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Andrews University

School of Education

COMPARATIVE STUDY OF NEEDS-ASSESSMENT METHODOLOGIES  
AS THEY APPLY TO THE DEVELOPMENT OF A UNIVERSITY  
COMPUTER SCIENCE CURRICULUM IN A  
CENTRAL AFRICAN COUNTRY

A Dissertation

Presented in Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

by

Perry Willard Munger III

March 1995

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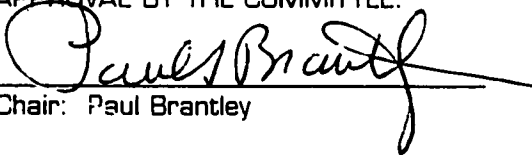
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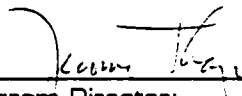
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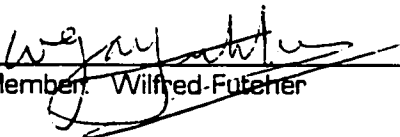
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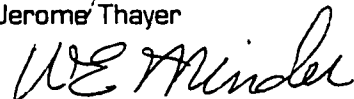
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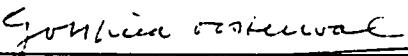
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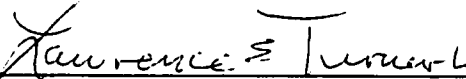
  
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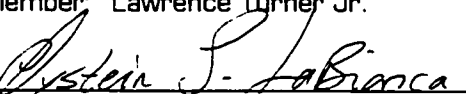
  
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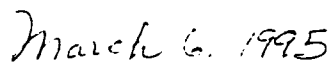
  
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**ABSTRACT**

**COMPARATIVE STUDY OF NEEDS-ASSESSMENT METHODOLOGIES  
AS THEY APPLY TO THE DEVELOPMENT OF A UNIVERSITY  
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**Perry Willard Munger III**

**Chair: Paul Brantley**

ABSTRACT OF GRADUATE STUDENT RESEARCH

Dissertation

Andrews University

School of Education

Title: APPROPRIATENESS OF NEEDS-ASSESSMENT METHODOLOGIES AS THEY APPLY TO THE DEVELOPMENT OF A UNIVERSITY COMPUTER SCIENCE CURRICULUM IN A CENTRAL AFRICAN COUNTRY

Name of researcher: Perry Willard Munger III

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Date completed: March 1995

A Central African society consisting of two local ethnic groups, as well as Europeans, Asians (Pakistanis and Indians), and North Americans, provided a milieu for the evaluations of five needs-assessment methodologies as to their appropriateness in a multi-ethnic environment.

Five methodologies, a questionnaire, a job analysis log, audio and video interviews, and an informal indigenous contact, were used in a needs assessment for the computer science department of the Adventist University of Central Africa, a private church-operated university, located at Mudende, Gisenyi, Rwanda, Central Africa. The five methodologies were evaluated in two different manners:

1. An evaluation of the appropriateness of the methodology based on 12 modified standards selected from those suggested by The Joint Committee on Standards for Educational Evaluation (1994), designed to assess the complete evaluation process (In this dissertation, the 12 selected standards were chosen and adapted to examine the impact of culture on the methodologies and to determine the appropriateness of the use of the methodologies in a needs assessment in the Fourth World.)
2. A comparison of the number of recommendations provided by each methodology. The numbering included the total count of recommendations provided by each methodology, the number of nonunique recommendations, as well as the number of unique recommendations. The recommendations were classified in "new," "consider," and "improve" categories. The recommendations were also examined as to how they were implemented.

The results of the study indicate that all five methodologies had their own set of unique strengths and weaknesses when used in a Fourth World setting. In fact, no one methodology would have been appropriate if used by itself. In this study, reducing the number of methodologies would have resulted in a loss of vital information needed for decision making. The greatest amount of information came from methods that allowed the researcher to develop a researcher-respondent relationship prior to collection of information. The single most productive methodology was the audio interview, with its greater use of affective communication.

While not an in-depth analysis of culture, the dissertation suggests that in the Fourth World, components of the culture critically impact both the conduct and the outcomes of the needs-assessment process.



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## **CHAPTER I**

### **INTRODUCTION**

Hall (1959), as a member of a human-relations committee in a large city, was requested to determine the willingness of city department heads to adopt nondiscriminatory employment practices. As a first step in the discovery process, Hall interviewed all department heads. Even though the department heads had been instructed by the human-relations committee to meet with Hall, many forgot or missed their appointments. Others kept Hall waiting up to 45 minutes. Most of the department heads spoke positively of the nondiscriminatory employment policy. From their verbiage, it appeared that the policy could be implemented. But Hall concluded from their actions, despite their words to the contrary, that most lacked interest in nondiscriminatory practices. "What people do is frequently more important than what they say. In this case, the way these municipal potentates handled time was eloquent testimony to what they inwardly believed" (p. 2).

What caused Hall to choose to make a decision based on the actions of the city department heads rather than their words? What is at the root of the old saying, "Actions speak louder than words"? Could it be that words do not necessarily mean what they are saying? If so, is it possible that written words could have a different meaning than their face value?

There is much more to human communication than simply words. Human expression is a communication of feelings, emotions, and nonverbal actions mingled with ideas and concepts in a cultural context that transcends verbiage. Maslow (1966) expresses it this way:

We have learned to think of knowledge as verbal, explicit, articulated, rational, logical, structure, Aristotelian, realistic, sensible. Confronted with the depths of human nature, we psychologists learn to respect also the inarticulate, the preverbal and subverbal, the tacit, the ineffable, the mythic, the archaic, the symbolic, the poetic, the aesthetic. Without these data, no account of a person can possibly be complete. (p 19)

Eisner (1985), speaking of behavioral objectives, puts the concepts in another way.

We try to articulate in words what we know in nonlinguistic ways. For much of our experience, discursive language performs rather well. But for the subtleties of human experience, for our knowledge of human feeling, for modes of conception and understanding that are qualitative, discourse falls far short. How many words would it take to describe insight, perceptivity, integrity, self-esteem. How would one describe how water tastes? How would one describe the qualities of a late Beethoven quartet in precise, unambiguous, measurable terms? (p. 115)

The needs-assessment process is further complicated by the human perception of needs. No two persons viewing the same need will perceive it the same way. Humans perceive their needs as a result of their view of the world filtered through their cultural and emotional experiences. The determination of needs must gather more than just facts. It must include methods that will allow the individual to communicate his/her view of the world. In Eisner's words:

It is wise to be aware of the fact that educational needs are not like the clouds or the grass. They are not simply out there to be discovered by interviews or tests. Educational needs are the products of judgments about what counts in educational matters. What constitutes an educational need depends on the educational values one holds. (Eisner, 1985, p. 197)

The communication of needs necessitates the communication of values and feelings, not purely cognitive facts. Most values and feelings are best communicated by the affective communication, rather than cognitive or evaluative communication. Oosterwal (1990) estimates that in the United States among members of the same ethnic community, 50-55% of all communication is cognitive, whereas most of the remaining is affective. In the United States, cross-cultural communication, communication between members of two different ethnic groups, is 20-30% cognitive. Central Africa, a region with many different tribes and ethnic groups, emphasizes personal affective communication. In places like Central Africa, Oosterwal estimates the cognitive level of cross-cultural communication to be only about 20%, whereas the intra-ethnic communication is similar to that in North America (50-55%).

Cross-cultural communication generally uses less cognitive and more affective communication than intra-cultural communication. All interpersonal communication is based on the passing of a message from one person to another followed by the return of some form of feedback, either verbal or nonverbal. The message is formulated by the speaker based on his past experiences and culture, usually transmitted in both words (verbal) and body language (nonverbal). The listener's decoding of the message in cross-cultural communication is based on the listener's experiences and culture, which are different from those of the speaker. The cultural differences between the speaker and the listener require a higher level of feedback. Cross-cultural communication with the different background requires a higher level of feedback. The difference in understanding of

vocabulary necessitates both the speaker and listener to pay close attention to the affective, nonverbal communication.

As a relationship is developed between the speaker and listener, the amount of feedback required is reduced. The understanding that is developed as part of the relationship facilitates communication. In close relationships this understanding can be developed to the point that the communicants can pass complete ideas with a look of the eye, a touch, or a gesture.

All cultures, to a certain degree, require some small talk when people meet after separation. When strangers meet for the first time, small talk is used as a means of establishing a relationship. When acquaintances meet again, the small talk is used to re-establish the relationship. The amount of small talk needed before resumption of the communication of facts and/or ideas varies: (1) from culture to culture, (2) on the amount of time spent together in the past, and (3) according to the length of separation. Central African cultures place a high value on relationship, hence, necessitating the reopening of each encounter with appropriate small talk.

Although important, the cognitive, affective, and evaluative domains are not the only way of portraying communication. The Johari Window (see Figure 1), as outlined in the book *Of Human Interaction* (Luft, 1969), describes four areas of knowledge affecting the communication process. This window is a matrix representation of information known and unknown by the speaker and his/her listener. The area marked "open" represents what the speaker is willing to share. The hidden area is what the speaker knows, and is unwilling to tell. The blind area is what the listener knows, but the speaker does not know. The unknown area is

information that is unknown by both the speaker and the listener. The Johari Window is intended to show the impact on the open area by changes in the hidden and blind areas. It is not intended to be completely proportional, especially the unknown area.

	Known by speaker	Unknown by speaker
Known by listener	Open	Blind
Unknown by listener	Hidden	Unknown

Figure 1. Johari Window with speaker feeling distrust.

Any fear and uncertainty in the speaker, including distrust of the listener, causes the human mind to reduce its recall capability, thus increasing the blind area. By contrast, a comfortable environment between both the speaker and the listener reduces both the blind and hidden areas, thus increasing the open area. Small talk provides a means of placing both the speaker and listener at ease with each other as a relationship is established. Once the speaker and listener have a comfortable relationship, effective cognitive communication can commence.

Needs are usually connected with feelings, which at times can be quite intense. Due to the interrelationship between feelings and needs, the communication and expression of needs generally involves a high level of affective communication. Any restriction of the affective communication process would

tend to reduce the capacity to communicate the need. The communication of needs is facilitated by the formation of a relationship and the development of trust. Humans feel uncomfortable communicating feelings and original ideas with strangers. The more intensely felt and/or the more personal the need, the greater the difficulty to communicate the need to a stranger. The difficulty of communicating needs is further increased if the listener is perceived as a person of great importance or influence in society.

The implications for research are worth noting.

1. Based on Oosterwal's estimate, a traditional needs-assessment questionnaire in North America would employ approximately 50-55% of the individual's total spectrum of communication. This restriction in the communication channel would likely reduce the amount of information captured. In multi-ethnic Central Africa, with its greater emphasis on affective communication, the same methodology might utilize as little as 20% of the individual's total spectrum of communication. This decreased emphasis on cognitive communication should have a significant impact on the type of methodologies used in the needs-assessment process.
2. Many methodologies do not include small talk. The lack of small talk may restrict the communication of needs.
3. In Central Africa the researcher is considered someone of importance and influence in the community, making the communication of need more difficult.
4. Central Africa's high value on relationships increases the difficulty in describing personal needs to a stranger. (This is not the same as begging

for money.) In a multi-ethnic, Central African setting, a traditional needs-assessment methodology may fail to reflect appropriately the richness of an individual's feelings and culture.

### **The Problems of the Needs-Assessment Process in a Non-Western Context**

Needs assessment in a non-Western setting is different from that in a Western culture. The type and nature of problems that one faces attempting to adapt traditional Western needs-assessment methods to the Central African setting include:

1. In a Central African culture, before serious communication can begin, there must be a period of small talk. This small talk develops the relationship between the respondent and the researcher, placing the respondent at ease, ready to answer questions. The necessary relationship is difficult to develop without a personal contact.
2. Many Africans have developed a fear of providing persons in "power" with information. This fear came from the colonialist misuse of information provided by the national. Persons in power are any persons who have influence over the respondent's life, the life of extended family members, and neighbors. Such persons would include educational researchers and curriculum specialists.
3. The perceived status of the person doing the research will have an effect on the respondent. If the person doing the research is perceived as being influential, the respondent is more likely to respond. If the researcher is perceived as being too important, however, the respondent may not



respond with complete truthfulness. He/she will respond the way he/she thinks the researcher wants him/her to respond. The status of the person through whom the respondent has been contacted will normally be the status attributed to the researcher, unless the researcher is extremely well known.

4. Fourth World countries tend to have multi-ethnic cultures that are in the process of adapting ideas from the West. Frequently, the ideas and methods used in research are imported with little or no modification. This lack of adaptation has resulted in many failures. Care must be exercised when importing Western methodologies. The cultural context, economics, language, and related areas must be examined to be sure that the imported methodology will function as intended. It would be expected that the most imported methodologies must be adapted to the local context.
5. The perceived importance of the research to the respondent will also affect how he/she responds to the research instrument. If the respondent feels that the research is important to the researcher and the researcher has a high perceived cultural standing, the respondent will generally respond favorably. Care must be taken in doing research to ensure that the importance of the research is understood by the respondent.
6. Many developing countries have problems with their postal system. Central Africa is no exception. Mail posted in Kigali, the capital of Rwanda, often takes 2 to 3 weeks to arrive at the University, a distance of approximately 140 kilometers.

7. If the researcher does choose a nontraditional needs-assessment methodology, he/she faces the problems of generalizability or transferability. Nontraditional needs-assessment methodologies tend to be time-consuming. A semi-structured interview typically takes from 1 to 2 hours. At a sample size of 90, this would involve 90 to 180 hours in fieldwork, plus the time necessary to arrange an appointment for the interview, and the time needed to gain the confidence of the respondent. Such a research project could require more resources than many needs assessments can afford.
8. The fact that there are not a lot of questionnaires used in Central African countries causes some respondents to be unsure or uncomfortable in responding to this kind of instrument. Research needs to be done to find ways of helping people feel more comfortable in responding to their first questionnaire. New methods need to be designed to improve the level of response, and, at the same time, provide further information about the respondent.

### **Background to Problem Statement**

As part of educational research, needs assessment may use many educational research methods. These research methods have been developed over the years in what was thought to be a monolithic culture. As such, conventional needs-assessment methodologies frequently fail to adequately consider cultural and subcultural differences among the respondents. By eliciting

responses at the technical-cognitive level, such methodologies often overlook the respondent's deeper meaning and intent.

In attempting to resolve this problem, Eisner (1985) encouraged the humanization of the evaluation process through educational connoisseurship and criticism. Eisner's connoisseurship is not negative criticism but rather positive evaluative criticism based on a "knowledgeable perception" of the object being criticized. It is based on the methods used by critics in literature, theater, film, music, and the visual arts. The art critic's main problem is rendering "those ineffable qualities constituting art in a language that makes them vivid" helping others perceive the work more deeply" (Eisner, 1985, p. 92). The critic has the added burden of attracting and holding the attention of many uninterested readers or listeners.

Eisner (1985) divides the critic's work into three areas or processes: descriptive, interpretive, and evaluative. At all three stages, the critic needs an understanding of the human interaction and feelings involved in the situation being evaluated. To develop this understanding, the educational critic must spend time in the classroom and the school interacting with students, teachers, and administrators. Constructive educational criticism and/or evaluation undertaken with a human context will produce a rapport between the researcher, the teachers, and administrators, reducing Johari's hidden and blind areas. This reduction will allow the teachers and administrators to be more open to the work being done. When they feel that they have been heard, they tend to be more willing to implement the recommended changes. Critical work done in this manner will produce what Eisner calls useful educational criticism.

Robert E. Stake's (1978) research goal was to help the people understand social programs and problems. He argued that "we must perceive and communicate in a way that accommodates their present understandings" (p. 5). As people's understanding is based mostly on their direct and vicarious experiences, Stake felt it wise to use the case-study method in his research. He also argued that responsive evaluation and holistic communication be the basis of program evaluation, and that case studies are best used for adding to our existing experiences with an understanding of humanity. In fact, for educational research, he argues that the case-study method "will often be the preferred method of research" (Stake, 1978, p. 5).

Guba and Lincoln (1982) moved from a rationalistic paradigm to the naturalistic paradigm in their attempt to better understand humans and human interaction. The naturalistic paradigm attempts to understand reality as a whole in contrast to the rationalistic paradigm's attempt to understand a well-defined limited area of knowledge. The naturalistic paradigm makes allowance for and encourages interaction between the inquirer and the respondent. This interaction requires that the context be well defined and places the report of such research in a context-bound setting. With the paradigm's emphasis on human interaction, human values play an important part in the understanding and analysis of the data. To be effective, interaction needs both feed-forward and feedback communication.

The close human interaction of the naturalistic paradigm makes it sensitive to human feelings and communication and should help the needs-assessment researcher understand the respondent's view of the world; but case-study

methods require long periods of time with just a few individuals. One of the goals of a needs assessment is to provide information in which the persons concerned with the curriculum will have sufficient confidence to be motivated into action. A low number of respondents could cause a lack of confidence in the result and impede the implementation of the results of the needs assessment.

In an attempt to better understand the relationship of intended outcomes and teacher-student interaction, Koppelman (1979) developed what he called the explication model. Based on an anthropological approach, this model attempts to reconcile scientific observation with human insights and judgments. It does not tend to judge the teacher, but rather attempts to understand the classroom interaction. It uses the students in an ethnographic process, while at the same time allowing for teacher input. The explication model provides a very good way of determining what goes on in the classroom in terms of achieving the school's goals and curricula.

Stearns's (1986) research with the Mayan Indians in Yucatan, Mexico, illustrates the problem that educators face. The teachers were from large metropolitan areas. Their cultural background differed dramatically from that of the rural Mayan environment. For this reason, they had trouble communicating with their students. As a result, the classroom curricula did not seem appropriate and of value to the Mayan students. The students did not do well in school. To bridge this gap between the students and teachers, the teachers were taught the ethnographic research process. They prepared an ethnograph describing the culture of their students. The link between the school and the home naturally led to a better school environment. The goal of this study was to

discover how the teachers could better help their students. It did not, in a direct way, attempt to determine the curricular needs of the students. In fact, the study plainly stated that the curriculum was a national political issue.

The work done by Eisner, Stake, Koppelman, Stearns, and others has made education more responsive to cultural and human needs. Their work, however, is limited in application and was done primarily in Western cultures. More needs to be known about the impact of communication and culture upon the needs-assessment process in diverse, non-Western societies.

### **Statement of Purpose**

The purpose of this study was to analyze the appropriateness of several small-scale needs-assessment methodologies in a Central African setting. A needs assessment for the computer science department of a small university in Rwanda, Central Africa, was used as a vehicle for the determination of the appropriateness of the methodologies. Most of the native cultures emphasize affective communication. Included in the populations of persons involved with computers in Central Africa are many persons from Asian, European, and American cultures. With the diversity of the cultures in Central Africa, the study accentuates cross-cultural communication problems. This study attempt to identify which methods are effective in cultures high in affective communication.

Logistic problems combined with the need to provide a culture-sensitive approach necessitated the modification of the traditional survey. By evaluating the impact of these modifications, the study should provide insights into the

appropriate methods and limitations of the traditional questionnaire, as well as more innovative methods.

These divergent restraining obstacles in the Central African setting suggest that no one methodology could effectively respond to all the problems. For this reason, it is more appropriate to use a mix of methodologies. This dissertation attempts to identify the best configuration of methodologies for the situation described. The insights gained will provide a basis for developing new standards, concepts, and methods of needs assessment appropriate to other cultures.

### **Research Questions**

This study focused its attention on finding appropriate needs-assessment methodologies for the development of a university curriculum in culturally-diverse Sub-Saharan Africa. The Adventist University of Central Africa (AUCA), a church-related university, and its computer science department operate in a mixed Fourth World culture. Little is known about the implications of conducting needs assessments in a Fourth World culture high in affective communication. Essentially, the researcher asks two main questions.

The first question, the center of the research, was which needs-assessment methodologies are most suitable for appraising the curriculum of a university program in the Fourth World? Several questions immediately follow: (1) What methodologies avoid producing an adverse reaction to the study in the mind of the respondent? (2) To what extent do existing methodologies react upon peoples' thinking, feelings, and/or needs? (3) What types of information are best

acquired by each methodology? (4) To be able to assess the appropriateness of a given methodology in a given multivariied cultural setting, the question should be asked, what impact does the interplay between cultural bias and communication have on a needs assessment? (5) And at what level or stage of the methodology should the consideration of culture begin?

A test case was needed to evaluate the main question and its subquestions. The research question of the test case was: How appropriate is the computer science curriculum at AUCA as evaluated by the five needs-assessment methodologies? The computer science curriculum of a Western university cannot be used as a standard of evaluation due to the differences of the settings. The Fourth World setting relies on the Western world–North America and Western Europe–for the tools of computer science. With Central Africa’s needs being more in the area of applied business, the courses should contain a high business orientation with an understanding of the business process as found in a Fourth World country, in particular, Rwanda.

The context of the study, a Fourth World setting, provides a cultural milieu with a far greater variance than normally found in the Western world. Chapter 3 describes the economic, communication, and cultural components of the Rwandan setting. Chapter 5 describes how these components were considered in the determination of the appropriateness of the methodologies.

### **Significance of the Study**

Though the study’s significance is primarily applicable in the non-Western world, where it attempts to provide insights into the impact of a multi-varied non-



Western culture on the needs-assessment process, it is also significant in other areas. North America and Europe can no longer be thought of as the monolithic cultures as they have been assumed to be. The influx of immigrants from various countries has brought in new cultures. The growth of minorities and their demand to be heard has made it important that any needs assessment in these countries be sensitive to cross-cultural communication problems.

Not only is the First World divided culturally along ethnic lines, but also along other subcultural lines. These subcultures include the work place, schools, churches, etc., and are themselves a mixture of ethnic and other subcultures. Due to the growing diversity of the subcultures in any given population, new needs-assessment methodologies sensitive to cross-cultural communication are needed.

Although this dissertation focuses on Central Africa, with insights that are also useful in other Fourth World contexts, it also suggests guidelines to First World scholars for the selection of appropriate research methodologies in divergent cultural settings.

### **Definition of Terms**

The following section defines terminology that provides the reader with a better understanding of this dissertation.

*Affective Communication:* Communication that transmits feelings, emotions, attitudes, or relationship. It includes the greeting, the small talk of the communication process, body language, and all nonverbal communication.

*Appropriate:* A valid suitable match between two or more entities. In this dissertation, the word appropriate includes the concept of matching the methodology to the local setting.

*Central African Country:* For the purposes of this study a Central African Country is defined to mean Rwanda. This small land-locked country is situated just south of the equator in the mountains of Central Africa.

*Cognitive Communication:* Communication in which knowledge is usually transmitted by verbal means.

*Culture:* "Integrated systems of ideas, feelings, and values and their associated patterns of behavior and products shared by a group of people who organize and regulate what they think, feel, and do" (Hiebert, 1985, p. 30).

*Cultural Bias:* "Whenever people learn a culture, they are to some extent imprisoned without knowing it" (Spradley, 1980, p. 14). This imprisonment colors the person's view of reality, quite often making it difficult to understand a different culture. Thus the actions of a different culture quite often seem bizarre and strange.

*Fourth World:* The Fourth World consists of the poorest nations of the world. Many of these are in Subshara Africa.

*Need:* "A need is something that is necessary or useful for the fulfillment of a defensible purpose" (Stufflebeam, McCormick, Brinkerhoff, & Nelson, 1985, p. 12).

*Needs Assessment:* "The process of determining a need" (Stufflebeam et al., 1985, p. 16).

*Needs-assessment Methodologies:* Tools and/or procedures for determining the need.

*Subculture:* Distinctive cultures within a larger culture.

### **Delimitations**

This study focused on the computer science department of the School of Business at the Adventist University of Central Africa and its related constituency of computer science personnel in local industries. As the School of Business does not have a secretarial department, the study excluded such people as secretaries, keypunch operators, and persons who do word processing and data entry. The population included approximately 100 persons.

The study was delimited to Rwanda, as the two other countries of Francophone Central Africa, Burundi and Zaire, are difficult for a Rwandan resident to travel in, due to restrictions and unrest. Time and financial restrictions necessitated the study to be further delimited to a single case test of the five methodologies. This last delimitation restricts the precision and depth of analysis in the determination of the effect of culture, economics and communication on needs-assessment methodologies.

### **Limitations**

The population is quite small due to the low number of graduates and the fact that the university has only recently introduced the computer science option. Even though the population for this study is small, approximately 100 persons, the sample size of the qualitative methods, 10 to 15 persons, as well as the method of sample selection are limitations in the study. Thus, in the truest

sense, the results of the study cannot be generalized to the computer science population in Rwanda or other countries in Central Africa. The university setting and cultural context are close enough to those of other universities in Central Africa that there is much that can apply to these other universities.

As the educated people in Rwanda are generally French-speaking, all the research instruments had to be translated into French, and the responses had to be translated from French into English, adding to the time necessary to complete the study. The translation and analysis processes required the information to be transcribed. The transcription and translation process caused a loss of affective information. Except for those persons of Francophone European extraction, a very small minority, French was not their mother tongue.

The purpose of this investigation was to determine the appropriateness of five needs-assessment methodologies. To evaluate the appropriateness of a needs-assessment methodology, the methodology must be implemented. A single researcher does not have the time to accomplish five in-depth needs assessments using different methodologies. Reducing the scale of the implementation of the methodologies does not limit the determination of their appropriateness.

### **Organization of the Study**

Chapter 1 introduces the study. It provides a statement of the problem, explanations of purpose, significance, limitations and delimitations of the study, as well as definitions of the special terms used in the study.

Chapter 2 includes a basic history of the needs-assessment process, a definition of the needs-assessment process, a review of Stufflebeam's understanding of the needs-assessment process, a review of educational evaluation and needs, and an examination of qualitative methodologies appropriate to needs assessments. It further examines the problems of sampling, reliability, validity, and generalizability in qualitative research. Chapter 2 looks at several possible methods that could be used in a Central African setting. The actual selection of the methodologies is discussed in chapter 4.

Chapter 3 describes the Central African country of Rwanda, giving an overview of the culture, the history, the economics, and their impact on education and computer science.

Chapter 4 describes the implementation of the test case research including: the five methodologies selected, the reasons the five were selected, the modifications necessary for their implementation in the study, and their analysis. Each methodology is treated as a separate study.

Chapter 5 assesses the appropriateness of the use of the five methodologies in a Fourth World setting, comparing the results of the methodologies as well as listing their strengths and weaknesses.

Chapter 6 gives the conclusions of the study, examines possible uses of the results of this study in other settings, and suggests future research possibilities. Chapter 6 also includes an epilog of political events that occurred in Rwanda following the death of the President on April 6, 1994, after the needs assessment had been completed.

## **CHAPTER II**

### **REVIEW OF THE LITERATURE**

This review of the literature starts with a brief history of evaluation, followed by a definition and description of evaluation. Needs assessment is looked at as a type of evaluation. Included is a brief history of needs assessment along with a historical look at the definition of need and needs assessment. Traditional needs-assessment methodologies are examined. This is followed by an examination of emerging and possible methodologies for needs assessments, including an examination of qualitative research methodologies applicable to needs assessment, as well as unobtrusive measures.

The research that has been done in Africa is examined to provide an understanding of the types of problems research faces in the Fourth World and in particular, Central Africa. This covers education in general, distance education, needs assessment, research on the use of computers and education, the impact of culture on education, the mutual impact of politics and education, some general research being done in Central Africa, and research that has focused on Rwanda. To develop a tool for comparing methods, the standard by the Joint Committee on Standards for Educational Evaluation (Joint Committee) is examined. Those areas applicable to needs-assessment methodologies are described.

## **Evaluation**

Educational evaluation is different from educational research. There are differences not only in purposes, but in intended outcomes and basic philosophies as well. An examination of the history and a definition of educational evaluation provides an excellent basis for understanding evaluation and its use.

### **A History**

Evaluation—particularly program evaluation—is quite often seen as starting in the late 1960s with the infusion of federal money into human service programs, but evaluation has a history that predates that by at least 150 years. According to Madaus, Scriven, and Stufflebeam (1983), the history of program evaluation can be divided into six periods:

1. from 1800 to 1900, the Age of Reform
2. from 1900 to 1930, the Age of Efficiency and Testing
3. from 1930 to 1945, the Tylerian Age
4. from 1946 to 1957, the Age of Innocence
5. from 1958 to 1972, the Age of Expansion
6. from 1973 to present, the Age of Professionalization.

They then go on to describe each period. The delineation of the history of evaluation is based on their history of evaluation.

### **The Age of Reform: 1800-1900**

This period encompasses the industrial revolution, a time of increasing reform and rapid change. Early attempts were made to evaluate the results of social programs during this period. These attempts were generally informal and

quite often conducted by a commission set up by the government for this purpose. Annual reviews in Great Britain were frequently obtained through the use of an inspectorate. Inspectors circulated the various institutions and submitted reports based on what they found. About the middle of the century, associations dedicated to social enquiry were formed. As a result of their findings, bureaucracies were usually set up, which appointed committees of enquiry to investigate social problems. This constitutes the beginning of an empirical approach to the evaluation of programs.

In the United States, the earliest evaluation was in Boston in 1845. It included the first use of a written essay test in the United States for evaluation purposes. The results were more often used to pressure out unwanted headmasters than to evaluate the curriculum constructively. The first formal educational-program evaluation in America was conducted between 1887 and 1898 by Joseph Rice. In it, he found no difference between schools that spent 200 minutes a week studying spelling and those that spent as little as 10. During this period, several accreditation institutions were established.

### **The Age of Efficiency and Testing 1900-1930**

Studies during this period were primarily focused on efficiency: Were the teachers/institutions being efficient? To this end, statistics were compiled on what were considered important aspects, such as expenditures, dropout rate, and promotion rates. Tests were developed to ascertain achievement in a standardized way so that individual schools could compare themselves with the norm. Many of these tests were used as propaganda and not as a true



measurement of need. During this time, universities formed groups to do field studies, and these became the precursors of the evaluation centers that grew up in the late 1960s and 1970s. During this time, testing was basically confined to the local area. Curriculum was largely instituted locally, so tests were designed to test only local areas.

### **The Tylerian Age: 1930-1945**

Ralph W. Tyler has been referred to as the father of educational evaluation, and indeed, he coined the term 'educational evaluation'. With the Great Depression over, Dewey and others tried to renew education, creating the Progressive Education Movement. Tyler was called upon to head up the research component of the Eight-Year Study, which was the first and last large-scale study of the differential effectiveness of various types of schooling until well after World War II. It compared the results of traditional high schools to the progressive schools. Tyler viewed evaluation as a comparison of the actual outcome with the intended outcome.

### **The Age of Innocence: 1946-1957**

The Age of Innocence could have just as well been called *The Age of Ignorance*, as there was widespread poverty in cities, heavy discrimination, and wanton depletion of natural resources. During this time, many new schools were erected, and little effort was made to verify the effects of all this expenditure, as the nation was riding on a wave of euphoria after the end of World War II. Standardized testing increased dramatically, spurred on by new improvements in mechanical scoring and analysis.

**The Age of Expansion: 1958-1972**

During the late 1950s and early 1960s, the government began to infuse large amounts of money into the school systems, largely in response to the Soviet launch of Sputnik. In order to verify that the money was making a difference, these programs were to be evaluated at set intervals. In the early 60s, it became apparent that the current evaluation methods were not particularly helpful to curriculum developers. Cronbach asked developers to conceptualize evaluation not as a horse race between competing programs, but as gathering of information to help curriculum planning.

It was during this time that the war on poverty was introduced. This also required a significant amount of verification. Many changes had to be made to the evaluation procedure in order to meet the government criteria.

Another problem was disadvantaged children. The standard tests were of little use in diagnosing their needs. Further, little was actually known about the "treatment" implemented, so it was hard to evaluate the results. As a result of this, Phi Delta Kappa set up a committee that called for new theories and methods of evaluation as well as training for evaluators. Many evaluations during this time showed the new programs to be failing, so their supporters called for a change in the evaluation techniques.

**The Age of Professionalization  
1973-Present**

Evaluation has gradually moved to a more professional status. Much has been published in the field of evaluation, and the training facilities have improved dramatically. Journals became available, and evaluation has gained political clout.

The Joint Committee established standards for evaluation. Although there has been a substantial amount of improvement, there are still problems; namely, the split between positivistic/quantitative and phenomenological/qualitative approaches.

Evaluation is a dynamic yet immature field, but it is becoming more important. In its early stage of development, evaluation was considered as just a fad, but the gains over the past 15 years have proven it is here to stay.

#### A Definition of Evaluation

Asher (1976, p. 17) suggests in his book *Educational Research and Evaluation Methods* that, "Evaluation . . . implies judgments based on facts which research methods supply." He adds: "Evaluation, then, is more than research and at the same time completely encompasses research methods." Table 1 delineates the main differences between evaluation and research in education. Educational evaluation is the process of defining, acquiring and disbursing appropriate information in such a manner as to facilitate the decision making process. Evaluation is used in many different areas of education including: grades, program evaluation, curriculum evaluation, program feasibility, design analysis, and needs assessment. Evaluation can be used to determine the goals, methods, improvements, and effectiveness of any educational program.

Rather than determine the generalizability of the data, evaluation is more interested in its relevance, importance, scope, credibility, timeliness, and pervasiveness (Stufflebeam et al., 1971). This does not mean that both internal and external validity, reliability, and objectivity are not important, but rather

**TABLE 1**  
**DIFFERENCES BETWEEN EVALUATION AND RESEARCH**

Item	Evaluation	Research
1. The goals	For specific decisions in specific situations	Add to the body of knowledge in education "Truth"
2. The audience	School decision makers	Universal--the educational community
3. Generalizable to	A unique local setting	World
4. Nature	Judgmental for decision	Descriptive for future research

these are viewed in the local context with its specific goals and objectives. Even though evaluation research is judged by the same standard as educational research, the information only needs to be transferable to the local context. This can change such things as sampling size. In some cases, the "importance" of decision making does not warrant the expense of doing a full evaluation, justifying modification to the research parameters.

The book *Evaluation Models* (Madaus et al., 1983) lists 13 types of evaluation. These types of evaluation are based on the intended use of the results. They put the 13 types of studies in three classes: politically oriented studies (or pseudo-evaluations), question-oriented studies, and values-oriented studies. The politically oriented studies are intended to improve the public relations of an individual or group. They tend to be biased, especially in the reporting. This does not mean that they are deceptive or poor evaluations, but the temptation to distort the fact is great. Question-oriented studies have particular questions that need to be answered. The questions usually have something to do with the administration of a given project. Values-oriented studies attempt to provide judgment about the quality and effectivity of a given program. They are usually of more value to administration.

Madaus et al. (1983) suggests that there are pitfalls in each of the 13 types of evaluation. All the 13 models have weaknesses and strength. These weaknesses must be understood and accommodated by the researcher in the evaluation design. If the weaknesses are accommodated, the advantages of the model will be enhanced.

Any one of the methodologies of the 13 types of evaluation can be used in needs assessments. Certain types are more valuable than others. In most cases, the methodologies of decision-oriented study are the best strategy for needs assessment; however, methodologies from the consumer-oriented studies have been used in needs assessment (Mahlom, 1978). The consumer-oriented approach checks with those who are considered to be consumers of education: graduates and their employers. In some ways, client-centered studies could be very useful. With the local administrators doing the needs assessment, the cost would be reduced and the administrators would have a better understanding of the local situation. Bias from the local administrators' points of view can color the needs-assessment report. The connoisseur-based study could be used in needs assessment, but should not be based on one expert.

### **Needs Assessment**

The concept of educational needs was developed in the early school surveys first implemented just after the turn of the century. From their inception, they were intended to improve the quality of the curriculum. By the time that Sears wrote *The School Survey* (1925), the school survey had grown to include almost all types of education. Cubberley, in the editor's introduction to Sear's book, accredits the school survey and the then new method of tests and measurements with having a large influence on school administrative decisions.

The school survey was intended to determine several basic factors necessary for educational administration. Sears outlines them as follows:

First, we must find out what kind of a scheme of education is needed; second, is the financial capacity of the community able properly to fulfill

these needs; third, to what extent do present school provisions satisfy the proper needs; and fourth, what constructive proposals are desirable in order to bring the schools up to the best that the community can afford. (Sears, 1925, p. 13)

As with any new and developing data-collection model or method, standards needed to be established. Sears (1925) outlines six basic criteria as the standard of data collection.

1. No data should be collected that do not show promise of being useful.
2. Data must not be collected or facts selected merely to make an argument. All aspects of a subject must be studied.
3. The form in which the data are gathered should have a view to economy in classification and tabulation.
4. Fact should be carefully distinguished from opinion, and the sources of both must be trustworthy.
5. Where mere samples of data are used, care must be taken that the samples are representative and sufficiently extensive.
6. Where comparative methods are used, there must be sufficient basis for comparison. (pp. 15-16)

Even though these may not be defined in modern terms such as reliability and validity, as a general standard of evaluation, they are still very effective.

In 1952, Sumption published *How to Conduct a CITIZEN SCHOOL SURVEY*. In it he suggested that it is the responsibility of the school board to establish the directing committee, a committee that studies everything in the community that affects education, including school buildings, school districts, finances, curriculum, and community needs. The citizen committee then analyzes the data, and proposes and prepares a Master Plan. Sumption reminded his readers that good public relations are essential to the survey.

Mort (1925) added confusion to the meaning of educational need when he published *Measurement of Educational Need*. He defined the term "educational need" as follows:

In a restricted sense . . . the educational need of a community is regarded as the composite of all of those elements in the community that would affect the cost of the public educational offering demanded by a state program for making available to all children a satisfactory minimum educational opportunity. (p. 1)

Mort's definition is based on cost rather than delineating the actual need.

The Great Society programs of the mid-60s instituted the requirement of a demonstrated need for a funding request. Although the meaning of need had not been clearly defined, the process of determining the need was called needs assessment. In fact, there is still some discussion about the definition of need.

As the needs-assessment process occurs in a local setting with specific goals, it is not research but rather educational evaluation. As its primary purpose is providing information to aid in the formation of educational and curricular goals, needs assessment as a rule does not use experimental educational research methods. For this reason many of the authors on needs assessment first had experience in educational evaluation. In fact, the definitive work on needs assessment, *Conducting Educational Needs Assessment* (1985), was written by Stufflebeam, McCormick, Brinkerhoff, and Nelson, most of whom are outstanding researchers in educational evaluation.

#### A Definition of Needs Assessment

The 70s brought many needs assessments. Kaufman, a leader in the needs-assessment process at that time, published many articles on needs assessment. He prefaced the *Educational Technology*, November 1977, special issue on needs assessment with the article "Needs Assessment in Perspective: Introduction to a Special Issue." It was during this time that Kaufman defined



need as the difference between what is required and what is. He argued that the audience of the needs assessment should be involved in the definition of the "ought" (what should be) and the "is" (what is). The needs assessor's main responsibilities were to (1) guide in the definition of the "ought" and the "is," (2) determine the gap by subtracting the "is" from the "ought," and (3) report the results.

Not satisfied with the 'gap' definition of needs, many tried to redefine the word "need," using many terms, including "felt" need. Stufflebeam et al. (1985) went beyond the concept of felt need by defining the needs-assessment process as "the process of determining the things that are necessary or useful for the fulfillment of a defensible purpose" (p. 16). Within the context of Stufflebeam's definition, the needs assessor is more interested in describing only the "ought." These then become the educational goals. It is the responsibility of the program implementors to determine what is necessary to obtain the goals.

### Needs-Assessment Process

It would seem that all that is necessary to conduct a needs assessment would be to gather the information, analyze the data, and report the results. Stufflebeam, and others like him, sees the needs-assessment process as much more. Stufflebeam suggests six steps (Stufflebeam et al., 1985, p. 18-21).

#### **Step 1. Preparation**

The preparation for the needs assessment would involve a written description of: (1) the location and the organization for whom the needs assessment was being done, including both the client and the other audiences;

(2) the purposes and goals of the needs assessment. It should include both stated and unstated reasons and whether the reasons are defensible. Even if it is never published, the needs assessor needs to formally note the above.

The preparation process should further identify the scope and limitations of the needs assessment. The contracts that will be required during the needs-assessment process should be developed with a view of maintaining political viability. The contract development and maintenance must be an ongoing process and must adhere to appropriate protocol. At the same time, the areas of need must be defined, including the setting, program variables, cost variables, philosophical and conceptual frameworks, and the outcome variables to be monitored.

### **Step 2. Information Gathering**

The information-gathering process includes the decisions that must be made as to the relevant sources of information and sampling plans. The methods must be selected and the instruments developed. A plan for each observation procedure must be specified. The verification aggregation procedures must be identified. The planned procedures must be implemented and the data gathered. Finally the data must be filed and stored.

### **Step 3. Analysis**

The analysis of needs includes a review of all the data collected along with a descriptive analysis of this data. The data must also be assessed for technical and substantive adequacy. At this time the analysis plan can be implemented. This plan should describe the data, the purpose of the analysis, the

assumption(s), and the analysis techniques. All the above analysis information should be included in the analysis report before the findings and the conclusions.

#### **Step 4. Reporting**

Special reports must be planned for each of the audiences with a right to know. During the preparation phase, a written design for each report should be prepared. This design should include the audience, purpose of the report, and the information that should be included with format and media. Several reports may need to be given—different reports for different audiences. During the reporting step, the reports are prepared based on the original plans that have been modified as necessary to accommodate any new unexpected information or changed methods or plans.

#### **Step 5. Using the Results**

The needs assessment is wasted if the information is not used. This is usually not done by the needs assessor but by the administrator of the organization(s) requesting the needs assessment. This is best done if the needs assessor is present to help clarify the information found. This process should include an examination of the cause-effect relationships, outcomes and objectives, and possible alternative strategies. The decision-makers need to know the sources of information and may need to judge their importance or reliability.

#### **Step 6. Evaluation of the Needs**

##### **Assessment**

No needs assessment is perfect. No methodology is a panacea. The effectiveness of the needs assessment and its methodologies and processes

should be evaluated throughout the whole needs-assessment process. This evaluation plan should be formulated and defined in the preparation phase. As the needs assessment is undertaken, the evaluation plan should be implemented, monitored, and changed as needed. At the end of the needs assessment, a formal written and oral evaluation should be given to the decision-makers. This formal evaluation will include the ongoing evaluation, which may have changed the direction of the needs assessment as well as the effectiveness of the overall needs assessment. It should include suggested changes for the next needs-assessment cycle.

With a constantly changing society causing constantly changing curricular goals, an ongoing complete program of needs assessment should be developed. Thirty years ago, computers were not in the curriculum. At many universities today, one cannot complete an MBA without owning a computer. If curriculum is to meet the needs of the continually changing society it is intended to serve, those making the decisions must have an ongoing method of assessing the curricular needs of the society. To accommodate the continual change of society, each needs-assessment cycle must have a formal written evaluation that the needs assessor should use in the preparation process for the next cycle.

#### Needs-Assessment Methodologies

Over the years many lists of needs-assessment methodologies have been formulated. Among these are Anderson and Ball (1978), Stufflebeam et al. (1985), and Tesch (1990). Anderson and Ball (1978, p. 37) suggest that there are eight general categories of possible methods for the needs-assessment

process. These are based on the type of research undertaken. Table 2 is a modification of Anderson and Ball's table. Each of the categories listed in Table 2 contains the type of research followed by the appropriate needs-assessment methodologies. Where necessary, a brief description of the methodology is given. To aid the education needs assessor, many packaged plans were developed in the early 70s.

### Nontraditional Methods

Nontraditional methods include unobtrusive measurements and qualitative methods. Webb, Campbell, Schwartz, and Sechrest (1966), in their book on nonreactive research (unobtrusive) in the social sciences, covered four areas of research methodologies. Following is a list of four areas with possible needs-assessment methodologies.

1. Physical traces: erosion and accretion

Examples include: Barzun (1961), Melton (1936), and Sawyer (1961)

- a. Popularity of a course or option
- b. Historical data, such as how many have taken a course in the past
- c. Making changes to the curriculum and then assessing popularity through current attendance or over a longer period of time as historical data

2. Archives

Examples include: Durand (1960), Winston (1932)

- a. Looking at political and other government records
- b. The mass media

**TABLE 2**  
**EIGHT GENERAL RESEARCH CATEGORIES**

Type of Study	Type of Research	Needs-Assessment Methodologies	Examples Include
1. Experimental Studies	<ol style="list-style-type: none"> <li>1. Differences between performance of clients and nonclients</li> <li>2. Performance differences for clients exposed to program variations</li> <li>3. Data on differential program effects for clients with different characteristics</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge Tests with control groups</li> <li>2. Performance tests and analysis with control groups</li> </ol>	Stanton (1994) Rhody (1993) Hamilton (1993)
2. Quasi-Experimental Studies	<ol style="list-style-type: none"> <li>1. Changes in client performance over the time of exposure to the program</li> <li>2. Changes in client performance for different program component variations</li> <li>3. Differential predictions of "success" for clients exposed and not exposed to the program.</li> </ol>	<ol style="list-style-type: none"> <li>1. Knowledge tests</li> <li>2. Performance tests and analysis</li> <li>3. Simulations</li> </ol>	Fischer (1993) Peterson (1994) Reilly (1994) Hart (1994)

Table 2--Continued.

<p>3. Correlational Status Studies</p>	<ol style="list-style-type: none"> <li>1. Correlations between program characteristics (sometimes including costs) and client performance</li> <li>2. Correlation between client characteristics (such as race and sex) and their performance.</li> <li>3. Correlation among program characteristics</li> <li>4. Correlations among client measures</li> </ol>	<ol style="list-style-type: none"> <li>1. Records analysis with control groups</li> <li>2. Logs compared to outcomes</li> <li>3. Interactions and outcomes</li> </ol>	<p>Heald-Taylor (1993), Honig &amp; Park (1988) Simons (1993)</p>
<p>4. Surveys</p>	<ol style="list-style-type: none"> <li>1. Studies of projection of manpower needs</li> <li>2. Summaries of attitudes and opinions about an ongoing program among program-delivery staff</li> <li>3. Descriptions of program characteristics, operations, and costs.</li> </ol>	<ol style="list-style-type: none"> <li>1. Behavior observation checklist</li> <li>2. Inventory checklist</li> <li>3. Judgmental ratings</li> <li>4. Opinion Surveys</li> <li>5. Survey questionnaires</li> <li>6. Telephone survey</li> <li>7. Assembling a cross section of the population to discuss and discover the need</li> <li>8. Mini-conferences open to all help at different times and places so as to be accessible to all.</li> <li>9. Town meetings</li> </ol>	<p>Brauer (1994) Barcelo (1993) Paladino-McCoy (1993) Sweitzer (1994) Wagner Williams (1993)</p>
<p>5. Personnel or Client Assessment</p>	<ol style="list-style-type: none"> <li>1. Profiles of characteristics of entering, leaving, past, or prospective clients</li> <li>2. Summary descriptions of characteristics of program personnel</li> </ol>	<ol style="list-style-type: none"> <li>1. Interviews (groups and individuals)</li> <li>2. Sociogram</li> <li>3. Delphi technique</li> <li>4. Self-ratings</li> </ol>	<p>Forson (1994) Mampuru (1993)</p>

Table 2--Continued.

