COMMUNICATION NETWORK ANALYSIS : AN INNOVATIVE WAY OF CONCEPTUALIZING THE DYNAMICS OF INTERPERSONAL COMMUNICATION IN A DEVELOPMENT SETTING.

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This study firstly aimed to illustrate the innovative value of network analysis for the development communication researcher. A case study with the emphasis on an intact system of farmers in the Border-Kei area is presented. The study was conducted in Komkhulu with 46 local farmers taking part in the research. Network analyses were done on a "Who to whom?" matrix basis in order to determine and to illustrate the dynamic interrelatedness amongst intact system members and its potential research value for communication and development researchers. Network analysis research in this study concentrated on three levels, namely, the system, clique and individual levels of analysis. A conceptual picture of dynamic network analysis aspects was revealed. The conceptual quality of network analysis is further enriched by the use and application of the open-systems approach orientation and the communication convergence orientation. The emphasis is not on the effects of communication, but rather on what is taking place among system members. Lastly, social scientists and development communication researchers in particular are encouraged to use network analysis in conjunction with or in support of other methodological orientations in community development research.

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INTRODUCTION

The central aspect in network analysis is the study and evaluation of communication as social phenomenon that manifests amongst people in systems or communities. Human communication is analysed through communication network analysis by identifying the communication structure in a system. The focus in this analysis is on relational data concerning the flow of communication among individuals. The unit of analysis remains some type of

interpersonal relationship that manifests among network members.

This paper is attempting to illustrate the innovative qualities of network analysis to especially the developmental oriented researcher. A particular case study with reference to the use and application of selected network analysis methods and techniques will be presented. The location of this focus is on a select group of farmers in the rural Border-Kei region, (Amatola Basin) namely, Komkhulu.

It remains important, however, to highlight some of the methodological considerations concerning network analysis which should be taken into account when communication networks are operationalized before an attempt is made to apply network analysis in this study.

COMMUNICATION NETWORK ANALYSIS : METHODOLOGICAL CONSIDERATIONS

A number of methodological considerations should be kept in mind by researchers for the purpose of analysis orientation. Three focus areas will be addressed in this regard, namely: the individualism-holism debate; defining network analysis as methodology; and network analysis and development communication research.

INDIVIDUALISM / HOLISM

Communication network analysis has not escaped the individual-society relationship question of the social science research methodology debate.

The individual-society relationship question has been a central theme over many decades in social science research. Strauss (1988), in this respect, gives a very appropriate overview concerning the issue. Other prominent contributions, related to the methodological dilemma created by the individualism-holism debate, come from a number of sources, inter alia; Berkowitz (1982), De Sola Pool (1983), Noelle-Neumann (1983), Rosengren (1983), Schramm (1983), Mathien (1988), Monge & Contractor (1988) and Haines (1988).

Haines (1988) with reference to the individual-holism debate found it necessary to underline two important points of view : Firstly, some approaches have contrasted the network methodology with methodological holism and methodological individualism. Secondly, others have developed a more direct link with social theory by comparing it with atomism and normative functionalism.

It is important, however, to note that the communication network analysis approach supported in this presentation is one that :

·Does not contrast the individualism-holism ontologies as though they are polar positions in social science research.

·Is one that attempts to integrate individualism and holism. The idea is that the open systems approach thesis of dynamic interrelatedness as model can be successfully applied in order to view methodologies, rather as complementary/interrelated positions, and not as exclusive, closed entities, as being either analytically or synthetically inclined in the Kuhnian tradition.

This position is supported by Berkowitz (1982), who points out that during the earlier to mid-1960s these two research traditions (individualism and holism), the first being more formal and analytic, and the second being more descriptive and phenomenological, came together in powerful ways. The result was the formulation of the social network concept. This concept proposes that the social structure is best

understood in terms of a dynamic interplay of the relations between and among persons (or institutions etc.) on the one hand and the positions and roles they occupy within a social system, on the other hand. Noble (1973) holds the position that not only on a conceptual level, but also on a practical level, it will allow for the addressing of developmental communication problems.

DEFINING COMMUNICATION NETWORK ANALYSIS

In defining communication network analysis, one aspect becomes evident, namely, the compatibility of communication network analysis methodology with the interrelatedness thesis of the open systems approach. Contributions in this regard, for example, come from Richards & Lindsey (1979), Rogers & Kincaid (1981), Yum (1984), Rogers (1986, 1987) and Williams, Rice & Rogers (1988).

Williams *et al.* (1988) state that the network approach is relational, and not individualistic. The network paradigm refocused researchers' preoccupations with individuals as independent senders and receivers of messages to that where individuals are regarded as nodes in a network of interdependent relationships.

Rogers & Kincaid (1981:82-83) view communication network analysis as "... a method of research for identifying the communication structure in a system, in which relational data about communication flows are analyzed by using some type of interpersonal relationships as units of analysis".

This definition of communication network analysis is accepted for this study. Reasons for this choice can be presented in the form of the following four consequences :

·It enables the researcher to get a holistic overview on the research problem. This quality becomes even more evident in the course of data analysis on both a qualitative and a quantitative level.

·Specific message flows of information can be traced, which conceptually speaking, assist the researcher in mapping the information flows and plot them practically. Network analysis proofs it self very suitable for diffusion of information type of studies.

·It allows for conceptualization of the interrelatedness between the communication structure and the social structure.

·It allows room for a contextually integrated approach to both the descriptive (qualitative) and the analytical (quantitative) aspects of the research problem.

NETWORK ANALYSIS AND DEVELOPMENT COMMUNICATION

In doing network analysis research for development communication purposes, a number of important aspects should be kept in mind.

Developmental communication in a "First-Third World" relation, mostly takes place as an intercultural exercise. On the one hand the researcher operates from within a particular cultural domain, with the accompanying norms, values, etc., which are contributing towards the development of the research process. On the other hand, the research target groups, which represents different sets of values, norms, and customs, is embedded in a particular culture, and has to be analyzed and evaluated by the researcher. Gilbert (1987) uses the Baobabs principle which refers to the differences in the experiencing of life worlds between

two culturally different people. Du Preez (1987) did some interesting research on cross-cultural psychology of identity, which links up with the idea of different life-world experiences.

In brief: The researcher develops instruments, theories and hypotheses, which are not value free. The researcher interprets responses received from the respondents by using these criteria. The responses received also reflect particular values, norms and beliefs. The meaning of "reality" as a construct, is therefore at stake between researcher and researched.

This kind of situation provides particular challenges to the South African researcher who wants to work cross-culturally. This causes some difficulties for the researcher who has been well taught in Western analytic research methodologies, to use these models interculturally, due to the differences in value and belief systems.

In order to address the stated dilemma, an orientation which allows for an integration of analytic and descriptive orientations may go a long way towards addressing the problem positively. For the purposes of distinctive analysis, quantitative and qualitative orientations can be used in order to enhance the contextual quality of the research. Korzenny & Korzenny (1984) stress the value of a dialogue between the main orientations (quantitative and qualitative), which will assist the researcher to comprehend the research problem more easily. While particular differences are identifiable, Kim (1984) stresses that the seemingly contradictory methodological perspectives may in fact complement each other's limitations in the end. The analytic-reductionist approach tends to oversimplify the complex reality of human communication. The holistic-contextual approach on the other hand, in its concern for a realistic description of the complex communication phenomena, lacks the power and popularity of the analytic-reductionist reasoning of causality (or more accurately, quasi-causality).

