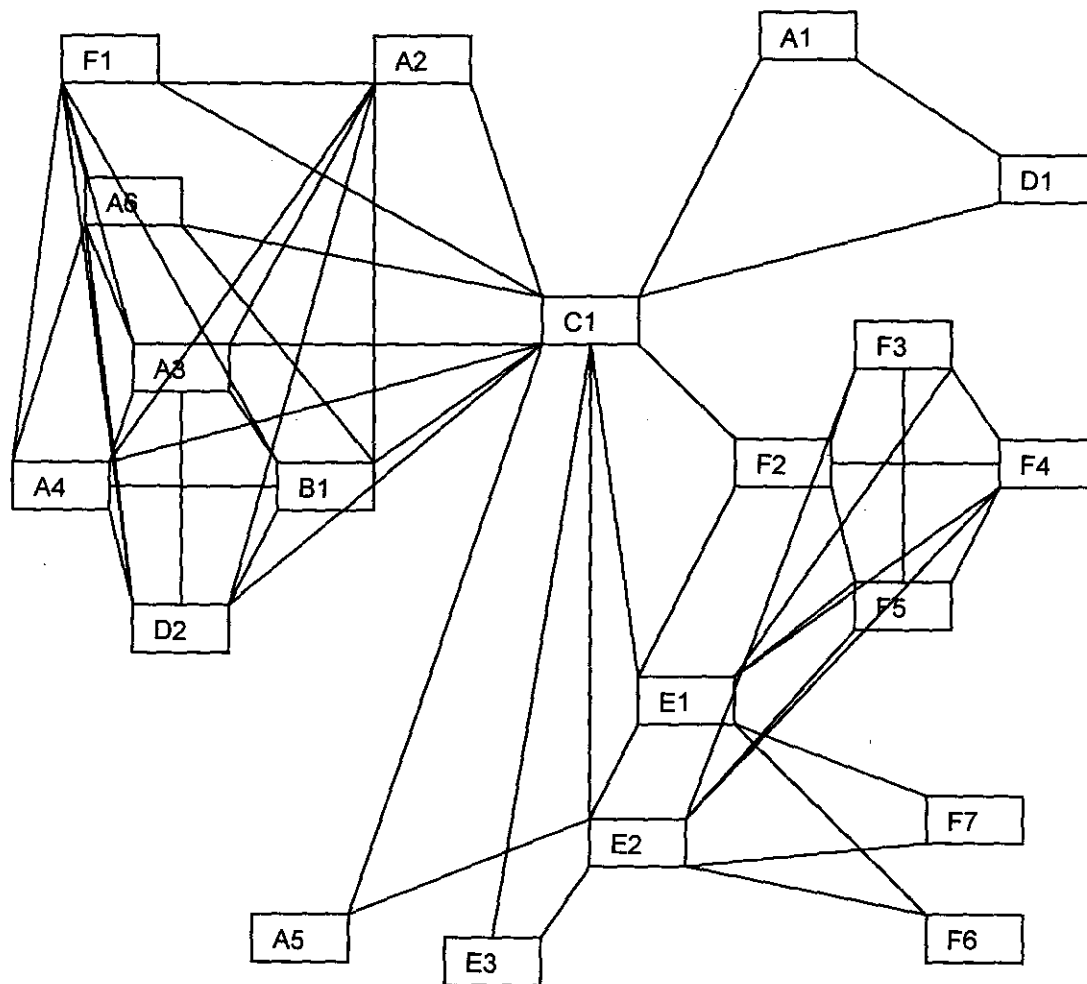
Observations from network analysis data was grouped into individual, clique and system level of analysis. This was done in order to allow the researcher to distinguish between individual characteristics, groupings of individuals (cliques) and ultimately to determine how the entire system functions as a whole.

5.8.2.1 Individual level of analysis

Clique reconstruction was done qualitatively and based on opinions of perceived network roles of different layers. Refer to Figure 12 for a sociogramme based on observations taking the following variables into account:

- Average point in/point out
- Betweenness
- Closeness

Figure 12 Qualitative sociogramme reconstruction on the perceived network role of different players based on individual level of analysis



If Figure 12 is examined, it can be stated that the following perceived network roles of the following actors are evident:

- Actor C1 fulfils the role of an opinion leader **as well as** gatekeeper. Actor C1 is the most vital link in the linkage project, actor C1 is the TELP project co-ordinator in South Africa. Actor C1 would be perceived by receivers of TELP training as an opinion leader, whereas senior levels of management would purely view the person as a vital link in the flow of information.
- Actors A1 and D1 is an isolated dyad. Actors A1 and D1 are both the most senior levels of management of the ECT and TSU involved in the linkage project respectively.
- Clique F2, F3, F4 and F5 are all receivers of TELP training and all members of the Engineering Faculty. It should further be noted that these members are tied by a stronger tie to the rest of the network through individual F2, who plays the role of gatekeeper between C1 and E1, the individuals with whom he is most closely tied. The clique also receives training from individuals E1 and E2 on a clique basis.
- Individuals F6 and F7 are virtual isolates, mainly due to their physical location and roles in the TELP project. Individual F6 is based in Queenstown and F7 in Butterworth. These two individuals would receive TELP training from E1 and E2.
- Individual E3 is an isolated TELP trainer due to the fact that the individual is based at a neighbouring Technikon. Individual E3 is linked to the network through association with C1 and E2 only.
- Individual A5 (from TSU) is an isolate to the project, mainly due to the fact that the individual was appointed recently in the position.
- Clique A3, A4, B1 and D2 are individuals at senior management level from both Institutions. This clique is loosely linked to individuals A2, F1 and A6 due to the administrative tasks that they fulfil for management.

The implications for the study of the above analysis are as follows:

- Individual C1 is a critical central person for TELP. This person links all the

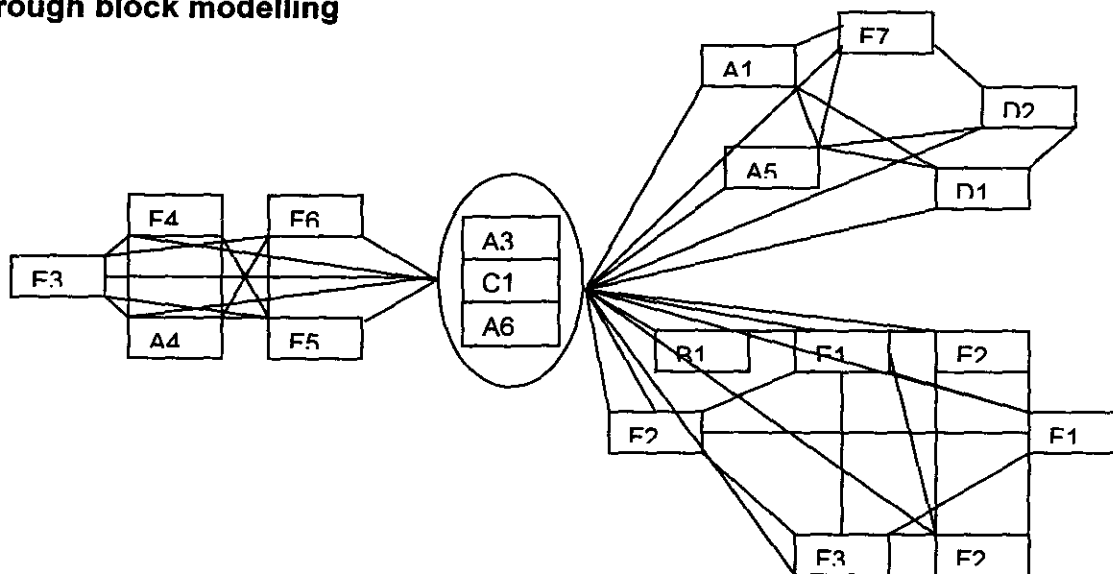
various groupings. High reliance of one person in this manner, from a strategic point of view, should rather be avoided. If the central person could rather be a dyad, triad, or even small clique the TELP programme would be less reliant on this person,

- Management only communicates through the central person, instead of being visible at all levels,
- The various cliques exist due their functionality in other organisational and institutional factors, instead of TELP specific objectives and outcomes.

5.8.2.2 Clique and system level of analysis

Clique reconstruction, done through the comparison of block and matrix densities whereby block values reveal greater density than the matrix density for the identification of strong and significant ties, also known as block modelling, revealed the existence of various cliques in terms of the variables identified in the focus group discussions.

Figure 13 Qualitative clique reconstruction based on TELP management through block modelling

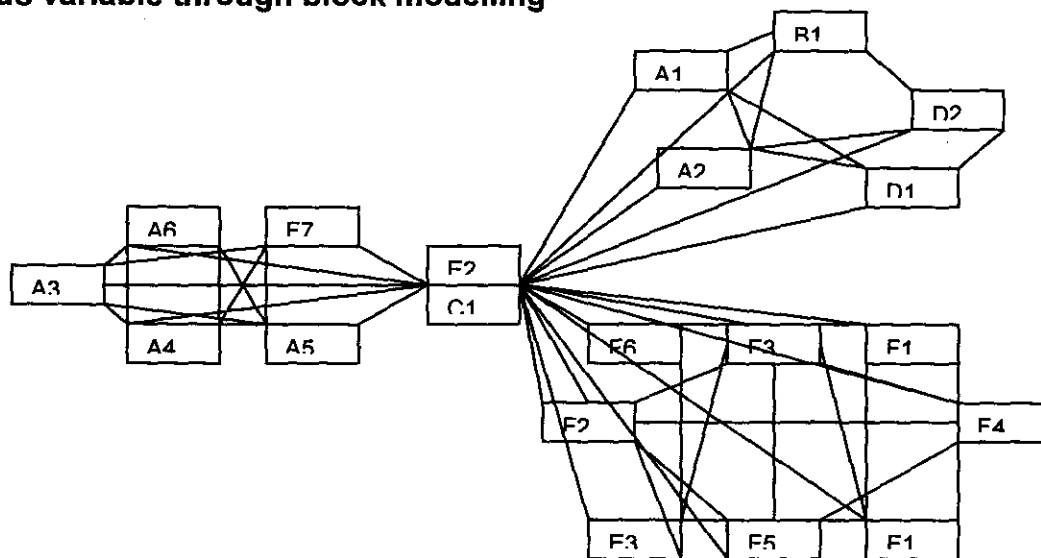


Refer to Figure 13 for a qualitative clique reconstruction based on this data of the TELP management analysis, and to Figure 14 (p172) for a qualitative clique reconstruction based on the data of TELP critical friends group.

Figure 13 illustrates the qualitative clique reconstruction based on TELP management variable through block modelling. The figure clearly illustrates that individuals E2 and C1 are the central hubs of the communication network, the opinion leaders, and flow of information would not take place in this specific network setting without the presence of these two individuals. Individuals A3, A6, F7, A4 and A5 is a central clique who receives information from the E2, C1 dyad.

In the same way individuals A1, A2, B1, D2 and D1 form a clique of their own and individuals F6, F2, F3, F1, F4, E1, F5 and E3 form another clique. Both these cliques respectively are dependent on receiving information from the E2, C1 dyad.

Figure 14 Qualitative clique reconstruction based on TELP critical friends variable through block modelling



From the TELP critical friends point of view (Figure 14), the central triad that controls the flow of information are individuals A3, C1 and A6. Individuals E3, F4, F6, A4 and F5 form a clique of their own and are dependent on receiving information from the triad. In the same way, individuals A1, F7, D2, D1 and A5 form a clique of their own and B1, F1, E2, F2, F1, E3 and F2 form a clique of their own. Both these cliques respectively are dependent on receiving

information from the A3, C1, A6 triad.