<p>6. Systematic "Expert" Judgments</p>	<ol style="list-style-type: none"> <li>1. Recommendations by a commission appointed to delineate a problem and recommend possible solutions</li> <li>2. Report of program process/materials to a review or evaluation panel</li> <li>3. Report of site visit to the program by a team of outside experts</li> </ol>	<ol style="list-style-type: none"> <li>1. Systems analysis</li> <li>2. Advisory, advocate teams</li> <li>3. Judicial review</li> <li>4. Time series analysis</li> <li>5. Fault Tree Analysis</li> </ol>	<p>Castle (1994) Howatt (1989) Musana (1988)</p>
<p>7. Clinical or Case Study</p>	<ol style="list-style-type: none"> <li>1. Analysis of program processes-- implementation, management, evolution, and so on</li> <li>2. Phenomenological analysis of institutional change</li> <li>3. Summary of impressions gained from examination of special client or personnel groups (for example, referrals)</li> </ol>	<ol style="list-style-type: none"> <li>1. Case studies</li> <li>2. Records analysis</li> <li>3. Logs</li> <li>4. Sociograms</li> <li>5. Interaction analysis</li> </ol>	<p>Alfa (1993) Fraser (1993) Frazier (1994) Robicheau (1994)</p>
<p>8. Informal Observation or Testimony</p>	<ol style="list-style-type: none"> <li>1. Anecdotes about experiences of particular clients, staff members, and so on</li> </ol>	<ol style="list-style-type: none"> <li>1. Panels, hearings</li> <li>2. Records analysis</li> <li>3. Logs</li> <li>4. Judgmental ratings</li> <li>5. Time series analysis</li> <li>6. Listening to pressure groups</li> <li>7. In-house meetings attended by local educational personnel</li> </ol>	<p>Eisner (1985) Rivera (1993)</p>



- c. Historical analysis of 1 & 2
  - d. Sales records
  - e. Industrial and Institutional records
  - f. Written documents
3. Simple observation
- Examples include: Doob (1961), Mabie (1931), and McCarthy (1929)
- a. Exterior Physical Signs
  - b. Expressive movements—body language
  - c. Conversation sampling
4. Contrived observation: hidden hardware and control
- Examples include: Boring (1961) and Flagler (1960)
- a. Audio tapes of conversation
  - b. Videotapes validating other methods, both with and without a hidden camera
  - c. The intervening observer, who uses the above methods to record the data while he/she makes changes to the environment. The presence of the intervening observer should have a minimal effect on the experiment.

Not all the methodologies mentioned above adapt easily to needs assessment. They all could be used in conjunction with other methodologies. For example, the audio and videotape recordings could be added to an interview, allowing the interviewer to have a more accurate analysis after the interview was terminated. It would also help the interviewer, as notes need not be taken. If the

interviewee was comfortable with the equipment, the communication should be better as he/she will have the full attention of the interviewer.

### **Qualitative Methodologies**

Qualitative research began with the birth of sociology in the work of Auguste Comte in the middle of the 19th century. Anthropology emerged with the publishing of *Primitive Culture* by Edward Tylor (1874). From the beginning, there was tension between believers in the methods of natural science and those who argued human beings could not be described by such simple causal laws (Tesch, 1990).

Those who argued for natural science methods could imitate, and their 'positivism' (quantitative) sounded upbeat and respectable. The 'anti-positivists' (qualitative) were inspired by the German Romantic movement which "recognized the life experience of humans, the emotional and vital feeling of life, and the engagement that humans have with others and with the world" (Polkinghorne, 1983, p. 21).

In 1927, Edward Lee Thorndike published *The Measurement of Intelligence*, which suggested that anything psychological could be measured with methods from probability and statistics. In 1949, Lee Cronbach published the *Essentials of Psychological Testing*, and in 1951, Robert L. Thorndike published *Educational Measurement*, precipitating scores of statistics books in support of positivism.

Problems remained. "Scientists are not and cannot be concerned with the individual case," said Kerlinger (1979, p. 270). He went on to state that helping an individual is the main interest of science, but the scientist can only deal in

statistics. Further, some scientists got results without adhering to the positivistic principles, such as B. F. Skinner, who worked entirely with individuals. Case studies and content analysis were other areas of investigations that Kerlinger could not accept.

There were still researchers who did not use positivistic methods, although many had to include some statistics just to get published. An example is *The Experience of Really Feeling Understood* by van Kaam in 1958.

Maslow published a book in 1966, *The Psychology of Science*, in which he distinguished between mechanistic science and humanistic science. He believed mechanistic science to be too limited, and that humanistic science must include all of reality.

By far the best way to learn what people are like is to get them, one way or another, to tell us, whether directly by question and answer . . . to which we simply listen, or indirectly by covert communications, paintings, dreams, stories, gestures, etc. which we can interpret. (Maslow, 1966, p. 12)

Further, Maslow said that science should find methods to fit the problem, not the other way around.

This touched off a revolution. Feyerabend published a shocker, *Against Method: Outline of an Anarchistic Theory of Knowledge* (1975). Many believed that Maslow's tolerance of mechanistic science was too narrow.

There were a few, such as Amedeo Giorgi, who were dedicated to systematic procedures. He became an advocate of phenomenology, a result of European attempts at objectification of the social sciences. Giorgi described his method, as well as the principles behind them, in the *Duquesne Studies in*

*Phenomenological Psychology* (Giorgi, Fischer, & von Eckartsberg, 1971), which began appearing in 1971.

Psychology and education finally came together under the work of Carl Rogers, as previous attempts at positivistic research in education had largely been futile. In 1953, action research arose with the publication of a book by Stephen Corey, *Action Research to Improve School Practices*. The idea was to let the teachers do the research. "Real scientists" did not like this practice and branded it sloppy, so it died out after a short boom in the early 60s. Carr and Kemmis (1986) saw it as an implementation of 'critical science', since it allows one of the objects being researched—the teacher—some part in the research.

Qualitative research found its way in through educational evaluation, as well, and soon the scene was full of qualitative publications: Erickson (1973), Smith (1974), Wolcott (1975), Rist (1977), and Tesch (1976). Several books on qualitative methods have appeared since: Patton (1980), Dobbert (1982), Bogdan and Biklen (1982), Lincoln and Guba (1985), Goetz and LeCompte (1984), and Miles and Huberman (1984). In 1986, a group of qualitative researchers formed the Special Interest Group at the AERA convention.

With the development of qualitative methodologies for educational and sociological research, there are other methods that can be added to the forgoing list. These would be classified as non-traditional methods. Tesch has developed a very good taxonomy of qualitative research methods. Not all of these would be applicable to the needs-assessment process.

The needs assessment's goal of determining what a need is or something that fulfills a rightful purpose would eliminate certain types of qualitative

research. The type of subject matter would also determine the type of methodology that can be used. If the needs assessment is trying to determine the wants or needs of the population at large, the only way is to ask them. In this case, the first and the third type of qualitative research can be used. The first type studies the characteristics of language. The third type understands the comprehension of the meaning of text/action. This means that such methodologies as structural ethnography, ethnoscience, and phenomenology could be used. In designing a curriculum for university courses such as computer science, one would be looking for regularities, themes, and job culture, both cognitive and interactive.

Reflection as a type of research does not really apply to needs assessment. Usually it is the researcher who is reflective and not the population. Thus, it would be biased in favor of the researcher.

Rather than trying to look at all of the possible methods of qualitative research, only those that appear to be useful in a needs assessment are examined. In the following analysis, the need of what the graduate ought to be is defined. This study was concerned with the computer science curriculum and hence wanted to know what its graduates need to know, and what skills they need on completion of university training. The description would include information for life in general as well as on the job.

#### Classical Content Analysis

Classical content analysis attempts to make a replicable and valid inference from the context of given data. This data can be oral or written. If it is

oral, it is usually transcribed before the analysis. This method tends to be numerical and statistical in nature. It looks for words and phrases or anything that would indicate the type of language used. Based on this type of information, the researcher attempts to understand the communication. Examples include Krippendorff (1980), Giorgi (1994), and Scheideler (1993).

### Ethnographic Content Analysis

Ethnographic content analysis is more reflective than classical content analysis and attempts to verify theoretical relationships. The analysis is done as the data is received and sometimes leads to changes in how the data is collected. The research attempts to gather hidden meaning rather than just numbers. Being reflective while analyzing the data, the researcher can change the direction of the study. This type of context analysis would be more appropriate to needs assessment as it would allow the researcher to return to retrieve more data from the population if necessary. Examples include Merryfield (1989), and Attheide (1987).

### Life Studies

Life studies are now not limited to biographies or autobiographies but include in-depth interviewing and some focused observation. It has been called the 'biographical ethnography'. Complete life studies would not be necessarily appropriate for a needs assessment, but a life study over a limited time would be appropriate. The researcher would need to do multiple life studies at the same time. Being able to describe the life of a person functioning in the intended vocation of a given curriculum would provide insights to the preparation necessary

for the job. This means multiple interviews over an extended period of time. Examples include Faraday and Plummer (1979), and Werner and Schoepfle (1987).

### Ethnography

Ethnography can be divided into two areas: holistic and structural. Ethnography was developed by anthropologists while studying cultures. Its purpose was to provide tools for the study of humankind. Ethnography usually uses participant and nonparticipant observation. It can also use informants in both structured and semi-structured interviews. Holistic ethnography is concerned with all or part of the culture or community being described. It attempts to show how the parts interact to make the whole. Structural ethnography is more interested with distributed subjective meanings, cataloging the forms and relationships in both time and space. Ethnography would be an excellent way of describing what is done in a given job context. A major drawback with ethnography is the amount of time that is needed for an appropriate finished ethnography, but ethnographic research can be used in needs assessments. Even if a complete ethnography was not written, a description of the job and hence the skills and knowledge necessary for a given job would be thoroughly outlined. Examples include Bunte (1994), Randolph (1993), Spradley (1970), and Denyer (1994).

### Ethnomethodology

Ethnomethodology studies the members of a given society during their normal interaction one with another. It attempts to identify and classify

indexicals. These are terms including how people make sense out of their lives and the things happening around them. They are only applicable to the local context and are not universal. This type of research would be important to the needs assessment in cases where the job required a fair amount of human interaction. Many believe that computer scientists do not interact much with others. On the contrary, both programmers and computer scientists tend to have a fair amount of interaction with other people. One of the major problems with programmers is their inability to interact effectively with the end user. On the other hand, the end user does not design the software appropriately. To resolve this problem, a new branch of computer science has been developed, called system analysis. The analyst listens to the end user, designs the software, and then communicates the design to the programmer in written form. Examples include Bailey (1987), Irons (1993), and Hicks-Harper (1993).

#### Event Structure Analysis

Event structure analysis attempts to examine and represent series of events in a logical structure. The results of event structure analysis are a model that can explain sequences of events. If the events that a graduate will face and the necessary interaction on the part of the graduate can be defined, then it is fairly easy to design a curriculum. The problem is defining or naming the events. This could be used in needs assessment if the job consists, in part at least, of a series of well-defined steps. For the programmer this would involve:

1. module design from written specification
2. coding (writing the program)



3. debugging, finding errors, or determining if the program meets specifications
4. if there are errors, returning to step 1
5. installing the software
6. maintaining the software.

Event structure analysis could be used to study these events and provide an in-depth analysis of the tools that a programmer should be taught in school. One example is Heisi and Lewis (1988).

#### Grounded Theory Construction

Grounded theory construction, sometimes called grounded theory, attempts to discover theory from data through methods of comparative analysis. The researcher does not take any theories to the field, but rather attempts to discover the theory while doing the research. These theories are then verified in the field. Grounded theory research has been used in needs assessment (Doxey, 1994). It has encouraged some qualitative researchers to begin their research with a minimal review of the literature. Examples include: Glaser and Strauss (1967), Kochanek-Ehlerman (1993), Feyerherm (1994), Ah Nee-Benham (1993), and Rogier Lesiak (1993).

#### Case Studies

The case study method studies individual cases, describes the case in detail, and then attempts to make sense out of the case. It is not statistically sound and is comparable with only one case. After many case studies have been collected in a given area of research, the results can be combined, with the

results becoming more comparable. It is usually very subjective in nature and varies from case to case. Examples include Nordbye (1993) and Dorgan (1994).

#### Action Research

Action research involves the participants in improving the practices. When used in a needs assessment, the participants are guided by the researcher to determine their own needs. This is, in many ways, what needs assessment is all about. If appropriately implemented, it is one of the best types of needs assessment. Examples include Stanza (1994), Newsom-Stewart (1994), and Tonack (1994).

#### Naturalistic Inquiry

In naturalistic inquiry, the researcher is the instrument and focuses his/her understanding on the meaning the people being studied give to their experiences. This contrasts with conventional inquiry, which tends to be experimental in nature. Naturalistic inquiry has been used as a label for qualitative research, as qualitative research does not tend to use experimental methods. Stufflebeam et al. (1985) suggested an ongoing evaluation of the needs assessment as it is undertaken. The results of this evaluation may suggest changes to be implemented in the methodology. For this reason, the researcher in needs assessment must make more decisions in the process than in true research. Thus, evaluation would be of a more naturalistic inquiry, but not necessarily more qualitative than quantitative. Examples include Leone (1994), Scarborough Gavares (1993), Jordan (1994), and Carr and Kemmis (1986).

### Phenomenography

In phenomenography, context analysis is used to describe conceptually the qualities of a phenomenon. The research is limited to only one phenomenon—a little limiting for needs assessment. The research methodology would be more useful if all the phenomena that the graduate would encounter could be defined, and then the needs assessment could consist of a phenomenographical study of each phenomenon. Examples include Marton (1986), Park (1994), and Ebenezer (1993).

### Phenomenological Research

Phenomenological research describes the essence of the subjective experiences between human subjects. For needs assessment, it is more limited. If it is combined with phenomenography, it could be of value. Examples include Bullington and Karlson (1984), Langeveld (1983), Young (1993), Viljoen (1994), and Reed and Johnson-Howard (1989).

### Qualitative Evaluation

Qualitative evaluation uses naturalistic inquiry, hence it can and does change research methods as it progresses. Thus, during the evaluation process, the process can be more important than the outcome. Therefore, it is able to evaluate the value of the outcomes. The foregoing are possible types of research that can be used in needs assessments. Current needs-assessment processes emphasize the need to be open-minded to new and different sources of data. These sources of data can be found after the needs assessment has begun. Thus, to really be effective, the needs-assessment process must be a type of

naturalist research where the needs assessor comes to the research with as little preconceived ideas and theories as possible and lets the needs assessment lead the researcher where it will. This means that the researcher must be a reputable person and the audiences must have confidence in him. Examples include Meek (1993) and Wiltshire (1994).

### **Research and the Fourth World**

A computerized search of current doctoral dissertations shows that the majority of research in the Fourth World is either nutrition-oriented, health-oriented, or basic education-oriented. This review of the research in Central Africa includes also some South African research projects that impact on Central Africa or would be of value if done in Central Africa.

### **Quality of African Education**

Chapman asserts that declining school quality is one of the most serious problems facing Fourth World countries—particularly in Africa (Chapman et al., 1991). This is influenced by the decline in the economic situation of the African countries. The effectiveness of the schools is not based on the home background as much as it is on school-based factors. Riddell (1989) used 32 Zimbabwean schools and multilevel regression to determine the importance of school-based factors. Much debate is being expressed over the efficiency of the African schools. Eisemon (1987) suggests that there are four domains of school outcomes that need to be examined:

1. The modernizing effects of the school
2. The effects of school-acquired literacy and numeracy

3. The relation between schooling and employment, earnings and productivity
4. The relationship between schooling and such benefits as health, nutrition, and fertility control.

If employment is used as a basis to study the value of primary and secondary education, it would be quite surprising if there is any correlation between salary and quality of education. University training, however, is different. If the university is well known in the field of study, the graduate can command a higher salary than if the university is lesser known. If the job market is tight, it can mean the difference between employment and unemployment.

An examination of these areas suggests that the best way to determine school effectiveness is to look at graduates: examine the graduate's type of employment, literacy, numeracy, health, nutrition, and fertility control. Looking at the product can give a better picture of the quality of education, its effectiveness, and possible flaws in the educational system.

Because many of the Fourth World countries have graduates that are unemployed or underemployed, there is much discussion about the type of change needed in the school curriculum. India has many motor rickshaw drivers that have master's degrees. These people have degrees in areas where there is not much employment or where they do not have the right people-skills to function. This is a problem in Africa, to a certain extent, in primary and secondary education. In Rwanda, the employment rate is equal to the unemployment rates of many of the Western nations.

Other factors have influenced the quality of university education; among them are loss of autonomy, a decaying infrastructure, inadequate salaries, an

internal job market void of opportunities, brain drain, intellectual isolation, diminished research, and fossilized curricula (Posnansky, 1989). Posnansky suggests expanding programs to include evening and summer programs, allowing more hours for those who teach during the day, and establishing a self-financing avenue. These conditions do not apply to all of the universities in Africa, but are true for many of the government universities.

### Distance Education

Another area of education that is carefully being looked at is distance education. The University of South Africa is using this to help educate its people and to help the other nations of Africa. Because of problems of cost and transportation, it is being recommended for Central Africa. One of the interesting areas of educational research in Africa is distance education. The cost of establishing and maintaining universities has encouraged the search for alternative methods of education. South Africa has been one of the leaders in distance education, particularly at the graduate level. It is possible to get a recognized Ph.D. by correspondence. The student may be required to visit the university a few times, depending on how his/her advisor feels about the work being done.

One of the major problems with distance education is the high dropout rate of undergraduate programs. The University of South Africa is designing strategies to alleviate the problem of unpreparedness in its students. This is not as much of a problem with distance education as it would be with full-time on-campus students. Because the students are at home, they may be working, and

the extra time necessary for the remedial course work is not as disruptive (van As, 1985).

Certain subjects, such as the sciences and business, need labs and hands-on training. This requires special forethought in the design of the distance educational program. The lab experiences must be similar to those on campus (Maxwell, 1985). Language, if appropriately handled, can be taught by distance education. One of the major means of doing this is through the use of video. The University of Illinois has developed special videotape materials and has done this with limited resources (Gillespie, 1985). Distance education is a growing field; Doerfert et al. (1989) were able to list about 200 distance education institutions throughout the world (Adey, 1987). They list institutions in 54 countries, of which 9 are in Africa. Although none were in French-speaking Central Africa, Central Africa is not completely left out. Another research project (John, 1991) lists 7 countries that are involved in distance education, including Burundi, but not Rwanda.

The first trans-African seminar on distance education was held in Arusha, Tanzania, on September 24-28, 1990. It covered such topics as technologies and research, priorities of distance education, required infrastructure, and cooperation and foreign aid. Another interesting concept is the Commonwealth of Learning (COL), which promotes access to learning between universities throughout the British Commonwealth with the Commonwealth of Learning (1991) through distance education.

The Makerere University in Uganda is trying to provide post-secondary education for a large share of the Ugandan population. Its goal was an extra-

mural degree course by October 1990. Chick (1990) believes that this can be met if funding is sufficient and most of the teaching materials are purchased from outside.

Another area of concern is the pacing of distance learners. They do not study on a consistent basis, so often they do not finish on time or fail to finish at all.

Perry (1984) suggests that the following be used with the lessons:

1. short-term regular assignments
2. tutorial letters
3. audio and videotape cassettes
4. computer assisted instruction.

South Africa has experimented with teleconferencing in developing critical thinking in adults (Smith & Castle, 1992). Canada, via satellite, has also helped upgrade physicians in remote and urban areas in Kenya and Uganda.

#### Needs Assessments Undertaken in Central Africa

There are just a few research projects on needs assessment in Africa. Janvier (1993) argued that a need existed for the examination of the method of gathering data. He was interested in the open-item interview and closed-item survey normally used in needs assessment. He referred to other researchers, Schuman and Presser, who had similar models. Janvier completed his dissertation in 1992 and chose to use Roger Kaufman as his guide rather than Stufflebeam. The population of this study included alumni, resident students, teaching, and administration. He split the population in half. One group was



given the question as an open-ended interview question, while the other was given the question as a survey question.

Respondents were requested to determine the priority of the item. In the open-ended form, the respondents seemed to give their first impression, lacking depth of thought. The respondent seemed to protect his/her responses when faced with controversial questions. Therefore, one might hold that the closed questions were more accurate. The closed responses seemed to provide more attitudinal responses. The respondents were not hesitant to identify problem areas or even people in the closed-item form.

The intention of Janvier's dissertation was to compare the closed item with the open item. The literature concerning qualitative research as well as a general understanding of culture would strongly suggest that if the open-ended interview was changed slightly, it might provide more data and information than the closed form. A better test would be to try the open-ended form with written surveys. That is, ask exactly the same question on the written form as in the open-ended interview. There should be a vast difference, particularly if the interviewer attempts to encourage the interviewee to talk and provides a climate conducive to friendly discussion.

Another study of needs was undertaken by Mwerinde (1994). His dissertation looks at the need for planning of well-organized, reliable statistical services for decisions in Uganda, Nigeria, and Morocco. It looks at the methods for collecting the statistical data and statistically trained people to manipulate and interpret the data. The author laments that in one of the countries there is only one university for 18 million people. This, of course, is characteristic of many

places in Africa. Most countries have only a government university. This study cannot be termed a needs assessment.

Another needs assessment was undertaken in a Fourth World country by Doxey's (1994) dissertation requesting a vocational curriculum for the college in the Marshall Islands. The Marshallese received their educational system from the Americans. Naturally, the system of education was not adapted to the local setting or culture. The study analyzed the technological skills needed to reduce unemployment. The author used qualitative, formative evaluation, conducting an occupational analysis and compiling a prioritized list of the skills needed. The final list was constructed using grounded theory to develop a contextually appropriate model.

#### Computers and Education in Africa

The falling price of computers is making computers viable in education on the continent of Africa. However, many schools that can never dream of having computers, even though they can be purchased for \$800 to a \$1,000. This is especially true of primary schools. Computers in education can be viewed from several areas:

1. Computer-aided instruction
2. CD-ROMs in computers
3. Information for the use of computer
4. The impact of culture on computers
5. Computers and business instruction
6. Teaching of computer science.

Computer Aided Instruction (CAI) has been tried in many forms. Until the computer became powerful enough to run graphics and appropriate sound, it had stagnated, but with the current trend in computers, it is gaining ground. It is being recommend for use in South Africa (Human Sciences Research Council, 1983), especially in computer awareness and computer literacy. CAI can be improved by combining it with videos, radio, and television. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has prepared software to help understand populations. It includes: (1) demography, (2) documentation, (3) education—including environmental, functional literacy, (4) fertility, family planning, and sexuality, (5) health and nutrition, (6) information and communication, (7) migration, urbanization, and human settlement, (8) population trends, (9) research and evaluation, (10) socio-economic factors, and (11) women.

There has been for some time on-line distance education in the USA and Europe. Kotze (1989) discusses the distance education of South Africa while reviewing that of Europe.

Testing is an area where computers can be of real value (Anderson & Saliba, 1987). Using a scanner, it is possible to scan published objective testing methods (true-false, matching, and multiple-choice items). Or these can be entered with the use of a word processor. The test can then be given by the computer. Even essay tests can be given using word processors. One area where the computer excels is machine scoring. It is possible for the computer to evaluate each question, and even each response, on a multi-choice question.

Thus, a computerized bank of tests could be developed and a computer-generated test be used.

Special problems, some of which have already been mentioned, were encountered when computers were introduced in African schools. Hawkrige (1990) discusses some of them. This has been done mainly in the more affluent East and South African Schools (Botswana, Kenya, Lesotho, and Zimbabwe).

Wiechers (1981) recommends that the microcomputer be used to teach basic skills in primary education in Fourth World countries. He has done research in the teaching of mathematics using CAI.

Laridon (1990) describes the use of computer-based interactive videodisc in high-school math in South Africa. Allen and Allen (1983) describe its installation in Central Africa. Both of them include an evaluation of the process and recommend it for further development and use.

With the improvements that have been made recently with the CD-ROM and video boards, it is possible to show movies on the screen of a computer. Jamsa (1994) has recently published a trilogy of computer science books on a CD-ROM. This CD contains *Jamsa's 1001 C/C++ Tips*, *Success with C++*, and *Rescued by C++*. These are three books that had been formerly published in paperback form, which is typical of computer books. But this CD-ROM is different. It has four icons that allow the user to compile what he is reading about, copy what he is reading to another file, listen to the teacher, and see Jamsa lecture about what he is reading. The price of \$49.95 (in 1994) is only a little higher than the price of just one of the three books with a diskette. This type of media greatly improves the usefulness of CAI, especially as the media

becomes cheaper. The machine to write to a CD-ROM costs just under \$6,000, making it possible for a university to purchase it. Further, the CD-ROM is seen as a means of doing on-line searches. It is not necessary to have all of the materials of the Educational Resources Information Center (ERIC) at a given school but rather keep the CD and then order only what is needed by the staff (Dubbeld, 1991). Not only does it reduce the stocking cost of the libraries at developing countries' universities, it increases the output of the research being done. Fourth World universities can also have references on CD-ROM and therefore do not need to have the actual volumes. The CD-ROM is actually cheaper than the books.

Not much has been done in developing computer science curriculum for Central Africa. Zeni (1990) spent a month studying the curriculum in South Africa for writing on the computer. Kotze (1984) suggests that computer repair and software installation be taught to gifted students in South Africa. In fact, several computer science curriculums in Central Africa produce graduates who have never touched a computer (interview with a visiting student at the Adventist University of Central Africa). The use of the computer in businesses is just now gaining a foothold in many Central African countries. Again the price and availability of the computer has restricted its use in many countries. Many Central African countries have also placed a high duty on the importation of computers. Rwanda had its duty at 40%, which included the price of the computer and the shipping costs. Many of the older administrators in these African countries do not necessarily see the value of the computer. In some

cases, the country is using computers only upon the insistence of the donor nation.

### Culture Education and the Fourth World

Africa has always been considered a good place to study the influence of life on culture and culture on life. Gitau's phenomenology study (1988) outlines the African culture, both liberal and radical, including such topics as culture, education, and identity. The unique African culture mix causes problems for research. Effective evaluation research must understand that humans are different and the respondent's view of reality is subjective (Cuthbert, 1984). There is a large amount of cross-cultural research on cognitive development. It is usually undertaken in three ways: (1) using traditional Western methods; (2) searching for culturally specific modes of learning; and (3) testing the innovation of education of minority children.

The problem of culture and education particularly occurs in Central Africa, where learning and thinking modes are vastly different from those of the Western world. Boateng (1983) describes how traditional education can be integrated into the educational system. Further, he warns that the education planners of Africa cannot ignore these cultural methods. Ayoade (1989) points out that the culture of Africa is also being used for political purposes and thus has influenced education. The African culture is based on the extended family and the tribe. The main method of passing on historical information, building character, and cultural values is storytelling (Lijadu, 1992). In fact, these stories are regarded as the unwritten curriculum of traditional information.

Ignoring the culture of the local setting can be problematic, and even dangerous. Abbott (1982) had a conflict with the older village woman of the local Kenyan community. The Kenyan village has a dominant structure with lip service being given to the males. But real dominance is in the hands of the old women. The local women refused to allow Abbott to interview them. When Abbott discovered who was causing the trouble and confronted her, she said that Abbott should have asked permission before beginning. The offended women in the process made several attempts to have local authorities oust Abbott and her team from the village. Eventually, the research project was completed.

#### Politics, Education, and the Fourth World

All of sub-Saharan Africa's educational systems started with the residue of the European colonizers. Generally, this was not well adapted to the local cultures. Several studies have been done on the history and legacy of the sub-Saharan African countries and their educational systems. Eshiwani (1990) outlined the history of education in Kenya from the time of independence onward. Dogbe (1987) argues that even some of the culture of the former metropolis has influenced endogenous creative efforts. Kogoe (1985) argues that the educational systems have gone from euphoria to crisis and then to reform.

The African educational systems have moved from its original European base to a more African base. This move has been influenced by several factors:

1. The feeling of pride in a new country and the feeling of independence has encouraged change simply to be different from the colonizer.

2. Once the European moved out, the reasons used to develop the educational system changed, the method of thinking changed, and the financial condition of the country changed. Thus, the government ministries in charge saw new ways to do things.
3. Since independence, many of the countries have grown at amazing rates. In many countries, birth control is not working, and where there was more than sufficient land, there is now little, if any, land left. In many cases, the land is not now as productive, so food production is down.

Knight and Sabot (1990) studied the problem of economies in developing nations, trying to understand the relationship between the economy and the quality of education. Their study showed that making education less scarce diminishes the inequality of access. Colclough and Letwin (1989) state that the growing debt in many countries has slowed down or reversed the work toward compulsory primary education. Today, this condition is worse with the global economy in trouble. The World Bank has been criticized for ignoring research and continuing its policies on primary and secondary education in developing countries (Eisemon, 1989).

The situation in most countries requires the decision to be made in the ministries of the central government. This means that the decision is made by just a few people, most of whom would be considered experts in the country. Such a situation does not allow for local differences and forces everyone to be treated equal. Furthermore, in many African countries the central government is controlled by one region. In the past, this has been particularly true with virtual dictators as presidents. Quite often the whole country was treated as the



president's people preferred to be treated. In other cases, more funds were given to the leader's home area. Education ministers have few and poor statistics to work with. The error rate in available statistics ranges from 16 to 40% (Chapman et al., 1991).

Changes in curriculum and educational direction are costly, but do occur, normally when there is a change in the top leader of a country.

Independent universities in African countries have to be very careful. They cannot survive without outside funding. The cost of running a university in Africa is far greater than what any student can pay. To illustrate this, the Adventist University of Central Africa charged each student about \$1,300 per year in its 1993-1994 school year. The Seventh-day Adventist church invested another \$4,000 in each student at the university. Although the figures are low in comparison to First World figures, they are very high when considering that the average income is under \$500 per person per year in the country. Large families are able to send only one child to the university, and they can do that only if everyone pools their funds. The student, when graduated, is expected to help other family members with schooling costs. There are many stories of families where the father is a cultivator, but where all the children have gone on to higher education earning doctoral and master's degrees. These families have encouraged their children to do well in school so that the children can obtain scholarships.

### Educational Research in Africa

A review of the literature shows that it varies from research on the influence of dance on communication and learning systems (Nicholls, 1993) to the formal evaluation of why undergraduate students fail. Research has been undertaken to determine the national educational quality indicators (Alkin, 1988). Typically, the research is based on several nations, including both African and non-African nations, using both quantitative methods such as multivariate studies (Fuller, 1987), and qualitative studies such as case studies and interviews (Campbell & Martin, 1992). It ranges from traditional education determining the efficacy of the teachers and schools in teaching mathematics (Lockheed & Komenan, 1989), to comparative education looking at learning over teaching (Yoloye, 1990), to research on informal education such as agricultural and extension education, to adjusting technology to the people (Campbell & Martin, 1992).

In some cases, the university is attempting to help the nation in its development process and the research project is an evaluation of the university's success (Aligaweesa, 1987). In other cases, the university is attempting to help with research and development in industry, trying to increase productivity in the developing nation (McMahon, 1987). "How valuable is education as an investment?" is the question raised by several research projects (Knight & Sabot, 1987).

Research in Africa has many problems. One of the worst is that governments tend not to use the research done by the university, discouraging the researchers. Others have pointed out that the funding of the World Bank has

very strongly influenced research in Africa (Samoff, 1993). In many cases the national university is criticized for the work it does. Moshia (1986) discusses the role of universities in African developing nations, detailing the problems faced.

The type of research varies from traditional statistics to the naturalistic approach (Lee & Shute, 1991). Proper communication of research results and the existence of appropriate data banks are needed in Africa. Several documents have been published discussing these needs (Chateh, 1980). Furthermore, educational research does not have a universal definition, argues Saif (1982). There seems to be a need to market information services. There are obstacles to the use of library and information services (Nawe, 1993).

One of the major concerns in Central Africa is the lack of compulsory primary education. Much research has been done on primary education in Central Africa, including the preparation of the student to enter secondary schools (Eisemon & Schwille, 1991). In one case in Tanzania, a clinical case study was conducted to document and evaluate achievement and problems in implementing universal primary education (Omari et al., 1983). Others have studied the distribution of students in primary education (Maas & Criel, 1982) based on the annual statistics reported by the national governments. Another question, often asked in research, is what language should be used in elementary schools (Mbuyi, 1987).

Human capital theory has been investigated with its implications in educational systems in Africa with its limited funding (Honig, 1993). It is noted that the training received in schools quite often has no relationship to the skills needed on the job. This is particularly true for secondary-school graduates. More

often, it is the informal training that the person receives that provides the necessary skills. Many of the blue-collar workers received their training on the job.

Africa is a continent of many languages. The educated African learns three or more languages, including his/her mother tongue, the local lingua franca, and a national European language. The European language is either English, French, or Portuguese. Usually the fourth language is English for those countries where the third language is not English. One of the research projects was to see if English could be taught better starting with French or with the mother tongue Kirundi (Niedzielski, 1981).

As this research is limited to educational research, most of the research on home, family, health and food was ignored, but the number of research projects was overwhelming. It should be noted that they, too, are important in understanding the African research. Most of these were some type of survey or clinical study. A few of the family studies were of ethnographic nature. A few were of experimental nature (Wagaw & Achatz, 1985).

Much of the education in Africa is based on a final exam. This exam is either at the end of the term or at the end of the level. Usually there is a semester exam which will be heavily weighted. In the final year of elementary or secondary school, there is a special exam set by the government. Alao and Gallagher (1988) studied the West African Examination Council policy and its impact on the teaching of chemistry in Nigerian secondary schools. Many times the teacher does nothing but teach the student enough to pass the government exam.

Anthropologists and missionaries have never been on the best of terms. They start from different philosophical bases. Salomone (1985) delineates these in his book *Anthropologists and Missionaries*. Much research is being done on the effect of missionaries in Africa and others suggest that maybe, after all, they were working toward the same goal. MacKenzie (1993) argues that the missionary was not part of the colonial conquest, but rather was a part of a complex relationship with the primary objective of religious conversion.

### **Research in Rwanda**

Nzanutuma (1993) did a family background study in the country of Rwanda. As a Rwandan, and later academic dean at the Adventist University of Central Africa, he understands the Rwandan context. His research used a questionnaire, which he hand-delivered to the schools that he studied. In his study, he noted that there were several cases of cultural bias where the students either answered what they thought the researcher wanted or answered so as not to get into trouble. Even though they knew that the questionnaire was anonymous, they still did not feel comfortable answering accurately. They did not respond accurately when asked the question about finance. Being Rwandan and knowing the students in the school and what answers he should have received, he was quite surprised at some of the answers received (I. Nzanutuma, personal communications, February 1994).

### **An Example of Problems in Validity in the Survey Questionnaire**

A church was trying to understand the values of its young people, and so they developed a questionnaire. This was done by a well-known researcher. My

son and nephew were each at different schools, several hundred miles apart, in which the students were each asked to fill out the questionnaire. When the cousins got together during a school break, they discussed the questionnaire. They both had overheard other students in casual conversation discussing the reported large amounts of deception on the questionnaire.

Later, when questioned, my son said:

A good 60 percent lied. I don't think that anyone was completely honest. I think that elsewhere the percentage of lying was higher. I think the lying was a result of a feeling that it did not matter to them and that it was felt to be an insult, because the students saw it as another attempt by the church to manage them. They felt this way because there was no personal contact with people who intended to use the survey. The students knew that they would assume the result correct no matter what. This is what they are expecting us to put down so this is what we put down, and a substantial amount of the stuff on the test no one has the right to know anyway. There was not any question about what I felt the church was supposed to be about. The questions were all about lifestyle (P. W. Munger IV, personal communication, June 20, 1994).

I, naturally, was quite surprised to learn about the amount of deception on the questionnaire. The fact that my son and nephew were attending unrelated schools several hundred miles apart indicates that this was more than just a local problem. The discussion points out that the problem of deception is quite significant. Several decisions have been made on the result of that study. One has to ask how valid are they?

### **Valid Information**

"The information gathering procedures should be chosen or developed and then implemented so that they will assure that the interpretation derived is valid

for the intended use" (The Joint Committee on Standards for Educational Evaluation [Joint Committee], 1994, p. 145).

Validity "refers to the degree to which the instrument succeeds in measuring what it purports to measure" (Rutman, 1977, p. 32). Validity can be divided into the following areas:

1. Internal Validity is interested in being confident that the causal inference is valid—not so much of a concern in evaluation (Rutman, 1977).
2. External Validity is concerned with how the findings of one study can be applied to another.
3. Construct Validity asks if constructs are valid in comparison to individual cases or situations.
4. Content Validity is concerned with whether a test covers a sufficient amount of the material in the course.
5. Criterion Validity checks the correlation of the instrument with other already established instruments.

As external validity is concerned with how the findings of one study can be applied to another study, it is really about generalizations. Qualitative research is not based on statistics and sampling methodologies that allow generalization in the full sense. For this reason, Goetz and LeCompte (1984) suggest the use of translatability or comparability. Translatability means that the finding in one area or location can be translated into another setting if the two settings are comparable. With translatability and comparability, one expects to find some differences, but no major ones. Following is a list of strategies suggested by various authors to improve validity in general.

1. The practice of living for long periods of time in the setting, collecting data while at the same time analyzing and refining constructs, allows the researcher to compare his constructs with the ongoing reality that he sees around him (Goetz & LeCompte, 1984, p. 221).
2. Using informant interviews as the sources of information forces the researcher to phrase questions in such a manner that the informant understands. This keeps the researcher close to the empirical categories of the participant and reduces abstraction (Goetz & LeCompte, 1984, p. 221).
3. Participant observation must be done in the natural setting reflecting the reality of life. It cannot be done in a contrived or laboratory setting (Goetz & LeCompte, 1984, p. 221).
4. The self-monitoring (disciplined subjectivity) normally used in ethnographic analysis keeps the research close to reality (Goetz & LeCompte, 1984, p. 221). This is further aided by the fact that analysis starts early and in the field.
5. Triangulation—using multiple researchers, multiple sources, and/or multiple methods provides greater confidence in the results (Merriam, 1988, p. 169).
6. Using participants at all phases of the research, continually taking the results back to them asking them to review the results provides continual feedback to the research process (Guba & Lincoln, 1981, p. 414).



7. Long-term observation or repeated observation and returning to the research site in the final stages of the writing of the report provides a breadth to the research (Merriam, 1988, p. 169).
8. Peer examination—asking colleagues to comment on the finding during the research and analysis removes some of the personal bias (Merriam, 1988, p. 169).
9. Participatory modes of research—actually using the participant to do the research in all phases of the research from conceptualizing to writing can provide better understanding of the local situation to the research (Merriam & Simpson, 1984).
10. Clarifying the research's biases, including research assumptions, world view, and theoretical orientation held at the outset of the study and any changes that occurred during the study helps the reader better understand the conclusions (Merriam, 1988, p. 170)

Anything that reduces the transferability or generalizability of a study reduces the study's external validity and the value of the study (Goetz & LeCompte, 1984, p. 228). If the studies are very similar in nature, then the findings of one situation should be translatable into the other. This similarity Wolcott describes as the typicality (1973). Thus, "external validity depends on the identification and description of those characteristics of phenomena salient for comparison with other, similar types" (Goetz & LeCompte, 1984, p. 229). To improve external validity the researcher needs to:

1. Providing a rich, thick description "so that anyone else interested in transferability has a base of information appropriate to the judgement" (Lincoln & Guba, 1985, pp. 124-125; )
2. Establishing the typicality or modal category of the case—that is, describing how typical the program, event, or individual is compared with others in the same class, so that users can make comparisons with their own situations (Goetz & LeCompte, 1984, referenced by Merriam, 1988, p. 177)
3. Conducting a cross-site or cross-case analysis. (Merriam, 1988, p. 177).

### Sampling

One area that is very important in evaluation is sampling. Sampling is done in many different manners. It is beyond the scope of this review of the literature to examine all the methods of sampling, but rather several are examined with a view towards understanding some of the important principles of sampling.

Sampling types vary depending on the type of research undertaken. Furthermore, the theoretical frameworks and the undergirding conceptual and philosophical frameworks on which the study is based will guide in the selection methodology (Goetz & LeCompte, 1984, p. 83). There are several good authors on sampling, among whom are: Goetz and LeCompte (1984), Glaser and Strauss (1967), Bogdan and Biklen (1982), and Pelto and Pelto (1978). All of these authors write about qualitative research and have good sections explaining the selection of appropriate sampling methods.

A research project describes the types of persons that would typically be used in the study—in other words, the people for whom the research is about. This large group of persons is referred to as the population of the study.

Normally not everyone can be used in the data-collection process. The group of persons providing the data is called the sample.

In many societies, the whole population is small and unknown. The only way to discover them is to use the network method of sampling (Pelto & Pelto, 1978). In the network method, the researcher starts with those he/she knows and then asks these individuals for other individuals who qualify to be in the population. Under certain circumstances this may be the only way to find members of the population. This method does not guarantee that all members of the population will be identified. Furthermore, if a sample is taken from only those who are first found, it will more than likely contain a large bias. For this reason, the researcher must make every effort to be sure that every member of the population has been found.

Anthropology quite often uses criterion-based sampling (Goetz & LeCompte, 1984). In criterion-based sampling, attributes for the sample are chosen. Then members for the sample are selected from the main population based on the criterion. The criterion must be such that the sample will be representative of the full population so that the research will be comparable or translatable.

In the ideal case sample (Goetz & LeCompte, 1984), the researcher chooses the most efficient, effective, and desirable characteristics from the population. Using these standards, the researcher makes a sampling selection. In both criterion and ideal case sampling, the researcher must report how the samples were selected, giving the number selected, and why they were

comparable to the population. Thus, the reader of the research should be able to replicate the research.

In a politically sensitive situation and in the Fourth World, researchers must be careful in the selection. They may be forced to do things they would not normally do; for instance, it may not be acceptable *not* to interview the whole group. Many times, the participants are volunteers, meaning that if they want to, at any time they can leave the research project. The participants may refuse to work with the project if a certain key person is included or excluded. To solve these types of problems, researchers must be creative. They must report the steps taken in solving these problems.

Traditionally, quantitative research requires the use random of sampling. The researcher must have a complete list of the whole population and have every member available to be able to select in a truly random manner. If the sample is selected in a random manner, the finding of the sample can be generalized over the whole population at a calculable confidence level and error range. There are variations to the probabilistic or random sample, including cross-sectional, stratified, and cluster strategies as well as trend analysis, cohort, and panel studies. Many of these have been adapted in ethnographic studies (Goetz & LeCompte, 1984, p. 75). In qualitative studies, this type of sampling is used only when a high level of reliability and validity as transferability is needed.

In earlier anthropological studies, it was not necessary to sample, as the anthropologists simply studied the whole population; however, they did not ask the same questions of the whole population, and in a sense, did some sampling. As the possibility to study small populations has been reduced and the complexity

of the populations has increased, the need for effective nonprobabilistic means of sampling has increased. In most qualitative research, probabilistic sampling is not appropriate, and in many cases not even a viable option. The following list illustrates the types of situations where it is inappropriate to use probabilistic sampling.

1. When the characteristics of the larger population have not yet been identified
2. When groups possess no naturally occurring boundaries
3. When generalizability is not a salient objective
4. When populations are composed of discrete sets, and characteristics are distributed evenly among them
5. When only one or a few subsets of characteristics of a population are relevant to the research problem
6. When some members of a subset are not attached to the population from which the sampling is intended
7. When researchers have no access to the whole population from which they wish to sample
8. Under certain conditions when a little-known or singular phenomenon is desired
9. Under certain conditions when studying special institutions, regions or population (Goetz & LeCompte, 1984, pp. 71-72).

### Reliable Information

"The information gathering procedures should be chosen or developed and then implemented so that they will assure that the information obtained is sufficiently reliable for the intended use" (Joint Committee, 1994, p. 153).

Reliability is repeatability or replicability. Reliability is not concerned with accuracy of the results but whether the same results would have been obtained by a similar researcher using the same methods under the same circumstances. The problem of reliability is of such a magnitude that Geertz and LeCompte (1984) state,

Credibility mandates that canons of reliability and validity be addressed wherever ethnographic techniques are used, even when they are adapted within a broader, more positivistic design. Reliability in ethnographic research is dependent upon the resolution of both external and internal design problems (Hansen, 1979). External reliability addresses the issue of whether independent researchers would discover the same phenomena or generate the same constructs in the same or similar settings. Internal reliability refers to the degree to which other research, given a set of previously generated constructs, would match them with data in the same way as did the original research. (p. 210)

It is extremely important that the researcher assess the reliability of his/her research. Although the pure sense of the word replicability is beyond the realm of possibility, it is possible to have a certain amount of it. Tesch (1990) argues that

in qualitative research no two scholars produce the same result, even if they are faced with exactly the same task. The differences in philosophical stances and individual styles will lead them to perceive and present the phenomenon each in her/his own way. ( p. 304)

Just like no two witnesses will see an accident in the same way even though they were viewing it from the same angle, no two researchers will see the same setting in the same way. To further complicate the matter, human nature is

such that under the same circumstances no two persons will do things exactly identical with the same attitude, force, actions, emotions, meaning, etc. For this reason Lincoln and Guba (1985) suggest that it is better to think in terms of dependability and consistency rather than reliability. They also prefer to sidestep the issue of reliability. "Since it is impossible to have internal validity without reliability, a demonstration of internal validity amounts to a simultaneous demonstration of reliability" (Guba & Lincoln, 1981, p. 120).

Another problem with reliability is that no two researchers will take the same picture, take the same notes, or use the same equipment; nor will equipment always function the same way under all circumstances. In fact, it has a habit of malfunctioning at the most inappropriate times. The respondents and informants do not tell the story in exactly the same way each time. If reliability is getting the same figures each time, qualitative research is highly unreliable. Even quantitative data is known to vary and the researcher does not get the same test scores from the same individual taking the test a second time. What counts is the information after the statistical analysis has been done. The same is true in qualitative research. Are the findings, the results, similar? Thus, it is not only a question of data-collection methodologies but also the analysis methodologies that are important to reliability (Goetz & LeCompte, 1984, p. 220).

Rules that will help the researcher improve the reliability of the research are:

1. The investigator's position: The investigator should explain the assumptions and theory behind the study, his or her position vis-à-vis the group being studied, the basis for selecting informants and a

description of them, and the social context from which data was collected (Goetz & LeCompte, 1984, pp. 214-215).

2. **Triangulation:** Especially in terms of using multiple methods of data collection and analysis, triangulation strengthens reliability as well as internal validity.
3. **Audit trail:** Just as an auditor authenticates the accounts of a business—independent judges can authenticate the finding of a study by following the trail of a business, independent judges can authenticate the finding of a study by following the trail of the researcher (Guba & Lincoln, 1981). In order for an audit to take place, the investigator must describe in detail how data were collected, how categories were derived, and how decisions were made throughout the inquiry. Essentially, researchers should present their methods in such detail "that other researchers can use the original report as an operating manual by which to replicate the study" (Goetz & LeCompte, 1984, p. 216)(Merriam, 1988, pp. 172-173)

Goetz and LeCompte (1984) list five major factors that influence external reliability of the data in qualitative research. These are:

1. researcher status position
2. informant choices
3. social situations and conditions
4. analytic constructs and premises
5. methods of data collections and analysis.