An active interplay and integration between the diverse approaches is therefore desirable, as supported by Mitchell (1984), who combined ethnographic methods with analytic network analysis. Bormann (1981) and Mouton (1986, 1987, 1988) provide guiding insights on the multiple-profile idea of diverse methodological approaches.

The emphasis is therefore on an effort to use the quantitative, analytic methods of communication network analysis and combine them with a descriptive, qualitative approach. From this account, the interplay and integration between the analytic and descriptive research orientations are quite possible if not desirable in developmental communication research. The belief is that better understood, described and analyzed researched phenomena, in relation to the research goals, can only contribute to better insight in terms of theory construction and discipline development. There are, however, as Retief (1988) emphasizes particular problems that the researcher needs to consider in intercultural research and therefore in developmental communication research. Two of the most problematic areas are comparability and equivalence, and bias and fairness. No attempt is made to discuss these problems. However, it seems appropriate to state that for the purposes of this study an awareness of the intricate methodological complexities of developmental communication research is important.

THE AIM OF THE STUDY

The study was conducted in the Komkhulu village of the Amatola Basin in the Border-Kei region.

The aim of this study was to indicate how the role of communication in development could be analyzed by using network analyses. Two aspects are important :

·To quantitatively analyze the communication network structures with reference to centrality and clique construction of the Komkhulu farmers as an intact system.

·Secondly, to quantitatively analyze network variables of centrality and clique construction with reference to specific development programmes.

For the purposes of this particular paper however, for illustrative value, the focus will only be on Komkhulu farmers as an intact system and the application of network analysis with reference to centrality and clique construction in the quantitative mode.

The rationale of the above-mentioned is to provide greater insight into the communication network dynamics of a community. The belief is that such insight would assist developers in the planning, implementation and analysis of development programmes.

Rogers & Kincaid (1981) view the use of network analysis as an attempt to identify communication structures in communities, which will assist the researcher in understanding the "big picture" of human interaction in a system. The research attempts to be holistic in nature in marked contrast to the study of communication effects on individuals. Boissevain & Mitchell (1973) also hold similar views to the above-mentioned.

It is important to note that network analysis research manifests itself more widely than a diffusion study, which might evaluate only the effects of, for example, the adoption of development programmes.

Although, as stated, the aim of this paper is to provide greater information on the usefulness of network analyses for communication research, it remains important to provide the following contextual information.

THE RESEARCH PROBLEM

The research problem to be looked at is to analyse the communication network structures of individuals belonging to the selected intact system of farmers and its potential significance for development communication. The belief is that these communication network structures are highly dynamic and that an analysis of the communication structure would provide developers with greater insight into the complexities of the social system.

The emphasis on the role of the intact system in this study is important because these systems play integral parts in community activities. The intact system as such is regarded as an important facilitator in development programmes.

RESEARCH DESIGN

The research was done in the Amatola Basin. The area is a typically Border-Kei area, underdeveloped with no sophisticated infrastructure in terms of Western standards.

The Amatola Basin comprises of thirteen villages. The Komkhulu village was identified for inclusion in this study for the following reasons: Komkhulu can be regarded as the main centre of the Basin. The local authority is also seated in Komkhulu as well as the postal services, clinic and agricultural extension services. Komkhulu could be regarded as the village of the Basin which was the most exposed to development programmes.

INTACT SYSTEM SELECTION

The intact system for analysis had to be selected from the identified intact systems of Komkhulu. The following intact systems in the Basin were identified by Bekker, De Wet & Manona (1981) and Burger (1983) :

·The traditional authority system.

·Women's clubs/societies including the Young Women's Christian Society; Methodist Church Organization; The Young Women's Christian Association; Zenzele Association; The Amatola Basin Women's Association; The Mother and Women's Union (Mayano); Sewing clubs.

- Mens' clubs/societies including sport clubs.
- Savings clubs, including Mgalelo, Masizake and Nomzamo.
- Burial societies, and the Masingcwabane (self-help).
- Interest groups such as the Ciskei National Independence Party, The African Nationalist Congress and The Pan Africanist Congress.
- Occupational groupings such as farmers.

The Komkhulu farmers as intact system were selected for analysis purposes in this study. Reasons for their inclusion are that farming plays the overwhelming role in the communities' activities and the development input was also prominently aimed at agricultural activities in the area.

The rationale for selecting the abovementioned is further motivated by the fact that :

- The intact system plays an integral part in the community activities.
- Information regarding the impact of development programmes would be reflected in a meaningful way by studying the communication networks of the Komkhulu farmers.
- That due to the integral nature of open systems, communication networks can play facilitating roles in tracing and facilitating information regarding development programmes amongst the farmers.

PROCEDURE

Three meetings were held with the Chief of that area, Chief Cyrus Mhlambiso. One meeting included his headmen from the Basin. At the meetings the aim of the research project was explained, as well as the procedures for obtaining the data. An interpreter explained the aim and procedures to the headmen, who would inform their respective villagers of the presence of the research team in their area on a specific day.

Every available system member was approached with a questionnaire, which was administered by a trained interviewer. A complete list of names of intact system members was not available. The village coordinator, Mr Mayekiso who also was the agricultural extension officer in that area, assisted in finding over a three day period, all possible members. According to his assessment, all possible available respondents were approached with questionnaires.

Name coding was done according to the coded names of intact system members after the completion of the questionnaires. A total of 46 Komkhulu farmers were administered by the 14 interviewers.

Sociometric questions were put to intact system members with a spread of not more than three contacts (individuals) per sociometric question per respondent confined to the particular intact system only.

A pilot study was undertaken to test the questionnaire and to help the interviewers with problems that might occur prior to the survey. The questions were asked and administered by the interviewers. Interviewing training was provided in three sessions of approximately two hours per session. Fourteen interviewers (students) were selected and the interviews were in Xhosa due to language problems with English. Interviewers visited the respondents at their houses. A questionnaire copy was also translated into Xhosa. The Xhosa questionnaire was used by the interviewers as a guideline in order to undercut ambiguity that may occur due to free translation from the English by the interviewer.

RESEARCH METHODS

The following quantitative network analysis methods were used:

QUANTITATIVE METHODS

The quantitative methods included the following statistical analysis programmes :

Centrality and CONCOR as network analysis programmes

Two specific programmes have been identified for network analyses purposes namely Centrality and CONCOR from the UCINET package. The UCINET package was obtained from Prof Linton Freeman from the University of Southern California.

Centrality

The Centrality programme should not be confused with the centrality concept of communication networks. The Centrality programme prints the following network related aspects :

·A social matrix (which is treated as a communication matrix).

- Social matrix density.
- The following centrality variables :
  - Point in and point out degree.
  - Betweenness.
  - Closeness.
  - Centralisation (the average centrality mean score).

A short description of the above-mentioned is presented for the purposes of clarity :

- Social matrix. The term social matrix was used in this study because the network analysis programme referred to social matrix. The application and analysis, however, were done in a communication matrix context. An analysis of the social matrix constructed on the question : "Who communicates with whom". Knoke & Kuklinski (1982) state that the standard algebraic treatment of network data is a tabular display, called a matrix. It is a rectangular array of elements arranged in rows and columns. The rows represent system actors and the columns represent the same actors in identical sequence. Nonsquare matrices are sometimes used in network analysis with columns representing other entities such as the research projects in this research.