This qualitative reconstruction is significant for the study in the following manner:

- It indicates differences in perceived network roles of the same individuals from both a management and critical friends perspective
- It indicates central network players important for the functioning of the network as an intact system
- It allows for the identification of opinion leaders in respective cliques

Generally speaking, it remains very noticeable that on all levels of analysis the system remains highly reliant on one, two or three individuals for continued functioning of the system. Furthermore, by examination of the sociograms, it can be seen that the groups are highly cliqued due to respective organisational and locational positions. The only relationships that emerged interorganisationally in dyadic form were between those individuals who brought about the TELP project (senior management), and the execution of the project through the organisationally appointed opinion leaders.

5.9 Conclusion

In this chapter a combination of analysis methods were used:

Focus group research served as an adequate method to investigate the research group for the determination of key management variables and for the researcher to find an orientation towards the social network structure for the purpose of questionnaire construction, which included demographic, social network data matrix and Likert-scale communication management-type questions.

An analysis of chosen social network variables revealed a very definite social network, which can be illustrated on the basis of individual and key

management variables data.

The fact that matrix density is considerably different between the two perceived groups (TELP management and critical friends group) is indicative that hierarchical effects on the social communication network can be detected.

Analysis of Likert-scale communication management-type questions, specifically between management- and site-type questions, suggest that not only the hierarchical effect has an influence on the structure of the communication network but, physical location as well. A more integrated communication structure and management of such a structure is required to enhance the output of the social network. This should be done especially in consideration of suggestions of mergers with neighbouring institutions.

Quality of communication-type questions scored similarly on both management and critical friends group levels, indicating that satisfaction with the communication medium exists as opposed to management of the communication medium. Cross-tabulation of this variable with strength of use, further strengthens these findings.

Efficiency-type questions revealed that management is more positive in terms of the efficiency of the system, although it should be mentioned that the critical friends group still scored within acceptable levels. Cross - tabulations with length of use shows that the longer a person has been using the system the more efficient the videoconferencing system is perceived. Reliability statistics fell within acceptable levels.

Chapter 6 will explore the final recommendations taking the research problem statement, research questions and aims into consideration, as well as providing an overview of the findings by placing it into context in terms of social network research and videoconferencing in new organisational environments. The chapter also makes recommendations for further research.

CHAPTER 6: DISCUSSION OF FINDINGS, SYNTHESIS DEVELOPMENT, RECOMMENDATIONS, SHORTCOMINGS AND CONCLUSIONS

6.1 Introduction

Synthesis development is achieved through a discussion of the major research findings through addressing the research questions, research aims and central theoretical statements. These findings are brought in relation to current theoretical notions through a discussion on the significance of social network analysis in new communication technology implementation and relational maintenance.

Subsequently the shortcomings and advantages of the study are addressed followed by recommendations. Recommendations for further research are addressed by examining the potential relationship between social networks and organisational hierarchies, as well as multiplexed studies. Cross comparison between hierarchical structures and social network structures allows for more effective management of videoconferencing. Videoconferencing, in turn, could only be addressed through social network analysis in a multiplexed study.

6.2 Discussion of findings

The findings of the research in chapter five are discussed in an integrated manner in this section in order to create a synthesis. The synthesis is an integrated process where the findings and theoretical concepts are integrated with the view to addressing the research problem, research questions, research aims as well as the central theoretical statements.

The following is a consolidated list of the major findings as discussed in section eight of chapter five:

- A strong, clear management policy regarding videoconferencing utilisation does not exist.
- Respondents had a neutral opinion on the usefulness of videoconferencing for the sharing of information, as an alternative to flying and its cost – effectiveness.
- Respondents had a positive opinion on videoconferencing creating new relationships, the effectiveness of workgroups, the improvement of quality of communication in the organisation and output of the respective workgroups.
- Management has a more positive outlook regarding the management of the videoconferencing system at TELP than the users of the system.
- On individual level of analysis it was found that one person links all the various cliques within the TELP communication network. Management only communicates through this central person, instead of being visible at all levels.
- The network is highly cliqued, with the various cliques existing due their functionality in other organisational and institutional factors, instead of TELP specific objectives and outcomes.

6.2.1 Research problem, research questions and research aims

The research problem investigated in this study was as follows:

What do selected social communication network properties and practices in the application of videoconferencing reveal (contribute) as strategic communication management tool in a new organisational context at TELP?

The research problem is addressed through a discussion of the various findings of the research.

In the analysis of data and overview of theoretical concepts, the following emerged:

6.2.1.1 Research question 1.2.1 and Research aim 1.3.1

Research question 1.2.1: Which properties of selected communication networks at TELP reveal what with regards to individual, clique and network participation using videoconferencing compared to theoretical foundations on videoconferencing and social networks in new organisational forms?

Research aim 1.3.1: To empirically determine what the properties of selected communication networks at TELP reveal with regard to individual, clique and network participation using videoconferencing compared to theoretical foundations on videoconferencing and social networks in new organisational formats

Selected communication network properties and practises, including individual, clique and systems analysis, that, as noted in sections 5.7.1.4, 5.7.2.3 and 5.7.3.1 respectively, allows for the identification of clearly identifiable network roles through triangulation of individual, clique and systems level of analysis. More specifically, individual level of analysis would reveal individual characteristics and give some indication in terms of network

roles, whilst clique level of analysis would confirm network roles through the identification of cliques as well as giving some indication of identification of opinion leaders, whilst systems level of analysis would confirm opinion leaders and other network positions, as well as give an indication of overall communication as an intact system.

Generally speaking, as discussed in section 5.8.2.2, it was found that both the TELP management and TELP critical friends groups were reliant on communication facilitation by one or two individuals, whom without, the communication network would collapse. Within the entire system highly cliqued groups emerged without necessarily strong ties between the cliques.

The above discussion should be brought in relation to theory by considering the concept of "boundaryless organisations" (Powell *in* Monge & Fulk, 1999:83 – refer section 3.2) and the concepts of connectivity and communality. Theoretically "more extensive communication and broader network participation" (Monge & Fulk, 1999:86) can only be achieved through a more strategic approach which would eliminate the highly cliqued organisational format that emerged at TELP. Since videoconferencing is still a relatively new medium to the Eastern Cape Technikon, higher technology integration needs to occur for relational maintenance between the two Institutions. This could only be achieved through effective managerial policies and practises (research question 1.2.3) through management of quality of communication and communication management performance (research question 1.2.2).

6.2.1.2 Research question 1.2.2 and Research aim 1.3.2

Research question 1.2.2: In what way do selected communication network properties at TELP influence the quality of communication practises and communication management performance at TELP?

Research aim 1.3.2: To analyse selected communication network properties

at TELP and how it influences the quality of communication practises and communication management performance at TELP

The communication network properties that emerged in 6.2.1.1 revealed (section 5.6.7), that a positive response towards videoconferencing and improving the quality of communication in the organisation were obtained, thereby confirming the need for videoconferencing to be done on a more regular basis for achieving greater group cohesiveness, as expressed in discussion 6.2.1.1. It was furthermore established that individuals doing more videoconferencing were more positive about the communication in the organisation than those who did not. This would achieve the higher levels of communality and connectivity (section 3.2), resulting in higher matrix densities.

Communication management performance was addressed in 6.2.1.1, and it was found that, in general, management had a far more positive orientation regarding the performance of communication management than the TELP critical friends group, as expected.

These findings should be brought in relation to section 3.2.4, where it was expressed by Verwey *et al.* (2002:170) that a new social architecture emerges due to the implantation of new communication technology, and this “*means that the ways in which computer-supported co-operative work systems restructure social relationships, if at all, depend on pre-existing patterns of authority, obligation and co-operation, and an organisation’s openness to change*” (Verwey *et al.*, 2002:170).

The selected communication network properties chosen for investigation shape the basis of connectivity and communality, that new organisational forms, such as TELP, are highly dependent and reliant on for quality communication practises and communication management performance. Managerial policies and practises are however required to implement communication tools, such as videoconferencing, that can facilitate

connectivity and communality.

These managerial policies and practises relate to the existing formal and informal structures in the organisation tied with organisational culture and identity.

6.2.1.3 Research question 1.2.3 and Research aim 1.3.3

Research question 1.2.3: Which practices and policies that are being applied by TELP management regulate videoconferencing communication as management practice with reference to social network practices?

Research aim 1.3.3: To identify and analyse practices and policies that are being applied by TELP management that regulate communication as management practice within reference to social network practices

Findings in terms of section 6.2.1.1 revealed that, quite simply, “no managerial policies regarding videoconferencing at TELP exist” and that it is the general practise of employees to simply apply videoconferencing as a communication medium as is required in the social communication context. Social networks are therefore not reliant at all on management for deciding when and how videoconferencing should be applied. In terms of the discussion below social connectivity is low:

Theoretically section 3.2.1 concludes that “it is therefore imperative that managers in settings where videoconferencing are used frequently establish some manner of system effectiveness evaluation” and “give attention to the nature and the way in which social interaction takes place for the formation of social communication networks that can be effective and beneficial for the nature of the business.” The need for setting of strategic objectives, evaluation of objective attainment and management of the social communication network is therefore imperative.

However, Personnel Today (2002:1) have indicated that communication systems in certain organisational types function more efficiently if staff are kept up to date informally, especially where organisational members are geographically dispersed (refer section 2.2.3.2).

It should however be noted that, as Haythornthwaite (2001:213) indicates, new organisational forms are dependent on strong, close and multi-relational ties, which can only be achieved by management bringing the decoupled employees in communication through connectivity to achieve communality.

6.2.1.4 Research question 1.2.4 and Research aim 1.3.4

Research question 1.2.4: What are the perceptions of communication network members of TELP's management of its communication policies and practices and to what extent does it influence the output of the social network?

Research aim 1.3.4: To determine the perceptions of TELP Management's enforcement of its videoconferencing communication policies and practices and to determine to what extent it influences the output of the social network.

Section 5.6.7 indicated that no strong clearly defined management policy regarding videoconferencing utilisation exists and that respondents are ambivalent towards issues concerning the sharing of information, cost – effectiveness of the system and as an alternative to flying.

Theoretically social connectivity (the ability of members of a defined public to directly communicate with each other) as defined by Monge and Fulk (1999:85) (refer section 3.2.4.1) in new organisational environments is dependent on new communication technology (like videoconferencing) for the formation of social communication networks. It should furthermore be noted that it is necessary for managers in virtual organisational settings to “redesign business processes” and, through the creation of virtual organisations, “form strategic alliances and partnerships that will enable them to focus on core

competencies while expanding organisational capabilities” (Appelgate, 1999:33) (*refer section 3.2.4.1*).

From a social network perspective it is clear that integration has not taken place and that social connectivity is low (*refer section 6.2.1.4*), and based on the above theoretical statements and qualitative as well as empirical observations, it can be concluded that the outputs of the social network are not as high as it could be.

6.2.1.5 Research question 1.2.5 and Research aim 1.3.5

Research question 1.2.5: What is the perceived effectiveness of TELP's management of the quality of communication within the respective social networks as per key management issue?