### **Standard for Evaluating Needs-Assessment Methodologies**

A certain amount of the burden of defining the evaluation standard rests with the researcher. Goetz and LeCompte (1984) state that the

evaluative criteria must be stated clearly so that they can be scrutinized and assessed by the community of scholars. If evaluative criteria are identified and codified, they can then be used to assess single studies or to evaluate the comparative merit of a group of related studies. (p. 209)



After this has been done, the researcher can share his/her prepublished manuscripts with peers and colleagues as Eisner and Peshkin (1990, p. 132) suggest. The evaluative criteria include, among other things, reliability, validity, replication, and possibilities for transferability and generalizations.

Many articles and books have been written concerning the metaevaluation of evaluation methods and processes. The book *The Program Evaluation Standards* (1994), prepared by the Joint Committee on Standards for Educational Evaluation, is designed to be a basis for the evaluation of any method, process, organization, entity, evaluation, or other object. As needs assessment is an evaluation process, this standard can be used to evaluate a given needs assessment. (See Table 3.) Furthermore, it can be used as a basis for the comparison of different needs-assessment methodologies.

As the standard is concerned with the whole evaluation process, not just the methodologies, there are parts of it that would not be applicable to the evaluation of a needs-assessment methodology. For example, the standard on reporting would not be applicable to evaluating a method unless that method made it difficult to provide an appropriate report. Comparing four methodologies further eliminates certain criteria such as the description of the site. The committee realized that not all of the standards would be applicable in all cases, so it prepared standards for the various phases of evaluation.

Although, the Joint Committee makes no explicit reference to criteria for the assessment of methodologies, portions of the standards relate directly to the question of methodology appropriateness. Table 3 contains a list of all the standards suggested by the Joint Committee. With each standard is a brief

**TABLE 3**  
**THE PROGRAM EVALUATION STANDARDS**

Standard		Included	Description and Reason Inclusion/Rejection
U1	Stakeholder Identification	Not Included	The stakeholders need to be identified before any methods are selected. The identification would not differentiate in determining the appropriateness of the methodologies.
U2.	Evaluator Credibility	Included	This was selected because in the Fourth World the evaluator's credibility will enhance or limit the amount and type of information that can be collected. It will also enhance or limit the usefulness of the findings.
U3.	Information Scope and Selection	Included	Methods vary in the information they provide and vary also in the usefulness of the information provided.
U4.	Values Identification	Included	In both a Fourth World setting and in needs assessment values are important. The type and importance of the values identified and provided will determine the effectiveness of the needs assessment.
U5.	Report Clarity	Not Included	The report is normally written after most of the information is in hand. The methods will tend to neither enhance nor detract from the clarity of the report aside from the quantity and type of information provided. This area is covered by U3 Information Scope and Selection.
U6.	Report Timeliness and Dissemination	Not Included	The report's timeliness and dissemination is normally controlled by the needs assessment team. If the methods take an inordinate amount of time they would impact on this standard. This area is covered in F3 cost effectiveness and F1 practicality.
U7.	Evaluation Impact	Not Included	The impact on the evaluation, as far as the methodologies are concerned, will be determined by the other standards that have been selected. That is, if a methodology is rated excellent in the selected areas it should have a positive impact on the evaluation.
F1.	Practical Procedures	Included	The practicalness of a methodology will impact on the cost and the timeliness of the needs assessment. A method that is not practical is not appropriate.

Table 3-Continued.

F2.	Political Viability	Included	The political impact of a method is an important aspect of the determination of the usefulness of the needs assessment. Any impact that the methodologies have on the political aspect can have large impact on the effectiveness of the needs assessment.
F3.	Cost Effectiveness	Included	Cost is a factor in most needs assessments. This is especially true in the Fourth World. The appropriateness of a method can rest heavily on its cost effectiveness. Or better yet on its cost feasibility.
P1.	Service Orientation	Not Include	This standard assures that the educational goals are appropriate for the learner and that the promised services are delivered. This is normally determined by an overview of the whole needs assessment and not one of the methodologies.
P2.	Formal Agreements	Not Included	A standard that pertains to the overall needs assessment, not to one of the methodologies.
P3.	Rights of Human Subjects	Included	Different methods can violate the rights of human subjects, making them inappropriate.
P4.	Human Interactions	Included	The human interactions can create feelings of helplessness, dislike, hurt and other harmful feelings. These feelings can hurt the overall needs assessment in many ways.
P5.	Complete and Fair Assessment	Included	The methodologies are selected to determine a certain field of information. The fairness of the needs assessment is determined by the mix of methodologies selected. The judgement decision formed based on the information provided by the methodologies also has an impact of the fairness or completeness of the needs assessment. As such, this standard is more important to the overall needs assessment than to the individual methodology.
P6.	Disclosure of Findings	Not Included	The disclosure of the findings is linked to the reports of the overall needs assessment rather than to any one methodology.

Table 3-Continued.

P7.	Conflict of Interest	Not Included	The researcher can have a conflict of interest in his choice of needs assessment methodologies. This is not necessarily the fault of the needs assessment, but is usually something connected with the researcher. Thus the standard could be Included in determining the appropriateness of the methodology for a given researcher. It is not useful in determining the appropriateness of the methodology for all researchers.
P8.	Fiscal Responsibility	Not Included	If a methodology was not cost effective it would be noted in the standard cost effectiveness. Even though a methodology may be very cost effective, under certain needs assessments with very restricted budgets, the cost of the methodology may not be fiscally responsible. This is a variable of the needs assessment and not of a particular methodology.
A1.	Program Documentation	Not Included	Documenting the program being evaluated needs to be completed before any methods are selected. The methods do not have an impact on this standard.
A2.	Context Analysis	Not Included	The context of the program needs to be included in the program documentation. It also needs to be included in the final report so that the reader can assess the appropriateness of the methods Included and the inference gained. It is more interested in the overall needs assessment than the particular methodology.
A3.	Described Purposes and Procedures	Not Included	Though these need to be complete for each methodology, if completed to the same level of depth for all methodologies, it will not differentiate in the appropriateness of the methodologies.
A4.	Defensible Information Sources	Not Included	If the information sources are described in detail the adequacy of the information can be assessed by the reader. If all methods are treated the same way this standard should show the same results for all methods and would not differentiate between the methodologies.
A5.	Valid Information	Included	The validity of the information provided by a method can be very effective in determining the appropriateness of a method.

Table 3-Continued.

A6.	Reliable Information	Included	The reliable information is effective in determining the appropriateness of a method.
A7.	Systematic Information	Not Included	This is concerned with the researcher checking the information gained and then counter checking to be sure of its accuracy. If completed for all methodologies, it would not differentiate between the appropriateness of the methodologies.
A8.	Analysis of Quantitative Information	Included	The analysis phase of any method is very important. If it is difficult, requiring special skills, or a certain magic, it may not be the most acceptable to the stakeholders. If the stakeholders can understand the analysis procedures, they can better appreciate the usefulness of the information provided.
A9.	Analysis of Qualitative Information	Included	The analysis phase of any method is very important. If it is difficult, requiring special skills, or a certain magic, it may not be the most acceptable to the stakeholders. If the stakeholders can understand the analysis procedures, they can better appreciate the usefulness of the information provided.
A10.	Justified Conclusions	Included	The conclusions of a methodology may not be justified in one setting while they are quite appropriate in a second. For this reason the justifiableness of the conclusions must be examined when determining the appropriateness of a methodology.
A11.	Impartial Reporting	Not Included	The reporting process is part of the overall needs assessment process. It is not part of a single method in a needs assessment process.
A12.	Metaevaluation	Not Included	An evaluation is normally undertaken during and at the finish of the needs assessment. A metaevaluation is the goal of Chapter V, where the methods are examined for their appropriateness. As the whole of Chapter V examines this standard, it was not felt that the standard should be included in the selected standards for determining the appropriateness of the methodologies. One might view it as attempting to answer the questions before all information is present.

explanation why the standard was or was not included in the standards to be used to assess the appropriateness of the methodologies. The selected standards are expanded and used in chapter 5.

### **Conclusions**

Although in the following quote Tesch (1990) is referring to problems of improving reliability and validity in qualitative research, the ideas and principles apply to all of the evaluation.

Qualitative research is to a large degree an art. The question of its validity does not depend on replicable outcomes. It depends on the employment of a data 'reduction' process that leads to a result that others can accept as representing the data. The result of the analysis is, in fact, a representation in the same sense that an artist can, with a few strokes of the pen, create an image of a face that we would recognize if we saw the original in a crowd. The details are lacking, but a good 'reduction' not only selects and emphasizes the essential features, it retains the vividness of the personality in the rendition of the face. In the same way a successful qualitative data reduction, while removing us from the freshness of the original, presents us instead with an image that we can grasp as the 'essence', where we otherwise would have been flooded with detail and left with hardly a perception of the phenomenon at all. (p. 304)

One might add that evaluation is an art or, maybe better put, an engineering project. The researcher is constantly balancing many concerns to obtain the best possible, the most understandable, and the most supportable results. The researcher is faced with the problem that each methodology has its own strengths and weakness, while at the same time can comfortably answer only a few facets of the multifaceted evaluation question. The art of evaluation and needs assessment is the skillful selection and integration of research methodologies into a convincing whole. The result is a report, while being convincing, provides a basis for replication, comparison, and curriculum development.

## **CHAPTER III**

### **CONTEXT OF THE STUDY**

The Joint Committee's (1994) A2 standard, Context Analysis, requires a description of the context of the evaluation. In his book on needs assessment, Stufflebeam et al. (1985) state that the needs assessor must have an understanding of the community in which the needs assessment is to be undertaken. For these reasons, the needs assessor must understand the object of the needs assessment and its community's organizations, goals, structures, and functions. The needs assessor must understand the way the organization interfaces with the community. In short, he/she must understand the setting of the study.

This chapter on the setting of the study examines the geographic, historic, educational, economic, cultural, and local computer science environments that could impact the needs assessment. During the time period in which this dissertation was written Rwanda was in a state of war. The war started in October 1990. By May of 1991 a stalemate had been reached that lasted until February 1993. It was during this period of stalemate that most of the research for this dissertation was completed. Chapter 6 has an epilogue giving more details of the war and its impact on this dissertation.

### **Geographical Setting**

Rwanda (see Figure 2), the "Land of a Thousand Hills," and the true source of the Nile, is a small landlocked country in Central Africa that is slightly smaller than the state of Maryland. The first sight one has as one flies into Rwanda from Nairobi, Kenya, is the surprising change from the savannas to a green and mountainous landscape often compared to that of either Ireland or Switzerland (Klotchkoff, 1990). It has a total area of 10,157 square miles, of which 9,621 square miles consist of land. Rwanda borders Uganda on the north (105 miles), Burundi on the south (180 miles), Tanzania on the east (135 miles), and Zaïre (135 miles) on the west. The western boundary between Rwanda and Zaïre traverses Lake Kivu, one of the great lakes of Africa (Software Toolworks, 1990).

### **Rwanda**

Rwanda gained its independence from Belgium in 1962 (Bureau of Public Affairs, 1989). At that time, it adopted a Republican form of government and moved its capital from Nyanza to Kigali. Today, Kigali is the only major city (population 350,000) in the country. Other cities include Butare, Ruhengeri, Gisenyi, Nyabisindu (the former capital, Nyanza), Cyangugu, Gitarama, and Kibuye.

### **Physiographic Setting**

Rwanda is subdivided into five main physiographic regions. The first, the Congo-Nile Highlands, constitutes the backbone of the country, running from north to south, parallel to Lake Kivu in the west. This region includes the continental divide between the Congo (Zaïre) and Nile River Basins and is composed of high mountainous terrain. The second physiographic region is the



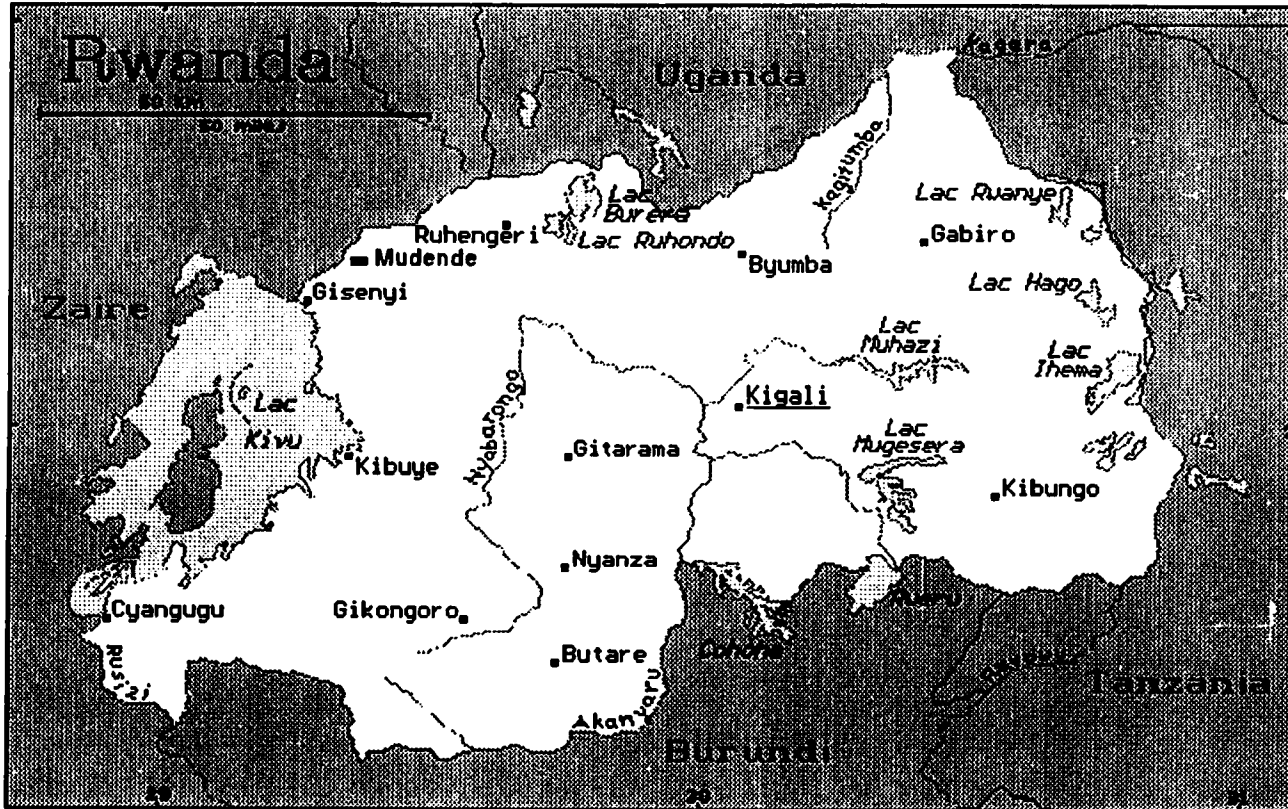


Figure 2. Map of Rwanda. Software Toolworks, Inc. (1990). Reprinted with permission.

Central Plateau, the nation's heavily populated heartland. This region ranges in altitude from 4,000 to 6,000 feet and is composed of thousands of rounded hills, the characteristic feature that gives the country its descriptive name "Land of a Thousand Hills." The third region is the Eastern Plateau, a somewhat lower and drier region extending eastward toward Tanzania and the Lake Victoria Basin. The fourth physiographic region is the Zaïre-Nile crest, a unique area of volcanic mountains called the Birunga volcanoes in the northwestern part of the country as well as an adjacent part of Zaïre, where they are called the Virungas (Klotchkoff, 1990). Within the Rwandan portion of this region are five high volcanoes. Karisimbi, a composite volcano, reaches up to 14,787 feet above sea level and is the fifth highest peak in Africa. The last region is a small area along the western margin of the country composed of Lake Kivu and the Rusizi Valley. For the most part, the Congo-Nile Highlands drop precipitously into Lake Kivu leaving only a few disconnected low-lying areas along Lake Kivu (4,800 feet). At the south end of the lake, the Rusizi River tumbles rapidly in a twisting valley as it descends toward Lake Tanganyika. Lake Kivu and the Rusizi River Valley are part of the western arm of the Great African Rift Valley.

#### Climactic Setting

Even though Rwanda is located only about two degrees south of the equator, much of the country enjoys a mild, temperate climate due to its high altitude. The daily temperatures on the Central Plateau range from around the low 60s at night to the upper 80s in the day. At higher elevations, temperatures run about 10 degrees lower, giving these areas an enviable eternal spring climate.

Precipitation is heaviest in the Congo-Nile Highlands and volcanic mountains in the north. Rwanda has two rainy seasons and two dry seasons. The Big Rainy Season runs from February to mid-May and the Little Rainy Season from mid-September to mid-December. The Big Dry Season runs from mid-May to mid-September and the Little Dry Season from mid-December to the end of January. Even during the rainy seasons, heavy downpours are interspersed with periods of bright, sunny weather. Only on the high slopes of the volcanic mountains of the north does one find cold conditions. Mount Karisimbi and several other high volcanoes experience snowfall for short periods of time (Klotchkoff, 1990). It is thought that the word Karisimbi, meaning a kind of white shell, got its name from the short-lived snowfall that occurs at its summit.

#### Land Use

Some 29% of Rwanda is composed of arable land and 11% of the country is in permanent crops. Meadows and pasture land cover 18%, and 32% is in forest and woodland (Software Toolworks, 1990). The wooded areas are being depleted rapidly as pressure for land drives the rapidly growing population, 95-97% of which live, not in cities, but in the countryside, to search for new farmland (Klotchkoff, 1990). This is a threat to the national parks as, according to J. P. Van de Weghe, head of the Belgian W. W. F. for the National Park of Akagera, "there exist constant attempts on behalf of certain farmers to settle within the limits of the protected zone" (Klotchkoff, 1990, p. 37). Soils are only marginal in fertility, but are surprisingly productive considering the high rate of erosion that occurs during the heavy equatorial thunderstorms. The alluvial soils

in the river valleys are good, as are the volcanic soils in the northwest, although these tend to be shallow.

### **Historical Setting**

The early history of Central Africa is known only in vague fragments due to the paucity of documentation, but according to the best evidence available, the first people to occupy present-day Rwanda were the pygmies, or Batwa (Klotchkoff, 1990). These were a forest people who survived by means of hunting and gathering.

The next ethnic group to enter the area were the Bahutu, a Bantu people who probably migrated southward from that broad Sub-Saharan belt between the Chad Basin and the Nile River. The Bahutu were farmers, and therefore in conflict with the "little folk of the forest" who preceded them. The third major migration into what is now Rwanda was in the 16th century (Klotchkoff, 1990) and made by the Batutsi, a Nilotic people (Bureau of Public Affairs, 1989), probably originating in the upper Nile Basin or on the Abyssinian Plateau. They were generally tall and slender and known for their large herds of cattle. The Tutsi established a feudal kingdom in this part of Central Africa sometime during the 1500s. For about 5 centuries, the three ethnic groups mentioned above have occupied the hills and valleys of what is now Rwanda and Burundi. To a great extent the Tutsi absorbed the Bantu language of the Bahutu (Kinyarwanda), but they ruled the area through their monarchical system headed by "mwamis" or kings.

The modern history of Rwanda replaces folklore. Count von Goetzen, a German lieutenant, arrived in Rwanda in 1894 (Bureau of Public Affairs, 1989).

He was the first European visitor in the country but was soon followed by missionaries. In 1899 the *mwami* yielded what is now Rwanda to the Germans without resistance. The Germans established a protectorate calling it Ruanda-Urundi. It became a part of German East Africa (Reyntjens, 1989).

In 1916, during World War I, Belgian troops from Zaïre occupied Rwanda and Burundi and gained control of the colony (Reyntjens, 1989). In 1924, the area became a Mandate of the League of Nations administered by Belgium and called the Territory of Ruanda-Urundi. After World War II it became a United Nations Trust Territory, again administered by Belgium. In the 1950s, Belgium instituted reforms encouraging a move toward democratic political institutions. The Tutsi king and his followers fled to Burundi. In September 1961, Rwandans voted to become a republic, independent of Burundi. Rwanda was granted internal autonomy by Belgium on January 1, 1962. In June 1962 a UN General Assembly resolution ended the Belgian trusteeship, granting full independence not only to Rwanda, but also to Burundi (Bureau of Public Affairs, 1989).

With independence came a period of civil disturbance in which there was heavy loss of life, particularly for the Tutsi. The Parmehutu party, campaigning for Hutu rights, was voted into power. Gregoire Kayibanda, the Parmehutu party leader, became Rwanda's first president (Reyntjens, 1989). His goals were to promote the peaceful negotiation of internal problems, social and economic elevation of the masses, and integrated development throughout the country. In the first 10 years he established relations with 43 countries, including the United States. Along with progress came inefficiency and corruption, which started to cause problems in the government ministries during the mid-1960s. In 1968

problems in the National Assembly ended in the eradication of the nonconformists instead of reform (Bureau of Public Affairs, 1989). This brought increasing social and economic disorder. Finally on July 5, 1973, the military, under the defense minister, Major General Juvenal Habyarimana, took power in a bloodless coup (Reyntjens, 1989). At this time he became the nation's president and head of state, assuming all power (Bureau of Public Affairs, 1989).

The new president, Major General Juvenal Habyarimana, put an end not only to both the National Assembly and the Parmehutu Party, but also to all political activity. In 1975 he founded the National Revolutionary Movement for Development (MRND), with the purpose of encouraging peace, unity, and national development. Officials are both elected and appointed (Bureau of Public Affairs, 1989). The constitution was inaugurated on December 17, 1978, and the nation's legal system is based on Belgian civil law and customary law. There have been elections marking the progress toward civilian rule. In 1980 there were elections of communal counselors. Then in 1981 a unicameral 64-member legislative body called the National Development Council (CND) was created for which deputies were elected. Finally, in December 1988 there was a presidential election with only one candidate, President Habyarimana (Bureau of Public Affairs, 1989).

Government policy has been ordered by the president, consulting with his 17 cabinet ministers, the Council of Government (Bureau of Public Affairs, 1989). There is a Supreme Court with judicial review of legislative acts. There are four senior courts with magistrates. The president introduces and submits laws to the CND for approval. But the power remains with the president. The

government has been characterized by political moderation and fiscal conservatism. It has focused on development problems: food production, education, health care, housing, and employment (Bureau of Public Affairs, 1989).

The country was originally divided into 10 prefectures, with Kigali, the nation's capital, located in the center of the country. The prefectures are as follows: Butare, Byumba, Cyangugu, Gikongoro, Gisenyi, Gitarama, Kibungo, Kibuye, Kigali, and Ruhengeri. The prefectures are in turn subdivided into a total of 143 communes. Recently, the prefecture of the capital city, Kigali City, became the 11th prefecture.

The main national holiday is Independence Day, July 1. The flag is composed of three vertical stripes using the popular pan-African colors of Ethiopia, with hoist side red, then yellow and green with a black "R" in the center of the yellow section (without the "R" it would be just like the flag of Guinea) (Software Toolworks, 1990).

#### History of the Sponsoring Church

D. E. Delhove was working with the Seventh-day Adventist missions in British East Africa when he was drafted by the Belgian army at the beginning of World War I (1914). While in the army he did clerical work in what was to become the Belgian mandated colony of Ruanda-Urundi. Being impressed by the people and the country, he encouraged the church to begin work in Rwanda. Pastor Delhove and his family, along with Henri Monnier of Switzerland, began the work in Rwanda shortly after the war (Neufeld, 1976).

The land given the church was filled with an aura of superstition and was known as the Hill of the Skulls. This long hill, visible for miles, became Gitwe Mission, the first center established by the Adventist Church in Rwanda. Later Henri Monnier began another mission (1921) near Ruhengeri, which was later moved in April 1921 to Rwankeri, due to the construction of a road. In 1923 a dispensary was started. Their work resulted in the first baptism conducted in 1924. The first was woman baptized in 1925 (Neufeld, 1976).

In 1925 a school was also opened at Rwankeri, with four out-schools. The teachers in these schools were Africans who had been taught the three Rs while working for Monnier. Today both Rwankeri and Gitwe are secondary schools (Neufeld, 1976). To these, other secondary schools, both denominational and non-denominational, have been added and in more recent years the Adventist University of Central Africa (AUCA) at Mudende, Gisenyi Prefecture. Mudende is located in a beautiful volcanic region in the northwestern corner of the country. It is the only French-language university for Adventist workers in Francophone Africa within the Africa-Indian Ocean Division. (The Africa-Indian Ocean Division in Abidjan, Cote d'Ivoire, is the Seventh-day Adventist Church headquarters for Francophone Africa.)

At first, the work in Rwanda was under the East African Union. In 1928 it was transferred to the Southern African Division. At that time the East Congo Union, with headquarters at Gitwe, consisted of the territories of Ruanda, Urundi, and the Kivu District of the Belgian Congo. Later, as the work developed in what was then the Belgian Congo (today Zaire), the union office for the Congo was placed in Elizabethville, today Lumbumbashi. The new Central Africa Union



was headquartered in Bujumbura with seven fields, five in Rwanda and two in Burundi (Neufeld, 1976). The growth of the church in Rwanda justified the formation of a union in Rwanda, headquartered in Kigali, starting with five fields. Later the name was changed from field to association and the number of associations reduced to three. The continued growth of the church has caused the number of associations to be increased to five (1994). Among the five are the North Association located at Rwankeri, the mission Monnier established, and a new central association located at Gitwe, the mission established by Delhove.

The church has a hospital and school of nursing located at Mugonero. Mugonero is located on a hill looking over the eastern shore of Lake Kivu, thus providing a beautiful setting for both the hospital and the school of nursing.

The humanitarian work of the church is spearheaded by the Adventist Development and Relief Agency, International (ADRA), and the Seventh-day Adventist Health Services of Rwanda (ASSAR), both located in Kigali. ADRA benefits Rwanda with development and relief work while ASSAR runs several dispensaries, some of which are in remote areas of Rwanda.

#### History of the Adventist University of Central Africa

The official date for the beginning of the Adventist University of Central Africa is October 17, 1978, when a telegram was received from the General Secretary of the President of Rwanda (Major General Juvenal Habyarimana) accepting the proposal for the university.

As soon as possible, construction was started under the direction of Dr. Elton Wallace. As the first Rector, Dr. Wallace opened the university with a small

number of students on October 15, 1984. At that time, the university offered degrees in Modern Languages (French and English), Theology, Education, Business, Math/Physics, Biology/Chemistry, and Agriculture. A business-orientated computer science program was added in 1987/1988 with Public Health and Technology starting in 1988/1989. Because of a lack of students, the Math/Physics, Modern Languages, and Agriculture degrees were terminated.

The university is recognized by the Ministry of Higher Education and Scientific Research (MINISUPRESS). On February 3, 1986, Dr. Charles Nyandwi, the then Minister of MINISUPRESS, placed the first stone in the current administration building. At this time an inspection of the university was arranged for February 22, 1988. The results of the inspection were satisfactory, allowing him to grant the university recognition and to sign the diplomas of the first graduating class. The same year the Education Department of the General Conference of Seventh-day Adventists sent an inspection team, which resulted in AUCA being accepted in the sisterhood of Seventh-day Adventist Universities and Colleges. On July 1, 1990, Dr. Robert Pierson became the second rector of the university.

The university is located near Gisenyi in the commune of Mutara at a place called Mudende. In all directions one can see tall mountains. In fact, the university is on the slopes of Mt. Karisimbi, the highest mountain in Rwanda, and the fifth highest mountain on the continent of Africa. The campus contains over 200 acres, providing space for a large farm as well as sufficient land for housing, educational buildings, and recreational facilities. The university is in a rural setting about 45 minutes from Gisenyi by car and 2½ to 3 hours from Kigali.

Public transportation is available within four miles of the university. From there the students walk to the university. At the beginning and end of major vacations, the university provides transportation to and from the main road.

From its small beginning, the university has grown to over 450 students (1993-1994) of which approximately 60% are Seventh-day Adventists. The enrollment comes from several countries of Africa and the Indian Ocean area, as well as from Europe. Most students come from French-speaking secondary schools and the official language of the university is French.

### **Demographic Setting**

The people of Rwanda are referred to as "Rwandais" in French. According to the Bureau of Public Affairs the noun and adjective in English is Rwandan(s) (1989). Barrett (1982) and Software Toolworks (1990) state the adjective of nationality is Rwandese (Barrett adds Rwandais, which is the French). The English-speaking residents of Rwanda usually refer to the people as either Rwandese or Rwandais. The Rwandan people live in the most densely populated country in sub-Saharan Africa, with an average of "256 inhabitants per square kilometer" (Klotchkoff, 1990, p. 37). The population in 1989 (Software Toolworks, 1990) was 7,322,039 with a growth rate of 3.8% per annum. For every 1,000 people there are: 53 births (with 117 out of every 1,000 live births resulting in infant mortality), 16 deaths, and the net migration rate is 0 migrants (Software Toolworks, 1990). The life expectancy at birth is 49 years for males and 53 years for females (Software Toolworks, 1990).

### Ethnic Setting

There are three basic tribes in Rwanda. The majority of the African population is composed of Hutu (Bahutu, 85-90%), farmers of Bantu origin. The main minority are the Tutsis (Batutsi, 9-14%), originally a pastoral people who are probably of Nilotic-Hamitic origin. The Tutsi are a people noted for their tall stature and slender bones. The remaining group is the Twa (Batwa, Pygmies, 1%), who are thought to be remnants of the earliest settlers of the area. The European population is only a small fraction of the total.

### Linguistic Setting

The common language of the people is Kinyarwanda. Both French and Kinyarwanda are currently taught in school and are the official languages (Bureau of Public Affairs, 1989). English and Kiswahili (Swahili) are being taught and are known as languages of business and commerce.

The Rwandan government requires each child to stay in school for 6 years, and 70% attend. The adult literacy rate is 37-50%. Few (not more than 2%) have received secondary education. Reforms were underway to change the elementary curriculum, to provide practical textbooks in Kinyarwanda, and to provide fundamental agricultural and academic skills.

### Religious Setting

The majority of the population is Christian (75.3%), with the largest part being Roman Catholic (51.7%), Anglican Presbyterian Churches (15.2%), Seventh-day Adventist (6.3%) and other Protestant (2.1%). Next are the traditional African religions (23.9%), and only 0.9% Muslim (Rwanda Government, 1978). At

the time of the 1978 census, more than 3% of the population were actual members of the Seventh-day Adventist Church. The remaining 3.3% were either children of Seventh-day Adventists or persons who were not members but claimed to be Seventh-day Adventists. The Seventh-day Adventist Church is a large enough portion of the population to be listed separately from the other Protestant Churches. Barrett (1982) suggests that the Seventh-day Adventist Church is the largest Protestant denomination in Rwanda. The 1978 census figures, however, do not seem to support this. The Seventh-day Adventist Church continues to have a high growth rate. Based on the membership records and the 1991 census, the Seventh-day Adventist Church most likely has over 900,000 adherents or nearly 11% of the population, making it the largest Protestant church in Rwanda (March 1994). Seventh-day Adventists are the only Protestants who are found in all parts of the country; the other denominations are regional (Barrett, 1982).

### **Economic Setting**

The labor force has 3,600,000 people. The majority (93%) are involved with agricultural activities. Raising cattle plays a key role in the nation's economy. The government and services make up 5% of the working force. Those working in industry and commerce account for 2%. Of the population, 49% are of working age (Software Toolworks, 1990). There are no organized labor unions. There is a difference between "employment" and "working force." The number of people employed is very minimal. The majority work in their fields and/or gardens.

Agriculture provides about 40% of G.P. (gross domestic product), with 80-90% of all exports being coffee and tea.

The amount of fertile land is limited, however, and deforestation and soil erosion have created tremendous problems. The industrial sector in Rwanda is small, contributing less than 20% to G.P. Manufacturing focuses mainly on the processing of agricultural products. (Software Toolworks, 1990)

During the first 25 years since its independence in 1962, Rwanda's G.P. had grown by almost 6%—a very good economic growth record for an African country (Bureau of Public Affairs, 1989).

In 1987 the gross national product (GNP) was \$2.3 billion (per capita of \$340 per year) with a real growth rate of 2.8%. During this time the annual inflation rate was 4.1% (Software Toolworks, 1990). The country is mostly agrarian with a small percentage of the population having full-time employment.

In 1987 the country's budget had revenues of \$270 million and expenditures of \$330 million. The short-fall in the budget was recouped in First World aid and loans. Rwanda exported \$113 million in 1987 (f.o.b.). In the same year Rwanda imported \$352 million (c.i.f., 1987). In December of 1988 the country owed \$537 million in external loans. In 1987 the country had an annual industrial growth rate of 7.5% (Software Toolworks, 1990).

Rwanda's record for economic growth between 1962 and 1989 was remarkable. There were increases in average annual agricultural production, exceeding the population growth rate (Bureau of Public Affairs, 1989). The war had brought instability.

Farming is the economic base. Over 90% of all the export cash crops are composed of coffee and tea. Others are cotton, hides and skins, and at one time,

pyrethrum (insecticide made from flowers). Raising cattle, goats, and pigs, is an important part of the economy. Bananas are the chief food crop, with others being cassava, beans, peas, sorghum, and sweet potatoes. The country's self-sufficiency was declining even before the war started. Some food is imported, as well as petroleum products and consumer goods.

Rwanda's natural resources include cassiterite (tin ore) and wolframite (tungsten ore), with possibly a few others. There have been four Belgian mining companies. In 1986 the state-owned mining company went bankrupt as the market prices for tin and other minerals dropped significantly (Bureau of Public Affairs, 1989). The government is working to revive mining in the country. (The Seventh-day Adventist Church bought the state-owned mining company's headquarters building in Kigali and turned it into the Rwanda Union Office, the church's Rwandan headquarters.)

Rwanda manufactures cement, processed agricultural goods, small-scale beverages (beer and soft drinks), soap, furniture, shoes, plastic goods, textiles, shirts, aluminum ware, and cigarettes. There is a small radio assembly plant. The people of Rwanda make some crafts: baskets, pictures and cards made from dried banana leaves, painted pictures, leather goods, goat-fur goods, wood carvings, and pottery.

Rwanda has hope for creating a substantial industry using the methane deposits dissolved in Lake Kivu, an estimated 57,000,000,000 cubic meters (Reyntjens, 1989). The brewery located on the shore of Lake Kivu is partly fueled by methane, but at present this is not an efficient energy source (Bureau of Public Affairs, 1989).

A chief source of energy for Rwanda has been charcoal, but this will have to change as forests are being depleted. With a plentiful supply of mountain streams, there is good potential for hydroelectric power. The electricity at Mudende comes from a hydroelectric plant. In 1988, with a capacity of 26,000 kilowatts, Rwanda produced 112 million kilowatt hours of electricity, 15 kilowatt hours per capita (Software Toolworks, 1990).

Transportation is a problem. Being a landlocked country with no railways, the Rwandan import and export depends on either air or land connections to seaports in Tanzania or Kenya. There were two airports that handled international traffic and seven that handle local traffic. The majority of internal transport is by road.

Rwanda receives a large amount of international aid, with the Peoples Republic of China being one of the principle contributors. Other foreign-aid sources for Rwanda have been the United States, Canada, Belgium, the Federal Republic of Germany, France, the World Bank, the UN Development Program, and the European Development Fund (Bureau of Public Affairs, 1989). This has allowed a substantial investment in electric power distribution, tea and pyrethrum production (used in DDT), swamp drainage, and road construction. With the war, the prospect of foreign aid from several of the above has been used to encourage the country to keep things under control. The Chinese have helped with agriculture and hydroelectricity, as well as being responsible for building surfaced roads complete with stone and concrete runoffs for rainwater in the mountainous region.



The total debt in 1987 was \$3.1 billion. In 1988 effort was made to reform the economy with revision of tariff and fiscal duty schedules. In 1989 Rwanda was counting on tourism to help economic growth. The mountain gorillas in the Volcanoes National Park, and Akagera National Park, a game park, were rivaling coffee for foreign exchange. The war has decreased tourism.

The currency is the Rwandese franc (RF, usually seen FRw). The official exchange rates have fluctuated over the past few years (see Table 4). They were the best between 1988 and 1990, with devaluation hitting hard after the war started. The fiscal year was the calendar year.

Rwanda was continually becoming more overpopulated. This is aggravated by a lack of natural resources and poor soil. The war was definitely not helping the development of the economy.

#### Communications in Rwanda

Roads in Rwanda total 4,885 kilometers (3,035 miles) of which 460 kilometers are paved highways, 1,725 kilometers are gravel and/or improved earth roads, and 2,700 kilometers of unimproved roads. Lake Kivu provides water travel by shallow-draft barges and native craft. For air travel there are two runways with permanent surfaces—one of which has 2,440-3,659 meters and the other the 1,220-2,439 meters. They have one major transport civil aircraft (Software Toolworks, 1990).

Rwanda has a fair system of air communications and a low-capacity radio relay system centered in Kigali. The Rwandan phone system has about 6,600 telephones. About 7 radio stations, AM and FM, are available. There was a TV

TABLE 4  
THE RWANDAN FRANC--U.S. DOLLAR EXCHANGE RATE

Date	FRw to US\$1
January 1993	145.00
July 1992	140.00
January 1992	130.00
May 1991	125.00
February 1990	77.50
1989	77.49
1988	76.45
1987	79.67
1986	87.64
1985	101.26

station. The phone system uses a SYMPHONIE satellite station and one Indian Ocean satellite station (Software Toolworks, 1990).

### The Basic Impact of Computer Technology in Rwanda

Rwanda has, along with its very small industrial base, a very small computer base. There are approximately four computer supply companies in the country, all of which provide name brands through European channels. Thus, these computers are very, very expensive. As of October 1991, a 286 HP (Hewlet-Packard) computer with a hard disk costs well over \$4,000 in the country, and the purchaser was expected to provide the hard currency for the purchase. Once the purchaser provided the hard currency, the computer would be expected to be delivered within 2 months. Many times the user would then have to order software, after the computer has been installed! Quite often the computer suppliers fail to tell the purchaser what software is needed to run the computer. The Adventist University of Central Africa, with approximately 50 computers, ranks third in the list of organizations having the most computers. Only the government and the National University have more computers. Most of the computers are owned by small organizations around the country, each having one to four computers.

The government of Rwanda is just now getting organized to place computers in the various offices of government officials. The number of computers is very limited there also. The National University at Butare does not offer a computer science degree at the current time, which is one of the greatest needs of the country. The person in charge of computer science for the

government is pleading with the government to institute a computer science degree at Butare and also a master's degree in computer science. Because of its position in Central Africa, and the type of courses that the Adventist University of Central Africa offers, it is the primary institution for computer science in the Central African region.

### **Culture**

The Rwandan culture is made up of three independent cultures. These cultures are African, Asian, and European. The Rwandan African culture divides into two subcultures, those who have lived a significant period of time outside of Rwanda and those who have not. This time spent outside of Rwanda will have modified their culture. The term Asian in Africa refers to both Pakistanis and Indians, persons from the area formerly known as British India. After the partition of the former British India, it was very offensive to call a Pakistani an Indian and vice versa. To eliminate this possibility, the term Asian was adopted. The European group includes both Europeans and North Americans of European extraction.

The African Asians have a culture that is different from their home culture in the former British India, tending to be more British in their culture. Many have been in Africa for generations. In fact there are some whose parents arrived in Africa during the 19th century (Salvadori 1989). The European diaspora are less formal becoming more like the American. The Americans who have stayed overseas for years will tend to be more formal, becoming more European.

In Africa, the Asian is thought to be antisocial, mainly because of cultural misunderstandings, one of which is that they do not marry Africans and have very little social intercourse with other communities. This has been the basis of many of the problems between the African and the Asian. In Kenya, the Asians have realized this and have made attempts at working with the Africans in social functions (Salvadori 1989). They have not—and it seems unlikely that they soon will—intermarry.

Because the distribution of persons of the three culture groups in the computer science community is not the same as in the general population, all three groups are examined. There is a larger percentage of Europeans and Asians than found in the general population. Most of this is due to the special training needed to work with computers. Of the four main computer companies in Rwanda, three were headed by Europeans. Only one had a full African staff. Many large company functional CEOs were either European or Asian.

#### Cultural Frames of Reference

Defining or describing cultures tend to place people in categories. These categories may be artificial. Cultures are made of people with different individual cultural characteristics. When describing a culture, one must remember that not everyone who is a member of the culture will behave accordingly. There are many things that can cause this person to behave differently. Those who have left their native land, the diaspora, will have a modified culture and may not react in the culturally prescribed way. Education and position change a person's cultural preferences.

Oosterwal (1994) has prepared a frame of reference for helping to profile cultures. This frame of reference contains 10 variables selected from other anthropologists. The profile, when defined by these variables, provides insights into a culture. The frame of reference can also be a basis of comparison of cultures, especially useful in the area of business. Each variable describes a frame of reference in the culture, which, when defined, provides insights into that culture's preference in the area of reference. To a certain extent these frames of reference provide insight into the values of a culture. However, it does not provide a ranking of values for a given culture. The frame of reference provides insight into problems of miscommunication that can occur in cross-cultural communication. Another area, the ranking of values, is also a source of problems in cross-cultural communication. The question of value ranking is discussed later. A discussion of the 10 variables follows:

### **1. Nature**

The first variable, nature, describes how people relate to nature. This variable divides cultures into three areas. One group controls nature, modifying it to meet their perceived needs and wants. In their value rankings, their perceived needs and wants are usually more important than nature. The next group wants to live in harmony with nature, tending to worship it. The third group fatalistically accepts what nature gives them, tending not to fight back.

The Africans tend to be a composition of the last two. That is, they fatalistically accept what nature delivers while at the same time having respect for nature. The Hindus of the Asian culture worship nature; however, under

certain circumstances, they are willing to control with respect. The European culture controls nature, modifying it as needed.

## **2. Time**

The way cultures treat time, the second variable, varies widely and on two different scales. Some cultures consider it better to do one thing at a time, monochronic, while others feel quite comfortable doing several things at a time, polychronic. Time is further divided into how the culture's attention is paid to the past, present, and future. Cultures will tend to concentrate their efforts in one of these three areas. Regions that have to prepare for winter will normally tend to be future-oriented. Those areas having long histories steeped in culture will tend to be past-oriented.

The African culture is polychronic, living mostly in the present with a little bit of the past. The Asian community is divided, with those of the Muslim religion being monochronic and the rest tending to be a mixture of mono- and polychronic. Both are steeped in traditions from the past. Europeans and North Americans are mainly monochronic, with those from North America being future-oriented, while those from French-speaking Europe more present-orientated.

## **3. Action**

Action, the third variable, provides insight into how people derive their status, prestige, or self-image. In cultures, such as North America, self-image comes from doing things, the job, or accomplishments. When people describe themselves by telling what they do for a living, they are an "action/doing oriented" culture. Those cultures that describe themselves by being part of a tribe, family,

cast, or station in life are "being cultures." Cultures with an emphasis on being are generally very interested in philosophy and in associating, and "being" together. They see happiness in "being" together. The doing culture will emphasize accomplishments and tend to be in pursuit of happiness.

The Rwandan African culture emphasizes being. They derive their self-image from being part of a tribe and the region where they were born. They enjoy being together, drinking, and socializing. Action cultures tend to think that being cultures are lazy. Being cultures view action cultures as both driven by their work and uncultured, due to their lack of interest in philosophy.

The Asians tend toward a being culture, deriving prestige from their family history and where their ancestors are from. French-speaking European cultures are a balance between the two, the being and the action. North America is strongly doing.

#### **4. Communication**

The level of directness in communication, the fourth variable, describes how the culture communicates facts, especially the uncomfortable facts. Cultures from North America are very direct in what they say. They will tend to tell it like it is. Cultures from Asia, especially Far Eastern Asia, are very indirect. Rather than tell a person that he/she is terminally ill, they will tell about several medical cases similar to the patient's, and let the patient define the illness. Cultures that are more indirect in communication will use yes and no less frequently than those that use direct communication. Indirect cultures will tend to take longer in formalities before communicating the information. Africans tend



to use indirect communication in contrast to the Europeans' more direct approach. The Muslim, though mostly indirect, are more direct than the other Asian communities.

Eye contact, another important part of communication, varies from culture to culture. Both Asians and Africans will not look someone directly in the eye who is thought to be higher on the social scale. Europeans, by contrast, tend to look nearly everyone in the eye. North Americans, going a step further, feel that they have communicated effectively, if the other person reciprocates, by looking them in the eye.

Cultures and sexes vary in their ultimate goal of communication. Certain cultures communicate to pass on information with no ulterior motive. Other cultures are more interested in developing a relationship while passing on facts. To this last group, the relationship is more important than passing on accurate facts. This goal of communication is evident in the amount of time spent in formalities before information can be communicated. Cultures more interested in relationships tend to spend more time talking. The culture, whose sole goal in communication is to pass on facts, has short formalities, gets to the point, and then terminates the communication. They are thought to be curt and unfriendly by those whose goal is to establish relationships.

Women tend to be more interested in the relationship than their male counterparts. North Americans and Europeans tend to communicate to pass on information. Africans and Asians tend to communicate to form relationships. Africans, though, are more interested in the relationship than Asians.

Nonverbal expressions vary among cultures. North Americans and Europeans use the least amount of nonverbal communication, contrasted by the highly nonverbal African cultures. Asians are in the middle, with a highly developed finesse of very slight nonverbal communication movements, that can be easily missed by the Europeans, the North Americans, and the Africans. To the African and Asian, nonverbal communication is an important part of the communication process.

### **5. Space**

Space, the fifth variable, describes the amount of private space each person needs to feel comfortable. If someone violates this private space of another individual, the person feeling invaded will feel uncomfortable and tend to pull away. As the amount of private space is reduced in the culture, there normally is an increase of touching. North Americans and Europeans need the most private space. Asians and Africans require less. The opposite is also true if the private space is too great; that is, too much public space. Those persons of cultures who are accustomed to too little private space will feel uncomfortable and move closer. This, naturally, is a real problem when two persons from the two extremes are talking together. The one wanting lesser space is moving closer to the one wanting more space, who is continually backing up. If the one wanting less space is also from a touching society, he may hold the other person's hand. If this person is from a nontouching society, he will be extremely uncomfortable. Such a situation frequently exists when an Indian (from India) and a North American communicate.

## **6. Power**

Power, the sixth variable, represents the emotional and social distance between the boss and the worker. In high-distance power (hierarchical) societies, the boss is treated with high respect and authority, possessing more symbols of wealth and prestige than any of his workers. In such a society, students would never address their professor by his/her first name. In hierarchical societies, there are special privileges for being the boss. By contrast, in low-distance power (equalitarian) societies, the boss is in on a plane just slightly higher than the worker. In fact the worker may have more symbols of wealth and prestige than the boss. The salary difference is small.

