COMMUNICATING SCIENCE TO RURAL COMMUNITIES REQUIRES BOUNDARY CROSSING

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Paper

1   INTRODUCTION

The underlying aim of communicating science to rural communities is to prove the usefulness of scientific information for social or economic progress. Important to keep in mind about this communication process is that scientists responsible for the creation of scientific information originate from a literate society, while most of the potential users in rural communities originate from a basic oral society. This has implications for the communication of scientific information. We should take into account that the generation and utilisation of science does not take place in a socio- cultural or environmental vacuum. Social and cultural dimensions are closely linked. Inadequate recognition of this fact can impede the purposeful communication of scientific information to rural communities. In a situation where the scientific information and the users in a rural community originate from different backgrounds, social and cultural dimensions become some of the boundaries which nee! ds to be crossed during the communication process.

2   STATEMENT OF THE PROBLEM

For purposes of this presentation we will look at the problem at hand from two angles. Firstly: It is well known that if information is not understood and therefore not utilised, it has very little value for the user exposed to it. For the communication of science to rural communities this has serious implications.

Since scientific communication is essentially the exchange of information between the sender and the user, it is important that both parties should have the same understanding to make the message meaningful. However, within the environment of the sender and user there are elements that cause misunderstanding or no understanding at all. These elements are the variables that act as boundaries that need to be crossed between the sender and receiver.

Secondly: The problem of scientific information crossing boundaries manifests itself in all too familiar situations encountered in developing endeavours by governments or donor organisations operative in developing communities. Governments which strive to improve the quality of life of developing people under their jurisdiction, realise more and more that scientific information can be a very useful resource in the development of rural communities. Certainly their intentions are that people in developing sections such as rural communities, should also benefit from the advantages brought by scientific achievements. However, it is also being realised that scientific information transferred in the form of technologically advanced products or processes to rural communities does not always comply with the intended expectations of the donors. There are well known cases where technology worth millions of dollars is channelled through donor agencies to developing countries with littl! e progress to show after a development project was completed, or where technical staff was withdrawn. The mass media report from time to time that consignments of equipment dearly needed for progress in developing areas are hardly touched, or broken equipment that are never fixed due to either a lack of money, or as a result of local people who lack technical skills to attend to the equipment, or they are unable to implement or sustain newly obtained equipment or programmes.

It is generally accepted that the communication process in development is not completed unless that which is communicated is implemented and become part of routine usage. So, if technologically advanced equipment was transferred with the intention to benefit development, and not implemented by the receivers on a routine basis, it implies that the communication process was not successful altogether.

Thus, the process of science communication for development purposes becomes the problem for which researchers try to find solutions. That is, which is the most appropriate way to communicate science (or its innovations) to developing communities? Currently development communication approaches focus on the receiver or end user of the communication process. In the past the focus was on the sender. Therefore, in this presentation we will pay attention to the role of the end user in the rural community.

Since the impact of the oral culture is still very strong in rural communities (Melkote 1991:218), we will look at the manner in which these people handle information, and what type of communication mechanisms they use. It will also be necessary to look at how the social environments of both the senders and receivers impact on the acceptance and implementation of science in rural communities. Lastly we will look at a model, which depicts the merging of input from both the indigenous knowledge system and the modern information resource system to contribute to the effective communication of science to rural communities. Finally the role of the intermediary in this merging process will be contemplated.

3   RURAL COMMUNITIES

As people in rural communities are the receivers of scientific information, it is important to understand how they handle information, compared to handling of information by people who want to communicate science to rural communities. We can depict the problem as two circles representing two information resource systems (Figure 1) that need to interact with one another. Their boundaries determine the nature of the information kept inside, and so distinguish them from one another. The boundaries are there to protect the identities of the two systems.

Often these boundaries are set up by social and cultural structures. Knowledge is a product of culture. Norms and values that guide our actions of creation and utilisation play a crucial role (Dissanayake 1986:269). We therefore need to understand the role that the user play in this communication process, as well as the social structure
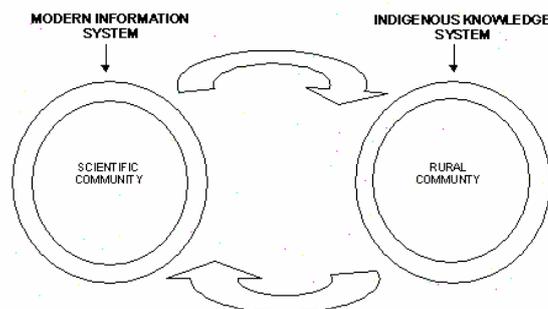in which the potential users are located.