Actors arranged in the matrix rows are initiators of the specified relations and

the actors arranged across the columns are the recipients of the relation. Subscripts i and j, which take integer values from 1 to N, are used to reference the elements appearing in columns i and j of the matrix because directed relations are seldom perfectly reciprocated and most matrices of directed relations will be asymmetric. That is, the element in row i, column j need not be identical to the element in row j, column i.

The matric elements are N2 numerical values that indicate the nature of linkages between the pairs of actors. The most basic elements are binary values with a "1" standing for the occurrence of a tie from actor i to actor j, and a 0 (zero) standing for the absence of such a tie between the pair. Binary matrices are also known as adjacency matrices in this kind of study.

- Social matrix density. Social matrix density was also discussed. Density, according to Knoke & Kuklinski (1982), is regarded as a proportion that is calculated as the number of all ties occurring in the matrix divided by the number of all possible ties (N2 - N, if self-directed relations are not permissible).
- Centrality variables. The centrality concept in short means that the more central an actor in a network, the greater the degree of involvement in all network relations. The following centrality variables were included for analysis :
  - Point in and point out degree scores. Attention was also given to point in and point out degree scores which meant, in the context of this analysis, communication (contact received and contact initiated) between farmers. Of importance to note is that the degree of point is regarded as the integer or number of other actors with which a given actor has direct contact.

The outdegree of actor i is the number of relations from that actor to all other actors. That means the sum of 1s within actor i's row.

The indegree of actor j is the number of relations received by actor j from all others. This is calculated as the sum of 1s within actor j's column.

- Betweenness. Betweenness as an index of centrality was also discussed with the emphasis on the control of information flow in a communication network by an individual. In order to understand the betweenness variable, an explanation of the centrality concept is needed. Bavelas (1950) and Leavitt (1951) introduced the concept of centrality, which dealt with the effects of social structure on human communication. The centrality concept means that the more central an actor, the greater the degree of involvement in all the network relations by an individual. The most basic centrality index for actor i, according to Knoke & Kuklinski (1982), is a ratio of the aggregate relations involving i over all relations in a network. That means the proportion of all network relations that would involve i.

Betweenness then should be understood as follows : the shortest path that links a pair of points, i and j, is known as a geodesic. Any point or points that fall on a geodesic, linking a

pair of points, is said to stand between the two end points. Applied in a communication context, the between points have the potential to control, distort or to disrupt the flow of information in a system. The higher the betweenness score the more control the individual has over the flow of information.

- Closeness. Closeness is determined by the degree of independence of an actor in relation to all other actors. Freeman (1979) says that with respect to time, cost, and communication efficiency, shorter distances mean fewer message transmissions with the aim of optimizing efficiency in communication. Freeman (1979) uses Sabidussi's (1966) approach to closeness calculation by summing the geodesic distances from one node to another. The matrices of interactor geodesics indicate the shortest path distances between all pairs of actors in the matrix. Closeness would then be computed as the average geodesic matrix row value for each actor. The lower the closeness score the more independent the actor and, potentially speaking, the more efficiently communication messages can be transmitted through the network to another actor. The more actors are involved in the sending of information, say from actor x to actor y, the more dependent actor x becomes on other actors to assist in the transmission of the information.
- Centralization (Average centrality mean score). The betweenness concept of centrality can also be applied to an entire network. An index of centralization is based on the differences between the centrality score of the most central actor and that of the N - 1 other actor. The closer the score to 1, the higher the centrality value and the greater the chances of having more access to information on a more evenly distributed basis.

CONCOR (Convergence of iterated correlations)

The CONCOR programme assists in providing the following information :

·Social matrix density.

·Clique identification (using structural equivalence) with block densities.

·Clique reconstruction.

A short discussion of the above-mentioned is presented for clarity purposes:

- Social matrix density. (The social matrix was discussed above).
- Clique identification and block densities. Attention was also given to clique identification through block modelling (clique formation) with block densities and matrix densities. Block densities which revealed a value greater than the calculated matrix density should be interpreted as indicating that there were significant ties (communication links — interpersonal contact) between block (clique) members (actors). Cliques were formed in this way. From a communication point of view, the closer the matrix or block density to 1, the higher the density

value and the more intense the communication activity between matrix or clique members.

CONCOR, according to MacEvoy & Freeman (1987), categorizes actors/respondents, based on the similarity, rather than exact correspondence, in the patterns of social ties. The categorization resulted in the identification of identifiable blocks or cliques. This process of categorization is also known as block modelling, and involves the process of structural equivalence.

CONCOR often finds cliques in the social system where the diagonal 1-blocks are regarded as cliques and the off diagonal 1-blocks indicate ties between cliques or between cliques and peripheral actors.

Knoke & Kuklinski (1982) give an important perspective, however, by saying that researchers regard cliques as having highly cohesive subsets of actors. In some versions, most or all clique actors show a specified relation, other versions regard clique actors as having more numerous or more intense relations with each other than with non clique actors. Actors with strong cohesive bonds among themselves are more likely to perform similarly.

Knoke & Kuklinski (1982) also state that cliques have been identified for single networks, while the application of structural equivalence to multiple networks has implied that the latter technique is preferable for analyses of multiple networks. The structural equivalence application simply sums comparisons across networks, disregarding substantive grounds for the summation. Comparable procedures in clique detection would also add relations among actors across several networks to obtain an aggregate relation matrix for analysis. Reitz (1988) prefers CONCOR because this programme softens the rigidity of strict structural equivalence like a clique with absolute direct links. Caldeira (1988:39) supports structural equivalence by saying : "In the real world few actors meet the pristine criterion of structural equivalence, so most investigators relax the requirement from absolute identity to similarity in relations".

- Clique reconstruction. A clique reconstruction was also given in order to indicate the processes involved in clique formation.

The reconstruction procedure was done by reading the split numbers (in brackets) from the bottom of the table upwards, merging each block with the block from which it was split. The next step was to rename each combined block with the numerically smaller of the two block numbers. The hierarchical structure of the blocks forms a tree with new blocks split at each branching of the tree.

Sociogrammes

Reconstructed sociogrammes were also included in the analyses. Sociogrammes were . manually constructed from data of the social matrices based on approximated geographical dispersion of the respondents. Knoke & Kuklinski (1982) describe a sociogramme as a two dimensional diagram displaying relations among the actors in a specific system. Sets of points represent actors, and the sets of relations linking them are represented by lines drawn between pairs of points having direct connections.

Unfortunately, a virtually limitless number of diagrams can be drawn that contain the same relational information, but impart starkly different impressions. As the number of actors and the number of connections increase, par-

simony and interpretability of diagrams rapidly dwindle.

Two observations seemed interesting : If all N2 - N possible lines between the set of N points are present, a graph is complete and two points are adjacent if a line directly connects them.

Sociogrammes were used in the research with the view to orientating the reader. Sociogrammes visually illustrate the interpersonal relations amongst the respondents. Patterns of relations reveal high, medium and low levels of interpersonal relations. No contact between respondents with reference to some projects was also recorded. The illustrative value of the sociogrammes rendered no need for an in-depth discussion of the sociogrammes. Two reasons are given :

- They served an orientation purpose.
- Much more substantial analyses were done by CONCOR and Centrality.