North Americans are highly equalitarian societies. Europeans are a mixture. To the American, they seem hierarchical. To the African, they seem more equalitarian. African and Asian societies are highly hierarchical. Africa has a system of chiefs, and children tend not to interact much with their fathers. In India, it is illustrated in the caste and social system.

## **7. Individualism**

The seventh variable is a continuum of individualism versus collectivity, describing the way the person tends to function in society and organizations. In Europe and North America, individuality is high with much value being placed on a person demonstrating individualistic characteristics. Africa is just the opposite, exhibiting a strong collective nature. The family, the tribe, the company are what counts, not the individual. This is demonstrated by students who, when not understanding something in class, tend to say "We don't understand!" instead of "I

don't understand?" They will use "We" even if the student is the only one that does not understand! The individual entrepreneur is rare in the African society. Asians are a communal society, having a tendency toward collectivity, having a greater individualistic tendency than the Africans. Education and the diaspora increase the person's individualistic tendencies, tending to make him/her a self-motivator and an independent self-thinker.

### **8. Competitiveness**

Competitiveness versus cooperation, the eighth variable, is also a continuum. Americans are highly competitive, and are easily motivated by competition. Europeans, a mix, can be motivated by competition but also prefer to work together or cooperate. Africans prefer to work in a group, cooperating on a project. Too much competition can actually be a demotivator in a highly cooperative society. The Asian also is a cooperator, willing to cooperate even with their competition in business if they can gain something. In school, competition can be quite high among the Asian students. However, it is not as great among the African students.

### **9. Structure**

The ninth variable is structure in society. Older cultures tend to have more structure. The North American culture with its frontier society has very little structure. The African however, has a very well-developed structure. Structure provides security for the individual. When a society loses structure such as when there is a war or a breakdown in the government, in general, crime will increase greatly.

Most organizations have a formal and informal power structure. For example, the tribe has its chief system, including advisors and businesses with the boss/owner and supervisors and advisors. In highly structured societies, the manner and nature that one uses the informal power structure is different than in unstructured societies. In a highly structured society, a person would try to approach the boss through some subordinate individual who is close to the boss. In a nonstructured society, the person would attempt to find a person that is viewed as a strong informal leader who has contacts with the boss. In highly formal societies, more use is made of the informal command structure than in nonstructured societies. In the Asian cultures, there is the clan and the cast. However, in the diaspora the structure is less formal. Europeans have a medium-structured society.

Africans and Asians have a high formal structure in their society. The African has the tribe and the extended family. This extended family would include aunts and uncles, as well as cousins. Asians have the extended family, usually controlled by a patriarch. It does not include the aunts and uncles once the father dies. European society is less structured, but still has structure remaining from the old courtly societies. America, by contrast, has little structure.

## **10. Formality**

The tenth and last variable is a single scale of formality. Formality is the tendency to have a lot of formal ceremonies in the culture. The African and Asian culture will tend toward formality. Both cultures prefer adding to ceremonies.

They are very careful that the formal protocols are followed. Anyone not following the protocol is viewed as uncouth. The French-speaking European cultures will have more of a balance between the two. North Americans tend to be very informal and uncomfortable with formality. Table 5 compares the three major cultures in Rwanda based on the 10 frames of references.

### The Thinking Process

Table 6 shows how the four cultures handle four areas of reasoning: factual, intuitive, analytical, and normative. An examination of this table shows how persons from one culture would have trouble understanding the reasoning pattern of another. The normative area can illustrate this. Europeans tend to like conflicts, whereas Asians like peace. In fact, to the Asian, peacefulness is what counts above all else. The African is similar to the Asian in that friendship comes before business. When faced with a problem, the European will be aggressive, attacking the problem. This will seem to the African and Asian to be attacking the persons involved in the problem. The African and Asian, however, will attempt to preserve the relationship in solving the problem. Both will seek solutions that make everyone happy.

Another illustration of the cross-cultural communication problem is demonstrated by an Indian graduate student, who was born in India and finished college there, visiting an American library. When the Indian graduate student speaks to the library staff helping him/her find books, the student will treat the staff member as a peon, someone of very low social standing, a servant. The

TABLE 5

## A COMPARISON OF THE THREE MAJOR CULTURES IN RWANDA

Frames of Reference	African	Asian	European
1. Nature	Controlled by nature	In harmony with nature	Controls nature
2. Time	Multi focus living in the present	Both multi and single focus with a combination of both past and present	Single focus planning for the future
3. Action	Being	Being with some action	Doing
4. Communication	Indirect  Little eye contact with superiors	Indirect  Little eye contact with superiors	Direct  Needs eye contact to feel they have communicated effectively
Reason to communicate	To establish relationships	To establish relationships	To inform
Nonverbal communication	Strong	Expressive but with finesse	Weak
5. Space	Little	Medium	Much
6. Power	Hierarchy High distance between workers and leaders. Leader gets many privileges.	Hierarchy High distance between workers and leaders	Equality Low distance between workers and leaders
7. Individualism	Highly collective	Collective	Individualistic
8. Competitiveness	Cooperative Originally little if a competition	Cooperative Can be highly competitive in education	Competitive At the same time cooperative. Competition can be a motivation factor.
9. Structure	Highly structured society. The tribe, the family controlled by the father and chief.	Structured. The clan is controlled by the father or older brother. Many businesses are family-run with the father in control.	Individualistic Balanced with some structure.
10. Formality	Very formal	Very formal	In Africa not as formal as in Europe. Less formal than the African or Asian

Note. Developed from personal communications with G. Oosterwal, February 1995

TABLE 6

## THINKING MODELS OF FOUR CULTURES

Types of Thinking	European Cultures	North American Cultures	African Cultures	Asian Cultures
<b>Factual</b>	Meanings are in individuals  Theoretical as opposed to practical  Inconsiderate	Individuals rely on the spoken words  Professional experiences are perceived as important  Pragmatic	Meaning come from the environment  Time is viewed as flexible, it is not rigid  "Things" are alive	Meanings are everywhere: in people, things...  There is no clear-cut separation between the internal and external worlds  Sensing is an illusion
<b>Intuitive</b>	Like to play with ideas  Creative and imaginative  Enjoy exploring new avenues	Look for ideas which can be used  Enjoy learning  Can be perceived as "naive" at times (simplistic ideas)	Superstitious  Ideas come from group interactions  What is perceived is at least as important as what is	Highly "spiritual"  A great sense of unity is shared by many people  Metaphysical
<b>Analytical</b>	Deductive  Rigid organizational structures  Centralized decision-making process	Inductive  Flexible organization cultures  Decentralized decision-making process	Are process oriented  Thinking is highly internalized (casual thinking)  Thinking is assimilated to "feeling"	Accept ambiguity  Open to many options (there is not just "one way")  Integrate polarities and contradictions
<b>Normative</b>	Over-critical  Quality of life is highly valued  Conflicts are enjoyable	Getting the job done is the priority  People like to be liked at the same time that they "push people around"  Self-esteem is largely based on professional accomplishments	The concept of kinship is highly valued  Friendship comes before business and is lasting  Interpersonal relationships are based on security	Simplicity and humility are highly valued  Peacefulness is what counts above all  Enjoy flowing with situational forces

**Note.** Adapted from *International Business Relations, Participant Workbook* by G. Oosterwal, 1994, Center for Intercultural Relations Berrien Springs p. Appendix B - 22. Not Copyrighted



library staff member, a North American, of course, will never think of themselves as a peon, and will be highly offended by the treatment.

### **Summary**

In general, the Rwandese people are friendly. They have a non-Western culture that is tribal, male-dominant, simple, and agricultural. Most of the population lives in very small homes or huts without electricity or running water. Because of a lack of books, they tend to memorize well, but without the chance to make practical application or necessarily understanding the principles or concepts. Their educational system is a filtering process—only the elite make it to the university level. Most people would be considered unemployed or unemployable by Western standards. Most do not have a secondary degree, and even fewer have university degrees and/or technical training.

Rwanda, just like the rest of Africa, is attempting to modernize. These attempts at modernization are also causing changes in culture, sometimes unknowingly. There are those, particularly older members of society who do not readily accept these changes. Often modifications are not natural and place stress on the culture and those functioning in the culture, especially, those who have come from a village setting. Individuals who have received a local education and are placed in posts of responsibility feel a lot of tension between what they see in the real world and the culture of their youth, which they feel to be the ideal. This type of stress can make it difficult for the individuals to function at their maximum efficiency.

Computers are one of the technologies that has brought dramatic change to Rwanda. It is also bringing cultural change, especially if it is allowed to become impersonal as it has in the Western world. The African business culture has certain basic tendencies. Following is a list of the basic cultural tendencies of the African business culture. In general, these characteristics apply to the Rwandan.

1. The basic unit of African society is the family, in its various extended forms.
2. Kinship relations are at the core of all business relations.
3. Relationship is essential to all forms of business: friendship, trust and reciprocity.
4. Time concept is event oriented; it is flexible, not rigid or segmented. People come first, then time. Time is not a limited commodity. There is always tomorrow.
5. People orientation is over task orientation.
6. Respect for authority is still high.
7. Age is an asset, not a liability; it demands respect.
8. There is a clear separation between home/family and business.
9. Religion is a very important factor in personal and business relations.
10. Organization tends to be rather hierarchial (Modified from Oosterwal 1994, p. Appendix B 41).

In summary, Rwanda, in general, was basically African with European and Asian communities. In comparison to the general population, these communities were small. However, in the computer science community, these subcultures

were comparatively much larger. The university computer science department contained individuals from African and American cultures. Any needs assessment that had as a goal the preparation of a computer science curriculum for Rwanda needed to be designed to function in a community that was composed of four vastly different cultures. In short, it needed to be capable of communicating cross-culturally with these subcultures.

## **CHAPTER IV**

### **AN EVALUATION OF THE AUCA COMPUTER SCIENCE CURRICULUM USING FIVE SMALL-SCALE NEEDS-ASSESSMENT METHODOLOGIES**

This chapter is divided into three divisions. The first is a description of the development of the base questions of the needs assessment. The second is the description of the population of the study. The final section, the largest, is the description, implementation, and results of the methodologies used in the evaluation.

To facilitate the understanding of the methodologies and their comparisons, this chapter treats each of five small-scale methods independently. As no researchers should refuse to look at data that they received from sources other than those in the original proposed plan, a fifth analysis includes data collected independently of the five methods. Each method's description contains: a rationale—an explanation why the method was chosen and its purpose in the study; a description of the time and place of the implementation of the method; a description of the population; a description of the methodology; an analysis of the data obtained by the method; summary; and recommendations for changes to the computer science curriculum. The formal comparisons and evaluation of the appropriateness of the methodologies are left to chapter 5.

### **Development of the Base Questions**

As suggested by Udinsky, Osterlind, and Lynch (1981), the following set of *base questions* was developed.

1. What are the major skills a computer scientist needs to possess to function in a typical Rwandan business?
2. How well do the graduates function in their working environment?
3. How well has the current curriculum of AUCA met the graduates' needs?
4. How well has the university prepared its students for other aspects of life?
5. What changes are needed in the computer science curriculum at AUCA to help it better meet the needs of its students?

The current curriculum was examined. All courses in the computer science subject areas were placed in major categories. These areas were then used in developing the instruments used in all five methodologies. Thus, the subject areas are the common denominator for the study. To facilitate the comparison of different methodologies and thus aid in the determination of their appropriateness, the five different methodologies were treated as five parallel studies.

### **General Population**

All samples were drawn from a population including all the available AUCA graduates as well as personnel or persons involved in computer occupations in Rwanda. As of 1992, the university had produced five graduating classes representing about 100 students. The number of computer science graduates, however, is quite limited as the program, a late-comer, has had only three graduating classes. The war, which started in October 1990, further reduced

the number of graduates by keeping one class from graduating. As AUCA is an international university, many of the computer science graduates returned to their homes in other Central African countries. Other graduates have left the country for advanced studies. For these reasons, the number of computer science graduates residing in Rwanda is small and not exactly known. It was under 20 in 1992.

The sampling method was, for all practical purposes, a combination of the network and the systematic sampling method. In the first methodology, attempts were made to obtain at least one questionnaire from each business having a significant computer department—more than one microcomputer. When the questionnaire was picked up, the organization was asked to suggest other businesses that qualified. The other three methodologies used samples selected on the criterion basis rather than on a probabilistic basis, to reduce the size of the sample. This sampling method relies on comparability and translatability of findings rather than on transference and generalization (Goetz & LeCompte, 1984).

Udinsky et al. (1981) recommend that the researcher consult with experts. The experts consulted in this study included: (1) government officials, (2) specialists in industry and commerce, (3) church officials, and (4) AUCA staff.

## **The Questionnaire**

### Rationale

This questionnaire method was chosen as representing one of the methods often used in needs assessments, providing a basis of comparison for the other

methods. The questionnaire method is easier to use in a Western country, with a good postal service and where people are accustomed to responding to questionnaires. It was felt, however, that the questionnaire would be effective after some adaptation for Central Africa.

### Population

This methodology used all organizations that could be found that had at least two or more microcomputers or a minicomputer. As much as possible, only one individual of an organization, preferably the chief executive or the person responsible for computers in the organization, was used. In Rwanda the person most knowledgeable about computers tends to be in administration. As no list exists of this population, the network sampling method was used to find the population. In place of a sample, the whole population was used.

### Time and Setting

The development of the questionnaire started in the fall of 1991. The university professors were consulted and the subject areas identified. The development and beta testing covered a fairly lengthy period of time. During the months of August and September of 1992, a student hand-delivered and collected the questionnaires in Kigali and Butari.

### Methodology

#### **The Instrument**

The areas of knowledge (see Table 7) were used to develop a questionnaire for a traditional needs assessment using Udinsky et al. (1981) and

TABLE 7

## COMPUTER SCIENCE SUBJECT AREAS

Subject Area	Subject Detail
Word Processing	Typing General Knowledge Desk Top Publishing
Spread Sheets	Spreadsheet General Knowledge Spreadsheet Budgeting
Databases	Maintenance Modification Programming Special Reports
Special Databases	Stock Control Accounting Programming
Programming	Programming Simple Programming Complex
Languages	Language C Language C++ Language Clipper Language COBOL Language dBASE Language Pascal Language SQL and Others
Computer Repair	Simple repair & maintenance Printer Repairs Card & Other Repairs
DOS Commands	Basic DOS Commands AUTOEXEC.BAT CONFIG.SYS
Accounting	General Accounting Administrative Accounting Adventist Accounting
General Courses	English -- general course Law Economy Statistics Marketing Research and Decision Making



Fowler (1988). The questionnaire (see Appendix A), originally developed in English, was given to several of the AUCA faculty members for comments, which were incorporated into the questionnaire. After translation, it was given to the graduating class for pilot testing. Jean Paul, a student from Reunion, was particularly helpful in improving the comprehensibility of the final French version. The questionnaire was prepared for printing by the secretary of the School of Business. A smaller font size allowed the questionnaire to be placed on a single sheet of paper, front and back.

The questionnaire used the Battelle model of two scales, one for the perceived need of the item and the other for the perceived level of preparation. It also collected data pertaining to the personnel and computers used by the company, and asked about job-site training possibilities involving the university.

The questionnaire was designed to be printed on the front and back of a single sheet of A4 paper. The first side of the questionnaire had three goals. These were to determine:

1. The number and type of workers in businesses that used computers in Rwanda
2. The number and type of computers in Rwanda
3. The types of courses organizations might wish to have their employees attend and the town in which these courses should be given.

The goal of the second side of the questionnaire was to determine the appropriateness and the effectiveness of the university's computer science curriculum.

### **The Data-Collection Procedures**

There were 100 copies made for distribution. At the suggestion of several Kigali businessmen, the questionnaire was hand-delivered. These men believed that there would be a low response rate if the questionnaires were mailed. The student delivering and collecting the questionnaires was instructed to ask for the names of others who were involved in computer science in the country. While the student was distributing and collecting the questionnaires, he took notes on the organization and the individuals with whom he was working.

The student who handed out and collected the questionnaires handed out a total of 88 questionnaires. He was able to collect 71 of these. I gave out and received 4 more. Also I was able to collect 2 from organizations that had turned down the student. Thus, a total of 92 questionnaires were handed out and 77 returned. Fifteen questionnaires, or 16.3%, were not returned. Many of those that did not respond either did not have computers or were in the process of purchasing their first computers.

The reasons given to the student for the nonresponses were interesting. They fall into five categories as follows:

1. The secretary was protecting the boss (7 cases)
2. No interest in questionnaire (4 cases)
3. The questionnaire was not understood (2 cases)
4. This has nothing to do with my business (2 cases)
5. Too busy or too busy now, come back later (2 cases).

The 17 instances listed above include the 2 I collected. Only 2 cases, those that did not understand, had anything to do with the quality of the questionnaire. One

of these businesses had just bought some computers and did not know anything about computers. The other one said that the questionnaire was too ambitious. Of the remaining, probably more than half would have responded if the researcher had requested the questionnaire in person. Thus, it was a cultural problem; the person delivering the questionnaire was of too low a standing in society to elicit a response, in spite of the fact that the student had a letter on university letterhead from the dean of the School of Business (the researcher) which he showed to everyone. Naturally, one can only ask what would have happened if the questionnaire had been mailed to the organizations.

#### Analysis

An examination of Table 8, the responses to the first side of the questionnaire, reveals that no Mudende graduate responded to the questionnaire. One of the questionnaires, however, was filled out by a former student who wished to finish his degree. This may seem a bit unusual, but there are very few computer science graduates in the country. The few that were found were all used in the interview methodologies. Most of these were found during the survey or after it had been taken. In fact, some of the interviewees graduated just before the survey or during it.

The first column in Table 8 is the question. The second is the number of people responding to the question. The third is the total of all responses. The first two questions were of a yes/no type. Only nine (11.6%) indicated that they knew something about the Mudende curriculum. This low percentage suggests that, although the school is considered the best computer science school in the

TABLE 8  
 RESPONSES TO THE FIRST SEVEN QUESTIONS  
 (N = 77)

Questions	No. of Persons Responding	Quantity Indicated
1. Are you a Mudende graduate? (Yes)	0	
2. Are you familiar with the Mudende curriculum? (Yes)	9	
3. How many graduates work for your company?	6	
4. How many computers does your company have?	73	
IBM PC?	63	481
Mackintosh?	12	27
Mini?	17	23
Mainframe?	0	0
5. Indicate the skills necessary for the type of work you do.	76	
Administration		56
Supervision		14
Data Entry		61
Accounting		60
Programming		26
Word Processing		64
Computer Familiarity		31
Data Processing		63
6. How many persons work for your organization?	73	12.363
7. Indicate the number of persons working in the following areas?	73	
Administration	48	663
Data Entry	56	300
Software Maintenance	23	46
Accounting	56	396
Programming	27	87
Word Processing	67	335
Computer Maintenance	18	31

country, it needs to improve its public relations so that people will better understand its curriculum.

Question 3 shows six graduates employed in six companies in the country. Sixty-three respondents said their organization used 481 IBM PCs and clones. A total of 481 computers for all of Rwanda seems to be low, indicating that those persons responding to the questionnaire do not represent the complete population of computerized business in Rwanda. Since there is no way to establish a list of all the organizations owning and using computers in Rwanda, it was impossible to determine the exact number of computers in the country. The ratio of 481 PCS to 23 minicomputers is high. It is probable that there are more than 481 PCS in Rwanda and 10–15 minicomputers. It is not likely that there are 17 companies in Rwanda that could afford or use a minicomputer. The high number of reported minicomputers is likely from a lack of knowledge about the types of computers.

The skills that the respondents used on the job were quite varied. Computer familiarity, programming, and supervision are the only ones that received less than 50 responses. At 31, 26, and 14 responses, they are much lower than the others. Though most of the respondents are CEOs or administrators, they reported a wide range of skills. Naturally, one would expect supervision to be a skill used by the respondents; this is not the case. This is congruent with the Rwandan context, where supervision is left to someone of lower rank, who usually stands around and watches the people being supervised.

Programming and computer familiarity are things the CEO/managerial respondents would tend to delegate to someone else. Since the number of

computers in the country was quite low, one would expect that most of the CEOs would not be using a computer. There were 31 individuals, or 40.8% of the administrators who were familiar with computers, indicating a fairly strong interest in computers in the country. The 26 or 34.2% of the respondents saying that they did programming shows that a fair number of officers of companies program out of necessity, meaning they do not have the programming staff to do it for them.

The survey involved organizations employing over 12,000 persons. This may seem like a small number, but in comparison to the number employed in Rwanda, this was very large. On an average, each organization employed 169 persons. As most industries in Rwanda are moderate or small scale, this is about the amount that would be expected. The Rwandan government was, without a doubt, the largest employer, employing up to half the persons employed in Rwanda. (No exact figures are available. This was based on comments of the director of computing for the government.)

Out of 1,858 total people reported, 799 people were employed in computer-related areas. The remaining 1,059 were employed in accounting and administration. Although there is no statistical significance, it does show that computer-related jobs are fewer than those in general business. If it is assumed that all administrators (663) and half of the accountants (198) do not work with computers, then 997 persons working with or on 531 computers means that on an average 1.9 persons work on every computer.

The purpose of question 8 (see Table 9) was to determine whether there was any interest in special training programs in the major cities in Rwanda. The

**TABLE 9**  
**NUMBER OF EMPLOYEES INTERESTED IN COURSES TAUGHT BY AUCA**

Area	Mudende		Kigali		Gisenyi		Other	
	Employees Interested	No. of Responses	Employees Interested	No. of Responses	Employees Interested	No. of Responses	Employees Interested	No. of Responses
Word Processing	3	1	244	22	0	0	34	6
Spreadsheets	0	0	220	21	0	0	36	5
Databases	7	2	180	21	0	0	42	7
Programming	9	6	50	14	22	2	27	4
Programming Languages	0	0	20	5	2	1	25	2
Software Design	0	0	28	4	0	0	27	3
Analysis	1	1	42	11	22	2	26	3
Computer Repair	9	5	25	11	0	0	33	6
Accounting	2	1	100	15	0	0	33	6
DOS	33	2	164	13	0	0	25	2
Administration	0	0	129	7	0	0	29	4

university is over 90 miles from Kigali. This, along with the fact that there was an 8 p.m. curfew in the Gisenyi Prefecture, made it impossible for any students working in Kigali to attend night classes at Mudende. Hence, it was not surprising to see little interest in Mudende. It was interesting to note that the exception to this was DOS. Those responding to the questionnaire must have thought of DOS as a general introduction to computers. During school vacations, Mudende has successfully done on-campus seminars.

Gisenyi, the town closest to the university, approximately 45 minutes away, had 22 people at two companies who needed to study programming and programming analysis. The need in the 'Other' towns was about the same—somewhere between 25 and 30 for each subject. It did not appear to be feasible to run courses in Gisenyi and definitely not in the other towns, as the number of students would not be sufficient to make it fiscally feasible.

Kigali, though, was quite different. In word processing and spreadsheets, the request was for over 200 persons. The question of how much the respondents would be willing to pay for such training was not asked. Word processing and spreadsheet training was being done in Kigali by several organizations. There was a need for effective training but can the university be competitive? The need was there. Over 100 would be interested in business courses. Over 160 would be interested in DOS, and 180 indicated that they would like instruction in dBASE. The number of persons interested in the rest of the computer science courses ranged from 25 to 50 people. These numbers might actually have been a little higher if the people needing the courses were asked. This represents only those companies willing to send and pay for their



employees to study these subjects. The number of employees willing to pay for the training themselves would be quite small, as few could afford it.

Only one respondent rated the university as to the quality of instruction, indicating a lack of understanding of the level of instruction at the university. The section of the questionnaire about the quality of instruction was not analyzed. A cursory examination of side 2 of the questionnaire revealed that many questions were unanswered, and those that were answered tended to be 'very important'. Special treatment of the data was obviously necessary. The data was keyed into a dBASE file using the following values: 0 = No response; 1 = Not important; 2 = Barely important; 3 = Important; 4 = Fairly important; 5 = Very important. The results showed bimodal data with the tendency to either "No Response" or "Very Important". The 52.9% (see Table 10) with no responses could be due to two factors. The first possibility is that the people simply followed instructions, leaving the question blank if they did not understand the question, representing a lack of knowledge. The second is cultural in nature. Many African cultures, including the Rwandan culture, prefer to answer a question positively if at all possible. One should not ask if the road goes to Kigali, for the respondent will answer "Yes" just to be positive, even though it goes the opposite direction. Rather, one should ask, "Where does this road go?" or, "How do I get to Kigali?"

In the second possibility, the respondents chose to appear ignorant rather than answer 'not important'. In this case, the nonresponse represents 'not important'. In the second case, adding a 'don't know' option to the question would not have solved the problem, as the respondent would have chosen 'don't know' rather than be negative ('not important'), choosing to appear ignorant rather than

TABLE 10  
 NUMBER OF RESPONSES FOR EACH TYPE OF RESPONSE

Number	Responses	Percentage of All Respondents	Percentage of Responses Only
2118	No Response	52.9	0.0
85	Not Important	2.1	4.5
44	Barely Important	1.1	2.3
134	Important	3.4	7.1
691	Fairly Important	17.3	36.6
932	Very Important	23.3	49.4

be unkind. It is quite possible that both options are correct, depending on the respondent.

### **Case 1: Lack of Knowledge**

If the first case is true, then the respondent's lack of knowledge indicates that he/she might not really know much about computer science and would not be an appropriate informant for the needs assessment. In such a case, it would be more appropriate to create a sample of "experts." A group of "experts" was created consisting of respondents answering more than 50% of the computer science questions on the questionnaire. It included 30 respondents, less than 50% of the total respondents.

A computer program was written to calculate the upper and lower quartiles, the median, the mean, the first and ninth deciles, the semi-interquartiles, the standard deviation, the skewness, and the kurtosis for all groups and all questions. Then a program was written that printed a histogram and the foregoing statistical figures for each question. A combined printout was prepared for each question. Figure 3 and Table 11 are the printouts for the question on the importance of teaching about the AUTOEXEC.BAT file.

When one examines the statistical sheets for each question, a greater number of "fairly important" or "very important" seems to indicate the more important subjects. Table 12 contains the responses and the median for all the respondents and for the group of "experts." The median calculation for all the respondents did not include zero or "No Response." The lowest median for all the respondents was 2.2, the highest 4.8. This low variation of values makes ranking

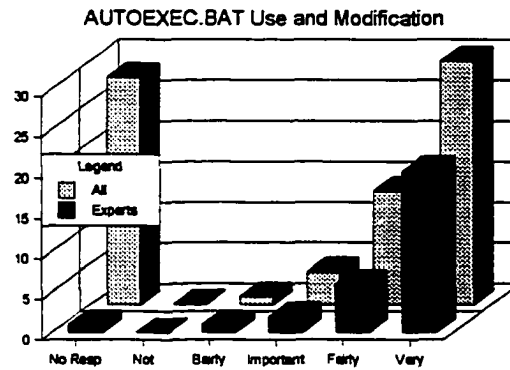


Figure 3. The importance of the use and modification of the AUTOEXEC.BAT file.

TABLE 11

STATISTICAL DATA FOR AUTOEXEC.BAT

Category	All Respondents	Expert Group
Group totals	77	30
No Response	28	1
Not Important	0	0
Barely Important	1	1
Important	4	2
Fairly Important	14	6
Very Important	30	20
Median	4.6	4.8

TABLE 12  
THE RESPONSES AND MEDIAN FOR EACH QUESTION AND GROUP

Questions	All Respondents							The "Experts"						
	0	1	2	3	4	5	Med	0	1	2	3	4	5	Med
1. Word Processing	13	1	1	3	28	31	4.4	2	1	1	2	9	15	4.5
2. DeskTop Publishing	55	3	1	5	6	4	3.9	11	3	1	5	6	4	2.5
<b>Spreadsheet</b>														
3. General Knowledge	19	1	0	1	27	29	4.5	1	1	0	1	12	15	4.5
4. Budget & Administration	40	2	0	3	10	22	4.6	6	2	0	2	7	13	4.2
5. Administration Research	46	2	1	7	7	14	4.2	6	2	1	6	5	10	3.5
<b>Databases</b>														
6. General Application	28	0	0	2	24	23	4.4	2	0	0	1	12	15	4.5
7. Maintenance	47	2	0	2	14	12	4.2	4	2	0	2	13	9	4.0
8. Modification	53	2	1	3	10	8	4.1	7	2	1	3	10	7	3.7
9. Special Reports	51	2	3	3	8	10	4.1	8	2	3	3	6	8	3.2
10. Control of Stock	44	1	4	1	8	19	4.6	4	1	4	0	6	15	4.5
11. Programming	37	1	0	2	17	20	4.5	2	1	0	2	11	14	4.4
12. Accounting	29	2	0	1	17	28	4.6	2	2	0	1	7	18	4.7
13. Import/Export Programs	52	3	1	1	9	11	4.3	10	3	1	1	7	8	3.5
14. Simple Programming	37	1	0	2	19	18	4.3	1	1	0	2	14	12	4.3
15. Complex Programming	49	1	4	2	8	13	4.1	4	1	4	2	8	11	4.0
<b>Programming Language</b>														
16. C++	59	4	0	2	5	7	4.1	11	4	0	2	5	8	1.4
17. C	63	3	1	3	5	2	3.5	20	3	1	2	2	2	1.2
18. Clipper	56	3	0	0	7	11	4.5	9	3	0	0	7	11	3.9
19. COBOL	45	4	1	2	12	13	4.2	5	4	1	2	8	10	3.9
20. dBASE	31	1	0	3	17	25	4.5	2	1	0	2	8	17	4.6
21. Pascal	53	2	3	2	7	10	4.2	13	2	3	2	6	4	1.5
22. SQL	61	4	3	0	6	3	3.6	14	4	3	0	6	3	1.3
23. Simple Software Engineering	51	3	1	5	6	11	4.1	8	3	1	5	5	8	3.1
24. Complex Software Engineering	54	3	1	5	7	7	3.8	9	3	1	5	6	6	2.9
25. Simple Computer Repairs	40	3	1	1	8	24	4.7	4	3	1	0	5	17	4.6
26. Printer Repairs	40	5	0	1	11	20	4.5	4	5	0	0	8	13	4.2
27. Comp. Cards & Other Repairs	46	5	1	5	9	11	4.0	6	5	1	4	5	9	3.2
28. Basic DOS Commands	23	0	0	2	12	40	4.8	1	0	0	1	2	26	4.9
29. Use & Mod to CONFIG.SYS	26	0	1	2	17	31	4.6	1	0	1	1	7	20	4.8
30. Use & Mod to AUTOEXEC.BAT	28	0	1	4	14	30	4.6	1	0	1	2	6	20	4.8

Table 12--Continued

Questions	All Respondents							The "Experts"						
	0	1	2	3	4	5	Med	0	1	2	3	4	5	Med
<b>Accounting</b>														
31. General	21	1	0	0	7	40	4.8	3	1	0	0	7	19	4.7
32. Advanced	44	1	0	5	12	15	4.3	9	1	0	5	6	9	3.5
33. International	53	1	0	10	7	6	3.6	11	1	0	9	5	4	2.8
34. Company	35	1	1	1	13	26	4.6	5	1	1	1	8	14	4.4
35. Adventist	60	4	6	6	1	0	2.2	15	3	6	5	1	0	1.3
36. Banking System	48	1	1	1	10	16	4.5	12	1	1	1	8	7	3.5
37. Auditing	43	1	0	1	11	21	4.6	12	1	0	1	7	9	3.6
38. Budgeting	27	0	0	1	17	13	4.7	6	0	0	1	10	13	4.3
<b>Administration</b>														
39. Personnel	23	0	0	0	21	33	4.6	4	0	0	0	10	16	4.6
40. Financial	30	0	0	1	19	27	4.6	6	0	0	0	10	14	4.4
41. Accounting	29	0	0	0	21	27	4.6	7	0	0	0	8	15	4.5
42. Budget	29	0	0	4	21	23	4.4	6	0	0	3	10	11	4.1
<b>Law &amp; Economics</b>														
43. Law	47	2	0	7	11	10	4.0	12	2	0	6	6	4	2.7
44. Economics	36	1	1	3	18	19	4.3	8	1	1	2	8	10	3.9
45. Statistics	29	1	1	2	23	21	4.3	3	1	1	2	10	13	4.3
46. Marketing	32	1	1	5	18	20	4.3	6	1	1	4	8	10	3.9
47. English	35	1	0	3	18	20	4.4	7	1	0	3	6	13	4.2
<b>Research</b>														
48. Accounting	44	1	0	0	19	13	4.3	8	1	0	0	12	9	4.0
49. Business	44	1	0	2	17	13	4.2	8	1	0	2	11	8	3.9
50. Programming--Computers	45	1	0	3	14	14	4.3	10	1	0	3	8	8	3.6
<b>Research &amp; Decision Making</b>														
51. Research & Decision Making	41	1	2	0	14	19	4.5	9	1	2	0	6	12	4.0
52. Research & Practical Problems	47	1	1	3	14	11	4.2	12	1	1	3	7	6	2.8

**Note.** 0 = No Response; 1 = Not Important; 2 = Barely Important; 3 = Important; 4 = Fairly Important; 5 = Very Important; Med = Median. The median for all respondents was calculated without the "No Response". The median for the "experts" was calculated including the "No Response".

of the subject areas difficult, thus making the median of all respondent an inappropriate means of determining the importance of the subject areas.

The question concerning the AUTOEXEC.BAT file had 28 people who did not respond. In comparison there was only one of the "experts" that failed to respond. The selection of computer science experts eliminates the problem of "No Response." An examination of Table 12 reveals that it did not eliminate the tendency to answer "very important". The bimodal problem seems to be more than just a lack of information.

### **Case 2: The Cultural Response**

The other possible explanation of the "no response" was that the respondent chose to not answer the question, to appear ignorant, rather than give a negative answer. If this is the case, those questions that were not answered should be treated as "not important." Thus, every question would have an answer. With every question having an answer and all respondents being considered, the median would be the indicator of importance.

The fact that the "experts" group answered at least half of the computer science questions, made it appropriate to use them as a basis for the development of a curriculum. But the tendency of respondents that answer "very important" would indicate that at least part of the problem is cultural. Therefore, in this analysis, "No Response" will be considered to mean either the respondent did not understand the question or did not wish to make a negative comment. Table 13 contains a ranking of all subject areas based on the subject area's median response by the group of "experts."

TABLE 13

## RANKING OF MEDIAN FOR EXPERTS GROUP

Rank	Subject Area	Median
1.	Basic DOS Commands	4.9
2.	Use & Modification to AUTOEXEC.BAT	4.8
3.	Use & Modification to CONFIG.SYS	4.8
4.	Accounting - General	4.7
5.	Databases - Accounting	4.7
6.	Simple Computer Repairs	4.6
7.	Programming Language - dBASE	4.6
8.	Administration - Personnel	4.5
9.	Administration - Accounting	4.5
10.	Databases - Control of Stock	4.5
11.	Databases - General Applications	4.5
12.	Spreadsheet - General Knowledge	4.5
13.	Word Processing	4.5
14.	Administration - Financial	4.4
15.	Accounting - Company	4.4
16.	Databases - Programming	4.4
17.	Statistics	4.3
18.	Accounting - Budgeting	4.3
19.	English	4.2
20.	Printer Repairs	4.2
21.	Spreadsheet - Budget & Administration	4.2
22.	Simple Programming	4.2
23.	Administration - Budget	4.1
24.	Research & Decision Making	4.0
25.	Complex Programming	4.0
26.	Programming Language - Clipper	4.0
27.	Databases - Maintenance	4.0
28.	Research in Accounting	4.0
29.	Marketing	3.9
30.	Economics	3.9
31.	Programming Language - COBOL	3.9
32.	Research in Business	3.9
33.	Databases - Modifications	3.7
34.	Accounting - Auditing	3.6
35.	Research in Programming--Computers	3.6
36.	Accounting - Advanced	3.6
37.	Spreadsheet - Administration Research	3.5
38.	Databases - Import/Export Programs	3.5
39.	Accounting - Banking System	3.5
40.	Computer Cards & Other Repairs	3.2
41.	Databases - Special Reports	3.2
42.	Simple Software Engineering	3.1
43.	Complex Software Engineering	2.9
44.	Research & Practical Problems	2.8
45.	Accounting - International	2.8
46.	Law	2.7
47.	Desk Top Publishing	2.5
48.	Programming Language - C++	1.5
49.	Programming Language - Pascal	1.5
50.	Accounting - Adventist	1.3
51.	Programming Language - SQL	1.3
52.	Programming Language - C	1.2

**Note.** Those in the top part of the table are important to the curriculum. Those in the lower part should be examined for the possibility of eliminating the subject areas from the curriculum.



Table 13 is divided into three parts. Those subjects that fall in the upper part of the list are very important. The curriculum needed to be evaluated to be sure that it covers them appropriately. Those falling in the last ten of the list could be unimportant. They needed to be examined to see whether they can be reduced or eliminated.

It is interesting to note that all of the third-generation programming languages fall in the last group and should be studied for elimination. If one is to teach the theory of computer science, one would need to teach a third-generation programming language such as C (52), Pascal (49), or C++ (47). C++ is the highest at 3.0. This lack of third-generation languages, other than COBOL, is surprising, but it shows that the major programming in the country is probably database management. It was noted that COBOL (31) was not in the lower area of Table 13, but was in the middle part of the list. Although the university did not teach any COBOL, this would indicate that the university possibly should. Due to time limitations and the fact that COBOL is in the middle area of Table 13, the teaching of COBOL was not added to the recommendations.

Printer repairs, #20 in the table, shows the problem faced by many of the computer scientists in the country. Parts for printers are not easy to find, and when found are expensive. If someone could repair them, he/she would be able to provide an invaluable service to his/her employer.

### **Other Problem Areas**

Included in the questionnaire were two areas that do not seem logical for a university in Central Africa to teach. SQL is a database language that is

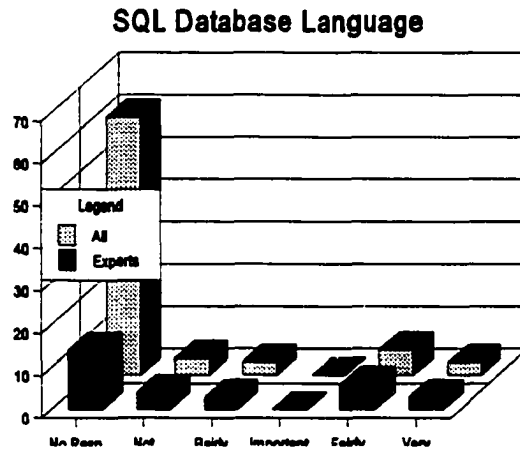


Figure 4. Responses to the importance of the SQL database language.

TABLE 14

STATISTICS FOR THE QUESTION ON SQL DATABASE LANGUAGE

Categories	All		Experts	
	No.	%	No.	%
Group Totals	77	100	30	100
No Response	61	79	14	46
Not Important	4	5	4	13
Barely Important	3	3	3	10
Important	0	0	0	0
Fairly Important	6	7	6	20
Very Important	3	3	3	10

Note. No. means number of respondents; % means percentage of the number of respondents.

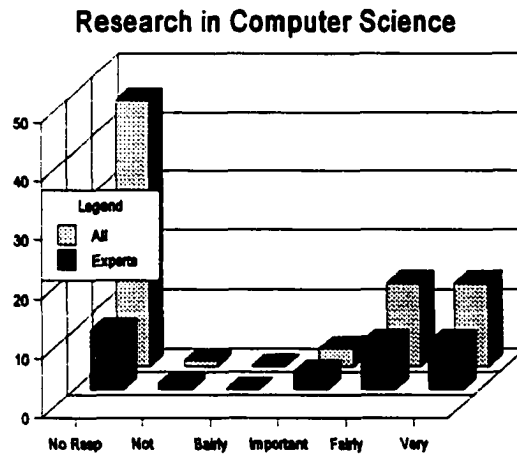


Figure 5. Responses in research in computer science.

TABLE 15

STATISTICS FOR THE COMPUTER SCIENCE RESEARCH QUESTION

Catagories	All		Experts	
	No.	%	No.	%
Group Totals	77	100	30	100
No Response	45	58	10	33
Not Important	1	1	1	3
Barely Important	0	0	0	0
Important	3	3	3	10
Fairly Important	14	18	8	26
Very Important	14	18	8	26

Note. No. Means number of respondents; % means percentage of the number of respondents.

generally used on minicomputers and mainframe computers. There is, however, a growing use of it on high-powered microcomputers. In Rwanda, there were 10 to 15 minicomputers and no mainframe computers, making the importance of teaching SQL at any depth nonexistent. Thus, one would be surprised at the "fairly important" and "very important" responses as seen in Table 14 and Figure 4. These responses seem to have come from the few owners of computers running the UNIX operating system. Owners of UNIX computers would be used to SQL and would think that it is important. It is quite probable that these responses represent the number of UNIX machines in the country. Question 22 (SQL) had one of the highest responses in the "not important" and "barely important" (7). Those responding to this question would tend to be persons who would be experts in computer science.

Another area that one would not expect to teach on a Bachelor of Arts level in Central Africa is the area of research in programming. Table 15 and Figure 5 show the statistical results for the responses to question 50, Research in Computer Programming. A rank of 36 in Table 13, the list of the median of the group experts, would suggest research in programming should be taught. As mentioned earlier, the exact position in the order of the medians of group experts is more an indicator.

### Summary

A survey questionnaire was administered by hand delivery. The population included all known graduates and computer science professionals. The response rate was relatively high at 83.7%. The response on the questionnaire was

bimodal with the modes being at the extremes ("no response," "very important"). The analysis used two groups, the complete population, and those who answered more than half the computer questions. Two sets of medians were calculated, one for all respondents and one for those who answered more than half the computer science questions. The medians of the group of "experts" were ranked. Those subject areas in the upper part of Table 13 should be considered essential. Those in the lower part should be studied for either removal from or reduction in the curriculum.

#### Recommendations From the Questionnaire

The university should:

1. Continue the combining of business training with computer science (The amount of people employed in the business area seems to be greater than those in computer science.)
2. Find ways to help the business community better know and understand its curriculum
3. Facilitate in any way it can the increase in the number of computers in the country, thus increasing the number of jobs for its computer graduates
4. Investigate the possibility of a night school in Kigali (ignoring the other cities)
5. Be sure that it is sufficiently covering the subjects in the "must have" group (Naturally, some can be covered in less time than others.)

6. Be sure that it studies the important group (It must weigh each of the subjects carefully to make sure that not too much time is given to these but that they are covered sufficiently.)
7. Examine carefully to see if any of the subjects in the study group can be eliminated or the amount of time spent on them can be reduced—especially those that have a median under 2.0, in particular Adventist Accounting
8. Help the computer science community better understand its curriculum as only one respondent filled in the side rating on the instruction given by the university
9. Develop a means of encouraging the respondents to balance their "not important" with their "very important" in future needs assessments.

### **Job Analysis Log**

#### **Rationale**

As a person answering a questionnaire or being interviewed merely expresses his/her feelings or thinking at the time of the response, a method was needed that would assess changing feelings and thinking over a longer period of time. This methodology needed to cover a long enough period of time that it would be representative of the type of work the individual did throughout the year. Furthermore, it would not be feasible to interview each person every day. A log was developed as a compromise between many interviews and long-term assessment.

### Sample

Thirty-three participants filled in the work sheet, including persons from the following categories. People:

1. who worked on a day-to-day basis with computers and programming.
2. who were typical of the local computer industry.
3. who would be doing the kind of work that our graduates would be expected to do.

Participants selected included:

1. Four AUCA students at a business
2. One AUCA graduate at government agency
3. One Rwandex employee
4. 16 at a computer store.
5. 10 computer workers at government agency
6. One AUCA graduate at Mission office.

Another computer store had promised to have its workers complete the job analysis log. The director of the store was given several logs. After several visits to collect the complete logs the director promised to mail me the logs. However, the logs were never received.

### Time and Setting

The job log was hand distributed by the researcher during the months of September and October of 1992 in Kigali. Many of the participants were employees of those interviewed.

## Method Description

### **The Instrument**

A special log was developed on which participants could quickly check the skills that they had used during the day. The log had enough space for 21 working days. The back of the log was intended to be used for noting anything that the participant thought was important.

### **Collecting the Data**

The selected participants were trained to do census counting on the type of work done, making notes in the log. They were asked to note anything exceptional. The log had room for 1 month of observations. The goal of this methodology was to determine what type of work was done and what percentage of the time was spent in this type of work. At the end of the month, where possible, the respondent was interviewed. Some organizations gladly took the logs and had their employees complete them, but did not want the disruption of having their employees interviewed.

The major difficulty lay in the people remembering to fill in the log. Persuading people to add comments about unique happenings to the log was even more difficult. Out of over 40 forms given out, only 33 were collected, and this only after many repeated visits to the respondents. During the interviews with those completing the log, the respondent was encouraged to make any changes he/she believed appropriate. Any information collected that could not be noted in the log was analyzed in informal indigenous contact.



### The Analysis

After the individual logs had been collected, the results were keyed into a dBASE file. It was noted that a number of the logs did not contain 21 days. They either were for a shorter period of time or had days missing. It was assumed that the days that the respondent did not mark the log followed the same pattern as the days marked. The number of days that the individual reported was placed in a field named "days." The number of check marks for each area was then recorded. A program was written that read each of the 33 records and divided each of the areas by the number of days reported. The program summed up each field giving a relative time, which was summed and converted into a percentage time worked. The percentages were then arranged in descending order (Table 16).

Figure 6 shows the relative amount of time spent in each of the areas examined. The fact that a particular subject or skill is used more than another does not necessarily mean that it should be taught more than the others. The table should be used as a method of prioritizing the subject areas. Those used more often should be thoroughly mastered. As many of them, such as word processing, can be mastered in a relatively short amount of time, more time can be spent on the more difficult subjects, such as programming.