Figure 1: Adapted version of Havelock's interactive model (1986c)

Our particular interest in the social and environmental structures of rural communities is to understand how information is used or exchanged. This can help us to better understand how

communication of science can be affected. Knowledge of rural people's information handling skills will determine how they should be approached to ensure that they understand, accept, use and eventually benefit from science.

However, it should be kept in mind that rural communities are not all alike. Different circumstances may impact on communities that result in their unique characteristics, and yet they may still have certain characteristics in common. Gassol de Horowitz (1993:170) points out that it has become customary when dealing with so-called "developing countries" to warn about the dangers of generalising about nations that are often far apart geographically and have totally different historical and cultural backgrounds. Although these countries – or rural communities within these countries – have some characteristics in common, they also have marked differences which influence their pattern of development. There are ethnic as well as cultural and social differences, and there are also different political alignments. It is equally evident, however, that rural communities in developing countries suffer from problems and conditions that are strikingly similar and all too often familiar.

For purposes of this presentation we will focus on rural communities where the impact of the oral culture is still prevalent. It is believed that people originating from oral cultures still form the bulk of the population in rural areas (Melkote 1991:218). Although many people in rural areas in South Africa (and most other countries in Africa) are used to the modern way of life, the impact of the oral culture in traditional societies is still very prominent. To communicate science to these areas it is important to understand what communication mechanisms are used.

4   COMMUNICATION MECHANISMS

In traditional societies communication mechanisms developed around the needs and demands of oral cultures. As in all societies existing knowledge is an important resource for the continued existence and development of communities and their communication mechanisms are indispensable for access to, and utilisation of knowledge. So, although communication mechanisms in traditional societies differ markedly from those of the modern society they serve their purpose perfectly well.

Rural people are still heavily reliant on the word-of-mouth form of communication for their continued existence (Manzvanzvike 1993:125; Ozowa 1995:8). Therefore, we can assume that the communication mechanisms used to exchange information comprise various forms of speech, acts, expressions, images and attitudes where the presence of both the sender and receiver is required.

When we talk of communication mechanisms we need to understand that people use different means to search, collect, store and interpret incoming information and disseminate information. Much of our understanding of communication mechanisms of oral societies are influenced by the viewpoints of Botha 1991; Goody and Watt 1963; Olson 1994 and Ong 1982). For the purpose of this presentation we will divide the communication mechanisms in four categories. These include the following:

4.1   Mechanisms to concretise and store information

In oral cultures most of the indigenous knowledge is preserved in people's minds - the so-called collective memory (Mundy & Compton 1995:120).

Unfortunately, the human memory has a limited capacity and stored information can be eroded by failing memories. To ensure that information is not forgotten it must be reinforced by various mechanisms to ensure that it can be recalled when needed. Therefore a number of mechanisms were devised to store information in the oral tradition. These include:

·   Mnemonic patterns. These patterns include repetition, fixed expressions, riddles, or proverbs.

o   Repetition. Repetition is way of reinforcing memory. It keeps both speaker and listener safely on track and let ideas sink in.

o   Fixed expressions. Fixed expressions are often used in political talk to make information more memorable or let ideas sink in .For example, concepts such as: "rainbow nation", "crime against humanity", etc.

o   Riddles and proverbs. These mechanisms are used for keeping knowledge embedded in the human life-world. This practice over a long period helps to develop sharp memories for which people in oral cultures are well known.

·   Add on with "and." Events or processes are remembered in succession and are recalled in the same succession. For example, genealogical lists to reveal social relationships.

·   Observation and practice. Observation plays an important role in preserving knowledge about skills. Skills are learnt by observation and practice with minimal verbal explanation.

·   Homeostasis. This is a remarkable feature for storing information in oral cultures. This is a way of constantly readjusting what is kept in the memory. Issues that cease to be of contemporary relevance is likely to be eliminated by the process of forgetting. The meaning of a certain word or expression that is no longer part of the present is commonly altered or it simply vanishes. What is no longer needed is dropped from the memory and eventually disappears.

4.2   Mechanisms to interpret and process information

Authority figures and group opinion are important communication mechanisms that determine how incoming information is judged and integrated into the existing store of knowledge. These mechanisms include:

·   Elderly people. It is well known that in traditional societies in Africa, older people receive the greatest respect, as it is believed that elderly people have accumulated wisdom and knowledge over the years. They act as knowledge stores for the society. It is highly likely that acceptance of information by a group will to a certain extent be sanctioned by the viewpoint of elderly people.