The sociogramme was constructed in accordance with geographical dispersion. It is important to note that no attempt was made to locate exact positions of respondents. The emphasis was on estimated positions as provided by the research coordinator, Mr Mayekiso, who worked and stayed as a farmer and as an extension officer in Komkhulu for many years. Positions were plotted with the aid of an orthophoto of the area taken in 1976 (The only available one). Estimated geographical positions were regarded as sufficient for the purpose of this study because they served primarily an illustrative function.

It is also important to note that both CONCOR and Centrality, in the analysis of network data, address the structural and relational aspects of communication networks. Knoke & Kuklinski, (1982) and Williams *et al.*, (1988) provide more detail on the structural and relational orientations aspects of communication networks.

In short, A network analysis orientation can thus be implemented to analyze communication networks on three levels, namely, the individual level, the clique level and the system level.

- Individuals. The identification of prominent network individuals is possible through the analysis of the centrality variables, namely point in and point out degree scores, betweenness and closeness scores and centralization values. Other analyses on this level include social matrix and sociogramme analyses. Sociogramme illustrations can also be included for the orientation of the reader and the researcher in the research process. Demographic variables can be used to supplement the analyses of individual respondents.
- Cliques. The identification of cliques as well as the reconstruction of cliques can be done by CONCOR through the processes of block modelling with structural equivalence. The abstraction of cliques from the sociogrammes is a powerful tool in network analysis. The cliques are plotted in terms of precise or approximate geographical positions for orientation purposes. Emphasis can also be put on block densities as indicators of clique identification. If the block density had been higher than the matrix density, a clique was identified with significant score ties between clique actors.

- System. Intact systems can also be analyzed as a system with the emphasis on the social matrix, the centrality variables of point in degree and point out degree score ties, betweenness, closeness and centralization. Clique identification with the emphasis on block densities, clique reconstruction, sociogramme analysis and clique construction can also be included in the analysis of the system on this level.

KOMKHULU FARMERS

A brief overview of the following demographic aspects regarding the Komkhulu farmers as intact system will be described in the next section, namely, age, length of residency and level of education. The belief is that information relating to these three areas would provide valuable contextual information regarding the respondents.

DEMOGRAPHIC VARIABLES : KOMKHULU FARMERS

The inclusion of demographic variables was aimed at giving some broader background on the respondents of Komkhulu. The following demographic variables were selected, namely, age, gender, education as well as length of residency in the village.

AGE (See table 1)

There were 25 male and 21 female respondents in this study. Of the male respondents, 18 or 72% were 46 years and older, whereas in the case of the females, 14 or 66% were 52 years and younger. A further observation was that the largest number of farmers namely five, were in the age group 67-73. The largest female group of six was in the age group 32-38.

LENGTH OF RESIDENCY (See table 2)

It was evident that the bulk of the respondents, both male and female, had been residing in Komkhulu for more than 20 years. Males, living in Komkhulu for more than 20 years, totalled 18 or 72% and females totalled 16 or 76%.

EDUCATION (See table 3)

An analysis of the educational qualifications revealed that 17 or 68% of the male respondents had an education of Standard 7 or lower. Of the female respondents 16 or 76,2% had an education of Standard 7 or lower. Only two male respondents indicated that they had not received any formal education.

KOMKHULU FARMERS AS AN INTACT SYSTEM

The network analyses programmes of Centrality and CONCOR were used to analyze the Komkhulu farmers as an intact system. This meant that the emphasis, for the purposes of this particular analysis, was on the farmers as a group. Two questions were used to construct the analyses on the basis of the question : "Who communicates with whom most frequently?" These questions were put as general questions by using a question (2), who identifies the specific respondent, and another question (10), which read : "To whom, in your system, do you most frequently talk? Name three, if possible, and rank them."

All the analyses of Section 8 were based on the above-mentioned general question.

Age	Male	%	Female	%	Total
25-31	3	6,52	1	2,17	4
32-38	2	4,35	6	13,04	8
39-45	2	4,35	4	8,70	6
46-52	4	8,70	3	6,52	7
53-59	4	8,70	0	0,00	4
60-66	3	6,52	5	10,87	8
67-73	5	10,87	2	4,35	7
Older	2	4,35	0	0,00	2
Total	**25**	**54,35**	**21**	**45,65**	**46**

Table 1 - Age

LOR	M	%	F	%	Total
1-5	3	6,52	0	0,0	**3**
6-10	2	4,35	0	0,00	**2**
11-15	1	2,17	0	0,00	**1**
16-20	1	2,17	5	10,87	**6**
21-25	0	0,00	1	2,17	**1**
26-30	4	8,70	2	4,35	**16**
> 30	14	30,43	13	28,26	**27**
Total	**25**	**54,35**	**21**	**45,65**	**46**

Table 2 - Length of Residency

Education	M	%	F	%	TOTAL
Primary	8	17,39	9	19,57	17
6-7	7	15,22	7	15,22	14
8-10	8	17,39	5	10,86	13
No education	2	4,35	0	0,00	2
TOTAL	**25**	**54,35**	**21**	**45,65**	**46**

Table 3 - Education

KOMKHULU FARMERS' ANALYSES AS AN INTACT SYSTEM

Centrality and CONCOR as network analysis programmes were applied for analyses in this section.

The following aspects relating to the Komkhulu farmers as a system were discussed in this section : The social matrix. Network centrality variables including point in and point out degree score ties, betweenness, closeness and centralization (the average centrality mean score); Block modelling or clique identification and clique reconstruction as well as sociogramme construction.

Social matrix

The social matrix was constructed on the basis of "who communicates with whom?" The Komkhulu farmers' communication network was based on the "who to whom" model of contact as portrayed by the social matrix. A refinement of the contact among farmers was further presented by the analyses of the centrality variables which were also presented in this section.

Social matrix 1. Komkhulu farmers. See Annexure 1.

The 0s indicate no contact or communication and the 1s indicate contact or communication among respondents.

Network centrality variables

Centrality, as network analysis programme, assisted in the analysis of the following network centrality variables : Point in and point out degree score ties; Betweenness; Closeness and centralization (the average centrality mean score).

Point in and point out degree scores for Komkhulu farmers

Point in degree scores of the farmers referred to ties received, i.e. communication not initiated by the respondent. Point out degree scores referred to ties sent and communication initiated by the respondent. The point in and the point out degree scores were as indicated in Table 4.

An analysis of Table 4 indicated that the following respondents showed a frequency of five and more for point in degree scores : Respondent 10 with 12; Respondent 40 with six, and Respondents 4, 6, 12, 30 and 32 with five frequencies each. The frequency total of five was chosen for analysis purposes because it was substantially

Farmer	In	Out	Farmer	In	Out
1	1	1	24	1	3
2	2	2	25	2	2
3	0	2	26	2	1
4	5	1	27	0	3
5	1	2	28	2	3
6	5	3	29	2	1
7	2	1	30	5	3
8	1	1	31	2	1
9	3	1	32	5	2
10	12	3	33	2	1
11	0	0	34	2	1
12	5	3	35	1	2
13	3	3	36	0	1
14	0	2	37	0	2
15	0	2	38	1	3
16	1	2	39	2	2
17	0	1	40	6	3
18	0	1	41	2	3
19	0	1	42	1	3
20	2	1	43	2	3
21	1	2	44	1	3
22	2	3	45	2	2
23	0	1	46	1	3
			TOTAL	90	90
			AVERAGE:	1,96	

Table 4 - Point in and point out degree scores

higher than the average tie score of 1,96. The higher the score, the higher the contact or the more communication took place among respondents. Only respondent 11 showed no contact with other respondents and can be regarded as a complete isolate on this level of analysis. A number of other respondents,

namely, 3, 14, 15, 17, 18, 19, 23, 27, 36 and 37 indicated no communication received from other respondents. These respondents in turn indicated that they had all had communication with other respondents.