### Summary

A log was prepared and given to persons working jobs similar to those of the graduates of the university. During the instruction they were asked to fill out the log on a daily basis for 1 month. At the end of the month, they were given a

TABLE 16  
PERCENTAGE OF TIME SPENT ON EACH SKILL

Area	Percentage
Word Processing	10.66
Spreadsheets	10.58
Databases Programming	9.28
Language dBASE	8.68
Special Databases Stock Control	7.08
Databases	6.09
Programming Simple	5.40
Language Clipper	4.03
Accounting	3.35
Programming	3.27
Computer Repair	3.27
Programming Complex	3.05
Databases Modification	3.05
Databases Special Reports	2.66
Databases Maintenance	2.51
Administration Budget	2.28
Special Databases Accounting Programming	2.21
Administration Accounting	2.06
Computer Repair--Simple Repair & Maintenance	1.90
Computer Repair--Card & Other Repairs	1.90
Special Databases	1.52
Language C++	1.14
Administration Finance	1.07
Computer Repair - Printer Repair	0.99
Language COBOL	0.84
Administration	0.53
Language Pascal	0.38
Software Projects and Development	0.15
Language C	0.08
Programming Languages	0.00
Language SQL	0.00

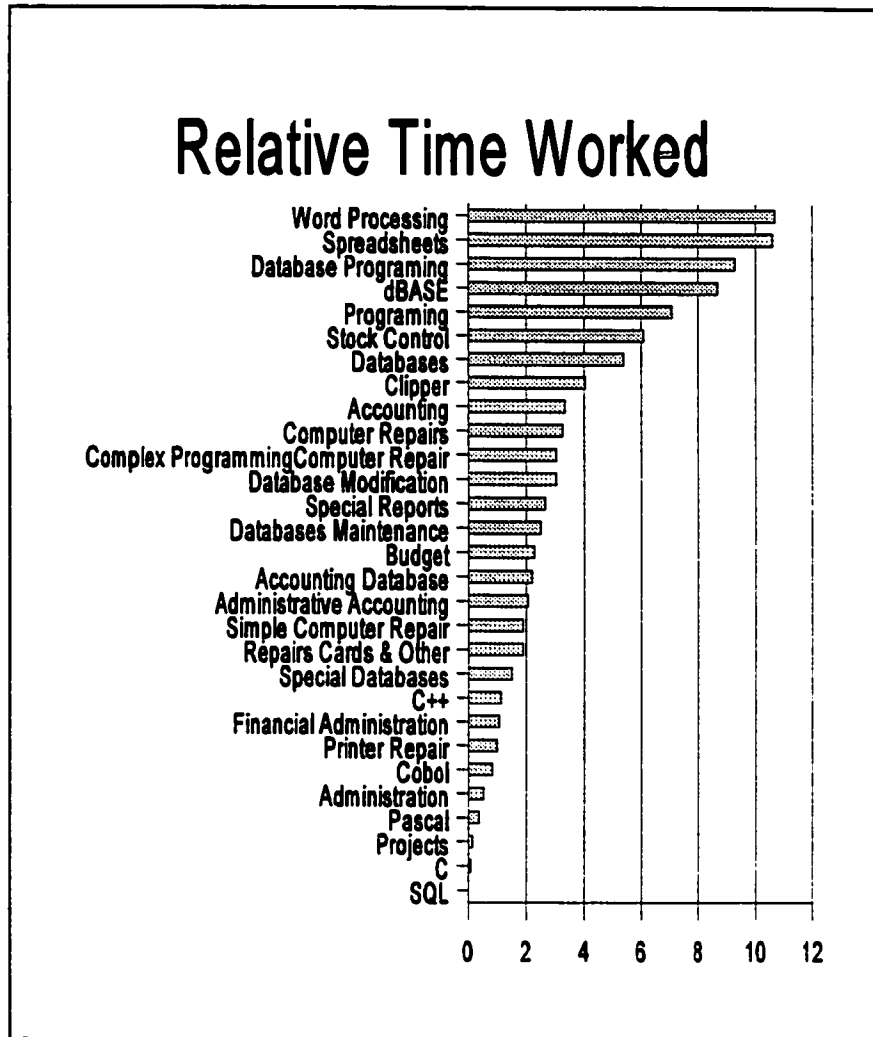


Figure 6. Relative time worked, in descending order.

short interview. A percentage was calculated and used to rank the areas. The word processing and spreadsheets area was considered appropriate and was not included in the recommendations. The other areas in the upper third of Table 16 were included in the recommendations.

### Recommendations

The university should ensure that:

1. It is covering dBASE programming at a level sufficient to allow the student to do dBASE programming upon graduation. This could be combined with Clipper.
2. The student is able to perform computer repairs.
3. Accounting continues to be taught at the current high standards.
4. The student understands the process of developing and maintaining a stock program.
5. The student has an understanding of how to develop special reports from dBASE files.
6. The basics are sufficiently mastered. These include word processing, spreadsheets, etc.
7. The student has an introduction to general programming languages, including COBOL, so that he/she can adapt to them if required.

### **The Semi-structured Interview Audio Analysis**

#### Rationale

As structured answers used in questionnaires or logs restricted the free expression of ideas and feelings, a semi-structured interview was added. Since

the goal of the interview was to permit free expression of ideas, the interview was based on a set of questions and the respondent was encouraged to express his/her understandings and feelings.

### Sample

The sample for this methodology included people taken from the general population, selected on a criterion basis. The sample was further restricted to those accessible by the researcher. Persons were included who had at least one of the following: (1) work on a day-by-day basis with computers and programming; (2) are typical of the local computer industry; (3) would be doing the kind of work that our graduates would be expected to do; (4) would be considered experts in the field of computers; and (5) are AUCA graduates.

There were a total of 14 persons interviewed. Five of these were also video taped for use in Method 4. To protect the individuals interviewed, the names were replaced with letters.

- "A"            A Mudende computer science graduate working for the church.
- "F"            Has a U.S. master's in computer science. "F" was working in computer science and accounting for a company in Kigali. "F" does not know how to program.
- "I"            A Mudende graduate working for the government in the area of computer science.
- "J"            The individual in charge of computers for the national government.
- "O"            A Mudende accounting graduate. At the time of the interview "O" was working for the Seventh-day Adventist church.
- "S"            A woman accountant working for the church at the time of the interview.

- "P" A person in charge of computers for a department that depends heavily on computers.
- "H" The owner of a computer store in Kigali.
- "C" The owner of a computer store in Kigali.
- "T" The manager of a computer business. "T" has since moved to another job outside of Rwanda.
- "M" The manager of the computer company at the time of the interview.
- "G" A graduate of Mudende that was working in computers and accounting at the time of the interview. "G" refused both video and audio taping of the interview.
- "K" A person responsible for the computers at a branch of the PNUD (a United Nations organization)
- "U" A Mudende graduate working for a public company.

#### Time and Setting

The semi-structured interviews were conducted during the last 2 weeks of September and the month of October 1992 in each participant's office or place of work in Kigali, Rwanda.

#### Method Description

##### **The Instrument**

The *base questions* served as the general grand-tour questions (Spradley, 1979, p. 223) of a semi-structured interview. The purpose of the interview was to understand the interviewee's feelings and perceptions of the workplace, as well as the skills necessary to enter and function in the workplace.

##### **Starting Questions Asked**

1. Where do you see the computer industry going here in Rwanda?

2. Where do you think that the software industry is going here in Rwanda?
3. What do you think should be taught in a computer science curriculum?
  - a. Language
  - b. Word processor
  - c. Spreadsheet
  - d. Operating system
  - e. Database manager
  - f. System analysis
  - g. Software engineering and design
  - h. User interface
4. What type of hardware do you sell? How many a year?
5. What type of software do you sell? How many a year?
6. How many graduates do you think the industry can absorb in a year?
7. How many computers do you think are in Rwanda?
8. Do you see a need for a basic computer repair course, such as putting in a hard disk?
9. Do you think that a small computer assembly business should be started in Rwanda?
10. Do you think that someone should start manufacturing stabilizers and UPSs?
11. Do you have trouble with these units burning out due to large voltage fluctuations?
12. Should we maintain the heavy accounting and business administration components in our curriculum?

### **The Data Collection**

Starting questions (see section above) were developed from the subject areas used in the questionnaire and the base questions described in the first part of this chapter. The individuals were asked the starting questions, beginning with the first question. If the comments led in a different direction, the direction was followed. Every attempt was made to cover the starting questions. Some of the computer store owners did not really want to talk about the repair or manufacture of computers in Rwanda, as this would be competition. Naturally, questions such as #4 and #5 were not asked if the person did not sell computers. Other questions were added as new areas were suggested by interviewees. The new areas included: system analysis, implementation of a work study program, starting a computer science M.A. program, and publishing a journal.

The poor quality of the batteries available in Rwanda for use in the audio cassette recorder caused the main problem encountered during the interview. They normally did not last more than one interview. This was discovered during the interview with "T," one of the more important interviews, when the tape recorder ceased to work.

Once the recording and the notes had been gathered, the tapes were translated into English and then transcribed.

### **Analysis**

All the interviews, including the videotaped interviews, were translated into English and then transcribed into individual files. Once transcribed, they were



changed to ASCII files and loaded into Alpha Text. Alpha Text is a program specifically designed to process interview data.

Alpha Text allows the user to class comments made in the interview into various categories. Then, when all the interviews have been classified, the program gathers the classified comments into a file for each code. With these files or a printout of these files, the researcher can analyze the interviews.

Originally, the table of the areas of classification was based on the areas on page 2 of the questionnaire, but, as the work progressed, it became obvious that these areas would not be enough, so other areas were added to the table. Table 17 is a list of the areas of classification grouped in subject areas. The first column is the code that was used in the Alpha Text program. The second column is a description of the codes. Not all the codes were used in the analysis.

The following is a summary of the analysis for each of the areas listed in the code table.

### **Spreadsheet**

Just about everybody uses Lotus as the spreadsheet. Many recognized that Quattro Pro was a better spreadsheet, but they had already started using Lotus. Rwandex and a few shops used VP Planner or WordPlan, but not many. On the Macintosh, Excel was used significantly.

For word processing, the distribution is similar to that in America, with WordPerfect being by far the most popular. "T" used Microsoft Word and "P" used WordStar 2000, version 2 or 3. "H" also suggested Word.

TABLE 17  
CODE USED IN THE ANALYSIS

Major areas	Code	Detailed areas
Word Processing	TG	Typing General Knowledge
Spread Sheets	TC TB	Spreadsheet General Knowledge Spreadsheet Budgeting
Data Bases	DA DP	Data Bases General Applications Data Bases Programming
Programming	PS PC DG NT	Programming Simple Programming Complex Accounting Programming ‡ Networks ‡
Languages	LC LCP LCL LCO LD LP LS	Language C Language C++ Language Clipper Language COBOL Language dBASE Language Pascal Language SQL and Others
Software Projects	SS AA UI	Software Projects simple Software Analysis ‡ User Interface ‡
Computer Repair	RS AS	Simple Repair & Maintenance Assembling of Computers ‡
DOS	DCO	DOS Commands
Accounting	CG AC CT	General Accounting Administrative Accounting Adventist Accounting
General Courses	GA	English -- General Course
Others ‡	CE CM CS CY EX MA NS OC JO WS AT NE	Computer Economy ‡ Computer Market ‡ Computer Science Curriculum ‡ Cycle Studies BA/MA etc. ‡ Experience ‡ Master Program ‡ Night School ‡ Other Computers ‡ Journal ‡ Work Study ‡ Attitude ‡ Networks ‡

‡ Areas not in questionnaire.

From the obvious scattering of the programs used, the university's use of WordPerfect and Quattro Pro seems to be compatible with what was needed.

### **Simple Programming**

Programming was divided into two areas—simple and complex. Simple would include one or two databases together, whereas complex would be an accounting package or something similar.

"A" had written a payroll program to be used where he worked. He felt that the student should write a simple program so that the student would understand all the steps of program development. In fact, he agreed to the idea that this should be the goal of the Advanced Commercial computer science course. He also thought that work experience would be a good addition to the courses taught.

"F" thought that the country should adapt existing programs to its needs and would not need much in the way of programming—especially nothing complex. "P" thought that there was a need for someone with programming skills. "P" and "P's" associates did 90% of the required programming in house. "S" said that there was always a need for the simple database programs, something that can be put together in a short time.

"I" emphasized the need for analysis, and, that even with the short programs, this was an important aspect that the university needed to improve. "I" did not agree with "A" in that a student should produce a program by himself. "I" thought that 2 or 3 students should work together on a program.

**C/C++ Programming Language**

"A" did not see the necessity of studying a third-generation language like C. "A" thought that Clipper was sufficient. "A's" argument was that one needed to program rapidly and to get the job done. "A" felt that he could do that in Clipper. "A" has never had a C compiler or taken a course in C.

"J" thought that the programming language for teaching computer science data structures should be C. In fact, "J" thought that it could even replace dBASE and Clipper, but that one should use a program that already exists if possible.

"T," without a moment's hesitation, said that the language of choice was C++. "T" could not use C++ as there was not any C++ compiler for the Macintosh. "T" felt that the language for database development should be FoxPro.

"H" with his UNIX background, naturally thought of C and C++. Out of the four computer sales and service companies in Kigali, three had C++ compilers and all three recommended C++. "C" showed the Turbo C++ compiler when asked what should be the third-generation programming language.

**Clipper Programming Language**

Most of the interviewees thought that dBASE was the database manager to use for instruction. Even those who were not familiar with Clipper thought that it would be the best to develop database programs. "H" thought that it would be a good idea to train students in several languages, so when they move from one job to another, they would be able to adapt to new languages and environments.

**COBOL Programming Language**

By far the most discussion on any programming language was generated about COBOL. The question was not whether it was important, but rather was it necessary to teach COBOL? "A" said that, in the business areas, there is a tendency to use COBOL, and one needs to be able to learn COBOL. "U" needed to know COBOL for one of the jobs he was asked to do. "U" was unable to do the programming because of his lack of knowledge of COBOL. "There is a need for COBOL, but it is very small!!" "F" said, "Even if they don't know COBOL they need to know programming in COBOL." "P" naturally would support COBOL as that was the language that was used on the UNIX mini where the majority of their data was stored. Ninety percent of their programming was done in COBOL.

Interestingly enough, "S" had not seen anyone in the country of Rwanda using COBOL. "S" had heard mostly about Clipper and dBASE. "H" recognized the difficulty of the question of whether one should teach COBOL or not. "H" said there are some that say that COBOL is dead; others that say that it is a good language. "H" suggested that a little bit of COBOL be taught. This way the students would have a little understanding of the COBOL language. "H" concluded, "Don't let COBOL die, as there are houses that are programming in COBOL."

"I" suggested that for minicomputers, COBOL was necessary as it was still being used on these machines. On the networks, one could use COBOL; but many like "I" were using dBASE. The student, at best, needs just an introduction to COBOL. "T", in referring to COBOL, said, "We have done a little bit; but it is very difficult."

**Pascal Programming Language**

Pascal has been taught at the university. In fact, it was taught until 1991, when the C++ language was introduced. Those that had taken it at school naturally thought of it. But, surprisingly, there were many suggestions to change to C or C++.

In fact, "T", as mentioned earlier, stated that the language of choice for teaching computer science was C++. "A" and "F" suggested that to teach data structures, Pascal was the language to use. "P" said that Pascal was used some, but naturally, it cannot be too much, as 90% of their programming was in COBOL.

"I" said that data structures could be taught in either C or Pascal, whereas all computer vendors thought that the language should be C, not Pascal. "C" said that the world is using C and C++, so the university should be teaching that, and not Pascal, which is not being used.

**SQL and Other Programming Languages**

SQL was only mentioned in passing by "H." "H" stated that they were using it on the minicomputers. "H" thought that an introduction to it would be good, but an in-depth study of SQL was not necessary.

"A" mentioned BASIC. "A" said, "BASIC is also something that has been done a little bit, but has not been used much." Since it has not been used much, the amount of instruction should be limited.

**Systems Analysis**

The area of system analysis was not included on the questionnaire as it is not necessarily taught on the Bachelor of Arts level. In one of the early interviews, the interviewee mentioned that one of the greatest problems in Rwanda was the lack of experience and knowledge of systems analysis. The interviewee made such an issue of it that the subject was added to all subsequent interviews.

In general, interviewees that understood the concept of analysis did not recognize the formal work that has been done in this area. Design of programs was the way most explained the idea of analysis. "A" put it simply: "One needs to be able to do more programming, and program design." Many recommended the French method of analysis developed by Merise. Merise is a complete method of analysis, but does not include many of the formal methods that have been developed elsewhere.

"U" suggested that analysis should be a concept that permeates all the computer science courses, while "F" thought that it should only be taught at the Master of Arts level. All agreed that it was important and, except for "F," that it should be included in the Bachelor of Arts curriculum.

**User Interface**

Although much was said about analysis, not a lot was said about the user interface. "I" was the only one to mention it. "I" said that there is a strong need for this type of training in program development. It may be that there was little understanding of the problems of developing good user interfaces.

**Simple Repairs**

"A" did a lot of repair and was very glad for what he had been taught at Mudende. In fact, "A" improved his skill by buying English books and studying them. "U" said he used the maintenance that he had been taught every day. In fact, "U" had gone beyond that and, using the same principles, had repaired printers and other things. "U" would try anything except soldering or desoldering something.

"S" said they needed someone who would be able to identify the problem and tell them how to fix it. "I" thought that the maintenance training that he had received was adequate. "I" lamented that they did not have electronics and could not repair computer cards.

Naturally, the four computer sales companies thought that the maintenance course was not needed. "J," though, thought that it was needed. In fact, "J" asked the university to follow up on a maintenance course that the government has given.

"H" thought that someone who could do a kind of first aid would be good to have in an organization, but not someone that could change cards, etc., because "H" thought that it took special training to change the cards in a computer. "H" saw the need for deeper training in computer repair, but only in electronics.

**Assembling of Computers**

In his interview "H" mentioned that it might be possible to assemble computers in Rwanda. The reaction was immediate and very strong. "H" felt it was not wise to assemble computers in Rwanda. "H" argued that at least 10% of all components were faulty on arrival and that the problem of maintenance



would be great. It was obvious that he was attempting to defend his turf. "H" had the same attitude about the course in computer maintenance. In fact, all four interviews with the four computer companies in Rwanda indicated that neither assembly nor maintenance of computers should be taught. "H," however, thought that it might be feasible if the market was expanded to include Burundi, Tanzania, and Zaire.

"F" stated that the idea of assembling computers was originally suggested in 1985 or 1986 by a Brazilian. The Ministry of Planning at that time thought that it was a little early to start assembling computers in the country. But "F" said that now he thought it was time to start the project.

Some of the non-computer store owners questioned whether it was cheaper to assemble computers in Rwanda. When asked to make the calculation, most agreed that it would be cheaper. Most did recognize that if the computers were assembled locally, computer parts would also be available locally.

### **Accounting Administration**

As the program at Mudende is a business-based program, all students must take a certain amount of accounting. All the interviewees thought that there was sufficient accounting for a business computer science course. Many believed it was unnecessary for the students to take Adventist Accounting as the material is covered in other courses. The only exception was the assistant treasurer of the Rwanda Union. Several, such as "J," thought that the number of accounting courses could be reduced.

One of the problems mentioned by one of the graduates was that graduates of the accounting program could not install and set up a simple accounting package, even though they had had several computer classes. Another suggested that the students should be required to write a simple accounting program.

### **English**

Everyone believed that English was important. After all, programming is done in English, and if one spoke English, one would find programming easier. (See the Master of Arts program section.) Almost everyone thought that it would be a good idea to have some of the classes taught in English, especially on the Master of Arts level. This is in line with the experience at Mudende, where third-year computer science courses have been taught in English without translation.

In the summer of 1992, four second-year students worked for a company in Kigali. During this time they learned the importance of English. They had to use English with certain persons in the company where they worked. When they returned, they, in telling of their experiences, described the importance of English, motivating all students of the 1993 graduating class to learn English.

### **Computer Economics**

The purpose of the computer economics question was to determine where the computer market was going in Rwanda. A growing computer market is important to a university computer science program as it will continue to provide jobs for its graduates. The university needs to know approximately how many graduates the economy can absorb in a given year. The direction of computer

economics and the number of computers found in the country are good indicators of the number of students that should be graduated each year.

All but one said that the computer market was growing and would continue to grow. One AUCA graduate disagreed, thinking the war would actually destroy the market. The majority believed that the government would be forced to computerize due to requirements of donor nations, encouraging the continued growth of the market.

The market for programmers was viewed in two different ways. Several suggested that it would be best if companies purchased already-developed programs and used them. Others saw a need for specially designed database programs in the country. "J," responsible for all computing in the government, said that 95% of all programming will be on a microcomputer.

"J" also said that in the market place, administration was going to demand more information. In fact, he believed the need for computer scientists would increase faster than the number of computers for the immediate future.

"T" estimates about 250 Macintosh computers in the country and "H" estimates between 1,000 and 2,000 IBM PC computers and less than 10 minicomputers in the country. The other computer companies tended to suggest something like 2,000 computers. Interestingly enough, at the time of the interview, "H" thought that there were only around ten 486s in the country. Mudende had two of these. The staff at Mudende believed that these estimates were probably low.

"J" said he thought the government would need 60 computer science personnel in a period of 5 years and that they would need 30 analysts (those with

an M.A.) over the same period. He also thought that the industry would need approximately the same amount of computer science people. This includes both undergraduates and graduate students.

In general, the trend for the use of computers was considered to be very strong and very important to the administrators of industry and government. Thus, the market should be able to easily absorb 20 to 40 computer science graduates on the B.A. level. In spite of the war, an on-going affair, in spite of the constant threats on Kigali, and the high prices for computers, the computer market seemed to be ready to increase.

### **Computer Science Curriculum**

The Rwandan Bachelor of Arts was a 2-year degree after 12 years of elementary and secondary education. It was really equivalent to the U.S. Associate of Arts degree, with regard to the number of years of school. The license (Master of Arts) was another 2 years, equivalent to the United States' Bachelor of Arts degree. The course content, however, was different. The concentration was at the same level as their United States counterpart.

The curriculum at Mudende was much more solid than at Saint Fidele, the only other school offering computer science in the country. In fact, it was quite complete. "J" felt that it would be good to add some more courses in computer science. This would mean fewer business courses, maybe less word processing, and less Lotus. Then one could increase the number of database and programming courses, reduce accounting, but keep the organization and administration courses.

At the time of the interviews, about two thirds of all the courses consisted of accounting courses. "J" thought that it should be the inverse, with accounting constituting about one third of all the courses. "J" suggested that maybe a third option could be added, one that is far stronger in computer science.

"J" suggested, "The current program you are doing would warrant another cycle [the Rwandan master's degree as described above], not necessarily the American master's degree." Also, Mudende had a 3-year Bachelor of Arts. At Saint Fidèle, it takes just 2 years. When graduates come to the market, they both get the same salary, but Mudende's graduates were more competent. Mudende should do a 2-year Bachelor Arts and then a 2-year second-cycle degree.

Here in Rwanda it is not the knowledge that is important; it is the diploma!!! We think in terms of a diploma. With this, you could add some advanced math in the graduate program. That way, in the end, one could finish with the equivalent of an American master's degree. ("J")

"H" agreed with "J" about adding computer science courses, but it still should be a Bachelor of Business Administration degree and not a pure computer science degree. If a person had only a pure computer science degree, it was generally agreed that the person would have trouble obtaining employment in Rwanda.

The importance of databases to business and industry is becoming more apparent at this time. For this reason, it was felt that database systems should be taught in greater depth. The students should be quite familiar with the

database system that is most popular and less familiar with the least popular ones.

The following is a list of the various databases used in the country. The order that they are given is not the order of importance.

1. The SQL language is in use only on the two or three UNIX systems in the country.
2. By far the most popular was dBASE III+. There are a few systems running dBASE II. Most of these are trying to convert to dBASE III+. Rwandex and its related business are using DBXL at the suggestion of the university about 4 years ago. dBASE IV was quite recent in Rwanda. The Social Security Department in the government and "H" were using dBASE IV for their Micros.
3. Transentra was pushing FoxPro as it was available both on the Macintosh and IBM compatibles.
4. The UN and the American Embassy have standardized on Paradox.
5. Clipper was being used in the government for compiling dBASE III+ programs. It was just starting to be used as a stand-alone compiler, where its real power is.
6. Some are still using COBOL as a database manager. Many suggested that the students know a little of this language as they may see it. (See the Language section.)

Based on the usages, the students need to know dBASE III+ and maybe dBASE IV. As FoxPro is an xbase language, as is dBASE, teaching it is not necessarily as important. As all but Clipper of the xbase family are interpreted, it

was felt that teaching dBASE III+ for the beginning database courses and using Clipper and/or C++ and a library for the advanced programs would be best.

### **Finding Work**

When "A" was asked what he had to do to find work, he said, "They had already contacted me. Even before I left the university I had work here waiting for me. People want Mudende graduates and prefer Rwandese, but normally there is not a problem finding work."

Normally, 2 months after graduation, all graduates have work, some of them at very high-paying positions. The only problem the university has had is not being able to supply enough graduates, especially if the business is not willing to pay enough money. The increase in pay over the Saint Fidele graduates is due to the Mudende reputation. The university had several graduates working in September 1993 for a take-home pay of 55,000 FRw per month compared to 25,000 to 30,000 Frw for Saint Fidele. This is \$379.31 per month and is very high when compared to long-time employees with master's degrees that are getting 80,000 FRw (\$551.74) per month.

The following is the experience of some of the School of Business graduates:

1. "A" worked in a society called Computermart that did training in word processing and spreadsheets as well as computer repair. "A" thought he was well prepared for this work. "A" is currently working at the Rwanda Union Mission in the accounting department.

2. "O" finished closer to the bottom of the class. "O" worked at the Awanda Union Mission for a period of time as a secretary. "O" was not a computer science graduate, but an accounting major. "O" did mostly word processing. In fact, he did not even have a computer to work on part of the time.
3. "I" finished in June 1990. "I" was working at a government agency, in charge of the network there. At the time that he graduated, he believed that the program needed strengthening.
4. "U" was a 1991 graduate and had a stronger program for a very short period of time. "U" worked at Transentra where he did FoxPro and Clipper programming. "U" was also asked to do some COBOL programming, which he was unable to do. It should be noted that even Transentra finally said they could not do the COBOL programming, as they had no one to do it. "U" then transferred to AliRwanda, a supermarket in Kigali, where he had the only computer in the business. It was a PC, but "U" did the accounting and payroll on it. "U" did payroll with a program that he had written. "U" is currently doing a master's degree in a prestigious university in Brussels.

### **Master's Program**

The university has been working on a master's in programming in computer science and accounting. One of the questions asked in the discussion was whether a master's program was needed and whether there would be students for such a program.



Everyone wanted a master's program, although some saw it to be a little different than what the university was planning. At the time of the interviews, the university was arranging for a master's program in conjunction with an American university such as Andrews University.

"A" thought that the university needed a master's program. "A" preferred a diploma issued by a university outside of Rwanda. "U" suggested that there would be many that would be willing to take a master's program. "U" thought that AUCA could have between 100-120 students. Many of them have studied math and science and would love to study computer science.

There was always some question about the cost. At \$10,000 or 1,450,000 FRw, many thought that it would cost too much. The average graduate would earn a maximum of 80,000 FRw per month after completing the master's course. It was impossible for the student to pay the cost himself. In spite of this, "U" thought that, even at this price, the idea was "interesting."

Naturally, when compared with the costs of transportation, living expenses, and tuition, the price of \$10,000 becomes very attractive. "J" agreed that this was true, but still had trouble believing that they could pay this much for something given in the country, even if the diploma came from America. "J" thought that \$3,000 would be more appropriate. The current cost at Mudende is about 200,000 FRw or \$1,380. "J" thought that in the U.S., one could get a graduate degree for \$3,000. Interestingly, "J" noted that Saint Fidele was 220,000 FRw for tuition only. The school was in town, and the students find their own room and board.

It was suggested that the course be taught in Kigali in the evenings and that taxis be hired for transportation. At the time of the interview, there was an 11 p.m. curfew in effect. Many, like "U," wondered whether taxis could be found, but "H" said that at that time of night, many taxi drivers would be happy to work on a contract basis to carry the students home. "J" agreed that having school after work would be a good idea, but not on Sunday.

There were many locations suggested, including the office of the headquarters of the Seventh-day Adventist Church in Rwanda (known locally as the Rwanda Union Office or Union Office).

"F" thought that there would not be much need in the country for a software engineering master's. "Only a few of the major centers will need the degree." "F" felt that there was a bigger need for a Bachelor of Arts in electronics than for software engineering. "F" felt that there would be a need for a Master of Arts with an emphasis in computer science. Later, though, "F" agreed that a master's in computer science would be useful. In fact, he thought that there would be a need for 10 graduates a year.

"J" thought that it would definitely be needed. "J" saw a need in the government for 60 persons with a M.A. in computer science over the next 5 years and in industry another 60. That is a total of 120, or 24 per year. He thought that there were not more than 10 trained analysts in the country. Few of those that complete their master's overseas come back. They need to be trained here. "J" felt a need for at least 30 who were trained at the master's level. "J" immediately changed the number to 6 or 10.

"J" thought that only 1 year for the American master's was short, but "J" was satisfied with the length, when "J" realized that one would need to add 1 year to the Mudende program before beginning the master's. "J" thought that the program needed to be open to other people who had done a master's in economics, math, science, etc. Also, something special would need to be done for those who had studied at Saint Fidele as they had done a 2-year Bachelor of Arts. The number of students would increase, he suggested, if it was oriented toward an Master's of Business Administration with an emphasis in computer science.

"P" thought that the master's should be a software engineering degree. The graduate needs to be able to do analysis and to be able to lead a team. Anyone doing program development will need a person like this. In fact, "P" said, "I don't see how they can do development without a person like that." This person would need to be a self-starter and be able to understand problems succinctly, develop the appropriate concepts, and communicate this information to the group doing the programming.

"I" stressed the need for analysis on the master's level. Graduates need to be able to go to a business and do the analysis for them.

All of the interviewees saw the need for English in the computer science program. No one saw it as a problem if part of the master's program was taught in English. The level of English used in the course would have to be controlled until the students were able to fully understand.

**Night School**

"H" suggested that courses could start easily at 6 p.m., as work stops by 5:30 p.m. The curfew problem was studied. The major problem was transportation, as most taxis stopped running at about 8 p.m. (due to the curfew in effect in September 1993). "H" suggested that there would be taxi drivers who would, for a fixed fee, be willing to transport the students home. This could be added to the student's charge for the course. Thus, classes could go to 10 p.m. In fact, he thought that one could get a better price then, as they have nothing to do during the night.

**Other Computers**

Even though the IBM PC and its clones are the predominant computers in the country, other types can be found. The other major brand is the Apple Macintosh. It is expensive and difficult to repair, as Apple requires the return of the damaged board before a new one is sold. There are a few minicomputers in the country, probably under 10, and no large mainframe computers. The minicomputers tend to use the UNIX operating system.

**Journal**

"A," in answering the question, "Are there other things that we could do that would help our teaching?" suggested a computer science paper. This would be good for the students and at the same time would help the graduates stay abreast of what is happening in the computer science world. "H" said that what Rwanda is missing today is someone to be a coordinator, to provide information to the various computer science people.

**Work Study**

"A" was the main one to suggest that a special work study program be developed for the students at Mudende. "A" felt that it would benefit the students greatly. It would help them develop skills in handling situations where they had resistance to computer science.

**Attitude**

Several of the interviewees suggested that something should be done about the general attitude of the computer scientists. Two of the interviewees spoke at length about it. Admittedly, it is not something that can easily be taught, but should be discussed and the students should be informed about the problem.

"U," a graduate of the university, stated that the new computer science worker has to make changes slowly and must be able to communicate effectively. Computer scientists must be careful about the words they use to make sure that their listeners understand them. Otherwise, there will be trouble and the communication process could be completely cut. Normally, recent graduates will feel tensions on their job right from the beginning. "U" discovered that it was better to prepare a step-by-step recipe for use when explaining the use of a program to new program users. He noted that many do not like to work with the computer, and he had to help them accept the computer.

"P" had problems with people who were not self-starters. "P" felt that this was more important in a computer science job than in other jobs. The workers need to be able to make appropriate decisions and be willing to put them

into action. Many people who he sees do not have enough responsibility or understanding of concepts to do the required work. "P" says they need to be responsible. They need to be self-starters and to keep going. This is particularly important for the group leader. "P" also saw a lack of willingness to do the thinking necessary to be a leader. Many group leaders have trouble writing the necessary information on paper. "P" felt this was not a problem of writing, but rather one of reasoning and thinking. This probably comes from the African tribal situation and culture where one does not want to stand out, nor is one generally willing to take the responsibility for making the decisions.

### **Networking**

Networking is a growing industry in the country. "A" said that he knew of many networks in the country. When asked which kinds, "A" said the main ones he knew of were LANtastic. He was very emphatic when he said that it was important for the students to study networks. "U" thought the market was moving toward networks and the student needed to be ready for networks and to know how to do network programming.

"P" naturally thought of his mini when he thought of networks and that a student definitely would need to know the concepts of a multiuser environment. "C" thought of the IBM Token Ring network, which it was installing in many of the government offices.

"T" said that they were using DOS 5.0 with Ethernet and Novell 3.11. "T" supported the Novel network at MINIPLAN. "T" had a special network designed to tie Macintoshes together.

"H" saw many multi-post systems with a larger mini at the hub—a UNIX type network, although they did use Novell when the client requested it. "H" stated that people seemed to be moving from Token Ring to Novell type networks, but there seems to be very little Novell Lite in the country. "H" felt that one of the problems slowing down the acceptance of networks in the country was training. "H" felt what would be sold in the future was Novell and Novell Lite. "S" used LANtastic in a peer-to-peer configuration.

"I" thought that the students should be taught to use flock (he probably means flock), a function in Clipper so that the student could save data in a shared environment; they should be taught to program for a network environment.

### Summary

A sample of experts, on computers, or graduates, was selected and interviewed in semistructured interviews. The interviews were translated and transcribed. The data was analyzed using Text Alpha.

### Recommendations

The university should:

1. Consider the introduction of a computer science course including system or program analysis
2. See what it can do to help students develop right attitudes in handling computer resistance, and help students to be self-motivated
3. Continue to encourage the development of the computer market in Rwanda so that its graduates will always be able to find employment

4. Consider the introduction of a 2, 2, 1 system of tertiary education, similar to the National University at Butare (The first 2 years would be called a Bachelor of Arts, and the second would be a license, while the fifth year would be called a Master's. Thus, at the end the student would have the equivalent of a United States Master's degree. Care must be taken that those giving scholarships do not stop funding after the student has completed only the first 2 years.)
5. Study the possibility of starting a master's program in computer science, and if possible start one
6. Continue database training in dBASE
7. Strengthen its teaching of the third-generation language C++ and use this to teach data structures
8. Strengthen its Clipper training
9. Introduce an introductory course in COBOL (This should not be more than 2 to 4 weeks.)
10. Start publishing a computer science journal
11. Improve its teaching of networking
12. Before graduation require all computer science students to complete a programming project, complete with the analysis through to the documentation
13. Develop curricular materials on user interfaces
14. Develop a stage (work study) program.



## **The Semi-Structured Interview Video Analysis**

### Rationale

The complete written transcription of the interview does not express all the feelings of the interviewee. The tone of voice, the expression of face, and the body language cannot be used in the analysis process of the audio interview. Only what can be reduced to words can be analyzed in the audio interview. To capture the nonverbal information, the fourth methodology added the use of the video camera to the interview.

### Sample

Six individuals were taken from the general population using a criterion selection process, as listed in audio interview. The audio was transcribed and must also have been used in the audio interview. The people selected had to be willing to be interviewed and must also have electric current for the video recorder in their place of work. The following were videotaped: (for a description of the individual, see Audio Interview); "A," "F," "O," "S," "P," and "K."

### Time and Setting

The videotaping was done during the month of October 1992 in the participant's office or place of work in Kigali, Rwanda.

### Method Description

#### **The Instrument**

The same instrument was used as in the audio interview.

### **The Data Collection**

Six people in the audio interview were videotaped during their interview. The analysis of the audio part of the recorded interview was included in the audio interview. The video was viewed with the marked text from the Alpha Text program analyzed in the audio interview. Each of the items was marked with a plus if the nonverbal language reinforced the verbal argument, and with a minus if the nonverbal language detracted from the verbal statement. Notes were made on all of the nonverbal messages.

While viewing the tape, general themes were examined. Feelings of the interviewee were noted. All this information was examined for each person and a report was written.

### **Analysis**

Four of the six videotaped interviewees felt they had to ask their supervisor for permission to be taped. Only one was really comfortable with the video camera, and it was probably because of his relationship with the researcher on a professor-student basis. Two of the interviewees actually showed fear in their eyes when they looked at the camera. In fact, one never looked at the camera. He moved his head in such a manner as to avoid the camera. It appears that the lack of TV and cameras in Rwanda has not allowed the people to become accustomed to the video camera. One person actually refused. In fact, she refused the tape recorder also, even though she was a graduate and understood the video camera.

The videos were watched with an English script of the interview. Any positive or negative reinforcement of the interview was noted. The interviews were viewed several times, looking for themes and meanings. As the main point of the interview was to find ideas for improving the curriculum, those changes in curriculum that seemed important to the interviewee were noted.

### **"K"**

"K" of the PNUD spoke in a scholarly, thinking manner. He was very positive, particularly about the number of computers that would be in the country. The video recording was limited as the current was not functioning.

### **"U"**

"U" was videotaped during a rain storm. The picture was one of the best, but the audio required close attention to be understood. "U" was very relaxed and attentive. As he explained how he got his job, he seemed, at first, to be hunting for words. When asked about the number of computers, he became very quiet. His response was given while in deep thought. His answer to the follow-up question was very emphatic. He felt that most computers in Rwanda were used for word processing. By contrast, his answer to the spreadsheet question was indecisive. The database question brought a confident, relaxed smile. "Without a doubt, it is dBASE III+." He was very emphatic that it was dBASE.

When asked about job hunting, he said with a smile, "They were waiting for me. They had already contacted me." When asked about other graduates, his hand went to his head indicating he really did not know. The question about COBOL programming brought hesitation. He did not seem to want to answer the

question. He was very pensive when he started talking about the Continental Bank and being asked to modify their accounting program written in COBOL. He was smiling by the time he finished. He did say that students need only an introduction. A theme that was missed from the transcriptions was the basic place where COBOL was needed. There was an urgency in his voice as he described the need for COBOL in program maintenance.

The question on computer maintenance caused him to turn, look at his printer, and, with a smile, he talked of the printer repairs and the computer repairs that he had done. The course is important, but sufficient. He emphasized that soldering and desoldering and card repair were not needed.

He was relaxed and smiling when he talked of the programs he had written, indicating personal confidence in programming. When asked where curriculum might be improved, he thought for a long while. Then, with growing emphasis, he started discussing analysis, especially Merrice. At the time of the interview, the researcher had never heard of Merrice. Merrice is a French computer scientist who has proposed a complete program analysis system. The French have used it almost exclusively.

He had again relaxed, but was emphatic, when he said students need to complete the whole process of writing a program from the formal analysis right through to installation and documentation. "They need to understand the process." When asked if he had ever faced an authoritarian administrator in computer science, he smiled and was somewhat reticent with the question. He then relaxed when he discussed the problem of user resistance to computers.

When asked about a master's program and how many students should be in the program, he became quiet. It is possible that he was being polite. Later he seemed to warm to the idea of a local master's, and said that there are several individuals studying math and physics who would be interested. The price of over 1,000,000 FRw shocked him, but he began to accept it when he realized what it included. He was unsure and quiet with the mention of a master's from Andrews, but became much more excited when he heard that it might be taught in Kigali in a night-school setting. This reaction showed that he was personally interested in a master's program, but not sure of the price.

When he was given the tape recorder, because of the noise of the rain, he accepted it with a smile, indicating cooperation. He again lit up when he thought of a computer journal. He was excited when suggesting that the university publish a computer science quarterly. He was confident when he spoke of the program at Mudende as excellent. His final suggestions, that the general business courses need improving, were clear. When speaking of the Pascal programming language, his body language was clearly negative.

**"O"**

"O" was one of the last to graduate from Mudende. At the time of the interview, he was working at the Union Office. He was definitely afraid of the camera. In fact, he did not look at the interviewer the first part of the interview, as he would have to look at the camera. During the whole interview, he did not look once toward the camera.

At the time of the interview, he was employed as a secretary to the Union Executive Secretary, and as he explained his work, he was very sad. It was

obvious that he did not like the fact that he was not working in accounting, his major. He again was very sad when he talked of being transferred from the cashier's job. When asked about the relationship between his present work and his training, his eyes opened and he emphatically stated there was not any relationship.

When asked about the course changes that he would make if he had the chance, his mind was somewhere else. He asked that the question be repeated. Again this seemed to come from problems on the job. He complained about a lack of computer science for the accounting students. He also complained about a problem in his cooperation accounting class; they were to have some periods with an accounting package that had been written by the former Dean of the School of Business, but the package never worked while they were there.

One of the forceful things that came out of the interview was that he felt that the professor should spoon-feed everything to the student, that the student should not have to think. It should be noted that this student was barely able to complete graduation requirements.

When asked about the accounting courses that he had taken, he did not really want to answer. It was as if there was something he did not want to say. When he did say that they were acceptable, he did so in a very indecisive voice. His major complaint was about a professor who had done his work in psychology and could have taught management courses. He, however, agreed to teach a course in economics. The teacher lasted only 2 weeks before being replaced by the Minister of Planning. His face lit up with a large smile with the comment that the Minister could really teach.

**"A"**

Due to the lighting in "A"'s office, the videotape recording was very dark, making it hard to see his face. "A" worked at the Union Office in Kigali and was among the first three graduates of the computer science program. At the start of the interview, he showed fear of the camera, especially when he looked at it.

He responded in a forceful way when saying that computers were hard to buy. He was emphatic that they were expensive in Rwanda. By this, he meant that the computer market was not good. The video showed that he obviously did not know what a 386 computer was, although they were available in the United States of America 3 years before he had graduated. They would not have been available in Rwanda, however. "A"'s lack of understanding of the 386 accentuates the fact that some method of keeping graduates informed of the happenings in computer science is extremely important.

He said that not many people will buy computers because they lack knowledge on their use. He again showed fear when he talked of word processing. This seemed to be fear of the camera.

He very strongly recommended a course on operating systems. It was his idea to include UNIX. When asked about UNIX on minis, he was very unsure, as if he did not know what a minicomputer is. (A minicomputer is a medium-sized computer larger than a micro yet smaller than a mainframe. There are very few in Rwanda.) He emphasized the need for networks, stating that there are many, such as Soras and MINIPLAN, but was unsure when asked which kind, indicating a poor knowledge of networks. He was insecure again when he explained that he

had taken a course in LANtastic. In fact, he had to stop and try to remember the name of the network.

"A" spoke with assurance on the need of a master's degree to be given in Rwanda. It was his idea and he pushed it. When asked if there were many who had master's degrees in computer science in the country, he was emphatic in saying that there were none. There were at that time four to five Rwandais known to the researcher to have master's degrees in computer science, and only a couple could really do anything in computer science, so the statement is approximately, but not completely, true. He stated with indecision that the outside degree was preferred, but he obviously wanted a local one. It is possible that he sees the local one as the only way for him to get a master's degree.

He was very excited about the need for accounting graduates to know more about computers. He said that they could not even set up a simple accounting package. They needed to have enough information to be able to write the program description for an accounting package and to be able to install any program package they were given.

He was hunting for words when he started talking about Adventist accounting, but in the end strongly recommended dropping Adventist accounting and adding other courses. The system of accounting in Rwanda is different than that used in the United States. The Adventist accounting is a system that can function in both systems. Students get enough to function in general accounting. He put his hand on his head when talking of the necessity of reading English. He had bought books in English and thought that it was very important that the graduate know English. When asked about accounting, he relaxed with a "let it



go" attitude. He was excited when he talked about the possibility of having a master's class in English.

Other programming languages are not really necessary; but Clipper, "it is essential!!!!" (the exclamation points correspond to the nonverbal emphasis). He did not seem to understand the idea of data structures, such as linked lists (special programming structures) "COBOL is essential," he said with strength. He emphasized that he had taught himself COBOL because he knew dBASE and Clipper. In the end, he reemphasized the need of computer science for accounting students.

### **"S"**

During the first part of the interview, "S" was pensive. When the interview started, she smiled and began to remember her arrival in Rwanda. "S" showed surprise to find computers in Rwanda at all. When "S" was asked how many computers were in the country, she put her hand to her face and indicated no idea. During the whole interview there was not much change in attitude. Her main complaint was, interestingly, that Mudende graduates do not know enough about computer repairs. She said this almost in fear and then ended up laughing. She is the only one among those contacted who indicated a lack of knowledge about computer repairs. When asked if the persons who did not know about computer repairs were computer science graduates, she did not know, sighing as if not fully sure. But later she thought that maybe they were accounting graduates, although still not sure of herself.

She strongly advised using Quattro Pro as the spreadsheet package. She was unsure when she indicated that she had used Lotus 3.0 before coming to Rwanda. She was very emphatic when she mentioned hearing project people talk about dBASE. She thought it would be appropriate to teach dBASE as a programming language. She shook her head when she said she had never heard of anyone using COBOL. She had used Clipper.

She pointed to the translation department when indicating that most of their work was word processing. When speaking of accounting, she was tentative when she thought that there should be more Adventist accounting taught. (She was the only one that suggested it. Most suggested just the opposite.) She emphasized the idea of what is called a stage in Rwanda: a work study plan where students go and work in industries and get class credit for it. In her response, she said that there were not many stage positions at the Union in Kigali, and that students prefer not to work for the associations in the outlying towns. I have since learned that this is a real problem. When asked about general business courses, she seemed to want "to get off the hook." She was very noncommittal in her response.

### Summary

This method used the same principles as the audio interview except that a videotape was made. The videotape was viewed while reading a transcription of the interview. Notes were taken and an analysis written.

### Recommendations

The university should:

1. Increase the training and the use of computers in the country so that the demand for computers will increase
2. Teach some COBOL programming
3. Consider the removal of the Adventist Accounting course, especially for Computer Science students
4. Keep its computer maintenance class, strengthening where possible
5. Introduce some form of program analysis
6. Strengthen its Clipper programming class
7. Consider starting a journal in computer science
8. Consider starting a master's program
9. Consider increasing the number of computer science courses it offers in the accounting program as well as strengthening those it already offers
10. Strengthen its network training, shown by "A"'s lack of knowledge and the amount in the country
11. Strengthen the English courses given, maybe even going to a minimum exam requirement for graduation
12. Keep its dBASE programming courses and do what it can to strengthen them.

## **Informal Indigenous Contact**

### Rationale

The term extrinsic conjures up ideas of being out and unimportant. The data in this methodology is from the outside, but it is important. Hence neither extrinsic nor extraneous are appropriate terms. The data is extraneous, or something from outside; that is, the data comes from outside of the planned methodologies. The data does not always come from the sources as planned, particularly in qualitative studies. The researcher must be ready to collect data from any source, and then evaluate the data based on the source of the information. The informal indigenous contact was not deliberately planned, but was collected during the data-gathering processes of the other four methods.

### Sample

The question of sample does not exist for this type of data. The information collected does not represent a sample of the population. It is rather a subset of the population and cannot be generalized to the population.

### Time and Setting

The data was collected at the same time as the questionnaires, during the months of August and September of 1992 in both Kigali and Butari.

### Method Description

#### **The Instrument**

There was no planned instrument.

### **The Data Collection**

When the questionnaires were hand-delivered, the student was asked to get the name of the organization and any other information possible. The student was able to observe, in many cases, the way the computers were used, the type of computer scientists employed, the type of work the organization did, the programming languages used, etc. This information was gathered and was not from a fixed sample. There is no way that it can even be considered comparable. Furthermore, it was not complete for each of the organizations. Yet it did contain some very valuable information. This information is discussed in chapter 5.

### **Analysis**

The notes the student made while delivering and collecting the questionnaire were examined to see which languages or programs are used. Table 18 lists the programs with the number of companies using the language or program. The student then asked where the computer scientists were from. He found that seven graduates were from Saint Fidèle. This data is not necessarily replicable, thus it may not be comparable, but it is significant and can be used for recommendations. For example, the fact that 16 of the 71 companies or 22.5% were using COBOL is very significant, especially as the university was not teaching any COBOL at the time. Why were there so many from Saint Fidèle and none from Mudende listed? The response to the questionnaire indicated that six graduates were employed. It might be that they were trying to earn master's degrees.