Research aim 1.3.5: To determine the perceived effectiveness of TELP's management of the quality of communication within the respective social networks as per key management issue

The two key management issues were identified as the TELP project management (8.1) and TELP training (8.2). Whilst the responses proved fairly positive in section 5.6.2, (8.1 = mean of 3.15 and 8.2 = mean of 4.0), further investigation (*refer section 5.6.3*) revealed that a particular bias existed from management individuals to answer these questions favourably. Further cross-tabulation with site (*section 5.6.3*) showed that those sites where management is based scored particularly higher than those sites where management is not based.

This perceived bias should however not be discounted, since it is the overall score that determines the perceived effectiveness of a training programme.

These results should be brought in relation to section 3.2 concerning the nature of social networks in new organisational environments. Monge *et al.*

(1998:311 – 340) refer to task interdependence as opposed to geographic location in the evaluation of the effectiveness of new communication technology. Despite negative results obtained in sections 6.2.1.3 and 6.2.1.4, the positive evaluation of perceived effectiveness in terms of task evaluation should not be discounted or overlooked.

6.2.2 Central theoretical statements

The theoretical statements central to the study are addressed in the following way:

Proposition 1: Videoconferencing facilitates organisational communication networks (social networks and thus communication management strategies are necessary to ensure that the quality of information disseminated over the social network contributes to sound managerial outcomes).

Organisational communication networks are revealed naturally purely through the nature of individuals in association with one another. The value of such personal networks are described as *“invaluable, not only for my professional growth and education ...”* (Barnier, 2000:7). It should also be noted that *“the network is a structure of perceived communication relationships...”* (Daniels et al., 1997:113).

Videoconferencing specifically places another communication medium into the myriad of communication tools available to individuals in organisations, and can facilitate *“more extensive communication and broader network participation”* (Monge & Fulk, 1999:86). Assumptions of individuals associating or not associating due to the presence or absence of new communication technology should not be relevant in a well-managed communication environment. Research as early as 1994 (Kydd & Ferry, 1994:374) established that videoconferencing should be managed to create a communication climate that would increase productivity, and that the medium is only effective under certain circumstances. Therefore videoconferencing

does facilitate organisational communication networks on the precondition that the communication networks and the communication environment is well managed. The nature of social networks reveals that it will always be in existence when human interaction is relevant, however communication management strategies are indeed required to ensure that the quality of information disseminated over the social network contribute to sound managerial outcomes.

***Proposition 2:** Communication management policies and practises affect individuals' experiences of videoconferencing (as a communication management tool) and in turn influence the effectiveness of the videoconferencing system as a group decision support system.*

The fact that many recommendations can be made (PicturePhone, 1996:1) for videoconferencing implementation to contribute to communication patterns in organisations, does not necessarily signify that management policies is required for a system to be effective. Some organisations have policies regarding the use of simple technologies like telephones, others don't, and there is no real sound managerial rule regarding this.

Whilst it is recognised that videoconferencing could be used as a group decision support system (Kelsey, 2002:37), the above proposition would only be true if an organisation utilises videoconferencing only for making decisions. It is known that videoconferencing could be used for other applications as well (VTEL, 1997:2).

Therefore, communication management and policies do not necessarily affect individuals' experience of videoconferencing, however, as a communication management tool, videoconferencing must be guided by effective communication management policies and practises for the group to be effective, but not necessarily as a group decision support system, since the group might not use videoconferencing for the purpose of making decisions.

Proposition 3: *Managerial videoconferencing policies and practices as a communication tool should incorporate social network identification as well as the maintenance of the social network structures through individual, clique and network participation.*

Verwey *et al.* (2002:170) is of the opinion that “a new social architecture emerges” with the implementation of new communication technology, thereby restructuring social relationships. Since social networks is the “*interaction with one another in sociometric patterns*” (Rogers & Argawala-Rogers, 1978:296) and network analysis is a method for social network identification (Ahuja & Carley, 1998:23), communication managers could manage social relationships over videoconferencing systems more effectively if they have knowledge of the social network.

Therefore, managerial videoconferencing policies and practises as a communication tool must incorporate social network identification. Often social networks are similar to hierarchical networks, but the nature of social networks allows for opinion leaders to exist *without* the incorporation of that individual into the hierarchical structure.

These social network structures should be related to individual, clique and system levels of analysis to ensure that managerial policies and practises of a videoconferencing system could make a level of contribution at every level.

6.3 The significance of the research for strategic communication management

This study has demonstrated that videoconferencing can be applied as a strategic communication management tool in new organisational environments. Specifically, through social communication network analysis, researchers are able to determine the structure and significance of a social communication network, as well as management policies and practises that either contribute or detract from the effectiveness of videoconferencing in a

new organisational environment. Communication managers have to be sensitive to the implementation of videoconferencing and relationship building, which, in turn, can be monitored through the methodology applied in this research.

General implementation of social network methodology implies *"the proximity of two actors in social networks is associated with the occurrence of interpersonal influence between the actors"* (Marsden & Friedkin, 1994:3). Within this broad sphere, applications seem numerous, and include, to mention a few, epidemiology (Morris, 1994:26), social cognition (Pattison, 1994:79), anthropology (Johnson, 1994:113), primate behaviour, (Sade & Dow, 1994:152), computer mediated communication (Rice, 1994:167), intraorganisational networks (Mizruchi & Galaskiewicz, 1994:230), marketing (Arabie and Wind, 1994:254) and elite structure and decision-making (Knoke, 1994:274).

With computer mediated communication and associated systems actors are often geographically dispersed (Ahuja, Galetta and Carley, 1999:4). Tele-education, tele-business and tele-working are therefore ideally suited for utilising computer mediated communication (James, 1999: 63, Wakamatsu, 1999:65).

Social network analysis is ideal for measuring relationships amongst people who are geographically dispersed (Fulk and DeSanctis, 1995:337). Certain centrality variables seem ideally suited for that, including average point in/out, betweenness and closeness. This study has however proved that relationships form interorganisationally on the basis of hierarchies, and that videoconferencing specifically only contributed to forming relationships between people on the same hierarchical level, whether it be intraorganisationally or interorganisationally. For this reason it seems important that human relationships be managed, and pertaining specifically to videoconferencing, that the use and application of the system be constantly managed, and that specific policies be established for the maintenance of

relationships and ensuring that the output of the group is effective, taking into consideration the cost of flying.

Management should however not decide upon applications, but allow applications to develop on the basis of videoconferencing policies and practises in the organisation specific to the organisation's needs.

Constant social network analysis would therefore be required upon implementation, but also at regular intervals to monitor the development and maintenance of social relationships, with specific consideration given to relationships that developed over a distance. While conducting such social network analysis some efficiency measure should also be developed, to ensure that not only relations are in tact but that there is some benefit to the organisation.

6.4 Shortcomings

A shortcoming to this study is developing a measurement technique that overcomes the problem of constant organisational change and the speed at which geographically dispersed relationships form, maintain and disintegrate.

Ideally this can be overcome by conducting a study over time. It should however be noticed that a study should never culminate in an effects study, since relationships measured over time does not signify the interrelationships in a social network at a specific point in time.

This can only be achieved by following a constant process approach on a regular basis to describe the social network at a specific point in time. Effects will only be relevant in the determining whether alteration of practises and policies had an effect on the perception of the organisations management practises and policies with regard to videoconferencing.

Alternatively, an on-going network analysis could take place through establishing sufficient computer software that undertakes the analysis itself through email during regular intervals. Researcher contributions would then only be qualitative with descriptive data. Descriptive data furthermore does not have to be measured at the same intervals as social network analysis.

6.5 Advantages

The specific advantage gained by this study was the fact that the researcher was a member of one of the institutions being measured. Researchers conducting this type of study without any foreknowledge of the organisational relationships will merely duplicate reality (reductionism), and only provide already known information to the organisation.

In-depth qualitative information is crucial to this type of study. Researchers who are not actively engaged in the institution should conduct relationship interviews before attempting the research. This will assist in gaining knowledge of the relationship between network actors before trying to explain the relationship pattern that emerges after social network analysis. Alternatively, researchers may conduct post-social network analysis focus groups to explain the nature of the social relationships discovered during the research process.

6.6 Recommendations

From the results it is clear that the identification of selected social communication network properties and practises, in the application of videoconferencing as strategic communication management tool in new organisational forms, could allow for more effective management of a videoconferencing system.

The following recommendations are made to the TELP programme on the basis of central theoretical tenets of the study and the findings of the empirical sections:

- A clear, well-developed videoconferencing management policy needs to be developed for the TELP programme. Videoconferencing users need to be made aware of the general implications that the implementation of a system has on the functionality of the organisation. The management policy should be comprehensive enough to deal with business practises such as viability of implementation and continued maintenance of the system, and should include return on investment (ROI) analysis, as discussed in section 3.2.1. Research by Kydd and Ferry (1994:374) and other similar studies (refer section 3.2.1) that make recommendations for implementation of videoconferencing and relational maintenance (refer section 6.3) should be taken into account for management of the output of the critical friends groups and TELP management groups.
- Regular communication network analysis should be undertaken by TELP management on users of the videoconferencing system for the identification of selected properties concerning social networks that could result in revealing of strategic planning issues that could result in a higher output from the respective groups using the system.
- Such regular analysis could allow for communication managers to endeavour for the improvement of the quality of communication practises and communication management performance of videoconferencing users. This will allow for the establishment, identification and maintenance of practises and policies regarding videoconferencing with reference to social network practises.
- TELP could improve the output of the social network through communication of policies and practises as established by management. TELP should actively engage the establishment of management policies and practises for videoconferencing and implement them, with reference to social network properties.
- The identification of key management issues surrounding

videoconferencing implementation by the TELP programme could enhance the perceived effectiveness of management's quality of communication. Once such key management issues have been identified, (much like those identified in this study), continued further network analysis on a regular basis by key management variables could allow for better management of specific objectives for the TELP programme.

Implementation of the above recommendations could reveal how videoconferencing facilitates organisational communication networks at TELP and how communication management of videoconferencing policies and practises affect individuals' experience of videoconferencing at TELP. Furthermore the incorporation of social network identification as well as the maintenance of social network structures through individual, clique and network participation, could result in more effective relational maintenance between users of the TELP videoconferencing systems.

6.7 Recommendations for further research

Recommendations for further research include the following:

- the identification and investigation of the organisational hierarchical structure in correlation with the identification of the social network structure for cross - comparison of leadership qualities and subsequent appointments and maintenance of organisational leadership structures.
- the improvement of communication quality and management performance on a multiplex level, including all methods of organisational communication through identification and investigation of the organisational hierarchical structure in correlation with the social network structure.
- the establishment, identification and maintenance of practises and policies on a multiplex communication level with reference to social network practises.
- to improve the output of the social network, hierarchical structure and

multiplex communication mediums and channels through communication of policies and practises by management and establishment of perceptions of the management policies and practises.

- to identify key management and hierarchical leadership issues to enhance the perceived effectiveness of management's quality of communication and quality of output achieved by the existing organisational hierarchy.

6.8 Conclusion

Overall this study examined new organisational environments and all of the environmental variables, internally and externally, that affect new communication technology and motivate the adoption and implementation of new communication technology within new organisational environments. The formal and informal structures within the organisation as well as organisational culture and identity influence this, and manifests socially in social communication networks. These social communication networks are the level of measurement of effectiveness of managerial practises and policies regarding videoconferencing.