Mr Mayekiso, Respondent 40, in his opinion as the extension officer in the Basin, regarded Respondents 6 (Gobodo), 30 (Ntlokonkulu), 32 (Salusalu) and 37 (Tongo) as the most prominent farmers in Komkhulu. Respondent 37 was not selected by the farmers. These farmers all served on the farmers association's committee of Komkhulu. It was also interesting to note that farmer 10, Mr Maphithiza, who received the highest point in degree frequency score, was not selected by Mr Mayekiso as an important farmer. The fact that the respondents did select him indicated that he had qualities with which a number of farmers could identify. Other prominent farmers, identified by Mr Mayekiso for their leadership and farming qualities in the community, were the following : Respondents George (4), Ginya (5), Chief Mhlambiso (12), Mtshawalana (20) and Nkomo (23). Their prominence with the point in and point out degree scores was, however, limited. Respondents 10, 40, 4, 6, 12, 30 and 32, the most prominent point in degree respondents, showed an even involvement in the point out degree scores. The differences between out and in degree scores in this context should be understood by keeping the following in mind :

- The questionnaire construction made provision for only three contact persons. That was underscored by the average of 1,96.

Betweenness scores : Komkhulu farmers (see table 5)

A further analysis of the data related to the centrality variable, namely, betweenness, was presented in Table 5. Betweenness, in this context, should be regarded as the position a respondent occupies in the network that would allow control over the flow of information. Krackardt (1990) argues that an individual who has a high bet-

Farmers	1	2	3	4	5	6	7	8	9	10	11	12
Scores	0,00	11,0	0,00	48,67	5,50	66,33	6,92	5,25	26,33	127,7	0,00	89,66
Farmers	13	14	15	16	17	18	19	20	21	22	23	24
Scores	120,4	0,00	0,00	10,71	0,00	0,00	0,00	34,13	1,75	15,83	0,00	0,00
Farmers	25	26	27	28	29	30	31	32	33	34	35	36
Scores	35,21	15,75	0,00	30,00	0,00	77,50	15,88	54,83	5,63	51,63	19,00	0,00
Farmers	37	38	39	40	41	42	43	44	45	46		
Scores	0,00	30,21	117,2	189,9	46,67	20,83	15,75	0,00	16,25	6,33		
Centralization	0,167											

Table 5 - Betweenness scores

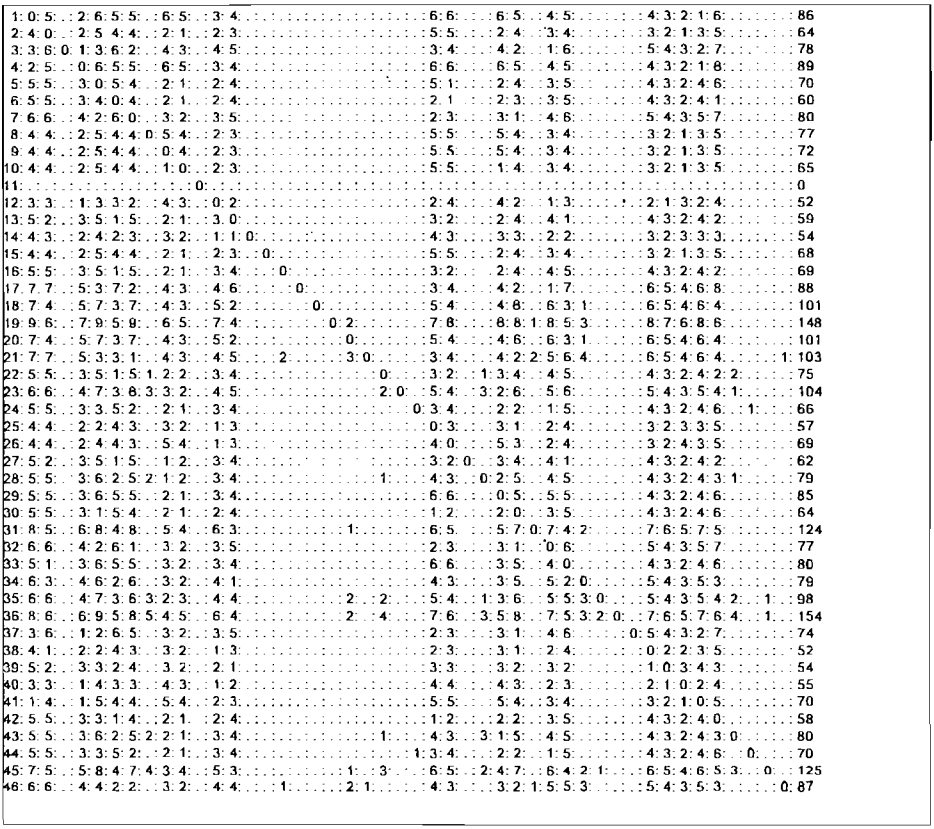

Table 6 - Closeness scores

weenness score can influence a group by withholding or distorting information. It serves as a control position. The higher the betweenness score, the greater the communication consequences for the network. This point was illustrated by Table 5 where the data related to a question (10), as a general question, was based on : "To whom, in your system, do you most frequently talk?"

The outstanding respondents were the following : 40 with 189,9; 10 with 127,7; 13 with 120,4; 39 with 117,2; 12 with 89,96; 30 with 77,50; 6 with 65,33; 32 with 54,83 and 4 with 48,67. The higher the betweenness value, the more prominent and the greater the chances of controlling the flow of information in a network. A great overlap existed in terms of prominence between the point in degree scores and the betweenness scores of Respondents 4, 6, 10, 12, 30, 32 and 40.

Closeness (see table 6)

Closeness as another centrality variable was also calculated for all 46 respondents in Table 6 by using the data obtained from the above-mentioned general questions. Freeman (1979) stresses that independence of an actor in a network is determined by its closeness to other respondents. The important principle, from a communication point of view is that the shorter the

distances among actors (the fewer the actors) in a network, the fewer the links the message has to pass through and, therefore, the better the chances of the communication process being efficient for all involved. Table 6 presents the closeness scores for all the 46 respondents as an intact system.

Closeness focused on the distances among actors. This meant that the shorter the distance, the fewer actors were used to convey the message from one person to the other and, therefore, the more efficiently the message could be disseminated among people in a network relationship. An analysis of Table 6 revealed that the following respondents scored closeness scores which indicated the greatest independence or lowest closeness values among the connected respondents in the network: Respondents 12 and 38 with a total of 52; Respondents 14 and 39 with 54; Respondent 40 with 55; Respondent 25 with 57; Respondent 42 with 58; Respondent 13 with 59; Respondent 6 with 60; Respondent 27 with 62; and Respondents 2 and 30 with a total of 64.