TABLE 18  
SOFTWARE USED BY RESPONDENTS

Software Used	Number Used
COBOL	16
dBASE	26
Clipper	10
C	1
Pascal	2
Paradox	1
Lotus	26
WordPerfect	21
Word	1
Excell	1

At the time of the interviews, the university was arranging for the master's program in conjunction with a U.S. university. But, in discussion with the government (Ministry of Higher Education and Ministry of Planning), it was found that funding for such a program would not be available and that the Ministry of Higher Education preferred that the university implement its own master's program. Thus, it became obvious that the university would need to start its own master's program.

#### Recommendations

The university should:

1. Start a course in COBOL immediately (This need only be an introductory course, but it is obvious that there were a fair number of companies using COBOL.)
2. Maintain dBASE as its database management language
3. Continue using WordPerfect as its word processor
4. Use Quatro Pro as its spreadsheet, as it has a Lotus imitator
5. Develop an alumni association and a means of following its graduates (This should be able to provide the university some information as to its effectiveness.)
6. Study the possibility of starting its own master's program in computer science.

#### **Curriculum History of the Computer Science Degree**

The accounting section of the School of Business started with the opening of the university in 1984. At that time it was a 4-year program. In 1987, the

program was dropped to a 3-year program, since the high-school and primary-school program took 14 years. Since then, the National University had gone to a 2-year Bachelor of Arts and the primary-school and high-school program had been reduced to 12 years. Mudende, however, remained a 3-year program.

In 1987, with the arrival of Ron Vyhmeister, the computer science curriculum was designed and implemented. Its primary goal was to provide the business sector with individuals who could install and maintain programs. These persons would normally be responsible for the training of personnel as well as the maintenance of hardware. They would be responsible for simple programs only as it was felt that the major need of the country was for the computerization of the business community rather than the preparation of computer programs.

Eighty percent of the first-year class requested the new computer science program. This represented about 16 of the 20 students. Of these, only 4 graduated in 1990. The number had grown to 10 by 1991 and over 25 by 1993. There were well over 40 students preparing to graduate in 1994. Most of the students were capable of doing both the computer science and accounting options. If students failed one of the options, it was more likely that they would fail the other option if they were allowed to change. All of the computer science graduates of the 1990 class had job offers before graduation. This was also true for both the 1991 and 1992 classes. In 1993, all graduates who wanted employment had been employed within 1 month of graduation.

Many of the suggestions (see Table 19) were implemented as soon as the research was completed. The first to be implemented was the suggestion that each student complete a programming project themselves. This was



**TABLE 19****PROPOSED CHANGES TO AUCA COMPUTER SCIENCE CURRICULUM**

Class	Changes
GEAD150	Move the Introduction to Computers course to the first semester of the first year. Increase the amount of dBASE programming taught.
New	Add a formal course in Analysis for programming.
GEAD254	Modify the lab of GEAD254 Commercial Databases so that it would have two sections. The section for the accounting students would have dBASE programming and the section for the computer science students would have Clipper programming. This Clipper programming courses would provide the tools needed to complete the final programming project.
GEAD358	Change the third generation language taught to C++. The GEAD358 Advanced Programming will include the instruction in the use of program libraries that will allow the student to complete his programming project in C++.
New	Introduce a new course in advance data structures and algorithms to be taught in the third year first semester.
GEAD318	Operating Systems and Communication will be expanded to cover Novel NETWARE, windows, OS2, including an in-depth discussion of the operating system as well as programming principles and practices. This course will include record locking and other related problems of programming in a multiuser environment.
GEAD388	Advanced Commercial Computer Science will be changed to include 2 weeks of intensive COBOL. Along with the programming project in the lab the student will be introduced to the design of user interfaces.

implemented in the spring semester of 1993 in conjunction with the course GEAD388 Advanced Commercial Computer Science II. Each student was required to write program specifications, write and debug the program, and write the documentation for it. To ensure that the student attained a certain proficiency in programming, the programming project was required to have at least two related files. At first the students were fearful of the project. As the course was mostly a lab course with the professor present to help the students, the students soon learned that it was a very good learning situation.

Several students who completed the GEAD388 course were employed as programmers immediately after completing the course. Until the massacres of April 1994, they were doing very well as programmers. These were the first full-time programmers who had graduated from the Mudende curriculum.

With the encouragement gained from this single change, the staff of the computer science department designed a new curriculum. It was the intention of the department to fully implement these changes in the fall of 1994. Table 19 lists the proposed changes.

Furthermore, the department was in the process of proposing a master's program in Computer Science. It was also the intention of the GEAD388 class to require the writing of reading reports. The better reports were then to be included in a journal that could be sold at cost to the graduates of the computer science department and other interested parties in the country.

Throughout its history, the department has tried to be cognizant of the impact that its technological and educational innovations were having on the local Rwandan setting and culture. The department never had more than two full-time

expatriate staff members. This represented only 20% of the staff. The rest were of African extraction. These African staff members provided feedback as to the appropriateness of changes in the curriculum. The appropriateness of the curriculum was evident in that the computer science degree included many practical business and accounting courses. The fact that the graduates were often employed before graduation and generally no later than 1 month after graduation indicated that the schooling at Mudende was effective and appropriate. Changing culture and economic development necessitated the continual renewal of the curriculum.

### **The Selection of a Third-Generation Language**

Many of the data structures used in the writing of programs cannot be implemented using a fourth-generation language such as dBASE or Clipper, members of the xbase family. Such things as linked lists, B-trees, Stacks, Queues, etc., are best implemented in a third-generation language. Of the third-generation languages, the one that is used the most is C. C is a language that is difficult for many beginning students to learn. The use of a language such as C++ provides the student many advantages:

1. The student is using a language that is used to write most of the commercial programs.
2. The student generally needs learn only one third language. After graduation if the student is working in a UNIX environment, C, C++, or COBOL will be the programming language.

3. Most of the data structures are easier to implement in C and even easier in C++, due the way C uses pointers.

By combining a fourth-generation language such as Clipper, the student who has trouble with C++ can still program using Clipper. In fact the experience at Mudende indicated that C++ was only an instructional language. It was felt, however, that with the introduction of some programming tools more students would use C++ in their programming project. This would be especially true when the low-cost Turbo C++ was available to the student. The student could not only do the final project in C++, but also have a compiler with libraries that could be used after graduation.

### **Summary**

Five methodologies were chosen to complete a needs assessment. These were a questionnaire, a job analysis log, audio and video interviews, and an informal indigenous contact. For comparison purposes, each methodology was treated as an independent study. Chapter 5 uses the comparison of the results as one of two means of assessing the appropriateness of the methodologies. After analysis, the results were used to produce recommendations. There were many duplicate recommendations, but no conflicting recommendations. The 48 original recommendations were combined into 32 recommendations. From this a table was developed showing the source of each of the 32 recommendations. Using these 32 recommendations, proposals were made to modify the curriculum and a third-generation programming/instructional language was chosen.

## **CHAPTER V**

### **APPROPRIATENESS OF FIVE NEEDS-ASSESSMENT METHODOLOGIES IN A CENTRAL AFRICAN SETTING: A COMPARATIVE ANALYSIS**

Five needs-assessment methodologies were used in the evaluation of a computer science curriculum of the Adventist University in Central Africa. This chapter examines the appropriateness of these five methodologies for Fourth World Africa from two perspectives. First, each evaluation standard selected in chapter 2 was used as a basis for determining the appropriateness of each methodology. Second, the methodologies were compared based upon the type and number of recommendations each methodology produced in the curriculum assessment case study.

The assessment of the curriculum was conducted in Rwanda between May 21, 1991, and April 6, 1994. The investigation reflects the efforts and perspectives of a single researcher operating within the limitations of a single-site case study. Principles can be learned from this special case that may well apply to needs assessments in similar contexts.

As a basis for the assessment of each of the methodologies, the standard, as defined by the Joint Committee, is quoted, followed by a description of the standard including the Joint Committee's list of applicable pitfalls. Relevant literature is included where it provides a better understanding of the standard.

The description of the standard is followed by a list of questions providing a guide for the assessment of the appropriateness of the methodology's use in a Fourth World context. Each of the standards, where applicable, was examined and modified to consider the following:

1. The methodology's cultural impact—both the way the methodology impacted on the relationship between the researcher and the respondent, as well as the respondent's reaction to the methodology and its instrument
2. The methodology's effect of cross-culture communication—including affective communication and feedback, the small talk necessary at the beginning of each contact, and the need for a relationship to be developed between the researcher and respondent
3. The methodology's economic and political impact in a Fourth World setting with the problems and restrictions characteristic of a developing nation.

No formal attempt was made in the second section to analyze the discrete effects of culture, cross-culture communication, and economics. However, an examination of the number, type, and manner of implementation of the recommendations provided by each method in this study gave an indication of the method's effectiveness, efficiency, and appropriateness in a Fourth World setting.

### **Comparison Based on Selected Standards**

Comparisons are most useful when based upon a criterion. In chapter 2, a set of standards was derived from those developed by the Joint Committee on Standards for Educational Evaluation (Joint Committee, 1994). A rating of 1 to 3 was given each methodology for each of the selected standards (see Table 3).

The discussion of each of the standards is divided into three parts: definition and description of the standard, questions to facilitate the assessment, and the assessment of each methodology. The definition and description of the standard are based on the book *The Program Evaluation Standards* by the Joint Committee on Standards for Educational Evaluation (1994). The intent of this dissertation is to compare the appropriateness of the five data-gathering methodologies used in the needs assessment. It is not an evaluation of the complete needs-assessment process. Only those standards related to the appropriateness of the methodologies are used as a basis for comparison.

#### Standard 1: Evaluator Credibility

"The persons conducting the evaluation should be both trustworthy and competent to perform the evaluation, so that the evaluation findings achieve maximum credibility and acceptance." (Joint Standards, 1994, p. 31)

There are at least four areas of evaluator credibility that can be examined when assessing this standard. A researcher who is untrustworthy in one methodology will tend to be untrustworthy in other methodologies. A researcher lacking competence in research practice in general will tend to lack competence with all methodologies. Neither of these conditions would address the issue of the appropriateness of the methodology, but rather the appropriateness of the researcher.

The researcher's training, experience, and cultural background vary considerably. These variations will provide some researchers with advantages when completing one methodology while possibly hindering his/her implementation

of another methodology. When researchers feel a lack of competence in implementing the data collection and analysis phases of a methodology they have three possible options. They can seek the necessary skills through formal training or some other method. They can recommend the use of a competent consulting firm. Or they can select an alternative methodology with which they are more comfortable, while still providing the necessary information.

Methodologies vary in the skills needed for implementation. Certain settings and cultures may require a higher level of expertise for a given methodology than other settings. The level of skills needed is related to the ease and practicality of the methodology. The importance of the issues of ease and practicability are sufficient enough that they have been considered in a standard by themselves (Standard 3).

A respondent's view of the research project and the researcher can be influenced by the reactions and feelings gained while interacting with the data-collection process. The respondent's impression of the research project is influenced by culture, the design of the instrument, and the amount and type of human interaction. These impressions will also be projected on the organization for whom the needs assessment is being conducted. A well-designed, culturally sensitive needs assessment can be a very good public relations tool. Just the opposite is also true: a poorly designed, culturally insensitive needs assessment can harm the sponsoring organization's image.

The Joint Committee (1994) suggested common errors that can hinder the perception of the evaluator's credibility. Any methodology implemented in a given setting that causes the researcher to appear incompetent in the eyes of



the respondents will hinder the needs-assessment process. If any group of stakeholders views a method as being biased against them, it will prejudice their minds against the research, possibly hindering the implementation of the results of the needs assessment. Turning over the research to students can also lower the view of the researcher in the eyes of the respondents.

Lincoln and Guba (1989) considered the importance of credibility to parallel that of internal validity. The difference, they said, was that "the focus has moved to establishing the match between the constructed realities of respondents or stakeholders and those realities as represented by the evaluator and attributed to various stakeholders" (p. 237). They did not limit it just to the evaluator's credibility, but also included the whole of the evaluation. Patton (1982) considered the need for credibility of the evaluator to be of such value that he recommended that the evaluator should resign if credibility could not be established and maintained. Patton noted that changes in credibility occur. These changes either improve or diminish credibility as the evaluator faces new issues and new audiences (Patton, 1982, p. 86).

Does the methodology, as implemented in a given setting, improve the respondent's view of the researcher and the organization for whom the needs assessment is being completed? Would certain methods of collecting data be more difficult for a Fourth World evaluator to master, thereby weakening credibility and acceptance?

The questionnaire as implemented lacked the element of personal contact between researcher and respondent. Most of the questionnaires were delivered and collected by a student. This lack of contact impacted on three facets:

diminished respect on the part of the respondent toward the research project, some nonresponse, and some possible perceived bias due to the prestructured nature of the questionnaire.

In the notes collected by the student, several statements were made as to the respondent's perceived lack of importance of the questionnaire. A major airline manager, a European, stated that "it was not necessary for him to respond to the questionnaire because he did not know to whom it was addressed." He had received a letter explaining the reason for the questionnaire as well as who should complete the questionnaire. He did, in the end, complete the questionnaire. Two other European managers refused to complete the questionnaire, but when approached by the researcher they gladly accepted interviews and completed questionnaires. It is obvious that in the minds of these individuals, the student's social standing was not sufficient to warrant completing the questionnaire. The researcher's social standing did make a difference.

This lack of respect was most likely the cause of most of the nonresponse. The researcher was able to collect five questionnaires, which were originally part of the nonresponse. These were returned out of respect for the researcher. In Rwanda, first impressions are very important. The social standing of the person delivering the questionnaire may determine if the questionnaire will be completed. For some reason, the post office's social standing is very low. Issumaël Nzamutuma (personal communication, February 24, 1994) noted this when reporting the problems the Ministry of Higher Education had with a survey mailed to institutions of higher learning. Nzamutuma commented that he was highly

commended when returning the university's response. Their survey was the first to be returned even though it was very late. If the Minister had his assistant to deliver and collect them, they probably would have been completed while the assistant waited.

A survey of the notes of the student delivering the questionnaires showed that 14 were not completed due to a lack of interest either by the director or the director's secretary. It is possible that most of these 14 individuals would have completed questionnaires if the researcher had personally asked.

The questionnaire was given to as complete a population as the student was able to find. The student, when leaving and/or collecting a questionnaire, asked for other organizations known to be using computers. Using the complete population, rather than a sample, would help reduce bias toward any one group.

As implemented, the questionnaire did not provide for the respondent to give his or her view. Respondents were asked to rate the importance of subject material selected by the School of Business. Thus, some respondents may have felt a bias toward what the university wanted to teach. For the foregoing, reasons implementation of the questionnaire was rated poor in enhancing the evaluator's credibility.

The questionnaire was rated poor in enhancing the evaluator's credibility due to the lack of personal contact, the lack of a means for the respondent to make personal comments, and the prestructured nature of the questionnaire.

In the job analysis log, the logs were hand-delivered by the researcher, allowing for more contact between the respondents and the researcher. In spite of this contact, some respondents felt confused with the job analysis log. When

the researcher returned to collect the log, an explanation eased this confusion, but did not eliminate it completely. Although the job analysis log sample was fairly representative of the job market, it was not random. As it was a representative sample, it should not have biased the results toward any one area of the job market. The job analysis log appears to neither enhance nor tarnish the researcher's credibility. Hence it was rated good in credibility.

The audio and video interviews involved personal, sustained contact with the researcher. The respondents were active in the discussion. In most cases, they were excited about improving the curriculum at Mudende. The interview developed mutual respect. A small representative sample was used for the interviews. The sample consisted of persons who knew computer science in Rwanda, a group of "experts." One of the experts was a chief executive officer who had a large computer science department, but did not understand computer science himself. Every attempt was made to minimize bias toward any one group. The audio and video interview methods appeared to be excellent in enhancing the evaluator's credibility.

At first glance, the indigenous contact does not appear to enhance or detract from the researcher's credibility. The data at first appeared to be useless. After thoughtful analysis, the data became quite useful. The fact that the data was collected in a manner that was acceptable to the Rwandan culture strengthens the credibility of the researcher and provided a positive impact. The data was gathered in an unobtrusive manner. In addition to those who completed the questionnaire, the informal indigenous contact also included information about those who refused to complete the questionnaire. As such it should have less

bias toward any one group. The information provided by the informal indigenous contact was not consistent. It was not always possible to get the same type of information at each organization. The indigenous contact was rated good in maintaining the credibility of the researcher in the eyes of the respondents.

#### Standard 2: Information Scope and Selection

"Information collected should be broadly selected to address pertinent questions about the program and be responsive to the needs and interests of clients and other specified stakeholders." (Joint Committee, 1994, p. 37)

In their description of Standard 2, the Joint Committee (1994) describes the need for the information to be "relevant to decision makers' objectives, important to significant stakeholders, and sufficiently comprehensive to support a judgement of worth and merit" (p. 37). It needs to consider effectiveness, harmful side-effects, costs, responses to learner needs, meaningfulness of assumptions and values underlying the program, as well as feasibility. Once the data have been found, or the sources noted, the data need to be examined for appropriateness. Evaluators should strive to collect all relevant data. In some cases the cost is prohibitive and/or it is not feasible to collect. Most of the guidelines and common errors suggested by the Joint Committee apply to the overall evaluation and are not useful in comparing the relative appropriateness of methodologies.

There are two common errors of concern. The first is failing to give voice to the stakeholder groups in the process of selecting priority evaluation questions. The second is "collecting information because it is convenient rather than because it is necessary" (Joint Committee, 1994, p. 39). The Joint

Committee points out, in an example, that the data should include all points of view, effectively assessing the feelings of all groups and/or persons (p. 40).

Does the information answer the questions of the needs assessment?

Was the information relevant? Does the data represent the feelings and views of all interested parties? Have any groups or persons been missed? Did the methodology provide a fair amount of extraneous data?

The questionnaire in this implementation did not allow for any comments, but rather asked the respondent to rate the importance of several subjects taught at the university. Thus, the respondent had no way to suggest new courses or materials to be taught. If the interviews had been completed first, there would have been several areas added to the questionnaire. It might have been better if comments had been allowed, although they would have been difficult to analyze. Although a questionnaire format makes it difficult for respondents to give their full feelings and views, the format has advantages. In a well-designed questionnaire, all questions are relevant and very little extraneous data was provided. The fairly small nonresponse and the attempts made to have the full population resulted with virtually no group being missed. With a balance in advantages and disadvantages, the questionnaire was rated good in the scope of the information collected.

As the data collected on the job analysis log were limited to determining the types of skills needed on the job, they did not generate extraneous data nor did they answer all the questions of the needs assessment. A lack of efficiency tends to exist in most of the companies using computers in Rwanda. This is largely due to a lack of understanding of possible computer usages. If the worker

had better training and the company had better perceptions of potential computer applications, probably the job description would have been different. The information collected was relevant, showing what types of jobs were available. As this was a job analysis, no request was made for the feelings of the respondents. Most groups were included in the sample as it was fairly large, although it was not a random sample. The job analysis log did not effectively answer the needs-assessment questions nor did it provide the feelings of the respondents and it missed some groups. For these reasons it was rated poor in the scope of the information collected. It would not be preferred to use the job analysis log as the major data source for a needs assessment. As most of the logs were given to the workers through the chief administrator of the organization, it was difficult to provide gifts or money as a motivation to respond to the log. Furthermore, it is quite possible that had the respondents had been promised something if they responded each day that later they might have filled in days that they had missed.

The audio and video interviews were based on questions derived from those of the needs assessment, so they tended to answer the questions of the needs assessment. As the discussion was designed for the needs assessment, most of the information was relevant; however, there was extraneous data provided. This was in the form of small talk, at times far from the subject. The sample was small and representative, selected to reflect the population. While there may be groups that were missed, it does represent those that could provide the most useful information about the computer science curriculum. The interview format was open-ended, providing a chance for the respondents to express their feelings

and views freely. Although both methodologies provided a fair amount of extraneous data, the analysis process was designed to reduce the effect of extraneous data. The main weakness of both methodologies was the small sample size and the possible risk of missing useful groups or persons. Although there were problems unique to the video interview, they did not impact on the evaluator's credibility. The audio and video interview methodologies were rated good in the scope of the information provided.

The informal indigenous contact methodology provided a wealth of information. The information was spotty and incomplete and not always relevant to the needs assessment. The information was acquired from persons at the company while delivering and collecting the questionnaire. There was no control on the qualifications of the person responding. This information was collected from all companies, even those that did not complete the questionnaire. The fact that the data was not always complete means that some groups or persons would not be represented. As the data collected were only information concerning the nature of the company and their use of computers, no feelings or views of the company or those working at the company were collected. The informal indigenous contact was rated poor in the scope of the information obtained.

### Standard 3: Practical Procedures

"The evaluation procedures should be practical, to keep disruption to a minimum while needed information is obtained." (Joint Committee, 1994, p. 65)



Was the method clear and simple? Can it be completed with a reasonable amount of work? Would the method disrupt the work of an organization as little as possible? Were the procedures functional in a Fourth World culture?

In many respects the questionnaire was the easiest of the first four methodologies to complete. Other than the lack of human contact and communication, the questionnaire can be made culturally functional. Most energy must be expended in the design and analysis phase. To be functional, the questionnaire must be designed such that it can be understood by all segments of the population. The data showed that many of the members of the population used in this study did not understand computer terms, making it impossible to use the whole population. At the time of the designing of the questionnaire the lack of comprehension of computer terms on the part of the population was not fully understood. The next generation of the questionnaire should be worded in more generic terms. Rather than ask the respondents what types of skills they believe should be taught, ask them what type of work they do, and if they had the trained personnel, what they would like to be doing? Being excellent in practicality and poor in functionality gave the questionnaire an overall rating of good.

The job analysis log appeared quite simple to complete. All that was needed was a form that could be completed by people working in computer science. Having these persons fill in the needed information, in spite of the fact that the daily completion of the log disrupts the work minimally and should be fairly well understood in a Central African culture, was much more difficult to accomplish than expected. To be functional the methodology needs to provide

information in which the stakeholders can have confidence. The job analysis log tended not to provide recommendations that were implemented directly, but rather ones that needed further study before implementation. The fact that many respondents failed to complete the form or missed days further eroded the confidence in the inferences. The job analysis log was rated poor.

The audio and video interviews take a fair amount of time for both the interview and analysis. Both are extremely culturally sensitive, fairly easy to implement, and the discussion is enjoyed by members of the African culture. Both disrupt the work program, and depend on the interviewer's skills as to the type, nature, quantity, and quality of information provided. If these interviews had not disrupted the work program they would have been rated excellent. As a compromise, the audio and video interviews were rated good in practicality of implementation.

The informal indigenous contact was much more difficult to analyze due to the nature of the data collected. This is largely due to inconsistency in the information collected for each organization. It does not disrupt the workplace. In a Fourth World context it is efficient, being very culturally functional, especially if undertaken by someone with middle or lower social standing, such as a student. The informal indigenous contact was rated good.

#### Standard 4: Political Viability

"The evaluation should be planned and conducted with anticipation of the different positions of various interest groups, so that their cooperation may be obtained, and so that possible attempts by any of these groups to curtail evaluation operations or to bias or misapply the results can be averted or counteracted." (Joint Committee, 1994, p. 71)

The Joint Committee (1994) described an evaluation as politically viable "to the extent that their purposes can be achieved with fair and equitable acknowledgment of the pressures and actions applied by various interest groups with a stake in the evaluation" (p. 71). Evaluators must exercise care and give attention to the various power groups affected by the evaluation. It is quite possible for stakeholder groups to manipulate the evaluation such that it will not succeed or will be biased in favor of the group's agenda, which may be hidden. The manipulation of the evaluation may take place before the evaluator is aware of it. Thus, for a method to be politically viable, it must consider not only the politics of the country, but also the politics of the organization, of each of the respondents, and of the university.

Does the methodology reduce the political impact of the needs-assessment process? Will the information from the methodology be acceptable to all stakeholders? Does the methodology assess the feelings of each group of the stakeholders in a fair manner, thereby reducing the possibility of negative political impact?

The reactive political impact of the questionnaire was small. It is an accepted method that is being used in the Fourth World. It tended to have a low response rate. However, with the work of the student and a few visits by the researcher, the response rate was dropped to an acceptable rate. The information from the questionnaire is generally very acceptable to the stakeholders. Since an attempt was made to contact all businesses using computers, the contacts represented a fair sample for assessing the stakeholders. The questionnaire was rated excellent in political viability.

The job analysis log had more difficulty with the politics in the respondent's organization as it required more time that the employer must give. Usually it required the permission of the employer. The stakeholders would accept the results of the job analysis log. It represented the stakeholders and the population fairly. The job analysis log was rated good in political viability.

The audio interview made interviewees feel important because they were selected as individuals having valuable information. As interviewees were generally in administration or lead programmers, they were free to make the decisions as to when and where the interview should be held. Most of the interviewees were directors of their divisions or companies, being completely free to accept or reject the request for an interview. The results might be questioned on the grounds that the sample either was not large enough or biased. This was offset by the fact that the interview method is very acceptable in Rwanda, and the sample does represent the computer science experts in Rwanda. The audio interview was rated excellent in political viability.

In the video interview, several interviewees felt that before they could be video recorded they needed to have permission from their supervisor. There was something about the camera and the recording that caused concern. This is contrasted with only one person refusing the audio recording. This person refused due to fear of being quoted to employers. This person was selected to be among those video recorded, and the tape recorder refusal may have been encouraged by the refusal of the video recording. The inferences from the video interview is less likely to be accepted than the inferences from the audio interview, due to a lack of understanding of body language and the difficulty of

reducing body language to text. The acceptability of the video interview inference is further reduced by the lower number of video interviews than the audio interviews. The video interview was rated poor in political viability.

The indigenous contact collected information in a non-reactive manner, and hence had little political impact. All the known companies were represented. The way the information was collected is acceptable in Rwanda. Due to the facial features, the student gathering the data was known to be a Hutu. At the time of the data collection, being Hutu enabled him to gather information more freely in the Hutu dominated Rwandan society. (This may not be the case today. See chapter 6.) The indigenous contact was rated excellent in political viability.

#### Standard 5: Cost Effectiveness

"Evaluations should be designed to assist organizations to address and effectively serve the needs of the full range of targeted participants." (Joint Committee, 1994, p. 83)

Cost effectiveness is one of the hardest factors to determine. The decision to eliminate any one of the methodologies due to cost factors would be difficult, especially since the elimination of any of the methodologies in the original design would have eliminated some information and recommendations. The indigenous contact would have eliminated the least number of recommendations. The indigenous contact made one important recommendation to the new curriculum being developed. Dropping the indigenous contact seems to be cost effective as it would eliminate only one recommendation, but it was the deciding factor in starting a course in COBOL. The indigenous contact had the lowest collection cost.

There are two parts to the determination of the cost efficiency of a methodology. The first is the amount of time and/or cost that it takes to collect and analyze the data. Since time and most other expenditures can normally be reduced to a dollar figure, this is considered the cost factor. The fact that the researcher was already in Kigali to write the other chapters of the dissertation eliminated the lodging and travel expenses. Most of the other expenditures were basically negligible.

The following list ranks the methodologies from the least to the greatest amount of energy spent in developing the instrument and collecting and analyzing the data.

1. The indigenous contact:

- a. No extra time spent collecting as this was done while collecting questionnaires
- b. Minimal time analyzing the data

2. The questionnaire:

- a. The time necessary to develop the questionnaire, including the time necessary to pilot test the questionnaire
- b. The duplicating costs
- c. The student's time and travel expenses needed to leave the questionnaire
- d. The time and travel expenses needed to collect the questionnaires  
(This included many return trips, mostly done by a student.)
- e. A fair amount of time was needed for the analysis

3. The job analysis log:

- a. The log development and reproduction costs
- b. The time needed to leave the form and explain the procedure
- c. The time needed to collect the forms, including a small interview when possible (This included many return trips.)
- d. The time needed to analyze the data (This was the least for any of the methodologies.)

4. The audio interview:

- a. The time needed to get the appointments and set up the interview
- b. The time needed to interview the respondent
- c. The time needed to translate and transcribe the interviews
- d. The large amount of time needed to analyze transcribed responses

5. The video interview:

- a. The time needed to get the appointments and set up the interview
- b. The time needed to interview the respondent
- c. The time needed to translate and transcribe the interviews
- d. The large amount of time needed to analyze transcribed responses
- e. The time needed to analyze the body language.

It should be noted that this is only an informal ranking, with no relative cost factor established. To provide a cost factor, the number of hours would need to have been tabulated, and then converted into a dollar figure. Some may question the placing of the questionnaire in the rankings. In this study, the major cost was that of the students' time, which is quite inexpensive in the Rwandan setting. If the researcher had delivered and collected the questionnaires, the

cost would have increased nearly tenfold. One might argue that the only time needed to analyze the data for the video interview was the time needed for the analysis of the nonverbal language. However, one would not normally complete both a video interview and an audio interview, but rather an audio interview or an audio/video interview. This explains the time required to analyze the audio transcriptions.

The other factor in cost effectiveness, the value of the information collected, is also a subjective judgment. Its real value will not be known until all the changes in the curriculum have been implemented. For this reason, the value rating of the data must be based mostly on the feelings and judgments of the researcher. I believe that the productivity of the methodologies should be ranked in the descending order as follows:

1. The Audio Interview
2. The Video Interview
3. The Job Analysis Log
4. The Questionnaire
5. The Indigenous Contact

These are ordered based on the number of recommendations implemented.

The above list does not place a value on the information produced by each methodology. Both the value of the information and the dollar cost of obtaining the information must be known before the cost effectiveness can be calculated. To facilitate the process, the methodologies were ranked based on the researcher's experience in the needs-assessment process and the curriculum restructuring.



The most cost-effective methodology was the indigenous contact. It cost virtually nothing and provided a fair amount of information, that mainly triangulated the other results of other methodologies. It could not be considered an effective methodology by itself, as the information was extremely inconsistent and limited in scope. As a method of triangulation, the indigenous contact was rated excellent in cost effectiveness.

The next most cost-effective method would be the audio interview. The wealth of information, insights, feelings, relationships, and understandings far outweighs any extra expense. An added value, difficult to measure, was the improved relationship between the computer science department and the community. The audio interview was rated excellent in cost effectiveness.

The third most cost effective methodology was the questionnaire. It provided comfort in knowing what the whole population felt about the curriculum, while being very inexpensive. If the questionnaire had contained questions about the new subject areas proposed by the respondents of the interviews, the effectiveness of the questionnaire might have been improved. The questionnaire was rated excellent in cost effectiveness.

The video interview ranked fourth in cost effectiveness. The extra time to set up the video camera and to complete the analysis did not provide that much additional information. Furthermore, the knowledge that the respondents were fearful and may not have responded freely was believed to lower some of the value of the information obtained. The video interview, however, does provide a triangulation for the audio analysis. The video interview was rated good in cost effectiveness.

The least cost effective of the five methodologies in the eyes of the researcher was the job analysis log. It provided a means of triangulating the results of the other methodologies. It could be very cost effective in providing a true picture of the computer science job market in Rwanda if it were improved so that there were more comments, and given sufficient duration to portray the long-time picture. Even though it was, however, the least cost-effective methodology, the job analysis log was rated good in cost effectiveness.

#### Standard 6: Rights of Human Subjects

"Evaluation should be designed and conducted to respect and protect the rights and welfare of human subjects." (Joint Committee, 1994, p. 93)

The Joint Committee (1994) suggests that the researcher should do everything to understand the culture and social values of the respondents (p. 94). Informants are to be advised of what is wanted and how it is to be used. Procedures need to be established that guarantee confidentiality to the respondents. When a potential respondent refuses, the refusal should be accepted without coercion. This standard is concerned with the physical as well as the emotional aspects of the respondent. The five methodologies placed no respondent in physical danger at the time of the assessment.

The questionnaire clearly stated what was needed and how the information was to be used. Although it had a place for the name, it clearly stated that it was optional. The name was requested if the respondent was interested in having the university provide on-site training for his or her organization. No name information was saved in the computer, so it is impossible to determine the

individual responses. The organization was known, as the questionnaires were hand-delivered to the organization. This information was not used in the analysis. The nature of the information sought should not have been a problem in the Rwandan context. Sixteen of the respondents gave their names. Almost all gave the company for which they worked. Every attempt was made to have the questionnaire acceptable and understandable in the Rwandan context. The impact of culture on the questionnaire is examined in Standard 7. The questionnaire was rated excellent in respecting rights of human subjects.

The job analysis log did not have a place for the name of the respondent. In all cases the permission of both the employer and the employee were solicited before the respondent was given the log to complete. The cultural aspects of the log are discussed in Standard 7. The job analysis log was rated excellent in respecting the rights of human subjects.

The audio and video interviews were arranged with the individuals who were involved. A handle was created for each of the respondents to aid in the analysis. A description was made of each of the respondents. These were made so that no one could be identified. The audio tapes were not brought out in evacuation from Rwanda and were stolen during the looting that began in July 1994. The loss of the tapes was not a problem as it would be impossible to identify the respondent from the tapes. The researcher still has all copies of the video interviews. The one person who refused the video and audio interview allowed notes to be taken. No coercion of any form was used to get the former student to allow the taping of the interview. This individual expressed fear of the employers gaining knowledge of what was stated. This interview was very limited in its value due to the

restricted amount of information provided. Many of the video interviewees were apprehensive of the video camera. This was more an uncomfortableness of the camera than a fear of the information being used against him. None had been video-taped in the past. If there had been a real fear of the information of the interview being used against them, this would have been visible to the interviewer. During the interview, the interviewer did not note any fear on the part of the respondents. Not one of the interviewees showed fear to the interviewer. In fact the researcher was surprised to see the uncomfortableness on the tapes. Both the audio and video interviews rated good in the rights of human subjects.

The informal indigenous contact collected only information about companies. It did not note the name of the respondent. As such it would be difficult to violate the rights of the respondent. The respondent did not sense that he or she was responding to research questions. The type of information collected about the company would be considered public information. The information provided by the analysis did not include any companies' names, thus eliminating the possibility of identification. The informal indigenous contact rated excellent in the rights of human subjects.

#### Standard 7: Human Interactions

"Evaluators should respect human dignity and worth in their interactions with other persons associated with an evaluation, so that participants are not threatened or harmed." (Joint Committee, 1994, p. 99)

The standard of human interaction is concerned with the human dignity of all participants, making sure that no one feels jeopardized or injured in any of the aspects of human interaction used in the research project. In this analysis the

comfort of the respondents is also evaluated. As the respondent's comfort increases, so does the ability to respond appropriately to the questions. This comfort would include comfort in culture, human emotions, and communication, both verbal and nonverbal.

Four areas of human reaction were examined. How responsive was the study to the respondent's point of view? Did it cover the audience's understanding of the needs assessment's goals? How was the respondent's understanding of the instruments used? How does it show consideration of the methodologies' sensitivity to the respondent's culture?

The questionnaire allowed only structured responses, ranking the importance of preselected subject areas. It was obvious that the persons responding did not really balance their responses. It was true that some information was obtained by arranging the medians in order, but this was quite general. The questionnaire in the Central African setting was rated poor for its responsiveness.

The job analysis log was even less responsive. Yet it was probably better than the questionnaire as it was interested in collecting the type of work done over a longer period of time. In many ways the methodology should be rated "not applicable", as it only obtained the type of work being done. The job analysis log was rated not applicable.

The audio and video interview methods were very responsive to those who were interviewed. The interviewee was listened to and questions were asked for clarification. The human interaction was dependent on the interviewer. A good

interviewer will make sure that he/she understands and is understood. These methods were rated excellent.

The indigenous contact attempted to gather information that did not contain value judgements. This information included the number of computers, software, and programming languages used by the organization. In the context of Rwanda, the indigenous person is very sensitive to the respondent's point of view. In some cases the student collecting the data noted viewpoints expressed by those providing the information. Where it was applicable, the indigenous contact was excellent in its sensitivity to the respondent's point of view.

The second area of human interaction examines the respondents' understanding of the needs assessment's goals. In most of the methods, the respondent must understand the needs assessment's goals to give an effective response. In some cases the respondent asked, "Why should I give my time to help with the needs assessment?" In other cases the respondent needed to understand the goals before providing value judgments.

The questionnaire included a paragraph explaining the goals of the needs assessment. The main weakness was the possibility of the respondent to answer the questions without reading the directions. If this had happened, the respondent would have tended to incorrectly answer the questions, which would have been obvious by the responses. This does not seem to have been the case in the group of experts selected in the analysis of the questionnaire. The questionnaire was rated good in informing the respondent of the needs assessment's goals.

The job analysis log did not contain a written explanation of the needs assessment's goals. The goals of the needs assessment were verbally explained in detail with the verbal instructions on the use of the log. The goals of the needs assessment were the main motivational factors for the respondent to cooperate by completing the log. The log was rated good.

Both the audio and video interview did not begin until the respondent had provided feedback showing that he or she understood the goals of the needs assessment. This understanding was essential to the discussion. The interviewee was asked what needed to be the curriculum of the computer science department. The audio and video interview methodologies were rated excellent in their effectiveness to communicate the goals of the needs assessment.

The indigenous contact attempted to communicate the needs assessment to the persons contacted. The nature and type of contact was not always effective. In the case where the person answering the questions was hostile to the needs assessment and/or the university, the goals were not communicated. Under these circumstances information about the company was still collected. Most persons, under the right conditions, provided information about the organization for which they worked. The indigenous contact was rated as good in communicating the goals of the needs assessment.

The third area of consideration in human interaction was the audience's understanding of the instruments used. People who had never seen a questionnaire, especially one of the type used, tended to have difficulty responding effectively. The newness to the concept of the questionnaire created a situation in which the respondent felt a lack of comfort. This lack of comfort did limit the

respondent's ability to communicate his or her feelings. A lack of understanding of the terms used in the questionnaire also made it difficult for the respondent to answer effectively. Inadequately understanding the process of rating various areas limited the respondent's ability to make effective selections. The respondent's ability to complete the questionnaire may have been improved if a sheet explaining the terms had been included. This would have raised the cost, with doubtful benefits. Repetitive use of the questionnaire during several needs assessments should help the respondents become more adept at selecting and prioritizing items, as well as to become more familiar with the terms used. Due to a lack of understanding by the respondents, the questionnaire was rated poor. The lack of understanding of the questionnaire on the part of the respondents somewhat limited the effectiveness of the questionnaire, not its ease of use or political viability. Thus it is still a practical methodology in a Fourth World setting.

While the simplicity of completing the job analysis log should not have had an impact, there were problems getting comments. It was unsure whether this was a lack of understanding or a motivational problem. Naturally, not all understood the terms on the forms. A lack of understanding would normally be associated with a lack of need to use the skill for a particular job. The lack of response and the lack of comments were attributed to a lack of understanding of the instrument, causing this method to be rated poor.

The audio and video interview methods were the best understood in the African setting. The African understands and enjoys talking and discussing a subject. This seems to be a human trait of the world population. Allowing people



to express their judgments and showing appreciation for their views encourages people to respond to the needs assessment. The audio and video interviews were rated excellent.

The indigenous contact did not require that the respondent know and understand the methodology for it to be effective. The person was being asked questions in an unobtrusive manner, typical of the local culture. For this reason the indigenous contact was rated not applicable.

Insensitivity to culture, especially in Central Africa, greatly limits the collection of data. Methods will naturally vary in their effectiveness, depending on the cultures in which they are used. The evaluations were based on the culture found in a Fourth World country (Rwanda in Central Africa).

In the Rwandan context the respondent needs time in an introductory, relationship-building level of conversation before responding at the affective level of communication. There are areas that the respondent is fearful to reveal without first experiencing human interaction. Had the questionnaire not been hand-delivered, few, if any, would have been returned. The respondents tended to be unfamiliar with ratings and multiple-choice tests. In Rwanda most examinations use the essay method, so, the use of a form with preselected, structured responses was new and probably uncomfortable. In the Rwandan culture the questionnaire was rated poor in its culture sensitivity. The lack of cultural sensitivity does not limit the ease of use or the political viability of the questionnaire.

The job analysis log lacks the personal touch. It was usually hand-delivered, with the researcher explaining what was needed. This tended to provide the

necessary human interaction. The respondents felt that they were completing the log for the researcher. The job analysis log required comments and checks on what skills were used during the day. The comments would have been similar to the responses on examinations taken in school. The checks required little judgment, making it more culturally sensitive than the questionnaire. The job analysis log was rated good.

The audio interview method provided the opportunity for the researcher to establish the necessary relationship for communication to begin. It did not limit the modes of communication, allowing the interviewee to respond at his/her own rate and in his/her own manner. The cultural sensitivity of this method was enhanced with an interviewer accustomed to the local culture and a person who was culturally sensitive to the local cultural constraints. The interview method allowed the interviewer to vary the formulation of the questions making the interview more culturally sensitive to the interviewee's personal culture. This was particularly helpful in the diverse culture found in Central Africa. The audio interview method, using what the Rwandan culture enjoys doing—discussing topics—was rated excellent in cultural sensitivity.

The video interview method has the same advantages as the audio interview method, with one added advantage and one added disadvantage. During the analysis phase, the video recording allowed the researcher the possibility of reliving the interview. Fear of the camera, in a society not familiar with its use, can occur in the interview. At times fear was only visible by observing the body language on the video tape. The attitude toward the interviewer was different. Fear limited the respondents' ability to freely express their feelings. The

disadvantage of fear made a method normally excellent in cultural sensitivity, poor in cultural sensitivity.

Knowledge of the local culture provided a basis for the development of the indigenous contact method. This method used communication practices from the local culture. It was completed by an indigenous person in an unobtrusive manner carrying on everyday conversation, normal for the culture. The indigenous contact was rated as excellent in cultural sensitivity.

Overall the questionnaire received a rating of poor while the job analysis log and video interview were rated good in human interaction. The audio interview and indigenous contact both were rated excellent in human interaction.

#### Standard 8: Valid Information

"The information gathering procedures should be chosen or developed and then implemented so that they will assure that the interpretation arrived at is valid for the intended use." (Joint Committee, 1994, p. 145)

The soundness or trustworthiness of the inference and hence the decisions are the primary concern of validity. In a needs assessment, if the data does not provide information that is of value for the making of decisions in a needs assessment, it is worthless. For this reason, Howe and Eisenhart (1990) were more concerned with the value of the information provided by the research. Their definition of value would include its trustworthiness and soundness as well as usefulness in making decisions. The value of the inference can be determined by comparing the inference with the goals and objectives of the needs assessment. The better fit (appropriateness) and/or the congruence, the more valuable the

inference. When examining a methodology for validity, the researcher needs to examine the trustworthiness, soundness, and the value of inferences.

The Joint Committee (1994) lists several conditions that need to be fulfilled for the determination of the overall validity of the evaluation:

- a detailed description of the constructs and behaviors about which information will be acquired;
- an analysis of what type of information a particular data collection procedure purports to acquire;
- a detailed description of how the procedure was implemented, how responses and observations were judged or scored, and how interpretations were made;
- a presentation of evidence—both qualitative and quantitative—that justifies the use of the particular procedure; and
- an overall assessment of the validity of the interpretation and use of the information provided by the procedure, with reference to the evaluation questions and processes. (p. 145)

The committee suggested that multiple methodologies allow for a greater assurance that all important variables are assessed. A program or process is usually multifaceted with many variables. One methodology will provide only one view of the object being evaluated. The use of multiple methodologies (triangulation) tends to provide multiple sources for the data. Multiple sources will tend to view the situation from different angles and thus provide a better understanding of the situation.

Trustworthiness would include the concept of truth-telling on the part of all respondents and participants. Truth-telling involves far more than just not telling a lie. It includes anything that would restrict the respondent from telling

the truth. These would include certain cultural values where interpersonal relationships are more important than the absolute truth. The way a question is asked, the amount of personal interaction, the amount of tensions in the data-collection setting, the respondent's past experiences, and the respondent's point of view, all influence a person's ability to be candid and to reveal information with as little personal coloration as possible. An example of personal coloration is the scene of an accident where there are usually as many different stories as there are witnesses. Many times the respondent does not have complete understanding of how he/she feels or what his/her real needs are. This information is in the blind area as shown in the Jahari Window (see chapter 1). All of these blind the individual to the truth. In all four cases the respondents feel that they are telling the truth. If response is colored, the respondents may not have knowledge of it. It might be argued that all responses are colored and the truth lies somewhere between the different responses. More points of view make it easier to determine the middle (truth).

Twelve out of 32 recommendations were provided by two or more of the methodologies, confirming the information provided by other methodologies. Only one recommendation was provided by all five methodologies. All methodologies triangulated at least three other methodologies. Triangulation involves two or more methodologies and is the concern of the overall research. As this section is rating each methodology on its individual performance of each of the standards, the question of triangulation is discussed later.

Does the methodology as implemented provide sound, trustworthy information and/or inference of value to the development of the university's

computer science curriculum? Do the respondents appear to be candid and willing to share the truth? What makes the information reliable? How does the methodology place the respondent at ease and aid him/her to be candid?

The original analysis produced a total of 46 recommendations. Many of these were similar, containing two or more recommendations from another methodology. A set of 32 unique recommendations was developed from the 47 original. All future reference to the number of recommendations refers to the 32 recommendations rather than the original 47. All of the 32 recommendations were congruent with the needs assessment's goals.

After the recommendations had been adapted for comparison purposes the questionnaire provided 13 recommendations, representing 27.6% of the total recommendations. The questionnaire was very effective at providing valuable information. All respondents were instructed that providing their name was optional. Many chose not to put their name on the questionnaire. Neither the person's nor the company's name was used in the analysis.

The fact that the sample for the questionnaire is the population makes the questionnaire's findings transferable. The internal validity was weakened by falsification, whether intentional or unintentional, on the part of the respondents, and their lack of understanding of computers. Misrepresentation in this situation would not necessarily be considered a serious offense. It would be a much greater faux pas to appear to upset the researcher by giving negative answers. The lack of understanding was removed by selecting a group of experts, but this did not, nor can it, remove the falsification. The validity of the inferences derived from the questionnaire were rated good.

The job analysis log provided 11 recommendations or 23.4% of the total. The log did not require the name of the person, although some people did provide their name. The analysis of the log did not use the name, thus protecting the respondents. The job analysis log provided an insight into the typical computer science job in Rwanda. While it is not what a computer science teacher would expect, it is in line with what the researcher was in the process of discovering by other means. The sample for the job analysis log was large, almost equal to 50% of the population. Although it was not random, its size improved its transference. The job analysis log's internal validity was fairly high. It did measure the time spent as intended. Its only problem was that at times the respondent failed to fill in the form. Allowance was made for this by taking the days with a response as a base and determining the percentage of time spent using each skill. The validity of the inferences derived from the job analysis log was rated excellent.