Subsequently videoconferencing emerges as a communication management tool and a new communication medium in the organisation with which many applications and challenges could be associated. Videoconferencing as a communication management tool should take into account the numerous applications that videoconferencing holds, but should at the same time consider all the implications for management. Users will experience difficulty at first due to alteration of the communication process, and it is important that communication managers should show a level of sensitivity on interpersonal relations establishment and maintenance using a videoconferencing system. Aspects that should be attended to include alteration of verbal and non-verbal communication processes, the establishment of virtual relationships and how it impacts on the social communication network on individual, clique and system level.

The study utilised focus group research, social network analysis and descriptive statistics in the investigation of manifestation of above-mentioned variables in the Tertiary Education Linkages Project (TELP), which is a linkage project between the ECT and Texas Southern University with the aim of the continued development of academic staff at the ECT. The study therefore utilised triangulation for establishment of acceptable levels of reliability and validity.

The analysis of data revealed that videoconferencing facilitates organisational communication networks on the precondition that the communication networks and the communication environments are well managed. The nature of social networks reveals that it will always be in existence when human interaction is relevant, however communication management strategies are indeed required to ensure that the quality of information disseminated over the social network contribute to sound managerial outcomes. Furthermore it was established that communication management and policies do not necessarily affect individuals' experience of videoconferencing, however, as a communication management tool, videoconferencing must be guided by effective communication management policies and practises for the group to be effective.

It furthermore demonstrated how managerial videoconferencing policies and practises, as a communication tool must incorporate social network identification. These social network structures should be related to individual, clique and system levels of analysis to ensure that managerial policies and practises of a videoconferencing system contribute to every level.

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ANNEXURES

ANNEXURE 1: MODERATOR GUIDE

Moderator Guide

1. Introduction and opening (2 min)

Who's whom in the group?

2. Brief explanation of the study (2 min)

M Student, Potch. Univ. Dissertation Title: Videoconferencing as strategic management tool in new organisational forms. The case of TELP.

3 major research aims:

Examining videoconferencing as a communication tool

Determining how videoconferencing influences the formation of cmn networks in new org forms.

Determining how the management of these communication networks influences the output of the group

*Explain 2 - step methodology. Identify individuals. 1 Focus Groups 2 Personal interviews through structured questionnaire. **Explain List Explain why moderator. Note: Group discussion being recorded.***

3. Why videoconferencing for TELP? (1 min)

***Moderator:** Open ended. Get the group talking. Probe on how essential videoconferencing is. What costs would have been involved if vc's were not held. How management and what did made management decide that vc's are the best option.*

4. Identification of social network topics.(2min 30 sec)(**Explain Cliques, Social Setting, TELP Setting**):

1. Topic:.....
2. Topic:.....
3. Topic:.....
4. Topic:.....
5. Topic:.....

5. Has videoconferencing changed the way in which you communicate? How?
(1 min)

Moderator: Probe on **past practises and present practises**. How and if the system have improved their ability to deliver a higher output, whether quality assurance is higher and if better delivery is taking place due to the use of the system. Do they feel comfortable using the system / or is ftf better, is ftf possible?

6. Has there been any significant savings in travel/cost due to the system?
(4min)

Moderator: At the cost of ...what...(personal interaction ...probe) ... Has it had a + or – effect on personal relations between people ...

7. Videoconferencing as a GDSS (5 min) – (Group Decision Support System)
Used for decision making? Y (see below) N – goto question 8. The Group must simply decide amongst themselves (it must be a group decision causing them to debate the topic) what the rating is.

Moderator:

(Rate as a group ... 1 = poor , 5 = excellent)

Effect on decision quality
Effect on time during decision making
Effect on equality on participation
Effect on user satisfaction with the decision process
Increase / Decrease on amount of shared information
Increase / Decrease in creativity
Increase / Decrease in mutual agreement and understanding
Effect on perceived level of stress due to system usage

8. **Moderator:** To what extent do management policies and practises regarding the use of the system influence your ability to communicate effectively? (5 min)

Probe and what management is doing unique to make the people use the system. Probe on the touchy subject of what management should be doing in other departments to have the same effect.

9. **Moderator:** Has new communication technology had an effect on traditional communication structures in your company? How? (5min)

It has been stated that new com technology allows for flatter org structures, faster decision making and more efficient delivery. Probe on these issues

10. Further questions – Refer Researcher

11. Thanks and Closure. End of session

Max. Time: 30 min

ANNEXURE 2: STRUCTURED QUESTIONNAIRE

Dear Respondent

Thank you for your willingness to participate in this study. The purpose of the study is to determine *whom communicates with whom and why* at TELP using videoconferencing facilities. Specifically, the research problem is defined as:

“An analysis of selected social communication network properties and practices in the application of videoconferencing as strategic communication management tool in a new organisational context at TELP”

The study aims to identify the functional communication network that exists through the use of videoconferencing facilities, and will thereby identify more and less prominent users in order to demonstrate how videoconferencing can be applied as a strategic communication management tool. Reasons for such prominence is furthermore investigated, and the subsequent advantages and disadvantages identified will result in usage recommendations to TELP.

Please note that the necessary permission was obtained to complete the study that forms part of my Masters Dissertation in Communication at Potchefstroom University under the supervision of Prof. Gideon De Wet. The results from the research are therefore to be made available to TELP on completion of the study.

Please realise that all names will be awarded numbers during interpretation of the data and will therefore be kept strictly confidential. All names will remain entirely anonymous in the final publication.

Please do not hesitate to contact me should you have any further queries, and thank you for your kind co-operation.

Ian Saunderson

Tel: +27 83 454 5846

E-mail : IanS@btech.tktech.ac.za

Section A - Demographic Information

1. Physical Location (state Country and City / Town)

2. Name.....

3. Surname

4. Gender (tick/bold) Male Female

5. Age (tick/bold appropriate box)

16 – 24	25 – 34	35 – 49	50 - 59	60 +
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6. Home Language (tick/bold appropriate box)

English	Afrikaans	Xhosa	South Sotho	Zulu
North Sotho	Swazi	Venda		

7. Length of use : How long have you been using videoconferencing system(s) ? (tick/bold appropriate box)

0 – 6 months	6 – 12 months	1 – 2 years	2 – 4 years	4 years+
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Section B – Your TELP communication network

8. As a first step, underline those names that you recognise from the following groups:

USA:

- Daniel Davis
- Jenifer Jolivet
- Mohamed Zanuba
- Gregory Maddox
- Mitchell Allan
- Claudette Ligons

Visiting Fullbright Professor:

- Barbara Tedrow

South Africa:

- Faith Sigaba
- Andrew Christoffels
- Chris van Wyk
- Adele Moody
- Irene Harvey
- Valife Dwayi
- Danie Bessinger
- Christo Louw
- Andrew Mkoko
- Brian Mtwana
- Sibongile Ndlazi
- Thandi Matsiliza
- Wendy Colyn

Let's say for instance you only recognise person AB, person CD and person EF (imaginary names). Only work with names you recognise. If you are of the opinion that person AB frequently communicates to person CD, you will place a 1 in the space provided (see example below). However, you may feel that person CD does not frequently communicate to person AB, you will leave the space blank (see example below).

In the same way you may feel that CD communicates to EF (1) that EF does not communicate to CD (blank), and that AB communicates to EF (1) and EF communicates to AB (1)

The above matrix, correctly filled in, will resemble the following :

Issue : TELP MANAGEMENT TEAM

	AB	CD	EF
AB	-		1
CD	1	-	
EF	1	1	-

You will probably find that your matrix will be different with regards to the two separate issues listed below. Now complete your video-communication network on the following pages.

ISSUE 1 : The TELP Management Team

Abbreviations : USA - Daniel Davis (DD), Jenifer Jolivet (JJ), Mohamed Zanuba (MZ), Gregory Maddox (GM), Mitchell Allan (MA), Claudette Ligons (CL), **Visiting Fullbright Professor** - Barbara Tedrow (BT), **South Africa** - Faith Sigaba (FS), Andrew Christoffels (AC), Chris van Wyk (CW), Adele Moody (AM), Irene Harvey (IH), Valile Dwayi (VD), Danie Bessinger (DB), Christo Louw (CO), Andrew Mkoko (AM), Brian Mtwa (BM), Sibongile Ndlazi (SN), Thandi Matsiliza (TM), Wendy Colyn (WC)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
		DD	JJ	MZ	GM	MA	CL	BT	FS	AC	CW	AM	IH	VD	DB	CO	AM	BM	SN	TM	WC	
1	DD	-																				
2	JJ		-																			
3	MZ			-																		
4	GM				-																	
5	MA					-																
6	CL						-															
7	BT							-														
8	FS								-													
9	AC									-												
10	CW										-											
11	AM											-										
12	IH												-									
13	VD													-								
14	DB														-							
15	CO															-						
16	AM																-					
17	BM																	-				
18	SN																		-			
19	TM																			-		
20	WC																				-	

ISSUE 2 : TELP Trainers / Critical Friends Group

Abbreviations : USA - Daniel Davis (DD), Jenifer Jolivet (JJ), Mohamed Zanuba (MZ), Gregory Maddox (GM), Mitchell Allan (MA), Claudette Ligons (CL), **Visiting Fullbright Professor** - Barbara Tedrow (BT), **South Africa** - Faith Sigaba (FS), Andrew Christoffels (AC), Chris van Wyk (CW), Adele Moody (AM), Irene Harvey (IH), Valile Dwayi (VD), Danie Bessinger (DB), Christo Louw (CO), Andrew Mkoko (AM), Brian Mtwa (BM), Sibongile Ndlazi (SN), Thandi Matsiliza (TM), Wendy Colyn (WC)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
		DD	JJ	MZ	GM	MA	CL	BT	FS	AC	CW	AM	IH	VD	DB	CO	AM	BM	SN	TM	WC	
1	DD	-																				
2	JJ		-																			
3	MZ			-																		
4	GM				-																	
5	MA					-																
6	CL						-															
7	BT							-														
8	FS								-													
9	AC									-												
10	CW										-											
11	AM											-										
12	IH												-									
13	VD													-								
14	DB														-							
15	CO															-						
16	AM																-					
17	BM																	-				
18	SN																		-			
19	TM																			-		
20	WC																				-	

Section C – Videoconferencing Effectiveness

Examine the statements below and tick the appropriate response.

1. Compared to a traditional face to face meeting I feel that more information is shared using videoconferencing facilities

Strongly Disagree Disagree Neutral Agree Strongly Agree

2. The videoconferencing system creates new relationships between participants

Strongly Disagree Disagree Neutral Agree Strongly Agree

3. A strong, clear management policy regarding videoconferencing utilisation exists

Strongly Disagree Disagree Neutral Agree Strongly Agree

4. Management will always investigate the probability of using the videoconferencing system when a request for flying to a remote location is made

Strongly Disagree Disagree Neutral Agree Strongly Agree

5. Workgroups, emerging from videoconferences, determine the key issues that need to be discussed to ensure proper delivery of the group's objectives.

Strongly Disagree Disagree Neutral Agree Strongly Agree

6. Workgroups that emerge during videoconferencing improve the quality of communication in the organisation.

Strongly Disagree Disagree Neutral Agree Strongly Agree

7. Employees using videoconferencing know how many people must be present for the videoconference to be cost-effective

Strongly Disagree Disagree Neutral Agree Strongly Agree

8. TELP Management has managed the videoconferencing system effectively to ensure the maximum output on the following issues from the TELP programme :

8.1 TELP project management

Strongly Disagree Disagree Neutral Agree Strongly Agree

8.2 TELP training / Critical Friends Group

Strongly Disagree Disagree Neutral Agree Strongly Agree

End of questionnaire - Thank you for your kind support and effort towards this study.