It was interesting to note that Respondents 6, 12, 30 and 40 were all prominently identified in both the point in degree score ties as well as in the closeness analysis of Table 6. The maximum closeness value for connected individuals was nine in Table 6. This meant that, for example, when Respondent 19 in Table 6 communicated with Respondents 1, 5 and 7, and Respondent 36 communicated with Respondent 6, a maximum of nine actors were used to convey the messages among them. From a communication point of view, the more people involved, the more complicated the communication process became. This is a well-studied principle in rumour and grapevine studies. Information on closeness scores could assist developers for instance, to evaluate the potential contact sphere of, for example, specific leaders in networks that are related to development issues.

Centralization (average centrality mean score)

The centralization value, or the average centrality mean score, for the Komkhulu farmers as an intact system or group of 0,167 or 16,7% represented a low score because the closer the score to one, the higher the centrality value and the greater the chances of having more access to information on a more evenly distributed basis. The average centrality mean score indicated the degree to which units were linked to other units in the system. The higher the score (closer to 1), the more centralized the network and the more centralized the communication of the information flow.

Block modelling (clique identification) : Komkhulu farmers as an intact system (see table 7)

Another analysis of the Komkhulu farmers as an intact system was to analyze communication networks by using CONCOR in order to identify cliques. The two general question (2) and question (10), were once again used to construct a social matrix on the basis : "Who communicates with whom?" Question 2 provided the name of the respondent and Question 10 read : "To whom, in your system, do you most frequently talk?" Block modelling revealed the following clique formations. (Block density, also named clique densities, and matrix density were abbreviated as B/DENS, and M/DENS).

The matrix density of 0,043 or 4,3% revealed a low value of interpersonal contact among the respondents in general. The reason for this was that the closer the matrix or block density score to one, the higher the density value and the more condensed, on

BLOCK N	SPLIT	MEMBERS	B/DENS	M/DENS
1	7	[1]	3,4,17,37,40,41	0,000
2	7	[1]	2,10,15,24,29,30,44	0,000
3	5	[1]	11,19,21,31,46	0,067
4	8	[2]	8,9,22,23,27,28,33,43	0,042
5	7	[1]	7,12,14,25,32,38,39	0,048
6	6	[2]	5,6,13,16,26,42	0,167
7	6	[3]	18,20,34,35,36,45	0,233

A reconstruction of the Komkhulu farmers, Table 7, revealed the following :

		4 --	(block 4) 8, 9, 22, 23, 27, 28, 33, 43
	2--	2 --	(block 2) 2, 10, 15, 24, 29, 30, 44
1			(block 6) 5, 6, 13, 16, 26, 42
		1 --	(block 1) 3, 4, 17, 37, 40, 41
	1		(block 5) 7, 12, 14, 25, 32, 38, 39
		3 --	(block 3) 11, 19, 21, 31, 46
			(block 7) 18, 20, 34, 35, 36, 45

Table 7 - Cliques

average, the communication activities were in such a network.

A reconstruction of Table 7 revealed cliques and ties among clique actors. The identification of cliques functioned as a mechanism to select respondents, who were grouped together as a result of their mutual involvement, in terms of similarities in their patterns of communication, though not exact correspondence. Information of this nature could be valuable to the developer who would like to get an insight into the dynamics of social systems such as, for instance, the position of a prominent person inside or outside a clique. Four points were of importance :

- Individual respondents (actors) were grouped together in the same block (clique) if similarity (rather than exact correspondence) existed in the pattern of their social ties and, therefore, their interpersonal communication.
- In the reconstruction of clique formation, the diagonal 1-block(s) indicated cliques and the off-diagonal 1-blocks indicated ties among cliques.
- No significant ties existed among cliques and among clique actors if the block density was smaller than the matrix density (MacEvoy & Freeman, 1987). (Symbols and were used to denote less than and greater than in this study.) The closer the density score to one, the

more dense the clique and, from a communication perspective, the more communication activities were possible in such a network or clique.

- The reconstruction of the processes of clique formation revealed important information to the developer because formation of cliques could reveal to the developer contextual images of associations/ties that were involved before the final orientation had been established.

An analysis of Blocks 1, 2 and 4 in Table 7, showed block densities the matrix density of 0,043. No significant ties existed among clique actors if the block density was the matrix density. Blocks 3, 5, 6 and 7 showed block densities the matrix density of 0,043. Therefore, significant ties existed among clique actors. Clique or block actors referred to respondents who belonged to the specific clique or block. An analysis of Cliques 3, 5, 6 and 7 showed block density percentages of low significance, namely, 6,7%, 4,8%, 17% and 23%. The higher densities represented a higher similarity of ties and, therefore, of communication contact among actors.

The demographic variables of gender, age and length of residency were further used in analysing the clique composition of actors. The aim was to identify possible trends among respondents such as respondents who cliqued together with the same gender, age or length of residency, or combinations of the variables. The rationale for using only the three mentioned variables was simply because they represented the most basic demographic variables of the respondents. Table 8 gives a summarised version of the raw data of each respondent's gender, length of residency in years in Komkhulu and age. A distinction was drawn in Table 8 between male and female farmers. The reason for including the raw data of the respondents in Table 8 was to give a broad overview on particulars of the specific respondents (see table 8).

Information provided by Table 8 served as a source to describe whether there had been any particular pattern as far as the demographic variables were concerned with reference to actors belonging to particular cliques which were selected for analysis purposes. The identified cliques' demographic particulars in this study were compiled from Table 8.

The presentation of the cliques by using the raw data was favoured because it gave a much more personal account of the details of each individual clique member. This would not have been the case had ordinary frequencies and percentages only been given.

Cliques 3, 5, 6 and 7 showed the following demographic qualities.

The following can be remarked with reference to the Komkhulu farmer cliques:

- Male respondents were dominant (in the majority) in Cliques 3, 5 and 6. Females were in the majority in Clique 7.
- No significant overall patterns in terms of age and length of residency could be detected in the cliques.
- Respondents 4, 6, 10, 12, 30, 32 and 40, the most prominently identified farmers through point in degree scores, betweenness scores and closeness scores, were spread across the total matrix reaching 27 or 58,6% of the total respondents.
- Respondent 11, who was identified as having no significant ties in Table 4, was grouped in Clique 3. This respondent was male, older than 73

Male Farmers			Female Farmers		
Male	**Years of residency**	**Age**	**Female**	**Years of residency**	**Age**
1	>30	67-73	**3**	>30	60-66
2	>30	46-52	**4**	26-30	46-52
6	26-30	25-31	**5**	>30	60-66
7	6-10	53-59	**8**	>30	60-66
9	26-30	32-38	**15**	16-20	39-45
10	>30	>73	**16**	>30	>73
11	>30	>73	**17**	6-10	32-38
12	>30	60-66	**22**	>30	>73
13	>30	60-66	**28**	>30	46-52
14	>30	39-45	**29**	>30	39-45
18	>30	46-52	**31**	>30	39-45
19	>30	53-59	**32**	>30	32-38
20	1-5	39-45	**33**	16-20	32-38
21	>30	46-52	**34**	>30	32-38
23	>30	>73	**35**	>30	46-52
24	>30	>73	**36**	16-20	32-38
25	>30	>73	**37**	>30	25-31
26	26-30	60-66	**38**	16-20	32-38
27	11-15	25-31	**43**	>30	60-66
30	1-5	25-31	**45**	26-30	39-45
39	6-10	53-59	**46**	21-25	67-73
40	1-5	32-38			
41	26-30	60-66			
42	16-20	46-52			
44	26-30	53-59			

Table 8 - Raw data

years and had been living in Komkhulu for more than 30 years.