·   Community structures. The strong hierarchical structures prevalent in communities and family circles in traditional cultures, require that information regarding decision making and planning are channelled through the headmen to the community, or through the male head of the household.

Not all information is accessible to everybody. The hierarchical system of and power relationships prevalent in traditional cultures certainly have an impact on the access of information (Awa 1980, Pickering 1996). Those in need of information should comply with certain requirements. It seems that access to information depends on two components: that of the public goods domain where everyone has free access to information available in this domain, and a proprietary goods domain which is held by experts and where information can be accessed for a small fee (Mchombu 1993).

·   Opinion of the group. As far as new information is concerned individuals often rely on the judgement of the group. The group serve as a sounding board to sort out uncertainties. The group also has the advantage that if decisions taken prove to be wrong the group has to accept collective responsibility and no single individual can be blamed.

·   Situational thinking. People in oral cultures tend to perceive new information, by comparing it to real-life situations they are used to.

·   Subjective interpretation. In the oral tradition it also seems that people do not clearly distinguish between factual information and traditional beliefs. This can have implication for planning and decision making processes.

·   Resisting outside information. Since people in oral traditions tend to have set ways of doing things they are often unable to absorb new improvements needed to keep in step with a rapidly changing world. These prevent them from accepting additional information and thus hamper the free flow of information.

4.3   Mechanisms to access information

Since most information is stored in the collective memory of the community and the main means of communication is by word-of-mouth it can be safely assumed that accessing of information take place along the same lines. In other words, accessing information requires face-to-face contact. The main communication mechanisms will be people such as:

·   Knowledgeable persons. In oral cultures people will mainly turn to knowledgeable people whom they know personally and whom they trust - usually authoritative figures and elderly people who proved to be knowledgeable.

·   Group gatherings. People obtain or exchange information while participating in group activities like farming practices, household chores, hunting or herding livestock. By participating in these group activities individuals learn from one another.

·   Observation. Through observation of activities carried out by an experienced person people access the IKS by looking and learning.

Considering the mechanisms to access information it seems that many of them are also used to control access. These include among others:

Power structures - where access is free in the public good domain, but available for a fee in the propriety goods domain held by experts

Resistance to change - often people do not trust outside information

Family structures - set ways passed down through generations prohibit unconditional acceptance of outside ideas

Social relevance - people tend to accept only what is of social relevance. The rest is omitted or forgotten

4.4   Mechanisms to communicate information

The communication mechanisms used are:

·   Face-to-face communication. Face-to-face is probably the most important mechanism to transfer information within an IKS. IKS are heavily reliant on the spoken word and dependent on close contact between the speaker and the listener. The presence of people is required to receive or to send messages.

Body language and demonstration play an important role to add meaning within a particular situation.

·   Metaphorical speech is used to relate new information to existing perceptions. Use of parables is a common practice. For example to convince your listeners of the importance of maize production for food security, you tell them the maize plant is like the musadi - the woman who cares for her family.

·   Storytelling, acting, dancing, role play. Information about norms, values, traditions, or to change attitudes is often transferred by mechanisms such as storytelling, dances, singing, acting or role play. A fieldworker who wanted to emphasise the danger of weed in the maize fields made up a story for small-scale farmers about the fierce lion that one night attacked the goats in the kraal because the gate was not locked.

·   Visual demonstrations. Demonstrations play an important part in communicating technical information. Demonstrations are an effective mechanism because people used to the oral tradition developed over time remarkably sharp observation abilities. This has to do with their ability of relating perceptions with real-life situations.

4.5   Distinctions of communication mechanisms

The discussion so far proved that the communication mechanisms of the IKS are different from those of modern information resource systems, and that they are fairly incompatible. This is quite understandable because the indigenous communication mechanisms developed along completely different lines in order to comply with the particular requirements of the IKS.

·   Dissemination capacity

One of the disadvantages of the indigenous mechanisms is that their ability to transfer information is limited to the boundaries of a community dependent on oral culture. Within such a community indigenous knowledge can be transferred over time from one generation to the other, but it seldom leaves the community unless the people of the different communities come into contact with one another, or build up IKS through experience. In contrast the modern communication mechanisms are able to disseminate information over long distances to unknown receivers and at an unlimited number of receivers wherever they are. In that way information stands a better chance to be disseminated further than is possible with the communication mechanisms of the IKS.