ANNEXURE 3: NETWORK ANALYSIS DATA

ANNEXURE 3.1: INDIVIDUAL LEVEL OF ANALYSIS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
TELP Management	A1	A2	A3	A4	A5	A6	B1	C1	D1	D2	E1	E2	F1	F2	F3	F4	F5	E3	F6	F7
Point In	12	13	11	11	10	12	13	19	12	12	8	18	8	5	1	2	1	4	1	1
Point Out	12	12	12	11	9	11	13	19	12	12	13	13	7	2	3	2	2	5	2	2
Av PI/PO	12	13	12	11	10	12	13	19	12	12	11	16	8	4	2	2	2	5	2	2
Betweenness	1	3	1	0	0	2	3	68	1	2	21	0	0	0	0	0	0	0	0	0
Closeness	26	26	26	27	29	27	25	19	26	26	25	25	31	36	35	36	36	33	36	36
TOTAL	63	66	62	60	58	63	67	144	63	64	78	72	54	47	41	42	41	47	41	41
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
TELP Critical Friends																				
Point In	11	18	19	18	9	19	19	19	15	15	18	18	13	17	18	18	16	16	14	14
Point Out	14	16	19	19	9	19	18	19	13	17	19	18	15	17	17	17	15	15	14	14
Av PI/PO	13	17	19	19	9	19	19	19	14	16	19	18	14	17	18	18	16	16	14	14
Betweenness	1	2	3	3	0	3	3	3	1	2	2	2	0	1	1	1	0	0	0	0
Closeness	24	22	19	19	29	19	20	19	25	21	19	20	23	21	21	21	23	23	24	24
TOTAL	62	75	79	77	56	79	78	79	68	71	77	76	65	73	75	75	70	70	66	66
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
OVERALL AVERAGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Point In	12	16	15	15	10	16	16	19	14	14	13	18	11	11	10	10	9	10	8	8
Point Out	13	14	16	15	9	15	16	19	13	15	16	16	11	10	10	10	9	10	8	8
Av PI/PO	12	15	15	15	9	15	16	19	13	14	15	17	11	10	10	10	9	10	8	8
PI - PO	-2	2	-1	-1	1	1	1	0	1	-1	-3	3	-1	2	-1	1	0	0	-1	-1
Betweenness	1	2	2	1	0	2	3	35	1	2	12	1	0	1	1	1	0	0	0	0
Closeness	25	24	23	23	29	23	23	19	26	24	22	23	27	29	26	29	30	28	30	30
TOTAL	61	72	70	68	57	72	73	111	66	66	74	76	59	61	57	59	55	58	53	53

AV PI/PO																				
13>	A2	A3	A4	A6	B1	C1	D2	E1	E2											
10-13	A1	D1	F1	F2	E3															
5-10	A5	F3	F4	F5	F6	F7														
Btwness																				
5>	C1	E1																		
1-5	A2	A3	A4	A6	B1	D2														
>1	A1	A5	D1	E2	F1	F2	F3	F4	F5	E3	F6	F7								
Closeness																				
25-30	A1	A5	D1	E3	F1	F2	F3	F4	F5	F6	F7									
20-24	A2	A3	A4	A6	B1	D2	E1	E2												
>20	C1																			

ANNEXURE 3.2: CLIQUE AND SYSTEM LEVEL OF ANALYSIS

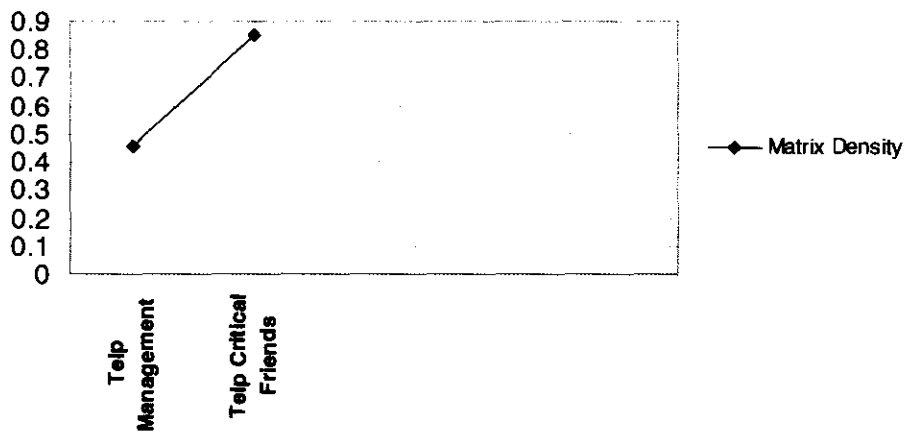
TELP MANAGEMENT

Block	N	Split	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member 8
1	5	1	A1	D1	B1	D2	A2			
2	7	1	F1	F2	F3	F4	F5	F6	E3	E1
3	2	1	C1	E2						
4	6	1	A3	A4	A5	A6	F7			

TELP CRITICAL FRIENDS

Block	N	Split	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6
1	5	1	A1	A5	D1	D2	F7	
2	1	1	A2					
3	6	2	B1	E1	E2	F1	F2	F3
4	5	2	A4	F6	E3	F5	F4	
5	3	0	A3	A6	C1			

Matrix Density



ANNEXURE 4: DESCRIPTIVE STATISTICS

ANNEXURE 4.1: DEMOGRAPHIC DATA

gender	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Female	9	45.00	9	45.00
Male	11	55.00	20	100.00

Age	Frequency	Percent	Cumulative Frequency	Cumulative Percent
25-34	5	25.00	5	25.00
35-49	10	50.00	15	75.00
50-59	4	20.00	19	95.00
60+	1	5.00	20	100.00

Language	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Afrikaans	3	15.00	3	15.00
English	11	55.00	14	70.00
Other	6	30.00	20	100.00

Length_of_use	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1: Less than 6m	6	30.00	6	30.00
2: 6m-1yr	4	20.00	10	50.00
3: 1-2yr	5	25.00	15	75.00
4: 2-4yr	1	5.00	16	80.00
5: More than 4y	4	20.00	20	100.00

ANNEXURE 4.2: LIKERT – SCALE DATA

The MEANS Procedure

Variable	N	Mean	Median	Std Dev	Maximum
C1	20	3.15	3.00	1.18	5.00
C2	20	4.00	4.00	0.73	5.00
C3	20	2.45	3.00	0.94	4.00
C4	20	3.05	3.00	1.39	5.00
C5	20	3.70	4.00	0.66	4.00
C6	20	3.80	4.00	0.83	5.00
C7	20	3.05	3.00	1.00	5.00
C8_1	20	3.45	3.50	1.10	5.00
C8_2	20	4.00	4.00	0.79	5.00

----- Age=25-34 -----

The MEANS Procedure

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	5	3.00	3.00	1.22	2.00	5.00
C2	5	3.60	4.00	1.14	2.00	5.00
C3	5	2.00	2.00	1.00	1.00	3.00
C4	5	2.60	3.00	1.67	1.00	5.00
C5	5	3.60	4.00	0.89	2.00	4.00
C6	5	3.40	4.00	0.89	2.00	4.00
C7	5	2.80	2.00	1.10	2.00	4.00
C8_1	5	2.60	2.00	1.34	2.00	5.00
C8_2	5	3.40	3.00	1.14	2.00	5.00

----- Age=35-49 -----

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	10	3.20	3.00	1.03	2.00	5.00
C2	10	4.20	4.00	0.42	4.00	5.00
C3	10	2.70	3.00	0.82	1.00	4.00
C4	10	3.30	3.50	1.06	2.00	5.00
C5	10	3.80	4.00	0.42	3.00	4.00
C6	10	3.90	4.00	0.74	3.00	5.00
C7	10	3.10	3.00	0.88	2.00	4.00
C8_1	10	3.90	4.00	0.74	3.00	5.00
C8_2	10	4.10	4.00	0.57	3.00	5.00

----- Age=50-59 -----

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	4	2.75	3.00	1.50	1.00	4.00
C2	4	3.75	4.00	0.50	3.00	4.00
C3	4	2.50	2.50	1.29	1.00	4.00
C4	4	2.50	2.00	1.73	1.00	5.00
C5	4	3.50	4.00	1.00	2.00	4.00
C6	4	3.75	3.50	0.96	3.00	5.00
C7	4	2.75	2.50	0.96	2.00	4.00
C8_1	4	3.00	3.00	0.82	2.00	4.00
C8_2	4	4.25	4.00	0.50	4.00	5.00

----- Age=60+ -----

The MEANS Procedure

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	1	5.00	5.00	.	5.00	5.00
C2	1	5.00	5.00	.	5.00	5.00
C3	1	2.00	2.00	.	2.00	2.00
C4	1	5.00	5.00	.	5.00	5.00
C5	1	4.00	4.00	.	4.00	4.00
C6	1	5.00	5.00	.	5.00	5.00
C7	1	5.00	5.00	.	5.00	5.00
C8_1	1	5.00	5.00	.	5.00	5.00
C8_2	1	5.00	5.00	.	5.00	5.00

----- Length_of_use=1: Less than 6m -----

The MEANS Procedure

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	6	3.00	3.00	1.10	1.00	4.00
C2	6	4.17	4.00	0.41	4.00	5.00
C3	6	2.17	2.50	0.98	1.00	3.00
C4	6	2.67	2.00	1.86	1.00	5.00
C5	6	3.50	4.00	0.84	2.00	4.00
C6	6	3.83	4.00	0.75	3.00	5.00
C7	6	2.83	3.00	0.75	2.00	4.00
C8_1	6	3.17	3.00	0.75	2.00	4.00
C8_2	6	4.17	4.00	0.41	4.00	5.00

----- Length_of_use=2: 6m-1yr -----

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	4	2.75	2.00	1.50	2.00	5.00
C2	4	3.50	3.50	1.29	2.00	5.00
C3	4	2.50	2.50	1.29	1.00	4.00
C4	4	2.75	2.50	1.71	1.00	5.00
C5	4	3.50	4.00	1.00	2.00	4.00
C6	4	3.00	3.00	0.82	2.00	4.00
C7	4	2.50	2.00	1.00	2.00	4.00
C8_1	4	3.00	2.50	1.41	2.00	5.00
C8_2	4	3.75	3.50	0.96	3.00	5.00

----- Length_of_use=3: 1-2yr -----

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	5	2.80	2.00	1.30	2.00	5.00
C2	5	4.20	4.00	0.45	4.00	5.00
C3	5	2.20	2.00	0.84	1.00	3.00
C4	5	3.40	3.00	1.14	2.00	5.00
C5	5	3.80	4.00	0.45	3.00	4.00
C6	5	3.80	4.00	0.84	3.00	5.00
C7	5	3.40	4.00	1.34	2.00	5.00
C8_1	5	3.60	4.00	1.14	2.00	5.00
C8_2	5	3.60	4.00	1.14	2.00	5.00

----- Length_of_use=4: 2-4yr -----

The MEANS Procedure

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	1	3.00	3.00	.	3.00	3.00
C2	1	4.00	4.00	.	4.00	4.00
C3	1	3.00	3.00	.	3.00	3.00
C4	1	4.00	4.00	.	4.00	4.00
C5	1	4.00	4.00	.	4.00	4.00
C6	1	5.00	5.00	.	5.00	5.00
C7	1	4.00	4.00	.	4.00	4.00
C8_1	1	4.00	4.00	.	4.00	4.00
C8_2	1	4.00	4.00	.	4.00	4.00