Sociogramme : Komkhulu farmers

A sociogramme, based on the geographical dispersion of the Komkhulu farmers, visually illustrated the patterns of interpersonal contact or communication. The points, or actors of concentration in the sociogramme corresponded with the identified high frequency respondents among the Komkhulu farmers in all the analyses.

A total network of the Komkhulu farmers as a group is presented in Sociogramme 1. The 46 farmers have been plotted according to their approximate geographical location. The parallel lines in the sociogramme illustrate two roads running through the village of Komkhulu.

An analysis of Sociogramme 1 revealed that the respondents identified as having a high point in degree scores in Table 4, namely, 4, 6, 10, 12, 30, 32 and 40, clearly showed high density activities in terms of contact (communication). It was also interesting to note that not a single isolate was identified in Sociogramme 1. It was significant to note, in reconstructing the cliques as identified in Table 7, that Respondent 10, with the highest in degree score of 12, as well as Mr Mayekiso, Respondent 40, with the second highest point in degree score, did not belong to cliques. This was also the case with Respondents 4 and 30. Although they did not belong to any clique, the contact with other members placed them in a favourable position in terms of their accessibility to the other network members. Respondents 40 and 10 clearly showed that they were more in contact with other network members than other respondents although they did not belong to any clique. Cliques have, potentially speaking, the effect of limiting the efficient flow of information throughout a network because clique members tend to move about among their favoured friends before they seek assistance from other people.

Table 7 revealed four cliques, namely, 3, 5, 6 and 7. Their block densities were all higher than the matrix density of 0,043. An illustration of the cliques based on the geographic location of farmers in the Komkhulu village, as clique members is demonstrated by the numbers as encircled black spots. The following is presented (see tables on the previous page for Cliques 3/5 and 6/7 respectively.

An interesting observation is that clique membership is not impaired by geographical distance. Clique members associate with one another because of their own interest which is in this case grouped through the process of structural equivalence.

Summary : Komkhulu farmers as an intact system

In summarizing the Komkhulu farmers as an intact system, the following levels of analyses seemed to be appropriate, namely, the individual level of analysis and the system and clique levels of analysis.

Individual level of analysis. On the individual level of analysis point in and point out degree scores, betweenness scores and closeness scores of respondents were used for the analysis of respondents. An analysis of those aspects revealed the following respondents as prominent Komkhulu farmers : 2, 4, 6, 10, 12, 13, 14, 25, 27, 30, 32, 38, 39, 40 and 42. Of all the respondents five, namely, Respondents 4, 10, 12, 30 and 40 appeared to be the most important respondents in point in and point out degree scores, betweenness scores and closeness scores. Only Respondent 12, Chief Mhlambiso, belonged to a clique. Respondents 4, 10, 30 and 40 did not belong to any clique

Clique 3.					
Male	Years of Residency	Age	Female	Years of Residency	Age
11	>30	>73	31	>30	39-45
19	>30	53-59	46	21-25	67-73
21	>30	46-52			
Clique 5.					
Male	Years of Residency	Age	Female	Years of Residency	Age
7	6-10	53-59	32	>30	32-38
12	>30	60-66	38	16-20	32-38
14	>30	39-45			
25	>30	>73			
39	6-10	53-59			

Clique 3/5

Clique 6.					
Male	Years of Residency	Age	Female	Years of Residency	Age
6	26-30	25-31	5	>30	60-66
13	>30	60-66	16	>30	>73
26	26-30	60-66			
42	16-20	46-52			
Clique 7.					
Male	Years of Residency	Age	Female	Years of Residency	Age
18	>30	46-52	34	>30	32-38
20	1-5	39-45	35	>30	46-52
			36	16-20	32-38
			45	26-30	39-45

Clique 6/7

on this level of analysis and, therefore, could play important roles in being more accessible to a larger part of the Komkhulu network. These farmers could serve as important contact persons for developers who would attempt to introduce, for example, information regarding development projects into a village such as Komkhulu.

System and clique level of analysis. The average centrality mean score for the Komkhulu farmers as an intact system was a low 16,7%. The matrix density was equally low with 0,043 or 4,3%.

Four cliques, namely, 3, 5, 6 and 7 with block/clique densities the matrix density, were identified as having significant ties among clique actors. Two cliques with the highest block densities were Clique 6 consisting of the following respondents (5, 6, 13, 16, 26, 42) B/DENS : 0,167; and Clique 7 consisting of the following respondents (18, 20, 34, 35, 36, 45) B/DENS : 0,233. Equally important was the reconstruction of the cliques in the sociogrammes which clearly indicated the clique and the non clique positions of the respondents.

By identifying cliques with significant block densities, assistance could be given to developers who would attempt to contact a relatively larger group of people with the view to getting more information regarding any needs or problems farmers might have.

THE SIGNIFICANCE OF NETWORK ANALYSIS FOR DEVELOPMENT

The analysis of the selected empirical data poses the question : "What is the significance of network analysis for development?".

Komkhulu farmers as members of a social system, contribute uniquely towards networks and to the dynamic nature of the networks of social systems in their community. This is of great importance for developers as will be argued later on. The farmers find themselves, as members of a social system, in dynamic and highly complex interrelationships with one another as was illustrated by the intricate network, cliques and interpersonal relations. These interrelationships can also manifest uniquely with reference to specific development projects in specific communities. The above discussed analyses concentrated on the macro contacts amongst system members. If developers can apply network analysis to specific projects or specific skills with reference to specific farmers, a very important, yet complicated convergence picture emerges of specific farmers and specific or overlapping projects and skills that present themselves to be available to address development needs in communities.

The convergence process, from a communication point of view, poses particular challenges to developers who would attempt to introduce development projects from "outside". This is particularly evident where "Western" inspired development projects are introduced in a non Western situation such as Komkhulu. The challenge is to create mutual understanding between developer and underdeveloped. The dilemma of mutual understanding is, for example, illustrated by the prominence of the more traditional leader Chief Mhlambiso and that of the more modern leader Mr Mayekiso.

From the communication convergence perspective, developers should be aware of the necessity of the creation of a social reality between them and the underdeveloped in their communication. One way of attempting to build a greater social reality is to use network analysis techniques which could assist developers in gaining insight into grass roots needs and activities.

The identification of individual farmers as opinion leaders for instance, and the identification of specific needs, could assist developers in their understanding and contribution to the creation of a mutual understanding between them and the underdeveloped. This social reality is the end result of processes of collective action and mutual agreement which lead to mutual understanding. The processes of interpretation, understanding, perception and believing are all contributing to the social reality. Greater knowledge, for instance, of the importance of religiously related aspects for local people could enhance the quality of the development communication effort as illustrated by Daneel (1988) where the planting of trees was intertwined with the religious (symbolic) significance of trees for the Shona in Zimbabwe. In this way, nature conservation was enhanced immensely amongst local people.