·   Human involvement

Another disadvantage of indigenous mechanisms is that they always require direct human involvement, where as in the case of modern mechanisms receivers and senders do not need to be present when information is transferred.

·   Collective memory

Within the IKS knowledge of a particular issue is scattered among many experts who comprise the collective memory. Since the access mechanism is to contact a person known to have expertise, it is not so easy to obtain the information. In the modern information systems, which are based on concrete formats (written or digital) this problem is addressed by using classification and indexing techniques to sort topics of likeness together and keep topics of unlikeness apart. To access the information one should know how to use indexing systems that guide one to the required information.

·   Accessibility

Modern communication mechanisms to a large extent require literacy to be able to access information outside the human memory for example, information in a written medium. In an oral

culture one only needs to listen, observe, memorise and have experience to be able to access the collective memory.

· Credibility

Despite their disadvantages indigenous communication mechanisms have high credibility among users of the oral tradition, since they are controlled locally. External mechanisms like the mass media are often greeted with scepticism among traditional groups.

Outsiders can also use indigenous communication mechanisms for both collection and dissemination of information, provided they know how these mechanisms are applied when and for what purposes.

Indigenous communication mechanisms offer opportunities for participation by local people in development efforts. Rural people can exchange ideas among themselves as well as with development officials and decision makers.

· Importance

When indigenous communication mechanisms are ignored development efforts can be retarded as a result of misunderstanding, or not understanding at all. So, it seems clear that indigenous communication mechanisms have a role to play when it comes to communicating scientific messages across boundaries of the modern and the IKS.

5   BOUNDARY CROSSING

Considering the differences as far as communication mechanisms are concerned, it seems clear that scientific information, originating from the developed world, needs to cross socio-cultural boundaries (reflected in the IKS) to be accepted and implemented by rural people. To explain this boundary crossing best, we will take a look at a simplification of Havelock's (Havelock 1986c:226) interactive model in Figure 2.
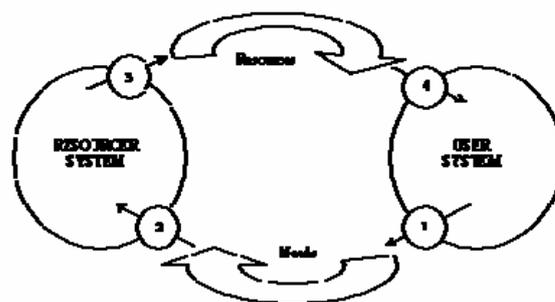

Figure 2:   Simplified version of Havelock's interactive model (Havelock 1986c)

From the discussion it will become clear how this model can be applied to the communication of science to rural communities. For our purpose we propose that the resource community depicted in Figure 2 comprise among others the scientific information that needs to be communicated to rural communities. This implies then that the user community in Figure 2 comprises the potential users of scientific innovations in rural communities, as well as their existing store of indigenous knowledge (IK). For the transfer of science to rural communities the interaction between these two systems is crucial to ensure that the rural community will benefit from science.

Considering the boundaries of these two information systems Havelock (1986b:85) argues that they act like semi-permeable membranes which regulate the flow of information to such an extent that they can benefit from outside information, but still protect their own integrity represented by information and knowledge inside. Each of these two systems has entry and exit points (numbered 1-4) which permit or prevent the flow of information as a result of certain requirements set by the two systems.

5.1   Need articulation by the users

To begin with we consider point number 1 at the user system, which represents an exit point for messages expressing needs. Need messages have to do with certain issues about needs, such as becoming aware of a need, seeking help and also the ability to articulate a need.

As far as awareness of a need is concerned, users do not always view certain conditions as a problem that can be solved. For example certain illnesses, child mortality, or disasters like droughts or floods are viewed as part of their fait and not something that can be changed through any kind of intervention (Todaro 1994, Freire 1972). On the other hand self-reliance is a strong value in all cultures and seeking help is often viewed as a sign of weakness or dependence. Thirdly many people cannot clearly pin point, what their needs are (Rogers 1992; Soergel 1985). They may realise that they experience problems, but are unable to express this awareness meaningful. To address the problems of expressing needs at this exit point, is something that often comes only after the potential users have been made aware of a resource that can offer a solution. This awareness can only result from prior contact with messages originating from the resource system. Here field workers of develop! ment agencies operating in rural communities can play an important role (Meyer 2002). By allowing participation through methods such as rapid rural appraisal (Chambers 1992) the people in need are empowered to become aware of their problems and express their needs in a meaningful way.