The 14 recommendations (43.8% of the total) provided by the audio interview were in some ways the most valuable in this needs assessment. Besides providing the most recommendations, the audio interview provided most of the new ideas for curriculum change. All the names of the respondents were modified so as to provide a handle during research. There is a tension between protection of the respondent and providing position information of the respondent. Information provided by the director of computer science for the government would be more valuable than that provided by a student. Labeling the position would identify the individual. In qualitative research, external validity is improved by carefully describing the process and the respondents. The setting,

the respondents, and the questions asked in both the audio and the video interviews were well described. This allowed for comparability. The audio interview's internal validity depends on the accessibility to future researchers of the interview questions, description of the respondents, and the transcription of the interviews. This information has been provided in as complete a form as possible. The validity of the inference derived from the audio interview method was rated good.

The video interview provided 11 recommendations or 23.4 percent of the total. The video interview also provided some new ideas for curriculum change, though not as much as the audio interview. The video interview's external and internal validity depends on the same factors as the audio interview method. The inferences derived from the video interview were rated good.

The informal indigenous contact methodology provided five recommendations or 10.6% of the total. While just over a third as many recommendations as the others, it still provided important information. Even though the names of the organization were collected with the data, the analysis did not make use of this information. No names of the persons providing the information were collected. The ad hoc data-collection methods reduced the external validity of the indigenous contact method. If the recommendations were based on a numerical analysis, this method would not be externally valid. (The sample for each of the numbers is not sufficient, nor is the data consistent.) On examining the data, the recommendations compared the types of programs and programming languages used. If similar data is collected in similar situations using the same analysis methods, the recommendations would be similar. The



indigenous contact used the same population as the questionnaire. One advantage of the informal indigenous contact was not having any nonresponse. All organizations contacted provided some information. Its weakness was that the information was not consistent. The validity of the inferences derived from informal indigenous contact were rated good.

#### Standard 9: Reliable Information

"The information gathering procedures should be chosen or developed and then implemented so that they will assure that the information obtained is sufficiently reliable for the intended use." (Joint Committee, 1994, p. 153)

Reliability refers to the degree of consistency of the data collected. There are several consistency factors. Kirk and Miller (1986) list three types of consistencies: quixotic, diachronic, synchronic. Quixotic consistency means attempting to realize some lofty or visionary idealistic situation that is not practical. Quixotic reliability appears to be very reliable but in educational research is quite often like fool's gold, not the real thing. It is like a jammed volt meter stuck at the same voltage measurement. Quixotic data tends to be repeatedly the same or very close to the same data. Diachronic comes from two Greek words dia and chronic. Dia refers to two parts and chronic refers to time. Diachronic consistency refers to consistency over time. It means that the methodology will provide similar results over an extended time frame. In our fast-changing world, diachronic consistency over a long time frame can be difficult to achieve. Synchronic consistency refers to consistencies occurring at the same time or in the same time period with different methodologies or local settings. Noise, suggested by the Joint Committee (1994), is a technical word for the

inconsistency that methodologies and instruments pick up because they are reading the effect of multiple variables. Many train stations in North India have myna birds living in them. To the bird watcher, studying the myna birds in the busy time period when the train is in the station, noise is not the aural noise drowning the bird's call, but the activity and bright colors that catch the bird watcher's attention detracting him from the task at hand, that of studying the myna birds. By careful attention to detail, it is possible to hear the myna's call and watch the myna's reaction to the activity in the station.

These four areas, quixotic, diachronic, synchronic, and noise, describe conditions that are of concern to the evaluation of reliability. Two, diachronic and synchronic, tend to describe reliability in a positive manner and two, quixotic and noise, in a negative manner. Like validity, reliability must consider the stakeholder's view and other alternative explanations. The expectation should be carefully defined so readers can determine if the expectation influenced the results. Only those items that can be attributed to systematic and explainable sources should be kept. The other, the unwanted variability that cannot be explained, should be rejected as noise. Common errors include (1) relying on published reliability reports; (2) assuming that the observations of the evaluator are not affected by his/her feelings and perspective; and (3) failing to consider all relevant material when developing conclusions (Joint Committee, 1994, pp. 153-154).

Other aspects of reliability include the researcher's philosophical and physical view, training, and the accessibility of the material and data to the researcher. Mead (1928) was a young woman trying to determine the

promiscuity of Samoan young women. Her research reported a high rate of promiscuity. Freeman, (1983) a mature male, adult father of children, attempted to confirm Mead's work at a later date. He found just the opposite: little promiscuity among the Samoan young women. The difference between the two was the fact that Mead was young and female, hence had access to the young female population, possibly a biased group, while Freeman had access to the young women's fathers and brothers, the more conservative group, but also possibly biased. The Samoan girls, among other things, wanted to feel free and their fathers wanted to believe their daughters to be proper young ladies. Who was right? When listing the source, both are correct. It is then up to the reader to assess the information (as cited in Kirk & Miller, 1986, pp. 45, 46).

Is the information provided by the method sufficiently reliable for its intended use? What was the random noise or error in the data? How much care must the researcher exercise to be sure that her perspective does not influence the results? Is the consistency of the information provided by the method quixotic, diachronic, and/or synchronic?

The questionnaire had the full population with the respondents ranking the importance of the subjects taught at the university. Thus, the recommendations are sufficiently reliable to rank the importance of the subjects. The data is inconsistent in the sense that it is bimodal or had the tendency to not answer or answer "very important". The impact of the noise, skewing toward "very important," was reduced in the analysis. A well-implemented questionnaire is not normally influenced by the researcher's bias. The spread of the distribution of the answers was not excessive, as the inferences are based on those who

understood computer science. The assessment of the diachronic consistency was impossible to assess in a single questionnaire. A comparison with a future questionnaire would permit an assessment of the diachronic consistency. The essay, or fill in the long blank, question is the preferred method of testing in Rwanda. The concept of multiple choice is new to many persons in Rwanda. Those who participated in this questionnaire should have a better understanding when completing the next questionnaire, as they will be more familiar with it. Had there been no major changes in Rwanda (see chapter 6) the computer science community should be more comfortable with a future needs-assessment questionnaire. In a Fourth World setting, great care must be taken in the design of the questionnaire. It might be better to have a full page explaining how to respond to the questionnaire. In a certain sense, the spread of responses is an indication of synchronic consistency. The tendency toward "very important" showed a certain amount of quixotic consistency in the questionnaire. The reliability of the inference based on the questionnaire was rated good.

The job analysis log was designed to describe the typical computer science job in Rwanda. It was not intended to be an in-depth description of the computer science job market. The design of the log reduces the possibility of the noise as well as the researcher's bias. The lack of time was a problem with the log. Had the log been completed over a longer time period, the diachronic constancy would have been improved. In the Rwanda job market, some tasks are seasonal, so it is probable some jobs were not defined appropriately. The reliability of the inference based on the job analysis log was rated good.

The goal of the audio and video interviews was to find ideas for improving the curriculum. As such, a small number of selected respondents is sufficient for the methodology. These respondents included government computer science employees, university graduates, and other persons holding important computer science positions. The use of base questions provided some similarity among the individual interviews. As with all interviews, there was a fair amount of noise—irrelevant information, small talk, and times when the respondent had gotten off the subject. The analysis reduced the noise. The analysis program tool, the base questions used in the interview, and a conscious effort to eliminate bias helped to reduce researcher bias. Quixotic consistency should not be a problem in interviews. One does not expect consistency in the responses of the respondents. The spread of responses is good in that it provides a possibility for more ideas for curriculum improvement. Most needs assessments should be an ongoing, repetitive process. When this is the case, the interview could be compared over a period of time, providing an indication of the diachronic consistency. In fact the interview should be the first of the methods implemented, thus, it could be validated by the other methods. The synchronic reliability tended to be high as there was very little disagreement among the respondents. The disagreement was limited to whether COBOL should be taught, if and how a master's program should be started, and other similar questions. The analysis of the video interview depends heavily on the researcher's understanding and judgment of the culture, and the body and tonal languages (nonverbal). The video interview allows the researcher to pick up nonverbal clues, both aural and nonaural. The researcher must reduce the nonverbal language to

verbal language. The reduction of the nonverbal language to language for verbal analysis is purely judgmental, and is open to researcher bias, misunderstandings, and/or a lack of experience. I have had 17 years of service in Third and Fourth World countries and felt that the amount of bias was minimal. In this study, the triangulation (see later in this chapter) showed a fair amount of synchronic consistency. The reliability of the inference based on the audio and video interviews was rated good.

The four inferences obtained from the informal indigenous contact are based on the weight of the internal evidence of the data. The fact that the same type of data was not collected from all organizations provided a fair amount of noise, reducing the possibility of a problem with quixotic consistency. As data was collected during a period of 1 month, it was not possible to determine the diachronic consistency. Information as to the types of work done by the organization would definitely have varied over a longer time frame. The type of work done by an organization was not used in the inferences. It is probable that the information used in the inferences would not vary much with time. This was mostly types of software used by the organization and the number of university graduates employed by the organization. Due to the nature of the implementation, synchronic consistency could not be determined. Again synchronic consistency is not a problem, as there were sufficient organizations using specific software packages to support the inferences. The lack of graduates was also noted by the other methodologies. The student, who served as the indigenous contact, was selected for his honesty and his "Rwandaness."

The reliability of the inference based on the informal indigenous contact was rated good.

#### Standard 10: Analysis of Quantitative Information

"Quantitative information in an evaluation should be appropriately and systematically analyzed so that evaluation questions are effectively answered." (Joint Committee, 1994, p. 165)

Only those methods that were appropriate to quantitative analysis are examined in standard 10. The audio and video interviews were analyzed using qualitative methods. Both were rated not applicable in this standard and were evaluated in standard 11. As the indigenous contact can be analyzed using both subjective and objective methods, it was evaluated in both standards 10 and 11.

The Joint Committee (1994) suggested that the analysis phase begin with a preliminary exploratory analysis. This preliminary analysis should provide an understanding of the data and ensure that the data are correct. The Joint Committee also suggested that it is best to conduct multiple analysis of the data, as is warranted. The report should contain descriptions of the weakness of the data (p. 165). The analysis should consider the practical significance of the size of the population and the replicability when drawing inferences. It is better to use simpler analytical methods and graphs, which tend to be more easily understood, rather than complex methods in evaluations (Joint Committee, p. 167). The committee warned against magic as it can weaken credibility.

Does the methodology need or require complex and difficult statistical analysis? Can the data, after simple treatment, be presented in the form of a

graph? Does the methodology facilitate the use of a sufficiently large sample to be transferable? Are the methods and analysis replicable?

Under normal circumstances the questionnaire uses simple statistical analysis, which can easily be displayed in a graph. For this questionnaire the analysis was much more complex. The high amount of questions not answered and the tendency to answer "very important" added difficulty to the analysis process. The data were finally displayed in a graph. As noted in the analysis section for the questionnaire in chapter 4, the tendency to rate everything as "very important" made it difficult to recommend the removal of any course. This was most likely a cultural problem that possibly could be overcome by design modifications to the questionnaire. This questionnaire used the whole known population. It was analyzed using a group of experts, the respondents who answered 15 or more of the computer science questions. Even though the selection reduced the size of the population of the questionnaire, it was still the known population of "experts." It represented the known population of organizations using computers that had someone responsible who understood computer science. The researcher has noted in his experience in Rwanda a need for qualified computer science persons in companies using computers. Due to the difficulty in analysis, the questionnaire was rated poor.

The job analysis log was relatively simple to analyze. All the figures reduced to a percentage that could easily be graphed. Large numbers do not pose an analysis problem. As a program had been written to complete analysis, the added burden of a larger sample would be the keying of the data. A larger sample would improve the accuracy of the results. The job analysis log is fairly



easy to replicate. The data provided useful information for the needs assessment. The job analysis log could easily be replicated. The job analysis log was rated good in the analysis of quantitative information.

The informal indigenous contact used the whole known population and was fairly easy to accomplish with the whole population. It would be difficult to replicate as the possibility of meeting the same persons would be low. The information collected and used in the needs assessment should provide similar results. The inconsistency of the data made analysis difficult. For all practical purposes, statistical analysis was impossible. The job analysis log was rated poor in the analysis of quantitative information.

#### Standard 11: Analysis of Qualitative Information

"Qualitative information in an evaluation should be appropriately and systematically analyzed so that evaluation questions are effectively answered." (Joint Committee, 1994, p. 171)

As explained in standard 10, only those methods that can be analyzed using qualitative or subjective methods are evaluated in standard 11. For this reason, the questionnaire and job analysis log were rated not applicable. The Joint Committee defines qualitative analysis as

the process of compiling, analyzing, and interpreting qualitative information about a program that will answer particular questions about the program. The result is a narrative presentation, in which numbers are rarely assigned to any of the information. While qualitative data can sometimes be quantitatively as well as qualitatively analyzed, qualitative analysis may give depth and perspective to the data that quantitative analysis alone is not able to provide. (Joint Committee, 1994, p 171)

The evaluator must ensure the accuracy of findings by seeking confirmatory evidence. The evaluator must report weaknesses in the data and establish

meaningful categories. This type of work is best done with frequent communication with the stakeholders. As the data are collected, they need to be analyzed and allowed to reshape the questions and analytical process.

Common errors include the failure to consider other realities and multiple value perspectives, especially in a situation that has many cultural backgrounds. Another common error is failure to evaluate qualitative and quantitative information on such bases as credibility, degree of expertise, and degree of involvement.

Do the respondents represent a broad spectrum of the available population? Do weaknesses in the methodology weaken or impede the analysis of the data? Does the methodology allow for the establishment of meaningful and useful categories? Does the methodology allow for reshaping of the questions and the analytical process? Does the methodology allow for viewing reality from several different angles? Does the methodology allow the researcher to examine the data for such things as credibility, degree of expertise, and degree of involvement?

The audio interview respondents represented all the computer experts in Rwanda. The major weakness in the method is the number of interviews completed. Time limitations will always restrict the number of respondents. Categories were established based on the courses taught at the university. New subject materials were added as new categories. As the categories were developed, new questions were added to the starting questions for the interview, reshaping the methodology. If the interviews were completed first, the information found in the interview could be used to shape the questionnaire. The

nature of an open-ended interview allows the interviewee to detail his or her view of the computer science community. This way the researcher will see reality from the eyes of each of the interviewees. An ethnographic computer program, Alpha, suggested by Tesch (1990), was used for the analysis. The use of such a tool allowed the researcher to place value on the information from persons with expertise, credibility, and a high degree of involvement. The audio interview was rated excellent in the analysis of qualitative information.

Many of the video interview qualities are the same for the audio interview. The major difference in the analysis phase was the difficulty in reducing the body language and voice intonations to words. For this reason, it is much better if the analysis is done some time after the interview. This time-distancing allows the researcher to see and hear things that might have been missed in a time frame closer to the interview. Many nonverbal messages can be culturally based, making the analysis more difficult for someone from outside the culture. The researcher doing the analysis should be fluent in the nonverbals of all subcultures involved in the needs assessment. The researcher also needs to be fluent in all languages used in the interview. It would be even better if the researcher were fluent in all languages used in the region of the needs assessment. In many cases in the Fourth World, the number of languages makes this either impossible and/or impractical. The video interview adds another dimension to credibility that the audio does not provide. During the analysis phase the researcher can examine the nonverbals for the forthrightness and committedness of the respondent in the interview. The results of the analysis can help reshape future interviews if the analysis is completed before further interviews are undertaken. Because of

the greater difficulty of the analysis, the video interview is rated good in the analysis of qualitative information.

The informal indigenous contact used all of the known population. As the people answering the questions did not have the same qualifications or positions, the information gained from the companies was not always the same. The type of data did not need categories for the analysis. The information obviously was divided into programming languages, programs used, types of computers used, and types of computer scientists employed by the organization. One of the weaknesses of this method is that it did not allow for major changes during the implementation phase. The types of questions asked can be changed only marginally during the data-collection process. As this was done by a student who was some 90 miles from the university, there was little chance for modifying the questions. The methodology did not allow the viewing of reality from different angles. While asking questions, it would be difficult to ascertain the computer science expertise of the respondent in an office. For this reason, the data is difficult to evaluate for credibility, degree of expertise, and degree of involvement. The inferences are based on the comparison of the relative number of programs and programming languages used by the organizations. These inferences were triangulated by other methodologies. The unique recommendation was based on the lack of reported graduates. It seemed that more graduates should have been reported. Where are these graduates? An alumni association would know. Hence, the recommendation for an alumni association. The informal indigenous contact method was rated good in analysis of qualitative information.

## Standard 12: Justified Conclusions

"The conclusions reached in an evaluation should be explicitly justified, so that the stakeholders can assess them." (Joint Committee, 1994, p. 177)

The Joint Committee (1994) states "the conclusions of an evaluation, which represent judgments and recommendations, must be defensible and defended" (p. 177). The conclusions must answer the audience's questions while being limited to conclusions on the current situations, time periods, persons, and purposes of the needs assessment. They suggested that it is wise to solicit feedback from a variety of stakeholders and program participants to improve the credibility of the interpretations, explanations, conclusions, and recommendations of the needs assessment. A possible error is ignoring the side effects of the evaluation.

The standard can have two objectives. First, one of the main goals of evaluation and needs assessment is to provide information for sound decisions, including information on the justification of the inference. Such information and/or inferences should motivate the stakeholders into action. Second, the concern of the Joint Committee (1994) in this standard is that the inferences are sufficiently justified (accuracy) so that actions taken by the stakeholders will be appropriate without side effects.

To be sure that the evaluation meets these two objectives the Joint Committee (1994) suggested the following: (1) a description of how the information was pertinent and answered the evaluation questions, (2) a description of how the information and/or inferences were based on sound

analysis and logic, and (3) where it is appropriate and possible, a description of plausible alternatives with the reasons for rejection.

A guide to whether the information provided by a methodology was pertinent and appropriately justified might be if the stakeholders implemented the inferences and/or recommendations. The methodologies were divided into three types of recommendations: consider, improve, and new. The new type of recommendations provided the stakeholders with recommendations that tended to be implemented (see Table 20). The "consider" recommendations all needed further study before implementation. The "improve" recommendations were mixed, with the majority needing further study before implementation.

Does the methodology provide pertinent information that can be acted upon (recommendations that were implemented)? Are the inferences sufficiently justified to provide appropriate direction for curricular decisions (new type of recommendations)? Does the methodology offer plausible alternatives?

All methodologies provide information pertinent to the needs assessment. It is shown below that if any one methodology had not been completed, information would have been lost. Pertinent information is defined in the assessment of this Standard as information that has already been implemented or is being implemented and does not need further action.

Out of a total of 13 recommendations provided by the questionnaire most were of the "consider" (4) or "improve" (8) type. The low number of "new" type recommendations was due to a lack of information that can be acted on and the nature of the data. The respondents tended either to not answer at all or to answer "very important." Of the 13 recommendations, 2 were implemented

TABLE 20

## RECOMMENDATIONS OF ALL THE METHODOLOGIES

Methodology No.	1	2	3	4	5	H
1. The university should continue the current business administration training with its computer science program.	C	C		C		S
2. Improve PR between the university and the business community, including providing information on the curriculum.	I					U
3. Facilitate increasing the number of computers in the country.	I	I	I			S
4. Investigate the possibility of night school in Kigali.	C					S
5. In future needs assessments encourage respondents to balance their responses.	I					S
6. Continue and improve the computer repair course.		I		I		S
7. Help students understand Stock programs.		N				U
8. Continue and improve dBASE programming courses.	I	I	I	I	I	S
9. Help students understand how to make special reports.		N				U
10. Make sure that the basic computer needs are met: word processing, spreadsheets, etc.	I	I			I	S
11. Study the general introduction to programming languages.		C				S
12. Teach some COBOL.		N	N	N	N	U
13. Teach systems analysis.			N			U
14. Help students develop right attitudes.			N			U
15. Consider a 2-2-1 years degree.			C			S
16. Introduce C++ and data structures.			N			U

Table 20-Continued.

17. Publish a computer science journal.			N	N		U
18. Improve the networking course.			N	N		U
19. Require a programming project before graduating.			N			U
20. Develop materials for training students in the proper user interface construction.			N			U
21. Study implementing a master's program.			C	C		S
22. Increase the number of computer science courses offered.				N		U
23. Strengthen the English courses.				I		S
24. Start an alumni association.					N	S
25. Drop Adventist Accounting.	N			N		S
26. Consider dropping the course in banking systems.	C					S
27. Consider dropping the law courses.	C					S
28. Be sure the level of instruction for the course in introduction to computer science is appropriate.	I	I				S
29. Insist on a high level of accounting ability.	I					U
30. Implement a stage (Work Study) program.			N			S
31. Improve the clipper course.		I	I	I		S
32. Be sure that the level of instruction for the personnel course is appropriate.	I					U

**Note.** The recommendations of all the methodologies. N = New Areas; C = Consider; I = Improve. The column labeled H shows how the recommendation was implemented as of April 1994; S = Studying; U = Implemented or Implementing.



immediately. Nine out of 10 recommendations needing further study before implementation indicates a lack of pertinent information. The questionnaire does not offer any plausible alternatives. The questionnaire was rated poor in justifiable conclusions.

The job analysis log provided 3 out of its 11 total recommendations that were new to the curriculum. The remaining 8 were mostly of the "improve" type (6). Out of 11, 3 were implemented immediately. While the job analysis log provided some inferences that could be implemented immediately, and hence were pertinent, it still provided more "study" type recommendations. Its recommendation on COBOL was an alternative. Based on the job analysis log recommendation alone, COBOL probably would not have been added to the curriculum. The job analysis log provided a ranking of the skills needed in the computer science job market. Those that appeared in the top of the ranking should be more important than those in the lower part. The lack of firm delineation of what was important caused many of the recommendations to be implemented as needing further study. The job analysis log was rated good in justifiable conclusions.

Of the 14 total recommendations for the audio interview, 9 were of the "new" type of recommendations and 7 were implemented immediately. The respondents discussed several alternatives and the reasons for using, or not using, the alternatives. Of all the methodologies, the audio interview had the most impact on the proposed curricular changes. The audio interview was rated as excellent in justifiable conclusions.

Five of the 10 recommendations provided by the video interview were of the "new" type. Four of these there were implemented. The video interview did not provide as many alternatives as the audio interview. The video interview was rated good in justifiable conclusions.

Two of the four recommendations provided by the informal indigenous contact were of the "new" type. While only one of the four was implemented immediately, it was the major factor in the decision to teach COBOL. It did not provide alternative possibilities. The informal indigenous contact was rated good in justifiable conclusions.

#### Summary Assessments of the Methodologies

Using Selected Standards, Table 21 details the results of all the methodologies. It shows the median for each method and each standard. It is interesting to note that the maximum variation of the medians among the methods was from 2.0 to 2.8. Most are near 2.1 or "good." This shows that each method was acceptable as a research method using the selected standards as an evaluation tool. The audio interview with 2.8 was the only method that could be rated excellent.

Each of the methods had weaknesses. No one method was assessed excellent for most of the standards. Figure 7 shows how the questionnaire and the audio interview complement each other. Figure 8 shows the mean of the two. The mean never falls lower than "good" in all standards; rather it falls between "good" and "excellent." For triangulation purposes, it is wise to use methods

TABLE 21  
AN ASSESSMENT OF THE METHODOLOGIES  
BASED ON SELECTED STANDARDS

Standards			Method					Median
			I. The Questionnaire	II. Job Analysis Log	III. The Audio Interview	IV. The Video Interview	V. The Indigenous Contact	
1	U2	Evaluator Credibility	1	2	3	3	2	2.5
2	U3	Information Scope and Selection	2	.	2	2	1	1.8
3	F1	Practical Procedures	2	1	2	2	2	2.0
4	F2	Political Viability	3	2	3	1	3	2.8
5	F3	Cost Effectiveness	3	2	3	2	3	2.8
6	P3	Rights of Human Subjects	3	3	3	2	3	3.0
7	P4	Human Interactions	1	2	3	2	3	2.5
8	A5	Valid Information	2	3	2	2	2	2.2
9	A6	Reliable Information	3	3	2	2	2	2.5
10	A8	Analysis of Quantitative Information	1	2	N	N	1	1.5
11	A9	Analysis of Qualitative Information	N	N	3	2	2	2.5
12	A10	Justified Conclusions	1	2	3	2	2	2.2
Median			2.0	2.2	2.8	2.1	2.3	

Note. N = Not Applicable; 1 = Poor; 2 = Good; 3 = Excellent.

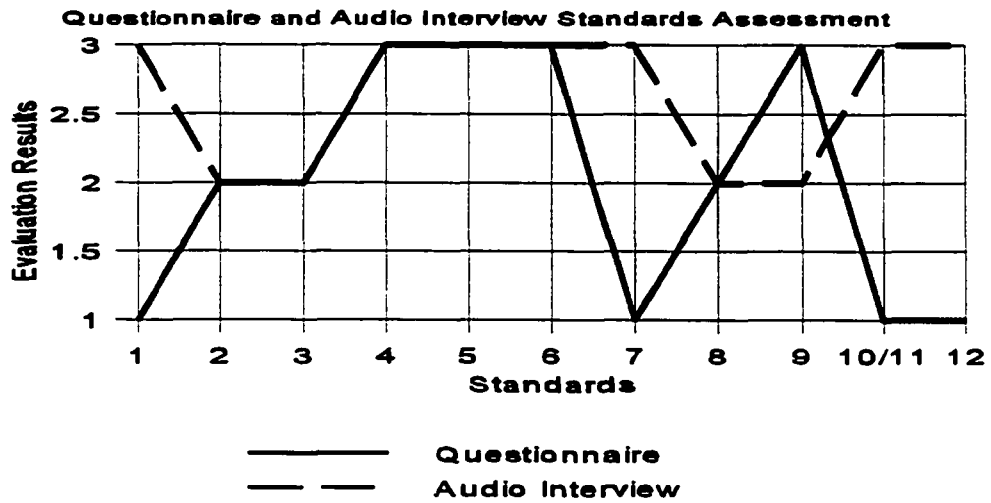


Figure 7. The evaluation results of the selected standards for the questionnaire and the audio interview. (Evaluation Results: 1 = Poor, 2 = Good, 3 = Excellent)

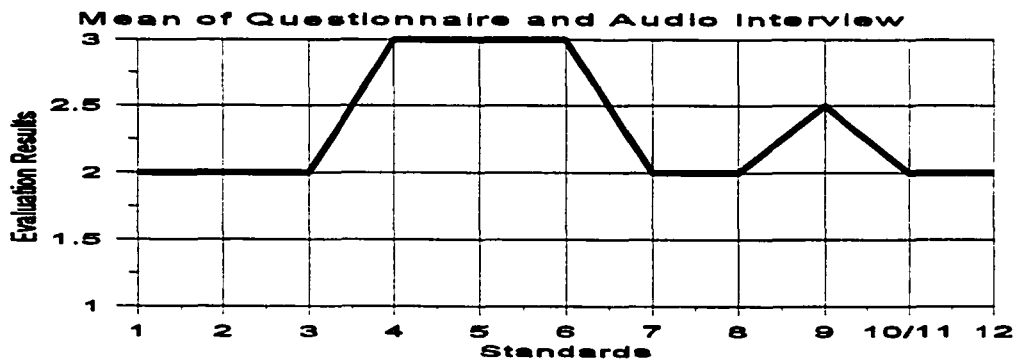


Figure 8. The mean of the results of the questionnaire and the audio interview, demonstrating how the two complement each other. (Evaluation Results: 1 = Poor, 2 = Good, 3 = Excellent)

that have strengths where the other methods have weaknesses, providing balance to the data collection.

Standard 10, the Analysis of the Quantitative Information, had a median of 1.5. It was the only standard that was considered 'poor'. Standard 10 was low due to the low rating of the indigenous contact and the questionnaire. These may be artificial. They were assigned to show that:

1. The indigenous contact can be evaluated from two different points of view. Its quantitative view is not as easily justified as its qualitative view.
2. The questionnaire had analysis problems in a diversified culture, mainly the bimodal response with the tendency to answer "very important."

All others were 1.8 or higher. If Standard 10 is not considered, the variation of the medians was 1.2. Eight of the remaining standards fall in the range of "good," three in "excellent," supporting the concept that there is greater strength in the diversity and triangulation of methodologies.

Marshall and Rossman (1989) in their book *Designing Qualitative Research* suggest mixing methodologies such that they complement each other's weakness with their strengths. They do this by showing the weaknesses and strengths in two different tables for qualitative methodologies (pp. 102-106). They do include the questionnaire, which could be considered a quantitative methodology in certain implementations. In their table of weaknesses, they use such things as pitfalls, cost effectiveness, and difficulty. These standards are not as rigorous as those by the Joint Committee (1994). Marshall and Rossman were concerned with research in general and not with evaluation or needs assessment in specifics. While a good needs assessment must be good research, it has the

added burden of motivating the stakeholders and/or administrators into action. This dissertation shows that by complementing the weaknesses of one methodology with the strength of another, the researcher obtains more convincing results—results, that the stakeholder and/or administrators will be more likely to implement.

### **A Comparison of the Methodologies Based on the Number and Type of Recommendations**

All of the recommendations from all of the methodologies were examined for commonness and uniqueness. Seven of the 47 original recommendations contained more than one recommendation, giving a total of 67. The duplicates were removed leaving 32 recommendations (Table 20). Only one recommendation was provided by all of the methodologies. Twenty recommendations were uniquely provided by one and only one of the methodologies. Twelve recommendations were found by more than one of the methodologies.

An attempt was made to better understand the recommendations and their value to the needs assessment. The recommendations were categorized two ways, the classification of the type of recommendations and how the recommendations were implemented. Three categories were selected for the type of recommendations. Recommendations suggesting that changes be considered were placed in the first category for the following reasons; (1) the nature of the information found, (2) the lack of strong supporting evidence, or (3) its interaction in the political climate in the School of Business at the university. The second category contained those recommendations that suggested instruction in subject areas currently being taught should be maintained or

improved. These recommendations did not specify exactly how the course should be improved and would need study before implementation. The third category included recommendations for new subjects to be added to the curriculum, or in one case a subject be dropped. Codes C (consider), I (improve), or N (new area) were placed in columns 1-5 in Table 20 for those methodologies providing the recommendations.

Two categories were also developed for the implementation of the recommendations. The studying (S) category included all recommendations that could not be implemented immediately. The implemented (U) category included all recommendations that were either implemented or in the process of being implemented in the curriculum. A S (studying) or U (implemented) was placed in the column labeled H (how implemented).

Table 22 shows the recommendations provided by each methodology. The number of recommendations ranged from four, for the informal indigenous contact, to fourteen for the audio interview. The mean was 10.6. All but one of the methodology, the informal indigenous contact, were greater than the mean. One might suggest that the informal indigenous contact could be eliminated since it provided only four recommendations, just over a third of the mean. In fact, the mean would have been 12.25 if the informal indigenous contact had been eliminated. Table 22 also includes the percentage of the number of recommendations each methodology provided. The highest percentage that any one methodology provided was 43.8%. This is less than half of the information provided by the sum of the five methodologies. If the audio interview, the most productive of the five methodologies, was used by itself, 56% of the information

**TABLE 22**  
**NUMBER OF RECOMMENDATIONS**

Categories	Questionnaire	Job Analysis Log	Audio Interview	Video Interview	Informal Indigenous Contact	Number Of Recommendations
<b>Number of Recommendations</b>						
Total	13	11	14	11	4	32
Triangulated	6	8	7	9	3	12
Unique	7	3	7	2	1	20
<b>Type of Recommendations</b>						
Consider (C)	4	2	2	2	0	7
Improve (I)	8	6	3	4	2	11
New (N)	1	3	9	5	2	14
<b>Categories of Implementation</b>						
Studying (S)	10	8	6	7	3	18
Implemented (U)	3	3	8	4	1	14
<b>Total Number</b>						
Percentage of Total	13 40.6%	11 34.4%	14 43.8%	11 34.4	4 12.5%	32 100%



would have been lost. The amount of lost information increases when any of the other four methodologies are used by themselves, demonstrating the need to use multiple methodologies with different paradigms.

The main reason for this divergence is most likely because the curriculum was originally designed by the School of Business for a major in a business administration with a little computer science knowledge. When the curriculum was originally designed, no needs assessment was completed. In the intervening approximately 6 years, the number of computers has grown dramatically in Rwanda. With this growth in computers there has been a growth in the understanding of computers and a demand for trained computer scientists. This growth of computers and the problem with the curriculum for computer science is typical of most of the countries of Central Africa. In fact, there are several universities teaching computer science in Equatorial Africa that do not have computers for student use. Only theory was taught at many Central African universities. A graduate of one of these university came to AUCA in 1992-1993 and requested permission to use the AUCA computer lab to gain the computer experience that he had missed in his studies elsewhere.

Figure 9 shows the relationships between all recommendations, recommendations provided by more than one methodology, and recommendations provided by only one methodology. It seemed a bit strange to obtain 20 unique recommendations and only 12 triangulated recommendations. As mentioned above, if the questionnaire had been constructed after giving the interviews, there would have been less divergence. The two methodologies with the highest unique recommendations were the questionnaire and the audio interview. The

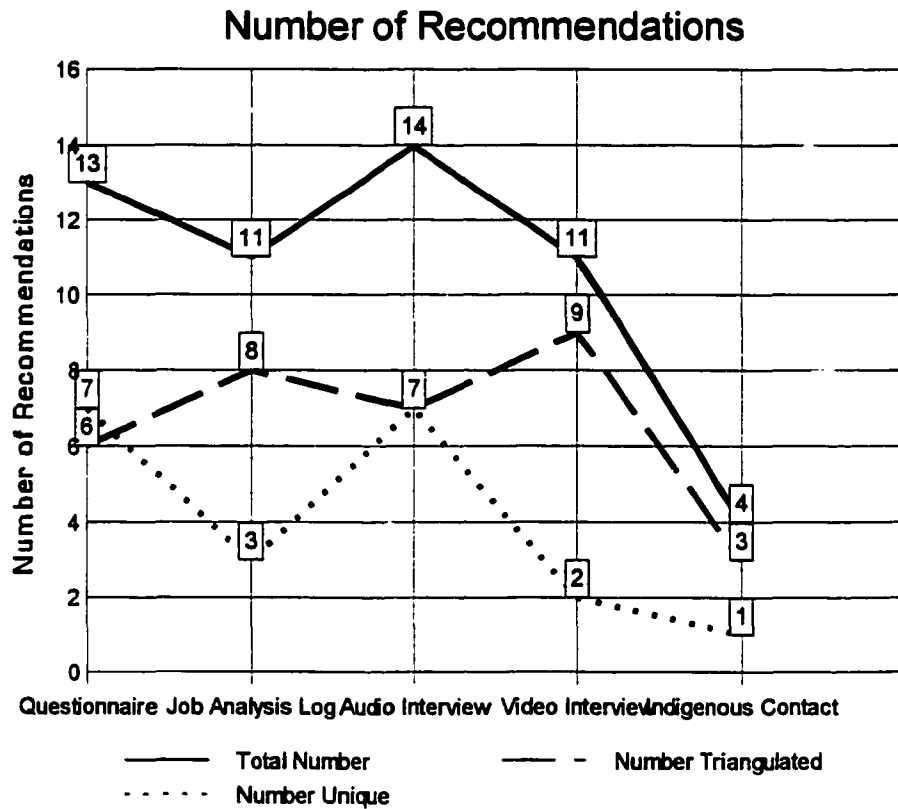


Figure 9. The number of total, triangulated, and unique recommendations.

recommendations from the questionnaire were based on the curriculum and any changes proposed to the faculty of the computer science department. The audio and video interview's recommendations were based on what the interviewees (community) thought. This would indicate that there had been a breakdown in the communication between the school and the computer science community. An examination of the history shows that in some ways, because of its more advanced knowledge in computer science, the university tended to go its own way. This is a very common problem in a Fourth World country, which is not limited to computer science. The idea that the university is the most advanced and can ignore the rest of the country can be seen in the curriculum of other subject areas as well. If a university wants to attract students, it must attract employers to hire their students. Therefore it must listen to these employers. If it does not, ultimately the business community will go off in divergent ways, and the graduates will find it difficult to obtain jobs.

Table 22 contains the distribution of the number of recommendations. The letter in the parenthesis after the type or implementation is the code used on Table 20. The distribution among the type of recommendations shows a fair amount of variation. The highest is the audio interview with nine of the "new" type recommendations. The lowest is informal indigenous contact without any "consider" type recommendations. The totals on the right of the table are not the sum of the rows, but rather the total of that type of recommendation, calculated directly from Table 20. As 12 of the recommendations were provided by two or more methodologies these 12 recommendations will appear in Table 22 in several places. Thus, the sum of the rows is greater than the actual total of

recommendations. Figure 10, a graph of the type of recommendations, shows that different methodologies tended to provide different types of recommendations. Figure 11 shows how the recommendations were implemented. Although there is variance between the two categories, the lines for "consider" and "improve" tend to follow each other. Three of the methodologies—questionnaire, job analysis log, and video interview—tended to provide the "consider" and "improve" type recommendations. (The job analysis log did vary a little in that it provided more of the "new" type than the "consider" type recommendations.) The audio interview was the only methodology that tended to provide the "new" type recommendations. The most likely reason for this is that the other methodologies did not allow for freedom of expression. Furthermore, in the Fourth World, few, if any, of the people would be likely to make unrequested comments on a questionnaire. The job analysis log appeared to be the same. Only those who knew the researcher made comments. They were the only ones comfortable enough in their relationship with the researcher to be able to make comments. To find any truly new subject matter, the respondent must be able to freely provide his or her ideas. This is accomplished in a relaxed environment. The video interview might have had more of the "new" type of recommendations if its audio data had been analyzed with its video data. This study is a comparison of five methodologies including both the audio and video interviews. For this reason, the analysis has been kept separate.

An examination of Table 20 shows a link between the "consider" and "improve" type recommendations and the state of implementation. Before a "consider" type recommendation is implemented, some study needs to be done to

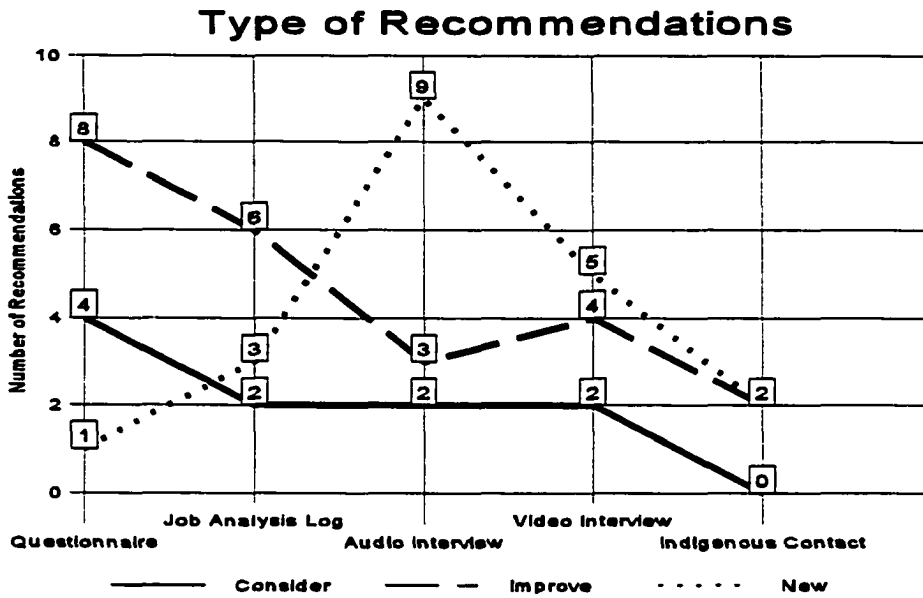


Figure 10. The type and number of recommendations for each methodology.

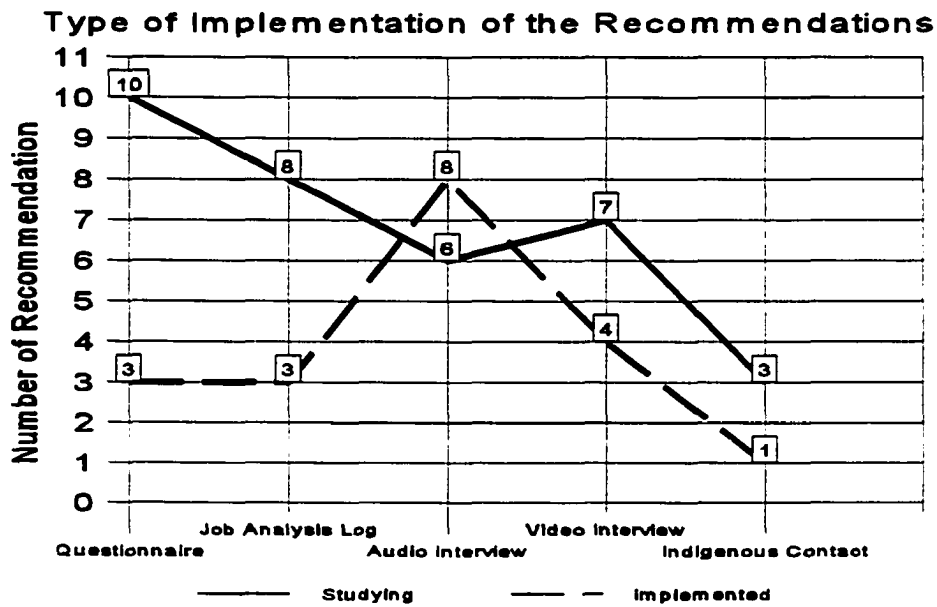


Figure 11. The implementation recommendations for each methodology.

provide the administrators with the best options. The "improvement" recommendations do not tell exactly how to improve the curriculum. Before improvements can be undertaken, further study must be done to determine how to implement the improvements. The questionnaire had the highest number of "study" category recommendations due mainly to the lack of confidence in the result of the questionnaire. Definitive responses make for definitive recommendations. The questionnaire lacked definitive responses, thus the lack of definitive recommendations. Of the other four remaining methodologies, three had five or six study recommendations—about half as many as the questionnaire. The informal indigenous contact had three out of four recommendations implemented as needing further study. For the informal indigenous contact, this represents 75% of the recommendations that it provided. Again there was not a high level of confidence in the data provided by the informal indigenous contact, due to its lack of structured data.

Some methodology theorists suggest that not only should the researcher use more than one methodology, but the methodology should be selected so that the data and inference are triangulated. It is interesting to note that Lincoln and Guba (1989, p. 240) hesitated to include triangulation as a credibility check. "In part, we have done so because triangulation itself carries too positivistic an implication, to wit, that there exist unchanging phenomena so that triangulation can logically be a check." Because it comes from two sources, one may assume the inferences are correct. This may not necessarily be the case. Wolcott in his chapter on validity in the book edited by Eisner and Peshkin (1990), led the reader to feel that triangulation is not sufficient.

Terms like triangulation and multi-instrument approach may strike neophytes as ample safeguard against error in qualitative research, but anyone who has done fieldwork knows that if you address a question of any consequence to more than one informant, you may as well prepare for more than one answer. I try to report what I observe and to offer an informed interpretation of those observations, my own or someone else's. But only the most central of issues in one's research warrant the thorough probing implied by triangulation. We are better off reminding readers that our data sources are limited, and that our informants have not necessarily gotten things right either, than implying that we would never dream of reporting an unchecked fact or unverified claim. (Eisner & Peshkin, 1990, p. 130)

Patton (1990) provides a very good illustration of the problem of triangulation in the form of a cartoon. There are fish lines hanging from each of the corners of a triangle at the end of a fishing pole. The three lines form a triangle where they enter the water. In the center of this triangle is a fish with a question mark above its head. The poor fish does not know which hook to bite. The point is made that triangulations do not, necessarily, mean that the correct information has been found. Patton asserts, however, that triangulation does have value in that such "studies use multiple methods in which different types of data provide cross-data validity checks" (p. 188). Furthermore, triangulation can increase credibility with the stakeholders, a necessity for needs assessors. Triangulation must be used with care, the users of the inferences must be informed that just because it is triangulated does not mean that the inferences are correct.

The only type of triangulation that is considered is triangulation of inferences by methodologies. Twelve of the 32 recommendations were involved in triangulation. Figure 12 and Figure 13 show graphically how the triangulated recommendations were classified and implemented. Table 23 lists the number of

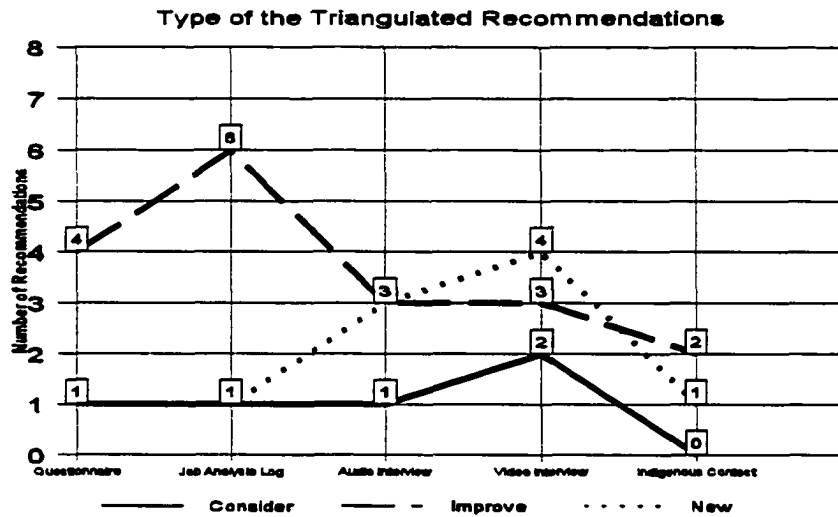


Figure 12. The different categories of the type of recommendations triangulated. The small boxes contain the actual number of recommendations triangulated for the methodology and category.

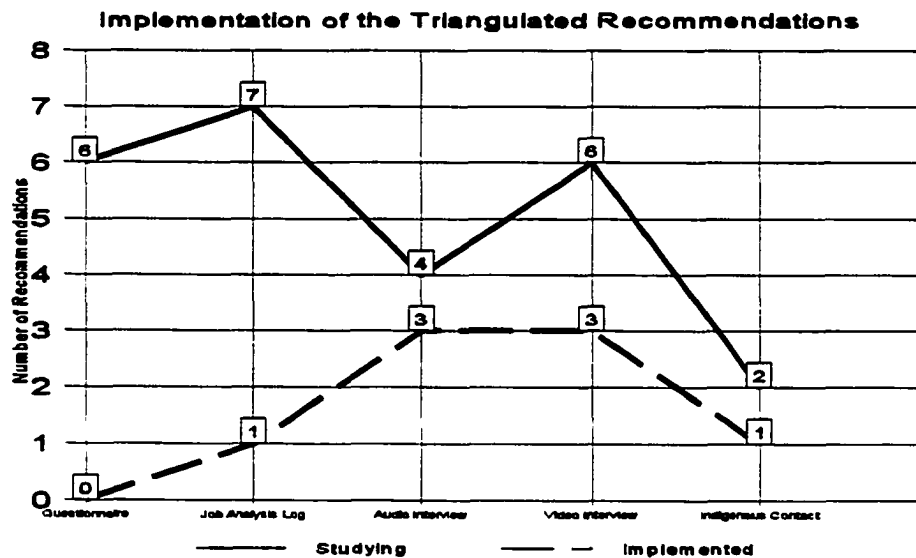


Figure 13. The different groupings of the types of implementation used for the triangulated recommendations. The small boxes contains the number of recommendations in the grouping.