----- Length_of_use=5: More than 4y -----

Variable	N	Mean	Median	Std Dev	Minimum	Maximum
C1	4	4.25	4.00	0.50	4.00	5.00
C2	4	4.00	4.00	0.82	3.00	5.00
C3	4	3.00	3.00	0.82	2.00	4.00
C4	4	3.25	3.50	0.96	2.00	4.00
C5	4	4.00	4.00	0.00	4.00	4.00
C6	4	4.25	4.00	0.50	4.00	5.00
C7	4	3.25	3.50	0.96	2.00	4.00
C8_1	4	4.00	4.50	1.41	2.00	5.00
C8_2	4	4.50	4.50	0.58	4.00	5.00

ANNEXURE 4.3: CROSS TABULATIONS

The FREQ Procedure

Table of Age by C1

Age	C1					
Frequency						
Percent						
Row Pct						
Col Pct	1	2	3	4	5	Total
25-34	0	2	2	0	1	5
	0.00	10.00	10.00	0.00	5.00	25.00
	0.00	40.00	40.00	0.00	20.00	
	0.00	33.33	40.00	0.00	33.33	
35-49	0	3	3	3	1	10
	0.00	15.00	15.00	15.00	5.00	50.00
	0.00	30.00	30.00	30.00	10.00	
	0.00	50.00	60.00	60.00	33.33	
50-59	1	1	0	2	0	4
	5.00	5.00	0.00	10.00	0.00	20.00
	25.00	25.00	0.00	50.00	0.00	
	100.00	16.67	0.00	40.00	0.00	
60+	0	0	0	0	1	1
	0.00	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	0.00	33.33	
Total	1	6	5	5	3	20
	5.00	30.00	25.00	25.00	15.00	100.00

The FREQ Procedure
 Table of gender by C1

gender C1

	1	2	3	4	5	Total
Frequency						
Percent						
Row Pct						
Col Pct						
Female	1	4	2	0	2	9
	5.00	20.00	10.00	0.00	10.00	45.00
	11.11	44.44	22.22	0.00	22.22	
	100.00	66.67	40.00	0.00	66.67	
Male	0	2	3	5	1	11
	0.00	10.00	15.00	25.00	5.00	55.00
	0.00	18.18	27.27	45.45	9.09	
	0.00	33.33	60.00	100.00	33.33	
Total	1	6	5	5	3	20
	5.00	30.00	25.00	25.00	15.00	100.00

Table of Length_of_use by C1

	Length_of_use					C1
Frequency						
Percent						
Row Pct						
Col Pct	1	2	3	4	5	Total
1: Less than 6m	1	0	3	2	0	6
	5.00	0.00	15.00	10.00	0.00	30.00
	16.67	0.00	50.00	33.33	0.00	
	100.00	0.00	60.00	40.00	0.00	
2: 6m-1yr	0	3	0	0	1	4
	0.00	15.00	0.00	0.00	5.00	20.00
	0.00	75.00	0.00	0.00	25.00	
	0.00	50.00	0.00	0.00	33.33	
3: 1-2yr	0	3	1	0	1	5
	0.00	15.00	5.00	0.00	5.00	25.00
	0.00	60.00	20.00	0.00	20.00	
	0.00	50.00	20.00	0.00	33.33	
4: 2-4yr	0	0	1	0	0	1
	0.00	0.00	5.00	0.00	0.00	5.00
	0.00	0.00	100.00	0.00	0.00	
	0.00	0.00	20.00	0.00	0.00	
5: More than 4y	0	0	0	3	1	4
	0.00	0.00	0.00	15.00	5.00	20.00
	0.00	0.00	0.00	75.00	25.00	
	0.00	0.00	0.00	60.00	33.33	
Total	1	6	5	5	3	20
	5.00	30.00	25.00	25.00	15.00	100.00

The FREQ Procedure

Table of Age by C2

Age	C2				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
25-34	1	1	2	1	5
	5.00	5.00	10.00	5.00	25.00
	20.00	20.00	40.00	20.00	
	100.00	50.00	15.38	25.00	
35-49	0	0	8	2	10
	0.00	0.00	40.00	10.00	50.00
	0.00	0.00	80.00	20.00	
	0.00	0.00	61.54	50.00	
50-59	0	1	3	0	4
	0.00	5.00	15.00	0.00	20.00
	0.00	25.00	75.00	0.00	
	0.00	50.00	23.08	0.00	
60+	0	0	0	1	1
	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	25.00	
Total	1	2	13	4	20
	5.00	10.00	65.00	20.00	100.00

The FREQ Procedure

Table of gender by C2

gender		C2						
Frequency	Percent	Row Pct	Col Pct	2	3	4	5	Total
Female	1	1	5	2	9			
	5.00	5.00	25.00	10.00	45.00			
	11.11	11.11	55.56	22.22				
	100.00	50.00	38.46	50.00				
Male	0	1	8	2	11			
	0.00	5.00	40.00	10.00	55.00			
	0.00	9.09	72.73	18.18				
	0.00	50.00	61.54	50.00				
Total	1	2	13	4	20			
	5.00	10.00	65.00	20.00	100.00			

The FREQ Procedure
 Table of Length_of_use by C2

Length_of_use	C2					
Frequency						
Percent						
Row Pct						
Col Pct		2	3	4	5	Total
1: Less than 6m	0	0	5	1	6	
	0.00	0.00	25.00	5.00	30.00	
	0.00	0.00	83.33	16.67		
	0.00	0.00	38.46	25.00		
2: 6m-1yr	1	1	1	1	4	
	5.00	5.00	5.00	5.00	20.00	
	25.00	25.00	25.00	25.00		
	100.00	50.00	7.69	25.00		
3: 1-2yr	0	0	4	1	5	
	0.00	0.00	20.00	5.00	25.00	
	0.00	0.00	80.00	20.00		
	0.00	0.00	30.77	25.00		
4: 2-4yr	0	0	1	0	1	
	0.00	0.00	5.00	0.00	5.00	
	0.00	0.00	100.00	0.00		
	0.00	0.00	7.69	0.00		
5: More than 4y	0	1	2	1	4	
	0.00	5.00	10.00	5.00	20.00	
	0.00	25.00	50.00	25.00		
	0.00	50.00	15.38	25.00		
Total	1	2	13	4	20	
	5.00	10.00	65.00	20.00	100.00	

The FREQ Procedure

Table of Age by C3

Age	C3				
Frequency					
Percent					
Row Pct					
Col Pct	1	2	3	4	Total
25-34	2	1	2	0	5
	10.00	5.00	10.00	0.00	25.00
	40.00	20.00	40.00	0.00	
	50.00	20.00	22.22	0.00	
35-49	1	2	6	1	10
	5.00	10.00	30.00	5.00	50.00
	10.00	20.00	60.00	10.00	
	25.00	40.00	66.67	50.00	
50-59	1	1	1	1	4
	5.00	5.00	5.00	5.00	20.00
	25.00	25.00	25.00	25.00	
	25.00	20.00	11.11	50.00	
60+	0	1	0	0	1
	0.00	5.00	0.00	0.00	5.00
	0.00	100.00	0.00	0.00	
	0.00	20.00	0.00	0.00	
Total	4	5	9	2	20
	20.00	25.00	45.00	10.00	100.00

The FREQ Procedure

Table of gender by C3

gender C3

	1	2	3	4	Total
Frequency					
Percent					
Row Pct					
Col Pct					
Female	3	1	4	1	9
	15.00	5.00	20.00	5.00	45.00
	33.33	11.11	44.44	11.11	
	75.00	20.00	44.44	50.00	
Male	1	4	5	1	11
	5.00	20.00	25.00	5.00	55.00
	9.09	36.36	45.45	9.09	
	25.00	80.00	55.56	50.00	
Total	4	5	9	2	20
	20.00	25.00	45.00	10.00	100.00

The FREQ Procedure

Table of Length_of_use by C3

Length_of_use	C3				
Frequency					
Percent					
Row Pct					
Col Pct	1	2	3	4	Total
1: Less than 6m	2	1	3	0	6
	10.00	5.00	15.00	0.00	30.00
	33.33	16.67	50.00	0.00	
	50.00	20.00	33.33	0.00	
2: 6m-1yr	1	1	1	1	4
	5.00	5.00	5.00	5.00	20.00
	25.00	25.00	25.00	25.00	
	25.00	20.00	11.11	50.00	
3: 1-2yr	1	2	2	0	5
	5.00	10.00	10.00	0.00	25.00
	20.00	40.00	40.00	0.00	
	25.00	40.00	22.22	0.00	
4: 2-4yr	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	11.11	0.00	
5: More than 4y	0	1	2	1	4
	0.00	5.00	10.00	5.00	20.00
	0.00	25.00	50.00	25.00	
	0.00	20.00	22.22	50.00	
Total	4	5	9	2	20
	20.00	25.00	45.00	10.00	100.00

The FREQ Procedure

Table of Age by C4

Age	C4					Total
Frequency						
Percent						
Row Pct						
Col Pct	1	2	3	4	5	
25-34	2	0	2	0	1	5
	10.00	0.00	10.00	0.00	5.00	25.00
	40.00	0.00	40.00	0.00	20.00	
	66.67	0.00	50.00	0.00	25.00	
35-49	0	3	2	4	1	10
	0.00	15.00	10.00	20.00	5.00	50.00
	0.00	30.00	20.00	40.00	10.00	
	0.00	60.00	50.00	100.00	25.00	
50-59	1	2	0	0	1	4
	5.00	10.00	0.00	0.00	5.00	20.00
	25.00	50.00	0.00	0.00	25.00	
	33.33	40.00	0.00	0.00	25.00	
60+	0	0	0	0	1	1
	0.00	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	0.00	25.00	
Total	3	5	4	4	4	20
	15.00	25.00	20.00	20.00	20.00	100.00

The FREQ Procedure

Table of gender by C4

gender		C4					
Frequency							
Percent							
Row Pct							
Col Pct	1	2	3	4	5	Total	
Female	2	2	2	1	2	9	
	10.00	10.00	10.00	5.00	10.00	45.00	
	22.22	22.22	22.22	11.11	22.22		
	66.67	40.00	50.00	25.00	50.00		
Male	1	3	2	3	2	11	
	5.00	15.00	10.00	15.00	10.00	55.00	
	9.09	27.27	18.18	27.27	18.18		
	33.33	60.00	50.00	75.00	50.00		
Total	3	5	4	4	4	20	
	15.00	25.00	20.00	20.00	20.00	100.00	

The FREQ Procedure

Table of Length_of_use by C4

Length_of_use	C4					Total
Frequency						
Percent						
Row Pct						
Col Pct	1	2	3	4	5	
1: Less than 6m	2	2	0	0	2	6
	10.00	10.00	0.00	0.00	10.00	30.00
	33.33	33.33	0.00	0.00	33.33	
	66.67	40.00	0.00	0.00	50.00	
2: 6m-1yr	1	1	1	0	1	4
	5.00	5.00	5.00	0.00	5.00	20.00
	25.00	25.00	25.00	0.00	25.00	
	33.33	20.00	25.00	0.00	25.00	
3: 1-2yr	0	1	2	1	1	5
	0.00	5.00	10.00	5.00	5.00	25.00
	0.00	20.00	40.00	20.00	20.00	
	0.00	20.00	50.00	25.00	25.00	
4: 2-4yr	0	0	0	1	0	1
	0.00	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	0.00	100.00	0.00	
	0.00	0.00	0.00	25.00	0.00	
5: More than 4y	0	1	1	2	0	4
	0.00	5.00	5.00	10.00	0.00	20.00
	0.00	25.00	25.00	50.00	0.00	
	0.00	20.00	25.00	50.00	0.00	
Total	3	5	4	4	4	20
	15.00	25.00	20.00	20.00	20.00	100.00