5.2   Receptiveness of the resource system

The second barrier in the interaction between the two systems appears as an entrance problem - point number 2 on the model. Once again here are three issues that need to be addressed. Firstly: scientists in the resource system may not be aware of certain conditions in rural communities where application of specific scientific knowledge may bring solutions. Secondly: scientists may be unaware or do not care about needs of rural communities. In other words they may not be open and attentive to need messages coming from rural communities. Thirdly: scientists may not know enough of the users' culture, traditions, their situation to be able to understand the need messages within context. Fourthly: Scientists may not be geared for the manner in which rural people communicate information regarding solutions to problems.

5.3   Familiarity with the user environment

The third barrier or obstacle to overcome is for scientific information to exit the resource system - point number 3 on the model. In order to provide science that can solve problems in rural areas, the senders must have the desire and the capacity to send messages. The scientists may not be aware of particular situations in rural areas where their inventions can be applied to solve problems. Or, it may be that scientists lack the ability to explain the invention at a level

comprehensible for users of a different background. Here knowledge of the information behaviour, means of communication in the indigenous knowledge system (Meyer 2002a) becomes indispensable in crossing the boundaries between the scientists and the rural community. By knowing how rural people respond to outside information and how they communicate information, senders of science can avoid pitfalls, but they can also apply communication mechanisms typical of rural communities to ensure the effective commun! ication of science.

5.4 Acceptance and implementation by users

The fourth barrier or boundary to be crossed is for science to enter the user system to solve the problem - point number 4 on the model. Here three types of problem, which can prohibit the communication of science, can be expected. These include: desire, comprehension and application.

There must be some willingness to acquire the new resources. The potential users must have some realisation that they can benefit from the particular type of information or technology. It must have value to the experienced need. All these will not happen unless the potential users can foresee that they can benefit (Rogers & Shoemaker 1971) from utilising the package offered. In order to be accepted, utilisation of the incoming product should not be risky. The product or technology should be not completely different from what the people has been used to. The potential users must be convinced that the incoming science will ensure a change for the better before the desire to accept it will evolve. This implies that a relationship of trust (Meyer 2000) needs to be established between the providers of science and the potential users in rural communities. Once the relationship of trust is established, the focus group will be more inclined to learn from outsiders in order to extend! their knowledge base on a particular issue or topic.

It can happen that messages about an outside product or process will be received and understood, but still not applied. The reason for this could be that the product or process was developed in an environment, which is totally unfamiliar to the receivers (Shields & Servaes 1989). To break through this barrier science needs to be adapted and communicated in a way that complies with all the requirements for acceptance by the users in the rural community. This is where knowledge of the communication mechanisms of the indigenous knowledge system comes into play. It seems that learning through training can be guaranteed only when the method of communication relates to those of the oral culture the people are used to. These include direct conversation where body language, metaphors and practical demonstrations play an important role as have been discussed earlier.

6 PRACTICAL APPLICATION

Now that the concepts, boundary crossing and communication mechanisms, have been discussed the introduction of a real-life case may serve as an example of how knowledge of the above could be applied in practice. The Phokoane case (Meyer 2000:140) serves as an example where the communication mechanisms of the IKS were used in a training programme to transfer scientifically sound information on maize production to illiterate small farmers in a rural area. The background to the Phokoane case is that a field worker devised a plan to teach illiterate people how to plant maize to combat hunger and provide in their own needs for food security. Those few who participated voluntarily in the first attempt harvested bumper crops and this gave rise for more people to participate in the training programme. After five years more than 7000 participants were able to produce maize for own consumption (Adendorff 1991). Analyses of this case showed how information from both the modern informat! ion system and the IKS could be merged to benefit the rural community. In the Phokoane case the trainer divided the information needed by the group in six consecutive lessons as illustrated by Table 1.