TABLE 23

## THE CLASSIFICATION OF THE TRIANGULATED RECOMMENDATIONS

Category	Questionnaire	Job Log	Audio Interview	Video Interview	Indigenous Contact	Total
<b>Type of Recommendation</b>						
Consider	1	1	1	2	0	2
Improve	4	6	3	3	2	6
New	1	1	3	4	1	4
<b>How Implemented</b>						
Studying	6	7	4	6	2	9
Implementing	0	1	3	3	1	3
<b>Total</b>	<b>6</b>	<b>8</b>	<b>7</b>	<b>9</b>	<b>3</b>	<b>12</b>

recommendations that each method triangulated. The number of recommendations that were triangulated was just over one third of the total recommendations. The questionnaire and the job analysis log were based on the curriculum at the university when the needs assessment was commenced. If these had been based on the curriculum, as well as the information provided by the audio and video interviews, the number of unique recommendations would have been dramatically reduced increasing the number of triangulated recommendations. There seems to be some divergence between what is and what should be in the curriculum.

Figure 12 is a graph of the different types of triangulated recommendations. Most triangulated recommendations belong to the "improve" category. Only the audio and video interviews have any significant "new" category recommendations, with the video having the most "new" at four. This tendency becomes even more obvious when the implementation categories of the triangulated recommendations are considered. In Table 23 and Figure 13 it is obvious that the greatest number of recommendations are in the "studying" implementation category. Nine recommendations out of a total of 12 are of the "studying" implementation category. Again only audio and video interviews have any significant number of implemented triangulated methodologies. The audio and video interviews provided three of the implemented recommendations. The questionnaire, with none, and the job analysis log, with only one, were both low in the number of triangulated implemented recommendations. The methodology having the least triangulated recommendations was the informal indigenous contact.

Table 24 shows the triangulated interrelationships of the methodologies. This table, except for the last row and last column, contains the methodologies on both the horizontal and vertical axis. The information is symmetrical around the diagonal, starting in the upper left-hand corner and descending to the lower right-hand corner. This diagonal does not contain any numbers, as it is the intersection of the same methodology. The bolded numbers show the largest number in the row, representing the largest number of recommendations triangulated by the methodology. The number in parenthesis represents the number of recommendations, triangulated by only one other methodology. The number of triangulations between two methodologies varied from two to six. The mean of the recommendations triangulated was 3.4. There were three pairs of methodologies that had five or more intertraingulations, the questionnaire and the job analysis log with five common recommendations, the job analysis log and the video interview with five common recommendations, and the audio and video interview with six common recommendations. One would expect the triangulation between the questionnaire and the job analysis log as their design was based on the same set of subjects. The same triangulation relationship is true between the audio and video interview, as their methodologies are very similar. The triangulation between the job analysis log and the video interview is surprising. Methodologies with a similar nature tended to triangulate each other in this research. Four of the triangulated recommendations between the job analysis log and the video interview were in the "consider" and "improve" type categories. These four were general recommendations and were implemented as needing further study. The fifth recommendation was to add the teaching of COBOL.

TABLE 24

## RELATIONSHIPS OF THE TRIANGULATED RECOMMENDATIONS

	Questionnaire	Job Analysis Log	Audio Interview	Video Interview	Indigenous Contact	Total Triangulated
Questionnaire		<b>5</b> (1)	2	3 (1)	2	6
Job Analysis Log	<b>5</b> (1)		4	<b>5</b>	3	8
Audio Interview	2	4		<b>6</b> (3)	2	7
Video Interview	3 (1)	5	<b>6</b> (3)		2	9
Informal Indigenous	2	<b>3</b>	2	2		3
Total Triangulated	6	8	7	9	3	12

Note. Each intersection contains the number of recommendations triangulated by the two intersecting methodologies. The final column is the total number triangulated for that row. The blank boxes are the intersections of the same methodology. The number in parenthesis is the number of recommendations triangulated by only one other methodology.

which has been implemented. There were two pairs that intertriangulated three and four times and four pairs that intertriangulated four times.

All methods intertriangulated with the remaining four methods. If any method, other than the informal indigenous contact, had been left out, there would have been a significant increase in the number of unique recommendations. Thus, some confidence in the information would be lost.

Figures 14 and 15 show graphically how the unique recommendations were classified and implemented. Table 25 contains a list of the number of unique recommendations provided by each methodology. This table shows what would happen if any of the methods are eliminated from the research. Naturally, those at the top of the list would not be eliminated. One might consider eliminating the informal indigenous contact, as it provided only one unique recommendation and three triangulated recommendations. Each of the triangulated recommendations was triangulated by at least three methodologies. Thus, it appears minimal information would be lost by eliminating this methodology. It was very cost-effective and was the deciding factor in starting to teach COBOL.

The audio interview, in contrast, produced the most total recommendations and tied with the questionnaire in the most number of unique recommendations. While the feelings and understandings gained by the audio and video interviews were very difficult to reduce to words, they were very useful in the development of the new curriculum.

Figure 14 shows the type of unique recommendations. From this it is obvious that the audio interview provided the most unique new recommendations. Table 25 shows that the unique recommendations tended to be the "new," than

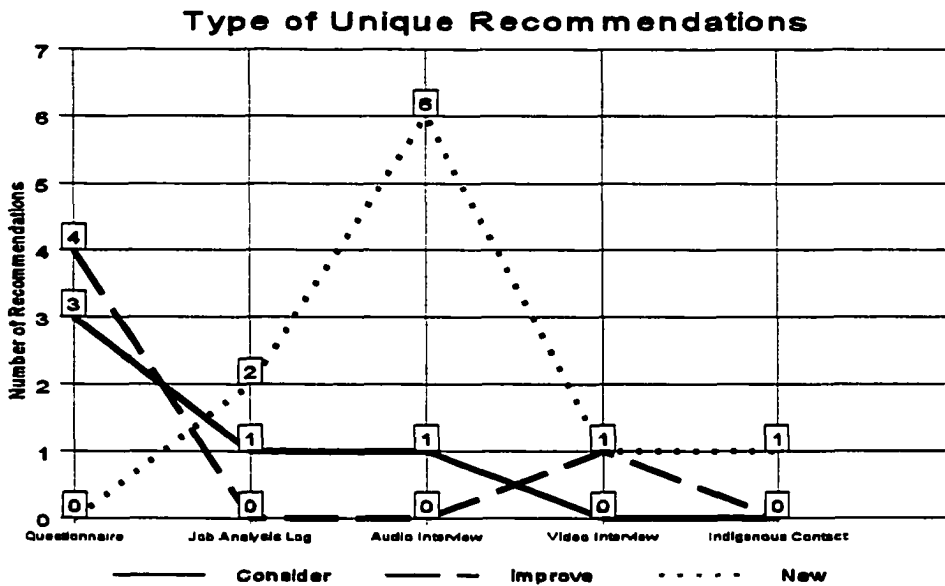


Figure 14. The classification of the recommendations uniquely provided by one and only one recommendation. The numbers in the small boxes are the actual number of recommendations.

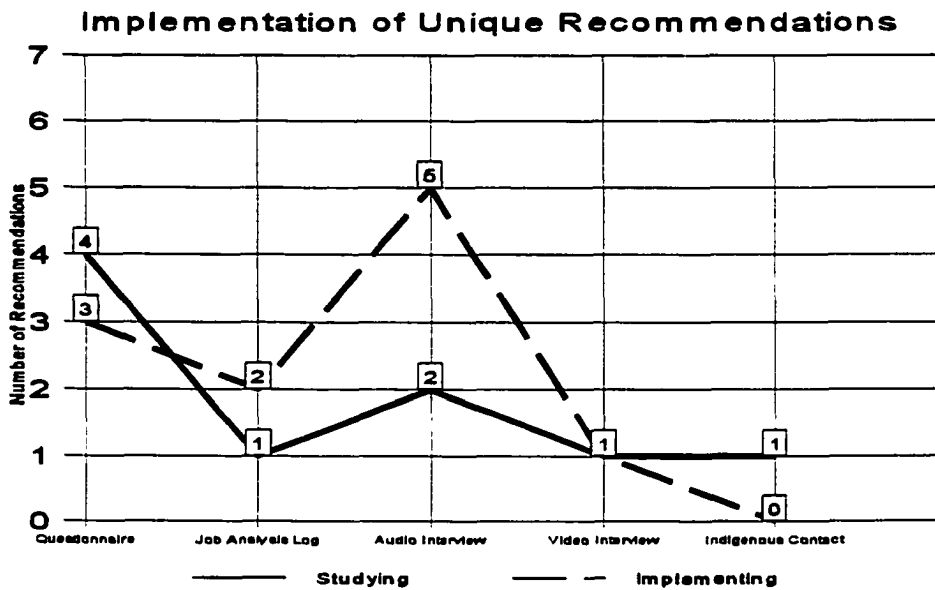


Figure 15. The implementation of the unique recommendations. The numbers in the small boxes are the actual number of recommendations.

TABLE 25

## THE CLASSIFICATION OF THE UNIQUE RECOMMENDATIONS

Category	Questionnaire	Job Log	Audio Interview	Video Interview	Indigenous Contact	Total
<b>Type of Recommendation</b>						
Consider	3	1	1	0	0	5
Improve	4	0	0	1	0	5
New	0	2	6	1	1	10
<b>How Implemented</b>						
Studying	4	1	2	1	1	9
Implementing	3	2	5	1	0	11
<b>Total</b>	<b>7</b>	<b>3</b>	<b>7</b>	<b>2</b>	<b>1</b>	<b>20</b>

any of the other types. Of these, six out of nine were provided by the audio interview. Again the table shows that there is a tendency for the "new" type of recommendations to be implemented and the other types to be of the "study" nature. The only exception is found in the questionnaire with its three recommendations in the "implementation" category. None of these three recommendations are new, as the questionnaire does not have any unique "new" type of recommendations. The three questionnaire recommendations that were implemented were in areas that the university had already been working on—improving the curriculum or its public relations.

By looking at Table 20 along with the other tables and figures in this chapter, it is possible to see that most of the course-changing recommendations provided by the questionnaire resulted in "study" implementations, and those of the audio interview in the "implemented" category. The job analysis log provided some of the "implemented" recommendations. Two of these came from comments on the log by recent graduates and students working during the summer vacation.

### **Chapter 5 Summary**

In this case study comparison, five methodologies were evaluated for their effectiveness, using 12 standards selected from those proposed by the Joint Committee on Standards for Educational Evaluation (1994). This was followed by a comparison of the number of recommendations produced by each of the methodologies. The methodologies were examined for the overall number of recommendations, the number of recommendations provided by two or more



methodologies, and the number of unique recommendations. The recommendations were also divided into categories for the type of recommendation as well as the manner of implementation. These categories were examined for the overall number of recommendations, the number of recommendations from two or more methodologies, and the number of recommendations coming from one methodology.

In this study the analysis showed that the questionnaire and job analysis log methodologies, with the least amount of human contact, provided most of the recommendations for further study. The audio and video interview had the most human contact, and provided the most recommendations that could be implemented immediately. The second group of methodologies would have an appeal to an educator, typical in the Fourth World, under pressure to improve the curriculum, usually with limited financial resources. The analysis showed that over 50% of the recommendations would have been lost if only one methodology had been used. The evaluations based on the standards showed that in the Fourth World no one method was 'ideal'. In this Fourth World context, a balance of methodologies would provide better evaluations with the methodologies complementing each other. The evaluation of the number of unique recommendations revealed that dropping even one methodology would have meant the loss of at least one of the 32 recommendations. If the methodology with the least number of recommendations was dropped, COBOL would not have been taught. The teaching of COBOL has since proven valuable.

The order in which the methodologies are completed is important. Those methodologies that must be completed over a period of time should be started

first, including the interviews and the job analysis log. The interviews, when completed, would provide information for the development of the questionnaire. The questionnaire in return would provide validation of the information found by the interviews. If the results of the questionnaire raised questions about the information from the interview, a select group of experts could be interviewed to attempt to resolve the problem. If a video interview is undertaken, it should be treated as an audio and video interview combined. Thus, two of the methodologies in this study could be combined into one, somewhat larger, methodology.

The needs-assessment process has as its goal the improvement of education. Anytime that there are several stakeholders or interested parties involved, there will be different points of view, all of which must be addressed. Such a situation can cause problems in any context, especially those with a complex political situation. One of the objectives of the needs assessment is to determine what changes are needed in such a way that all stakeholders, including administrators, are motivated into *united* action, reducing the political interaction. Literature points out several possible pitfalls of using multiple methodologies to triangulate recommended curricular changes. In this study, however, triangulation by the use of several methodologies will build the needs assessment's credibility in the minds of the stakeholders.

In Central Africa authority tends not to be questioned. This is also true of experts who tend to be highly respected and are not generally questioned. This study shows that experts, though highly respected, would not have provided all the information. As experts do not know every situation in Rwanda, there was a

need for balance. In a Fourth World setting, with a great diversity in culture, both the researcher's and the needs assessment's credibility is enhanced when the researcher can show that the information for the needs assessment comes from not only the experts in the country, but also the general population.

## **CHAPTER VI**

### **SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND EPILOGUE**

This dissertation examined the impact of a diversified culture on the needs-assessment process, comparing the appropriateness of five methodologies in a Fourth World setting. Five research methodologies were compared as to their relative appropriateness for use in a Fourth World culture. The setting was a Fourth World Central African country, Rwanda; the project was the development of a computer science curriculum at a private church-operated university, serving a computer science community that includes members of three main cultures: African, Asian (Indian and Pakistani), and European.

The first methodology, the questionnaire, was a traditional survey instrument, adapted to the local situation, which attempted to determine the importance of the various subjects taught in the university computer science curriculum. The responses to the items on the questionnaire were bimodal. Either the respondent did not respond to the question, or they tended to respond "very important." Although the tendency not to respond was felt to be a cultural problem, this tendency could have been a lack of understanding of the computer science field. To test the latter, a special group of experts was extracted from the questionnaire respondents by selecting only those that answered 15 or more

of the computer science questions. The group of expert respondents answered a significantly larger number of the questions. The responses, however, still tended to be "very important." A table was created using the median of the responses of the group of the 30 experts. Subject areas on the lower part of the table were suggested for elimination from the curriculum, while those that were on the upper third were considered essential.

The second methodology, the job analysis log, was a longitudinal methodology. Respondents were given a form that allowed them to check the skills they had used each day. The respondents were instructed to add anything they thought unusual and/or any skills they lacked. Most respondents did not note any missing skills. Only the recent graduates who were familiar with the researcher provided any information about lacking skills. The data were converted into a fraction by dividing the occurrences by the number of days. This was tabulated for all the respondents and again converted to a percentage, dividing by the number of respondents. A table was made of the resulting figures. Subject areas on the top of the table were considered essential and those on the bottom of the table needed to be examined for elimination.

The third methodology consisted of a semi-structured audio-taped interview. A set of beginning questions covering the topics found on the questionnaire was developed. The tape recordings were translated, if necessary, and transcribed. Topic headings were selected and the transcriptions were categorized into topic areas. From the categorizations, a report was written.

The fourth methodology was a semi-structured videotaped interview using the same questions as the audio interview. The audio transcriptions were used in

the analysis of the audio interview. The video recordings were viewed with a copy of the transcriptions. Notes were made on the transcriptions about the person's non-verbal reactions to the various parts of the discussion. Areas that appeared unimportant in the written transcription were significant on the video recording. These notes were then assembled into a report.

The fifth methodology, the informal indigenous contact, was not part of the original proposal, but rather information gathered in the process of implementing the other methodologies. When the questionnaire was distributed and collected, the student approached various persons whom he felt would be knowledgeable and willing to answer questions. In the normal, friendly small talk, he asked informal questions about the companies' use of computers. The information gained was unstructured. When tabulated, it triangulated the information gained in the other methodologies. Further it provided one unique recommendation, and was the deciding factor in the teaching of COBOL.

After the five methods were analyzed, recommendations were developed for each. The research was for the Adventist University of Central Africa, and the recommendations were in the process of being implemented in April of 1994.

The researcher then rated the methodologies for their effectiveness based upon a set of 12 standards selected from criteria developed by the Joint Committee on Standards for Educational Evaluation (1994) (see chapter 2). A matrix comparing the five methodologies with the recommendations suggested an estimate of the relative contributions of each methodology.

Overall, ratings of AUCA's computer science curriculum, assessed by the country's computer science community through the five methodologies, were

favorable. Information yielded by most of the methodologies did suggest a number of curriculum changes. The university considered each recommendation for change, and had begun implementing those it believed were appropriate.

### **Conclusions**

For the comparison of the five methodologies this study has used as criteria (1) 12 selected standards, (2) the type or types of recommendation the methodology tended to provide, and (3) how the recommendations of a given methodology tended to be implemented. These three methods of comparison provided a variety of information concerning the appropriateness of the five methodologies for use in a needs assessment completed in a Central African setting. Two themes were apparent throughout the findings. The first was the importance of using multiple methodologies in needs assessments undertaken in a culturally divergent Fourth World setting. The second was the impact of culture on research in general and the needs-assessment process in particular.

#### The Use of Multiple Methodologies

While in all settings the use of multiple methodologies improves research, in a Fourth World country the use of multiple methodologies seems even more important. The study demonstrated that in Rwanda the use of multiple methodologies improves research in at least three ways.

1. Complementing each others' weaknesses: For each of the selected 12 standards I estimated the effectiveness of each methodology. An examination of Table 26 revealed that all five research methodologies had weaknesses. Not one of the methodologies would be appropriate if used by

itself in a needs assessment in a Central African country. The study further showed that a combination of methods tended to cancel the weaknesses. Thus, when multiple methods are combined in a needs assessment one would expect a closer fit with the standards as set by the Joint Committee on Standards for Educational Evaluation (1994).

Choosing both qualitative and quantitative research methods seemed to provide a better balance in a culturally diverse Fourth World country.

2. Providing a greater wealth of information: Table 16 shows that 20 recommendations were provided by only one methodology. Thus, if any one of the five methods had been eliminated, some recommendations would have been lost. The distribution of unique recommendations demonstrated that different methodologies with distinct approaches allow for various modes of communication and produce diverse results. A broad spectrum of methodologies produces a broad spectrum of information.

The study confirmed that when large quantities of exploratory information are needed or when the administration is not sure of what the audiences feel or think, it is wiser to undertake a qualitative methodology similar to the audio or video interview. In the setting of this study, these methods provided a wealth of information useful in the preliminary stages of research and/or development. Later, other methodologies (e.g., questionnaire) may be used to validate the information found by qualitative methodologies.

3. Confirming information provided by other methods: The audio interview provided a large base of information, understandings, and feelings that



were extremely useful in the development of the curriculum. The job analysis log provided an insight into the job market that neither the questionnaire nor the interviews could. The questionnaire validated the information provided by the job analysis log, while the video interview and the informal indigenous contact tended to triangulate the information and feeling provided by the audio interview. Because in this study common information was provided by (a) experts in the audio interviews, and (b) the general computer science community in the questionnaire provided greater confidence to the implementers of the curriculum.

#### The Impact of Culture on the Needs-Assessment Process

The higher number of new recommendations from those methodologies that started with small talk indicated that the personal relationships that developed between the interviewer and the respondent resulted in an increase in the size of the open area in the Johari window. The relationship reduced the hidden and blind areas of the Johari window for both the interviewer and the respondent. The respondents were at ease and felt they could make recommendations. Under these situations, several new ideas for improving the curriculum were suggested. Most of these recommendations had been implemented.

This research showed the key role of culture to the interview process. Quite different interview techniques were used to elicit cooperation from European, Asian, and indigenous African interviewees. Ignoring the differences in approach could seriously undermine validity of the findings. Furthermore, the

approach of the interview varied according to the hostility of the interviewee. Greater care in building the relationship was necessary if the interviewee was hostile to the university or its curriculum.

All methods provided an opportunity for the university to communicate with the computer science community. The results showed that even though the university was recognized by most of the respondents as being the best in computer science curriculum in the country, most respondents did not really understand the university, nor the curriculum. Use of the various methodologies provided an opportunity to inform the community about the university's computer science curriculum and its goals.

### **Recommendations for Practice**

#### **An Informal Needs-Assessment Panel**

The wisdom of eliciting needs-assessment information from a select group of enlightened respondents became evident during the course of the research. These persons would be used as a sounding board in the development of the curriculum. The persons in this enlightened group would need to be computer scientists or very familiar with computer science. They would also need to be interested enough in the curriculum to donate their time. (Most schools of this nature could not hire such a group.)

The special group members would then be given proposed changes or perceived needs and asked to give their responses. One possibility would include sending the proposed changes to the group members in advance, followed by semi-structured interviews. The interviews would discuss the changes, collecting

any reactions, ideas, and/or modifications. Care must be taken to make sure the respondents believe that what they have stated is of value and has potential impact.

### Multiple Methodologies

Needs assessments especially in Third and Fourth World countries should include multiple methods of data collection. These methods should complement each other, using a method of strength where another has a weakness. In the design the methods should be selected with the following areas in mind.

1. The methods should triangulate the results. The diversity in the methods will increase the confidence in the results.
2. The methods should increase the validity of the results, using the qualitative method first, then triangulating them with quantitative methods so that the results may have greater generalization.
3. The methods should complement each other in nature and type of information collected.

In this way, a broader spectrum of information will be collected. Researchers need to be sure that they use all the levels of communication including the affective domain.

### On-going Assessment

My experience in this research conducted over nearly 4 years confirmed that needs assessment should be an on-going process, particularly in the Fourth World with a rapidly changing subject like computer science. Methods need to be selected that can be repeated at regular intervals. Attention should be given to

the effectiveness of the methods selected. If the effectiveness declines, the methods need to be modified or replaced by other methods.

### **Recommendations for Research**

This dissertation was not an in-depth analysis of the impact of culture and cross-culture communication on the needs-assessment process. It did provide, however, an increased appreciation of the impact of culture on the needs-assessment process. The results of the dissertation seem to indicate that the greater the diversity of the culture, the more divergent the results. As this was a single test-case study, it was impossible to test this hypothesis, leaving the hypothesis confirmation for future research. Another possibility would be to increase the sample sizes, subdivide the samples into their cultural groups, and then examine the appropriateness of each of the methodologies for each subculture group. The culture variable could be clearly defined for each of the groups, thus providing insight as to the interaction of culture types and the effectiveness of the methodology.

More research needs to be undertaken to determine the effect of culture on a questionnaire. In many Fourth World cultures, the importance of relationships is near the top of the culture's values scale. The value of forming and maintaining relationships is evident in the high level of affective communication used by members of the culture. Some methods need to be developed to determine if the respondents really are defining how they see reality. Personal contact between the researcher and the respondent seems to improve the veracity of the information provided. The results of the questionnaire might

be improved if the researcher would personally hand-deliver the instruments. The researcher could then develop a relationship with each respondent, then ask the respondent to complete the questionnaire while he/she waits, suggesting that it will only take a minute and the researcher could answer any questions the respondent might have.

New methods need to be developed for the use of questionnaires in societies not accustomed to questionnaires. When designing these methods the researcher needs to understand the cultures, and develop methods that reduce many of the fears that the respondent has when confronted with a questionnaire for the first time.

#### Nonverbal Communication

More research needs to be done on analyzing nonverbal communication. Methods of analysis would be useful in interpreting the video recording. Such methods of analysis would include instructions on nonverbal communication and what it means, and provide a method of understanding cross-cultural nonverbal communication. The method of analysis should include a system of nonverbal note-taking. Such a system would need a method of linking the nonverbal notes with the recorded transcript.

#### Possible Changes to the Five Methodologies

More research on the use of audio and video recordings needs to be undertaken. Future research on video-recorded interviews should experiment with hiding the video camera, and various methods of informing the respondents that they are being recorded. The main thrust of this research would be to

reduce the amount of fear in the respondent, thus allowing the respondent to freely express his/her feelings both verbally and nonverbally.

The job analysis log needs to be improved. Methods need to be developed to improve the instrument so that it would be more effective in obtaining comments from the respondent, while encouraging the respondent to complete the appropriate section each day.

The informal indigenous contact was one of the most efficient methodologies in this research project. The informal indigenous contact's efficiency is based on the fact that the information is gathered while collecting the questionnaire. The information is collected by a national asking questions normally asked in the normal computer science business workplace context. The interchange that takes place is part of the normal small talk, making the method unobtrusive. More research needs to be undertaken on developing the informal indigenous contact method as a means of soliciting information. The national collecting the information was provided with a list of questions and instructions on the type of information and how to ask for the information. Care must be taken to be sure that spontaneity is not lost. The informal indigenous contact might be developed into a structure interview thus replacing the questionnaire.

#### Cultural, Ethnic, and Political Recommendations

Rwanda's two main ethnic tribal groups are fairly well intermingled. Both groups speak the same language and many of the Tutsis or Hutus could be distinguished only by the identity card that they carried. In fact, certain individuals carried two cards, one identification card for each of the ethnic

groups. Even though there are small differences between the ethnic groups, there are many similarities. Education seemed to reduce the differences between the ethnic groups, with educated members of both ethnic groups appearing quite similar culturally. The computer science community was composed of several vastly different cultural groups: European, Asian, American, and Rwandan. The difference between these cultural groups was far greater than the difference between the two main tribal groups of Rwanda. The tribal situation in other countries in Central Africa is different from that of Rwanda and Burundi. Most are composed of several tribal groups with different languages and practices. The tribal difference, along with the usual European and Asian mixture, increases the cross-cultural communication problems. The impact of culture on the needs-assessment methodologies should be examined in countries with multiple culturally divergent tribes.

In Sub-Sahara Africa, changes are the result of plans designed by the central government. For this reason, any instability in the central government causes changes in the local sector. All sectors of the local community are affected by changes in the central government, including universities. While some of the political changes are predictable, most are not. An institution wishing to survive must plan for changes in the political scene and its impact on the institution's life. While most are for the good, unfortunately, on several occasions, political changes have brought unrest and even death. Research design needs to consider not only cultural and ethnic aspects of a society, but also the political interactions between the needs assessment, the university, and the government.

The communication band width describes the largeness of the communication channel. The wider the communication band width, the more information that can pass. The communication band width is dependent on several factors.

1. Amount of personal interactions and the relationship developed
2. The method of communication, one mark and/or word, as in the questionnaire and job analysis log, to the full channel in the video interview
3. The cultural context (Cultures that use less affective communication can communicate better in a narrow band width.)
4. The amount of non-visual communication used in the society (Non-visual communication includes the use of telephones, computer-networks, and E-mail.)
5. The type and nature of the instrument.

While the fifth factor includes parts from several of the other factors, the sum of the type and nature of the instruments warrants an examination of its overall impact on the communication band width.

Research needs to examine the relationship between limiting the communication band width to just a circle, a word, or a number and the amount of information collected? In contrast, does allowing the respondent to verbally communicate his/her feelings in a semi-structured interview facilitate the collection of information? Or does using the full band width, the video interview, provide the most information? The results of this dissertation suggest that the wider the communications band width, the more information collected. Further research needs to compare the impact of relationships and the communication



band width on the needs-assessment process. Such research should determine if both are necessary, or if one of the two, relationships or the communication band width, is more important.

### **Epilogue**

In the early 80s when Mudende was selected for the site of the Adventist University of Central Africa, Rwanda was considered by many to be the most peaceful and stable country in Central Africa. It was the only French-speaking country considered stable enough to invest the money to construct a new university. Furthermore, it was also in the heart of the region containing a high concentration of French-speaking Seventh-day Adventists. The final factor in the selection process was that the government of Rwanda was willing to give the new university a charter. One of the founders of the university in reminiscing over the selection process stated, "There was no other country in the region better suited than Rwanda for a university and no other place better suited than Mudende" (Wallace, personal communication, May 9, 1994).

All of this started to change on October 3, 1990, with the rebel attack on Rwanda from Uganda. After April 1991, the war seemed to stalemate with the rebels holding a small portion of the country and both sides making small counteroffensives. For all practical purposes, the country seemed to have stabilized in a state of war.

Negotiations were undertaken by neighboring countries, at first without success. The counter offensive of February 8, 1993, changed the status with the government forces losing and then recapturing Ruhengeri. During this

offensive, the rebels took and held part of the main road between Ruhengeri and Kigali, the main artery to Gisenyi where the brewery is located. It was also the main link between the university and Kigali. After the February 1993 offensive, both sides were ready to negotiate.

A peace accord was signed on August 4, 1993. The Arusha Accord, as it was called, defined a new government with power sharing. It would have multiple parties and would represent all ethnic and regional factions in the country. The new accord seemed like a workable plan and appeared to give new hope to the country.

During the month of March 1994, most of the needed ministers were named and the interim government was ready to be installed. In the first part of April 1994, President Habyarimana flew to Dar es Salaam for an update on the implementation process of the Accord. On the sixth of April during the descent to the Kigali Airport, the president's plane was shot, and crashed, killing the presidents of both Rwanda and Burundi, along with other officials from both countries.

Immediately after the crash of the plane, an extremist party's radio station, Mille Colines (Thousand Hills), began broadcasting that the rebels had killed the President and that the Tutsis were going to kill all of the Hutus. The Hutus needed to kill all the Tutsis before they killed the Hutus. This along with direction from some of the government leaders led to a massacre. The massacre started in Kigali, moving to the countryside. The massacre did not start on the university campus until early Friday morning, April 8. By Friday evening, over 500 bodies were removed from the campus. Most of these were villagers. Although

the exact number of students killed is unknown, the number is believed to be between 50 and 100 students (12%–24%).

The foreign staff and students of the university were evacuated at 8:30 Sunday morning. During the crisis, the university bargained for the lives of two of the staff families, who were later killed. The loss of two families has been felt by the remaining staff. The staff, however, is thankful that this number was not higher.

#### Situation on Campus as of September 1994

Currently the campus cannot be used for school as it is located four miles from the border between Zaire and Rwanda. It would be very difficult to provide protection for the approximately 1,000 persons normally on campus. Furthermore the university has lost most of its large transportation vehicles, making an evacuation nearly impossible.

In September of 1994, university officers visited the campus. Sometime between the evacuation and the visit, the university had been heavily looted, with many of the windows and locks being broken. Almost all the rooms had been forced open, including staff homes and university storerooms.

A visit to the damaged campus and the surrounding area with its lack of stability raises the question, what has the Seventh-day Adventist church lost at Mudende? It is obvious that Mudende will not be able to be used as an international university in the foreseeable future, possibly not even as a local Rwandan university for several years. The money lost in the inability to use the Mudende property and the looting is well over US \$10,000,000.

The war cannot be attributed to any one single factor. Although the war has roots in ethnic violence, it was also caused by other political factors, including a high level of north-south tension. It was the means of changing what was considered to be the most peaceful country in Central Africa to a bloodbath. It has accentuated the ethnic distrust in the region and has the possibility of re-igniting similar violence in other parts of Central Africa.

What can an educator learn from the traumatic events (1994) of Rwanda? The "most" stable country does not always stay stable. No matter how carefully the search committee does its work, in the future there may be trouble. The curriculum and buildings need to be designed and constructed so as to reduce the cost of relocation if a political situation forces the university to move. An international university may need to have campuses in different countries. This would not mean all duplicate staff, as staff with special skills could be moved between the campuses, teaching accelerated courses. Libraries need to be designed to train the student for the type of information sources that he/she will be able to access after graduation. The lack of journals and information sources could mean that the university may need to publish journals for its graduates. The greatest challenge is the design and implementation of a cost-effective curriculum for both the Bachelor of Arts and the Master of Arts degrees. French-speaking Central Africa can no longer afford to send students to Europe and/or America to study.

What can a researcher learn from the recent (1994) political instability in Rwanda? Political unrest brings fear. Fear of the unknown. Fear of political reprisals. Such fear restricts the flow of information, especially with strangers.

With the increased fear, more time must be spent in small talk, building relationships. If the fear is high enough, it may be impossible to build a relationship that will permit the free flow of information. Political unrest brings a restriction of travel. The accompanying curfews mean that less can be accomplished in a day. Thus more time will be needed to complete the needs assessment.

Computer scientists can be important people. Some may be involved in politics, meaning that as the political climate changes, respondents may flee the country and be lost from the sample. Samples must be selected large enough so that the loss does not affect significantly the needs assessment. It is possible that needs-assessment staff may feel it necessary to flee. Thus, it is wise to have a broader base of staff. If some are lost, others will know how to complete the needs assessment.

Political unrest or traumatic situations destroy or reduce the population's confidence in the economy. This reduction in confidence means a slowing of the economy, which may mean a reduction in the needs-assessment budget. Care must be made during times of political unrest that methods are selected that can be completed with a minimum of financial outlay. The limited growth of the economy may impact the implementation of the needs assessment, as funds may not be available to implement fully the recommendations.

## APPENDIX

APPENDIX A  
QUESTIONNAIRE

These were originally designed to fit on A4 paper (8.27" x 11.69"). The layout has been modified for letter-size paper.

ADVENTIST UNIVERSITY OF CENTRAL AFRICA

School of Business

First & Last Name:  
(Not obligatory)

Date: / /

Organization:  
(Not obligatory)

Needs Questionnaire

The faculty of School of Business of Adventist University of Central Africa (AUCA) is attempting to improve its curriculum. AUCA's School of Business is asking you to help them by taking a few moments to answer the following questions. Your response is important and will help the School of Business know what changes to make to its curriculum. There are three parts to the questionnaire. The first section will help us understand you better. The second will help us understand what you feel should be taught in a school of business and how well the School of Business is preparing its graduates. The third will indicate how you feel about possible areas of expansion for the School of Business.

General Information

\_\_\_ If you are an AUCA graduate enter the year of graduation otherwise enter 0.

\_\_\_ Please check if you are acquainted with the course taught AUCA.

\_\_\_ Please indicate the number of AUCA graduates your organization employs.

Please indicate the number of computers that your organization owns

<b>Micro</b>	___	Macintosh
	___	IBM PC and compatible
<b>Mini</b>	___	
<b>Mainframe</b>	___	

Please check all the following descriptions that would apply to the type of work that you do.

___ administration	___ accounting	___ computers
___ supervision	___ programming	___ data processing
___ data entry	___ word processing	



Please indicate the approximate number of person your organization employs. \_\_\_\_

Please indicate the approximate number of persons your organization employs in the following areas.

____ Administration	____ Accounting	____ Word Processing
____ Data Entry	____ Programming	____ Computer Maintenance
____ Software Maintenance		

Please indicate the number of employees that your organization would be interested in having your personnel trained.

Subject	Location		
	Mudende	Kigali	Gisenyi
Word Processing	____	____	____
Spreadsheets	____	____	____
Data Bases	____	____	____
Programming	____	____	____
List of languages			
Software Design	____	____	____
Analysis	____	____	____
Computer Repair/maintenance	____	____	____
Accounting	____	____	____
DOS	____	____	____
Management	____	____	____

## What should be taught?

The School of Business is attempting to determine how it can serve industry better. Below you will notice several areas of instruction. On the right and the left of these areas of instruction are the words None, Little, Some, Fair, Much, Great. The left side indicates how important of this area of study. The right side represents how much graduates know about these areas of study. Please circle the word on both the left and the right side that best represents your feelings. If you do not understand what is meant by an area of study please do not respond. If you are not a graduate of AUCA or are not acquainted with the courses taught at AUCA do not circle any words on the right.

Amount Should Teach		Amount AUCA Graduates Know
None Little Some Fair Much Great None Little Some Fair Much Great	<b>Word processing</b> General knowledge Desk top publishing	None Little Some Fair Much Great None Little Some Fair Much Great
None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great	<b>Spreadsheets</b> General knowledge Budgets and business Business research	None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great
None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great	<b>Data bases</b> General application Design and programming Maintenance Redesign Special reports	None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great
None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great	<b>Special data bases</b> Stock control Accounting programs Import/export information control	None Little Some Fair Much Great None Little Some Fair Much Great None Little Some Fair Much Great
None Little Some Fair Much Great None Little Some Fair Much Great	<b>Programming</b> Simple programs Complex programs	None Little Some Fair Much Great None Little Some Fair Much Great
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**Software Design**

Simple programs  
 Complex interactive programs

**Analysis**

Simple programs  
 Complex interactive programs

**Computer Repair**

Simple repair & maintenance  
 Printer repair  
 Repair cards and other equipment

**DOS**

Commands  
 Utilization of config.sys  
 Utilization of autoexec.sys

**Accounting**

General  
 Advanced  
 International  
 Societies  
 Adventust  
 Banking  
 Auditing  
 Budgeting

**Administration**

Personnel  
 Financial  
 Accounting  
 Budgeting

**General Courses**

Law None Little Some Fair Much Great  
 Economics  
 Statistics  
 Marketing  
 English

**Research**

Accounting  
 Business management  
 Programming  
 For decision making  
 Solve business problems

None Little Some Fair Much Great  
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UNIVERSITE ADVENTISTE D'AFRIQUE CENTRALE

Ecole de Gestion

Nom et Prénom :  
(pas obligatoire)

Date : / /1992

Société :  
(pas obligatoire)

Questionnaires sur les besoins

La faculté de Gestion de l'Université Adventiste d'Afrique Centrale (UAAC) travaille actuellement en vue d'une amélioration de ses programmes. Vous pouvez y contribuer en prenant un moment pour répondre à ce questionnaire. Vos réponses seront importantes et nous permettront de prendre connaissance des changements que vous estimez nécessaires pour atteindre cet objectif. Le questionnaire se divise en deux parties. La première nous aidera à mieux comprendre votre situation actuelle, tandis que la deuxième aura un double but : Nous permettre d'apprécier vos demandes sur l'enseignement à dispenser ainsi que le niveau au sein de la Faculté de Gestion et apprendre par là même ce que vous pensez de l'intention que nous avons d'étendre le programme de Gestion.

**Information Générale**

Si vous êtes diplômé de l'UAAC, mettez votre année de graduation, sinon écrivez 0.

Etes-vous au courant des cours qui sont enseignés à l'UAAC ?

Mentionnez le nombre de diplômés de l'UAAC employés dans votre organisation.

Indiquez le nombre d'ordinateurs que votre organisation possède.

**Micro**

Mackintosh

IBM PC et compatible

**Mini**

**Mainframe**

Indiquez ce qui est nécessaire pour le genre de travail que vous faites.

<input type="checkbox"/> administration	<input type="checkbox"/> comptabilité	<input type="checkbox"/> ordinateurs
<input type="checkbox"/> surveillance	<input type="checkbox"/> programmation	<input type="checkbox"/> traitement des données
<input type="checkbox"/> entrée des données	<input type="checkbox"/> traitement de texte	

Indiquez le nombre (approximatif) de personnes employées dans votre organisation .....

Indiquez le nombre (approximatif) de personnes employées dans votre organisation dans les départements suivants :

<input type="checkbox"/> administration	<input type="checkbox"/> comptabilité	<input type="checkbox"/> traitement de texte
<input type="checkbox"/> entrée des données	<input type="checkbox"/> programmation	<input type="checkbox"/> entretien des ordinateurs
<input type="checkbox"/> entretien des software		

Indiquez le nombre d'employés de votre organisation qui souhaiteraient revoir une formation ?

Matières	Localisation			
	Mudende	Kigali	Gisenyi	Autre ville
Traitement de texte				
Feuilles de calcul				
Bases de données				
Programmation				
Liste de langues				
Dessin des systèmes				
Analyses				
Réparation d'ordinateur/entretien				
Comptabilité				
Dos				
Administration				

### Que doit-on enseigner ?

La Faculté de Gestion essaie de trouver une façon de mieux servir les firmes. Ci-dessous vous remarquerez plusieurs domaines d'études. A gauche et à droite de ces matières se trouvent les mots qui expriment le degré de l'importance et de la qualité de l'enseignement. Le côté gauche indique l'importance de ces domaines d'études. Le côté droit indique la qualité de l'enseignement que les diplômés ont acquise dans ces domaines d'études. Veuillez encercler les mots qui expriment vos idées dans les deux côtés. Si vous ne comprenez pas ce qu'une de ces matières signifie, veuillez ne pas y répondre. Si vous n'êtes pas habitués avec les cours enseignés à l'UAAC, n'encerclez aucun mot sur le côté droit.

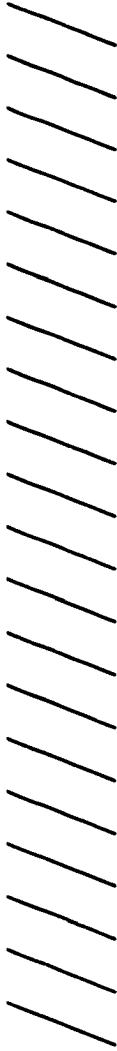
Importance						Qualité de l'enseignement					
Aucune	Faible	Passable	Important	Très important		Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	<b>Traitement de texte</b>	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Connaissance Générale	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					Desk top Publishing ?						
					<b>Tableur</b>						
Aucune	Faible	Passable	Important	Très important	Connaissance générale	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Budgets et affaires	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Recherche des affaires	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Bases des données</b>						
Aucune	Faible	Passable	Important	Très important	Application générale	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Programmation et projet	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Maintenance	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Modification	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Rapports spéciaux	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Bases des données particulières</b>						
Aucune	Faible	Passable	Important	Très important	Contrôle des stocks	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Programme de comptabilité	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Contrôle d'information exportation/importation	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Programmation</b>						
Aucune	Faible	Passable	Important	Très important	Programmes simples	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Programmes complexes	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Langages</b>						
Aucune	Faible	Passable	Important	Très important	C++	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	C	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Clipper	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Cobol	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	dBase	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Pascal	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	SQL	Aucune	Faible	Passable	Bonne	Excel	Très Excel

Aucune	Faible	Passable	Important	Très important	<b>Projet de Software</b>	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Programmes simples	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					Programmes interactifs complexes						
					<b>Réparation d'ordinateur</b>						
Aucune	Faible	Passable	Important	Très important	Réparation Simple et maintenance	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Réparation d'imprimante	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					Rép. des cartes et d'autres équipements						
					<b>Dos</b>						
Aucune	Faible	Passable	Important	Très important	Commandes	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Utilisation de config sys	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Utilisation de autoexec bat	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Comptabilité</b>						
Aucune	Faible	Passable	Important	Très important	Générale	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Avancée	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Internationale	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Des sociétés	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Adventiste	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Bancaire	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Vérification	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Budgétaire	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Administration</b>						
Aucune	Faible	Passable	Important	Très important	Personnel	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Financière	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Comptabilité	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Budget	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Cours généraux</b>						
Aucune	Faible	Passable	Important	Très important	Loi	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Economie	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Statistique	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Marketing	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Anglais	Aucune	Faible	Passable	Bonne	Excel	Très Excel
					<b>Recherche</b>						
Aucune	Faible	Passable	Important	Très important	Comptabilité	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Gestion des affaires	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Programmation	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Prise de décision	Aucune	Faible	Passable	Bonne	Excel	Très Excel
Aucune	Faible	Passable	Important	Très important	Résolution des problèmes d'affaires	Aucune	Faible	Passable	Bonne	Excel	Très Excel

APPENDIX B  
JOB ANALYSIS LOG

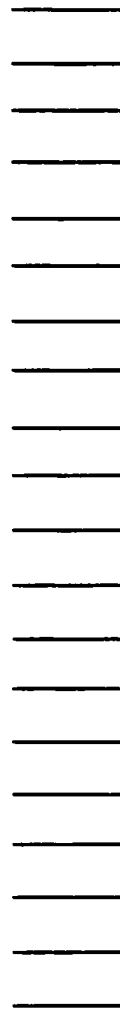
These were originally designed to fit on A4 paper (8.27" x 11.69"). The layout has been modified for letter-size paper.





DATE

Word Processing .....	
Spreadsheet .....	
Databases .....	
Maintenance .....	
Modification .....	
Programming and Projects .....	
Special Reports .....	
Special Databases .....	
Stock Control .....	
Accounting Programming .....	
Programming .....	
Simple Programs .....	
Complex Program .....	
Languages .....	
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C++ .....	
Clipper .....	
Cobol .....	
dBase .....	
Pascal .....	
SQL .....	
Software Projects .....	
Computer Repair .....	
Simple Repairs and Maintenance .....	
Printer Repairs .....	
Computer Cards and Other Equipment .....	
Accounting .....	
Administration .....	
Budget .....	
Accounting .....	
Financial .....	
Personnel .....	





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# PERRY WILLARD MUNGER III

## EDUCATION

ANDREWS UNIVERSITY *Ph.D., Curriculum and Instruction, Graduated 1995*  
ANDREWS UNIVERSITY *MS Computer Science Graduated 1985*  
ANDREWS UNIVERSITY *MA Educational Administration Graduated 1978*  
LA SIERRA COLLEGE *BA Chemistry Graduated, 1966*

### Other Studies

ANDREWS UNIVERSITY *1 year on a B. Div. in Applied Theology 1966 - 1967*  
ANDREWS UNIVERSITY *1 year on a MAT in Physics and Mathematics 1967 - 1968*  
CLEVELAND INSTITUTE OF ELECTRONICS *Advanced Electronic Technician 1978 - 1982*  
*Completed course work only. Did not take the final examination.*

## EMPLOYMENT

ADVENTIST UNIVERSITY OF CENTRAL AFRICA *Dean of School of Business July 1991 -*  
*Developing new Computer Science Curriculum*

ADVENTIST UNIVERSITY OF CENTRAL AFRICA *Dean of Students (Acting) 1992 -*  
*Included Administration of Security*

MICRO RWANDA – ADVENTIST UNIVERSITY OF CENTRAL AFRICA *General Secretary July 1991 -*

ADVENTIST PERSONNEL SERVICE, GENERAL CONFERENCE OF SEVENTH-DAY ADVENTIST  
*Assistant Director April 1985 - October 1990*

SPICER COLLEGE *Assistant Professor November 1982 - July 1983*  
*Taught Physics, Math, Beginning Computer Science Courses, and Theology*

ROORKEE SEVENTH-DAY ADVENTIST HIGH SCHOOL *Principal July 1979 - November 1982*

PAKISTAN ADVENTIST COLLEGE *Assistant Professor August 1974 - July 1979*  
*Taught Science, Education, and Theology Courses, Responsible for Construction*

COLLÈGE ADVENTIST DU KIVU, at Lukanga, Zaire *Teacher November 1968 - June 1974*  
*Taught Secondary level Science, Math, and Bible course, Responsible for construction*

## PUBLICATIONS

*The Economic Impact of Andrews University 1976 - 1977* by Klimes, ..., Munger, and ....  
(Eric Document)

*Needs Assessment for Bernien Springs and Eau Claire Community Education 1978* by  
Klimes, Munger, Bisseli (ERIC Document No.)

## SKILLS

- Computers:
  - Program in C, C++, dBASE, and Clipper
  - Repair and build computers (IBM PC Clones)
- Electronics
  - General Engineering and Repairs
  - Repair and Installation of Generators and Hydroelectric plants