The FREQ Procedure

Table of Age by C5

Age	C5			
Frequency				
Percent				
Row Pct				
Col Pct	2	3	4	Total
25-34	1	0	4	5
	5.00	0.00	20.00	25.00
	20.00	0.00	80.00	
	50.00	0.00	25.00	
35-49	0	2	8	10
	0.00	10.00	40.00	50.00
	0.00	20.00	80.00	
	0.00	100.00	50.00	
50-59	1	0	3	4
	5.00	0.00	15.00	20.00
	25.00	0.00	75.00	
	50.00	0.00	18.75	
60+	0	0	1	1
	0.00	0.00	5.00	5.00
	0.00	0.00	100.00	
	0.00	0.00	6.25	
Total	2	2	16	20
	10.00	10.00	80.00	100.00

The FREQ Procedure

Table of gender by C5

gender		C5					
Frequency	Percent	Row Pct	Col Pct	2	3	4	Total
Female	1	0	8	9			
	5.00	0.00	40.00	45.00			
	11.11	0.00	88.89				
	50.00	0.00	50.00				
Male	1	2	8	11			
	5.00	10.00	40.00	55.00			
	9.09	18.18	72.73				
	50.00	100.00	50.00				
Total	2	2	16	20			
	10.00	10.00	80.00	100.00			

The FREQ Procedure

Table of Length_of_use by C5

Length_of_use	C5			
Frequency				
Percent				
Row Pct				
Col Pct	2	3	4	Total
1: Less than 6m	1	1	4	6
	5.00	5.00	20.00	30.00
	16.67	16.67	66.67	
	50.00	50.00	25.00	
2: 6m-1yr	1	0	3	4
	5.00	0.00	15.00	20.00
	25.00	0.00	75.00	
	50.00	0.00	18.75	
3: 1-2yr	0	1	4	5
	0.00	5.00	20.00	25.00
	0.00	20.00	80.00	
	0.00	50.00	25.00	
4: 2-4yr	0	0	1	1
	0.00	0.00	5.00	5.00
	0.00	0.00	100.00	
	0.00	0.00	6.25	
5: More than 4y	0	0	4	4
	0.00	0.00	20.00	20.00
	0.00	0.00	100.00	
	0.00	0.00	25.00	
Total	2	2	16	20
	10.00	10.00	80.00	100.00

The FREQ Procedure

Table of Age by C6

Age	C6				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
25-34	1	1	3	0	5
	5.00	5.00	15.00	0.00	25.00
	20.00	20.00	60.00	0.00	
	100.00	16.67	33.33	0.00	
35-49	0	3	5	2	10
	0.00	15.00	25.00	10.00	50.00
	0.00	30.00	50.00	20.00	
	0.00	50.00	55.56	50.00	
50-59	0	2	1	1	4
	0.00	10.00	5.00	5.00	20.00
	0.00	50.00	25.00	25.00	
	0.00	33.33	11.11	25.00	
60+	0	0	0	1	1
	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	25.00	
Total	1	6	9	4	20
	5.00	30.00	45.00	20.00	100.00

The FREQ Procedure

Table of gender by C6

gender C6

Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
Female	1	3	4	1	9
	5.00	15.00	20.00	5.00	45.00
	11.11	33.33	44.44	11.11	
	100.00	50.00	44.44	25.00	
Male	0	3	5	3	11
	0.00	15.00	25.00	15.00	55.00
	0.00	27.27	45.45	27.27	
	0.00	50.00	55.56	75.00	
Total	1	6	9	4	20
	5.00	30.00	45.00	20.00	100.00

The FREQ Procedure

Table of Length_of_use by C6

Length_of_use	C6					
Frequency						
Percent						
Row Pct						
Col Pct		2	3	4	5	Total
1: Less than 6m	0	2	3	1	6	
	0.00	10.00	15.00	5.00	30.00	
	0.00	33.33	50.00	16.67		
	0.00	33.33	33.33	25.00		
2: 6m-1yr	1	2	1	0	4	
	5.00	10.00	5.00	0.00	20.00	
	25.00	50.00	25.00	0.00		
	100.00	33.33	11.11	0.00		
3: 1-2yr	0	2	2	1	5	
	0.00	10.00	10.00	5.00	25.00	
	0.00	40.00	40.00	20.00		
	0.00	33.33	22.22	25.00		
4: 2-4yr	0	0	0	1	1	
	0.00	0.00	0.00	5.00	5.00	
	0.00	0.00	0.00	100.00		
	0.00	0.00	0.00	25.00		
5: More than 4y	0	0	3	1	4	
	0.00	0.00	15.00	5.00	20.00	
	0.00	0.00	75.00	25.00		
	0.00	0.00	33.33	25.00		
Total	1	6	9	4	20	
	5.00	30.00	45.00	20.00	100.00	

The FREQ Procedure

Table of Age by C7

Age	C7				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
25-34	3	0	2	0	5
	15.00	0.00	10.00	0.00	25.00
	60.00	0.00	40.00	0.00	
	37.50	0.00	28.57	0.00	
35-49	3	3	4	0	10
	15.00	15.00	20.00	0.00	50.00
	30.00	30.00	40.00	0.00	
	37.50	75.00	57.14	0.00	
50-59	2	1	1	0	4
	10.00	5.00	5.00	0.00	20.00
	50.00	25.00	25.00	0.00	
	25.00	25.00	14.29	0.00	
60+	0	0	0	1	1
	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	100.00	
Total	8	4	7	1	20
	40.00	20.00	35.00	5.00	100.00

The FREQ Procedure

Table of gender by C7

gender C7

Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
Female	5	1	3	0	9
	25.00	5.00	15.00	0.00	45.00
	55.56	11.11	33.33	0.00	
	62.50	25.00	42.86	0.00	
Male	3	3	4	1	11
	15.00	15.00	20.00	5.00	55.00
	27.27	27.27	36.36	9.09	
	37.50	75.00	57.14	100.00	
Total	8	4	7	1	20
	40.00	20.00	35.00	5.00	100.00

The FREQ Procedure

Table of Length_of_use by C7

Length_of_use	C7				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
1: Less than 6m	2	3	1	0	6
	10.00	15.00	5.00	0.00	30.00
	33.33	50.00	16.67	0.00	
	25.00	75.00	14.29	0.00	
2: 6m-1yr	3	0	1	0	4
	15.00	0.00	5.00	0.00	20.00
	75.00	0.00	25.00	0.00	
	37.50	0.00	14.29	0.00	
3: 1-2yr	2	0	2	1	5
	10.00	0.00	10.00	5.00	25.00
	40.00	0.00	40.00	20.00	
	25.00	0.00	28.57	100.00	
4: 2-4yr	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	14.29	0.00	
5: More than 4y	1	1	2	0	4
	5.00	5.00	10.00	0.00	20.00
	25.00	25.00	50.00	0.00	
	12.50	25.00	28.57	0.00	
Total	8	4	7	1	20
	40.00	20.00	35.00	5.00	100.00

The FREQ Procedure

Table of Age by C8_1

Age	C8_1				Total
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	
25-34	4	0	0	1	5
	20.00	0.00	0.00	5.00	25.00
	80.00	0.00	0.00	20.00	
	80.00	0.00	0.00	25.00	
35-49	0	3	5	2	10
	0.00	15.00	25.00	10.00	50.00
	0.00	30.00	50.00	20.00	
	0.00	60.00	83.33	50.00	
50-59	1	2	1	0	4
	5.00	10.00	5.00	0.00	20.00
	25.00	50.00	25.00	0.00	
	20.00	40.00	16.67	0.00	
60+	0	0	0	1	1
	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	25.00	
Total	5	5	6	4	20
	25.00	25.00	30.00	20.00	100.00

The FREQ Procedure

Table of gender by C8_1

gender		C8_1				
Frequency						
Percent						
Row Pct						
Col Pct	2	3	4	5	Total	
Female	4	2	1	2	9	
	20.00	10.00	5.00	10.00	45.00	
	44.44	22.22	11.11	22.22		
	80.00	40.00	16.67	50.00		
Male	1	3	5	2	11	
	5.00	15.00	25.00	10.00	55.00	
	9.09	27.27	45.45	18.18		
	20.00	60.00	83.33	50.00		
Total	5	5	6	4	20	
	25.00	25.00	30.00	20.00	100.00	

The FREQ Procedure

Table of Length_of_use by C8_1

Length_of_use	C8_1				
Frequency					
Percent					
Row Pct					
Col Pct		2	3	4	5
					Total
1: Less than 6m	1	3	2	0	6
	5.00	15.00	10.00	0.00	30.00
	16.67	50.00	33.33	0.00	
	20.00	60.00	33.33	0.00	
2: 6m-1yr	2	1	0	1	4
	10.00	5.00	0.00	5.00	20.00
	50.00	25.00	0.00	25.00	
	40.00	20.00	0.00	25.00	
3: 1-2yr	1	1	2	1	5
	5.00	5.00	10.00	5.00	25.00
	20.00	20.00	40.00	20.00	
	20.00	20.00	33.33	25.00	
4: 2-4yr	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	16.67	0.00	
5: More than 4y	1	0	1	2	4
	5.00	0.00	5.00	10.00	20.00
	25.00	0.00	25.00	50.00	
	20.00	0.00	16.67	50.00	
Total	5	5	6	4	20
	25.00	25.00	30.00	20.00	100.00

The FREQ Procedure

Table of Age by C8_2

Age	C8_2				Total
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	
25-34	1	2	1	1	5
	5.00	10.00	5.00	5.00	25.00
	20.00	40.00	20.00	20.00	
	100.00	66.67	9.09	20.00	
35-49	0	1	7	2	10
	0.00	5.00	35.00	10.00	50.00
	0.00	10.00	70.00	20.00	
	0.00	33.33	63.64	40.00	
50-59	0	0	3	1	4
	0.00	0.00	15.00	5.00	20.00
	0.00	0.00	75.00	25.00	
	0.00	0.00	27.27	20.00	
60+	0	0	0	1	1
	0.00	0.00	0.00	5.00	5.00
	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	20.00	
Total	1	3	11	5	20
	5.00	15.00	55.00	25.00	100.00

The FREQ Procedure

Table of gender by C8_2

gender	C8_2				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
Female	1	2	3	3	9
	5.00	10.00	15.00	15.00	45.00
	11.11	22.22	33.33	33.33	
	100.00	66.67	27.27	60.00	
Male	0	1	8	2	11
	0.00	5.00	40.00	10.00	55.00
	0.00	9.09	72.73	18.18	
	0.00	33.33	72.73	40.00	
Total	1	3	11	5	20
	5.00	15.00	55.00	25.00	100.00