The analysis of the network analysis data of various projects on the network, clique and individual levels can emphasise the importance of knowledge of the involvement of local people (grass roots involvement) in development projects because such analyses can identify prominent people as well as to assist in the development of priorities for the community in particular. The context of the empirical findings of this study could, for example, be tried to secure better explanations from farmers themselves as to why greater communication (higher matrix densities) with certain farmers, was indicated and not with others. The identification of the prominent farmers through centrality and clique analysis enables developers to obtain invaluable information regarding prominent community leaders and local communication network patterns concerning community needs. Such information would enable developers to evaluate, plan and execute development projects with greater confidence. The convergence aspect could be more complete by using network analysis information in development.

On the clique analysis level, the clique or block density reveals the quality of the communication amongst clique members. The same density principle applies here. The analysis of communication network contact on the interpersonal contact level with the emphasis on, for example, the variables of point in and point out degree scores, betweenness and closeness scores all contributed towards a better understanding of the communication networks in a society and the role specific farmers were playing in the flow of information. Such an analysis, as was done in this study, provides developers also with greater insight into the flow and potential flow of information in networks from a diffusion of innovations point of view. The two-step and multi-step flow of information theories, where the principle of interpretation of information by the leaders and their contact with the rest of the network's important aspects are, can also be applied to the prominent positions of Chief Mhlambiso and Mr Mayekiso, namely as interpreters of information. The closeness and betweenness aspects as discussed were important here. Betweenness refers to the control of information and closeness refers to the efficiency of the flow of information in a network. Both Chief Mhlambiso and Mr Mayekiso were identified as playing prominent roles in this respect. Chief Mhlambiso and Mr Mayekiso might also serve as role models for the other farmers concerning their credibility as far as their involvement in specific projects were concerned.

The visual, albeit limited, presentation of the sociogramme due to the static nature thereof, provides a picture of the network contact amongst the farmers. Using geographical mapping would also provide invaluable informa-

tion about the physical conditions on the ground. For example an analysis of physical conditions like the general infrastructure (roads, telephones etc), passibility of the train, the physical distance, the presence of structures, social status conditions, etc would all enhance the interrelatedness quality and premise of network analysis contextually. A number of other factors can also be added like the climate, season, etc. Using that as point of departure could provide invaluable orientation information to developers on the networks in a community and the communication links amongst network members on different projects in communities, for example. The contextual value of networks would be enhanced greatly in this way for the planning exercises of developers.

The analysis for instance of data on the three levels namely, the macro or network level, the meso or clique level and the micro or individual level, enables developers to identify the numerous intricate communication networks, clique and individual network members, and the manifestation of the network variables, with reference to for example specific development projects. The analysis also indicated that communication not only "takes place" in a social system, but it also contributes towards the nature of the social system, and as a result, the link between communication and development becomes more evident. The conclusion can be drawn that communication and development are inseparable qualities in the process of change.

In essence, the attempt in this study was not to evaluate the effect of interpersonal relations, but rather to find out, though to a limited extent, what was happening communication wise among people in the networks.

It is appropriate to conclude, finally, that the social structure is inextricably intertwined with the manifestation of communication in social systems. The communication structure manifests itself with reference to specific networks, cliques and interpersonal relations, which demonstrates the point that development planning and communication patterning manifestations in communities cannot be separated in the developmental context.

LESSONS FROM THE USE OF NETWORK ANALYSIS

The following can be listed as the most prominent lessons from this study:

- Such surveys do not incorporate the processual nature of communication over time. Changes in the structures of communication processes should be studied over a period of time. Data should be gathered at different time intervals and under different conditions, such as when great economic and political changes are taking place or when it is extremely dry, for instance.
- The stability of networks over time could not be studied. Relationships do change over time and such changes have consequences for communication networks.
- The actual content of information exchanges needed to be looked at in more detail. Information on content details should assist researchers in getting a broader contextual view on communication networks. Such information could contribute towards the enhancing of the convergence process.
- Barnes (1979) and Rogers (1987) both state the problematic nature of sampling and thus the generalizability of findings. It was problematic in this study that all farmers

belonging to the farmers' association should have been included. All the farmers belonging to the farmers' association, however, do not stay in the village. Some farmers were not available. The network analyses were done on the available farmers, administered over three days. According to the coordinator, Mr Mayekiso, a very high number of farmers were included in the survey. No up to date records concerning membership of the farmers' association could be found, nor was official information on the farmers' association's structure or functions in the Basin available.

- The gathering of data could have been more complete in places in spite of using trained interviewers who speak the Xhosa language, and the use of translated (Xhosa) questionnaires. "Third World" conditions, however, do not always allow for "First World" planning.
- Spending only three days in the area might not have been enough. An ideal situation would be where ethnomethodology techniques and network analysis methods could be combined.
- The lack of local network analysis experts and software availability were two serious obstacles. UCINET was ordered from the USA. The lack of exposure to network analysis methods among social scientists was another problem. The support system on this level of social science research was very limited. Standard social science research textbooks hardly take note of network analysis. Rogers (1987:288) says with reference to the above-mentioned problems : "Network analysis has not yet received much treatment in social science research methodology textbooks."
- The terminology confusion in network analysis methodology and theory was another major problem that had to be overcome, sometimes with great difficulty.
- The use and application of network analysis should not only be viewed as a method with certain mechanical requirements, but it should also be viewed as a philosophy. Wellman (1983:156) stated in support of this the following : "I view network analysis as a broad intellectual approach, and not as a narrow set of methods."
- One severe problem in network analysis studies is the complete ignorance shown towards the importance of the social context in which and of which humans are central players. An advantage, though limited to some extent, of this study was that the data analyses could contribute towards a broader contextual viewpoint. Rogers (1987:298) says in this regard : "The historical dimension of context often helps us understand the nature of the cross-sectional network data we usually analyze."
- The tremendous privilege of doing research in the "Third World" context was an invaluable educational experience. A very encouraging belief, having had a look at the results of this study, is that using network analysis methods and combining them with qualitative oriented approaches could open new insights to developers. This becomes even more relevant when communication

is viewed as an integral part of social systems.

- Rogers (1987), with reference to the advantages of newly developed network analysis hardware and programmes, states that computer-monitored data can help toward the solving of the respondent accuracy problems, can deal with the network sampling/ generalizability difficulties and can also provide more accurate message content information as well as to assist in a more meaningful way in the investigation of network behaviour over a period of time.

CONCLUSION

The innovative value of network analysis for development communication researchers was demonstrated in this study. The compatibility of the network metaphor with the open systems approach was in particular highlighted by the dynamic interrelatedness of system, network and clique compositions. The interrelatedness quality manifests also hierarchically with reference to macro, meso and micro levels of analysis. The individual/holism orientation was also appropriately accommodated.

The interrelatedness aspect enhances the convergence quality of the communication process further. Here the convergence aspect of communication implies the sharing of information which creates and defines relationships between individuals. The focus is on: "Who is linked to whom?" Communication behaviour becomes thus the dependent variable and not the independent variable. The ultimate goal is to identify the communication structure in a system and to analyze the relational data about communication flows by using for instance, systems, networks, cliques and individuals.

Although the innovative value of network analysis was illustrated in the study, the use of network analysis for development purposes needs to be developed much further. Social scientists have an opportunity not only to enrich research per se, but also to contribute immensely towards a better understanding of the role of communication in the intricate processes of community development through the use of network analysis. This process can also be further promoted by the integration of multi-disciplinary and multi-methodological orientations in the network analysis research process.

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ANNEXURE 1

Social matrix: Komkhulu Farmers as intact system.