The FREQ Procedure

Table of Length_of_use by C8_2

Length_of_use	C8_2					
Frequency						
Percent						
Row Pct						
Col Pct		2	3	4	5	Total
1: Less than 6m	0	0	5	1	6	
	0.00	0.00	25.00	5.00	30.00	
	0.00	0.00	83.33	16.67		
	0.00	0.00	45.45	20.00		
2: 6m-1yr	0	2	1	1	4	
	0.00	10.00	5.00	5.00	20.00	
	0.00	50.00	25.00	25.00		
	0.00	66.67	9.09	20.00		
3: 1-2yr	1	1	2	1	5	
	5.00	5.00	10.00	5.00	25.00	
	20.00	20.00	40.00	20.00		
	100.00	33.33	18.18	20.00		
4: 2-4yr	0	0	1	0	1	
	0.00	0.00	5.00	0.00	5.00	
	0.00	0.00	100.00	0.00		
	0.00	0.00	9.09	0.00		
5: More than 4y	0	0	2	2	4	
	0.00	0.00	10.00	10.00	20.00	
	0.00	0.00	50.00	50.00		
	0.00	0.00	18.18	40.00		
Total	1	3	11	5	20	
	5.00	15.00	55.00	25.00	100.00	

The FREQ Procedure

Table of site by C1

site	C1					
Frequency						
Percent						
Row Pct						
Col Pct	1	2	3	4	5	Total
BTW	0	0	1	2	1	4
	0.00	0.00	5.00	10.00	5.00	20.00
	0.00	0.00	25.00	50.00	25.00	
	0.00	0.00	20.00	40.00	33.33	
EL	1	4	2	2	0	9
	5.00	20.00	10.00	10.00	0.00	45.00
	11.11	44.44	22.22	22.22	0.00	
	100.00	66.67	40.00	40.00	0.00	
QTN	0	0	1	0	0	1
	0.00	0.00	5.00	0.00	0.00	5.00
	0.00	0.00	100.00	0.00	0.00	
	0.00	0.00	20.00	0.00	0.00	
USA	0	2	1	1	2	6
	0.00	10.00	5.00	5.00	10.00	30.00
	0.00	33.33	16.67	16.67	33.33	
	0.00	33.33	20.00	20.00	66.67	
Total	1	6	5	5	3	20
	5.00	30.00	25.00	25.00	15.00	100.00

The FREQ Procedure

Table of site by C2

site	C2				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
BTW	0	1	2	1	4
	0.00	5.00	10.00	5.00	20.00
	0.00	25.00	50.00	25.00	
	0.00	50.00	15.38	25.00	
EL	1	1	6	1	9
	5.00	5.00	30.00	5.00	45.00
	11.11	11.11	66.67	11.11	
	100.00	50.00	46.15	25.00	
QTN	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	7.69	0.00	
USA	0	0	4	2	6
	0.00	0.00	20.00	10.00	30.00
	0.00	0.00	66.67	33.33	
	0.00	0.00	30.77	50.00	
Total	1	2	13	4	20
	5.00	10.00	65.00	20.00	100.00

The FREQ Procedure

Table of site by C3

site	C3				
Frequency					
Percent					
Row Pct					
Col Pct	1	2	3	4	Total
BTW	1	2	1	0	4
	5.00	10.00	5.00	0.00	20.00
	25.00	50.00	25.00	0.00	
	25.00	40.00	11.11	0.00	
EL	3	2	4	0	9
	15.00	10.00	20.00	0.00	45.00
	33.33	22.22	44.44	0.00	
	75.00	40.00	44.44	0.00	
QTN	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	11.11	0.00	
USA	0	1	3	2	6
	0.00	5.00	15.00	10.00	30.00
	0.00	16.67	50.00	33.33	
	0.00	20.00	33.33	100.00	
Total	4	5	9	2	20
	20.00	25.00	45.00	10.00	100.00

The FREQ Procedure

Table of site by C4

site	C4					
Frequency						
Percent						
Row Pct						
Col Pct	1	2	3	4	5	Total
BTW	1	1	0	1	1	4
	5.00	5.00	0.00	5.00	5.00	20.00
	25.00	25.00	0.00	25.00	25.00	
	33.33	20.00	0.00	25.00	25.00	
EL	2	3	1	1	2	9
	10.00	15.00	5.00	5.00	10.00	45.00
	22.22	33.33	11.11	11.11	22.22	
	66.67	60.00	25.00	25.00	50.00	
QTN	0	0	1	0	0	1
	0.00	0.00	5.00	0.00	0.00	5.00
	0.00	0.00	100.00	0.00	0.00	
	0.00	0.00	25.00	0.00	0.00	
USA	0	1	2	2	1	6
	0.00	5.00	10.00	10.00	5.00	30.00
	0.00	16.67	33.33	33.33	16.67	
	0.00	20.00	50.00	50.00	25.00	
Total	3	5	4	4	4	20
	15.00	25.00	20.00	20.00	20.00	100.00

The FREQ Procedure

Table of site by C5

site	C5			
Frequency				
Percent				
Row Pct				
Col Pct	2	3	4	Total
BTW	0	0	4	4
	0.00	0.00	20.00	20.00
	0.00	0.00	100.00	
	0.00	0.00	25.00	
EL	2	1	6	9
	10.00	5.00	30.00	45.00
	22.22	11.11	66.67	
	100.00	50.00	37.50	
QTN	0	0	1	1
	0.00	0.00	5.00	5.00
	0.00	0.00	100.00	
	0.00	0.00	6.25	
USA	0	1	5	6
	0.00	5.00	25.00	30.00
	0.00	16.67	83.33	
	0.00	50.00	31.25	
Total	2	2	16	20
	10.00	10.00	80.00	100.00

The FREQ Procedure

Table of site by C6

site	C6				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
BTW	0	1	3	0	4
	0.00	5.00	15.00	0.00	20.00
	0.00	25.00	75.00	0.00	
	0.00	16.67	33.33	0.00	
EL	1	4	3	1	9
	5.00	20.00	15.00	5.00	45.00
	11.11	44.44	33.33	11.11	
	100.00	66.67	33.33	25.00	
QTN	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	11.11	0.00	
USA	0	1	2	3	6
	0.00	5.00	10.00	15.00	30.00
	0.00	16.67	33.33	50.00	
	0.00	16.67	22.22	75.00	
Total	1	6	9	4	20
	5.00	30.00	45.00	20.00	100.00

The FREQ Procedure

Table of site by C7

site	C7				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
BTW	3	0	1	0	4
	15.00	0.00	5.00	0.00	20.00
	75.00	0.00	25.00	0.00	
	37.50	0.00	14.29	0.00	
EL	3	3	3	0	9
	15.00	15.00	15.00	0.00	45.00
	33.33	33.33	33.33	0.00	
	37.50	75.00	42.86	0.00	
QTN	0	0	1	0	1
	0.00	0.00	5.00	0.00	5.00
	0.00	0.00	100.00	0.00	
	0.00	0.00	14.29	0.00	
USA	2	1	2	1	6
	10.00	5.00	10.00	5.00	30.00
	33.33	16.67	33.33	16.67	
	25.00	25.00	28.57	100.00	
Total	8	4	7	1	20
	40.00	20.00	35.00	5.00	100.00

The FREQ Procedure

Table of site by C8_1

site	C8_1				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
BTW	2	0	1	1	4
	10.00	0.00	5.00	5.00	20.00
	50.00	0.00	25.00	25.00	
	40.00	0.00	16.67	25.00	
EL	2	4	3	0	9
	10.00	20.00	15.00	0.00	45.00
	22.22	44.44	33.33	0.00	
	40.00	80.00	50.00	0.00	
QTN	1	0	0	0	1
	5.00	0.00	0.00	0.00	5.00
	100.00	0.00	0.00	0.00	
	20.00	0.00	0.00	0.00	
USA	0	1	2	3	6
	0.00	5.00	10.00	15.00	30.00
	0.00	16.67	33.33	50.00	
	0.00	20.00	33.33	75.00	
Total	5	5	6	4	20
	25.00	25.00	30.00	20.00	100.00

The FREQ Procedure

Table of site by C8_2

site	C8_2				
Frequency					
Percent					
Row Pct					
Col Pct	2	3	4	5	Total
BTW	0	0	3	1	4
	0.00	0.00	15.00	5.00	20.00
	0.00	0.00	75.00	25.00	
	0.00	0.00	27.27	20.00	
EL	0	3	5	1	9
	0.00	15.00	25.00	5.00	45.00
	0.00	33.33	55.56	11.11	
	0.00	100.00	45.45	20.00	
QTN	1	0	0	0	1
	5.00	0.00	0.00	0.00	5.00
	100.00	0.00	0.00	0.00	
	100.00	0.00	0.00	0.00	
USA	0	0	3	3	6
	0.00	0.00	15.00	15.00	30.00
	0.00	0.00	50.00	50.00	
	0.00	0.00	27.27	60.00	
Total	1	3	11	5	20
	5.00	15.00	55.00	25.00	100.00

ANNEXURE 4.4: RELIABILITY STATISTICS

The CORR Procedure

9 Variables: C1 C2 C3 C4 C5 C6 C7
C8_1 C8_2

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
C1	20	3.15000	1.18210	63.00000	1.00000	5.00000
C2	20	4.00000	0.72548	80.00000	2.00000	5.00000
C3	20	2.45000	0.94451	49.00000	1.00000	4.00000
C4	20	3.05000	1.39454	61.00000	1.00000	5.00000
C5	20	3.70000	0.65695	74.00000	2.00000	4.00000
C6	20	3.80000	0.83351	76.00000	2.00000	5.00000
C7	20	3.05000	0.99868	61.00000	2.00000	5.00000
C8_1	20	3.45000	1.09904	69.00000	2.00000	5.00000
C8_2	20	4.00000	0.79472	80.00000	2.00000	5.00000

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.807092
Standardized	0.816689

Cronbach Coefficient Alpha with Deleted Variable

Deleted Variable	Raw Variables		Standardized Variables	
	Correlation with Total	Alpha	Correlation with Total	Alpha
C1	0.447427	0.797769	0.443344	0.806903
C2	0.660828	0.775506	0.660012	0.780221
C3	0.359487	0.804906	0.371257	0.815356
C4	0.650763	0.768112	0.655395	0.780810
C5	0.390968	0.801160	0.412123	0.810590
C6	0.582588	0.780059	0.592021	0.788803
C7	0.342854	0.807850	0.330779	0.820013
C8_1	0.665468	0.764378	0.646953	0.781884
C8_2	0.547415	0.784659	0.540510	0.795177

Construct validity, section C

The FACTOR Procedure

Initial Factor Method: Principal Components

Prior Communality Estimates: ONE

Eigenvalues of the Correlation Matrix: Total = 9 Average = 1

	Eigenvalue	Difference	Proportion	Cumulative
1	3.76434125	2.11128480	0.4183	0.4183
2	1.65305645	0.61246623	0.1837	0.6019
3	1.04059022	0.25554845	0.1156	0.7176
4	0.78504177	0.21837839	0.0872	0.8048
5	0.56666337	0.08275172	0.0630	0.8677
6	0.48391165	0.08712464	0.0538	0.9215
7	0.39678701	0.20728859	0.0441	0.9656
8	0.18949842	0.06938855	0.0211	0.9867
9	0.12010987		0.0133	1.0000

3 factors will be retained by the MINEIGEN criterion.

Factor Pattern

	Factor1	Factor2	Factor3
C8_1	0.78852	-0.46141	-0.04675
C2	0.77800	-0.23730	0.02900
C4	0.75568	0.19160	0.03260
C8_2	0.70756	-0.38748	-0.42973
C6	0.66845	0.47933	-0.01115
C1	0.59483	-0.50835	0.26409
C3	0.46972	0.61189	-0.26557
C5	0.51046	0.52387	-0.16756
C7	0.42866	0.24488	0.82666

Variance Explained by Each Factor

Factor1	Factor2	Factor3
3.7643412	1.6530564	1.0405902