LECTURES FOR MAIZE PRODUCTION PROGRAMME
Lecture no.   Contents of Lectures

1	1.1	Introduction to the maize plant	1.2	Requirements to produce a good crop	1.3	Utilisation and conservation of natural resources	1.4	Soil cultivation
2	2.1	Fertilisation	2.2	Purpose of agricultural lime
3	3.1	Weed control	3.2	Witch weed	3.3	Crop rotation
4	4.1	Pest control	4.2	Stalk borer and termites	4.3	Establishing a maize crop	4.4	After-care of maize crop
5	5.1	Farmers' identification of problems	5.2	Stock and grazing
6	6.1	Examination	6.2	Issuing of certificates	6.3	Slide and film show

Table 1: Lectures for training programme (Adendorff 1991)

Only information needed for the particular situation was selected. The "lectures" were set to follow the different stages of the maize growing cycle. The group's personal and local situation was taken into account. For example: since the people were illiterate every bit of information needed to be memorised. So, the language used needed to be clear and simple and not too much to overburden their memory capacity.

The training programme started by introducing the maize plant to the group as a musadi - a woman - since he knew women were held high by the group. He went on to explain how the maize plant care for farmers as a woman will care for her family. He used the method of story telling to demonstrate how the maize crop needs to be protected against weeds and pests. Demonstrations and drawings were used to warn against the incorrect ploughing of maize fields and soil erosion. The last part of the training programme focussed on the group's responsibility to arrange in time for harvesting, marketing and how to borrow money and planning for the next season.

Analysis of this particular training programme proved that scientific information can be communicated successfully to rural communities, provided that the focus group is involved right from the start, and that their information behaviour and their information handling skills are taken into account during the communication process. The communication process needs to be conducted in a logical manner and participation of the focus group should be reflected in each consecutive step.

7 MERGER MODEL

Analysis of the Phokoane Case gave rise to the development of the Merger Model (Meyer 2000) depicted in Figure 3. The model reflects how knowledge from both the IKS and the modern information system can be repackaged and communicated in a structured way where there is consistent interaction between the sender and the receiver at grassroots level. This action is heavily dependent on the intervening of a facilitator knowledgeable of both systems. It is believed that by following consecutive steps, and involving the target group with the help of appropriate communication mechanisms through all the phases of a development project, it is possible to ensure the successful communication of science to rural communities.
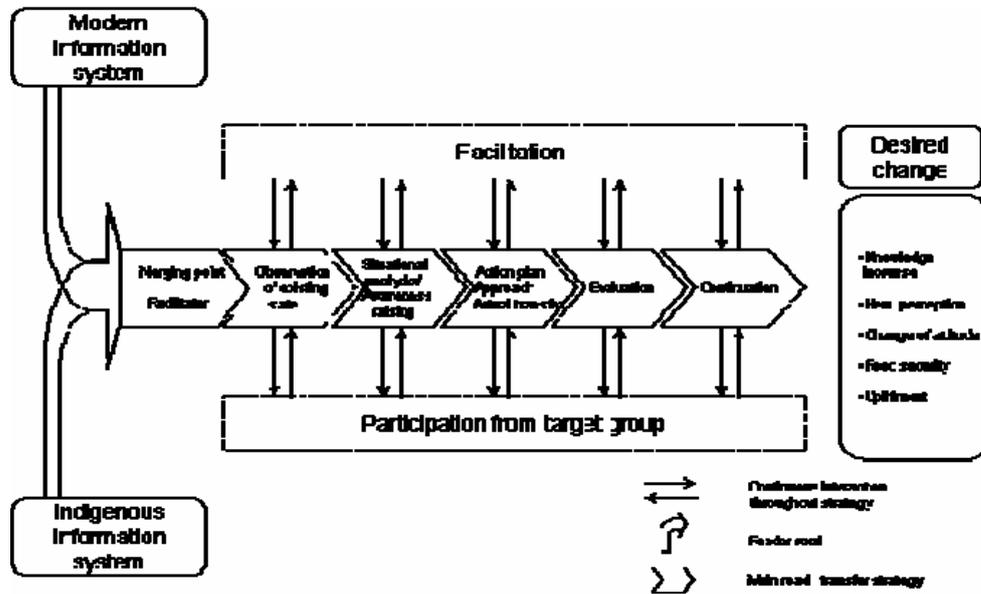
Figure 3: The Merger Model (Meyer 2000)

8 ROLE OF THE INTERMEDIARY

The Merger model shows clearly the important role of an intermediary to ensure that the information from the scientist is understood, accepted and implemented by the potential users in the rural community. Communicating science to rural communities demands from an intermediary to have skills and knowledge that seldom come naturally. This implies that intermediaries whether they are field workers, facilitators, extension officers, or whatever, should undergo appropriate training to ensure that science will effectively cross the boundaries caused by orality and literacy.

Apart from being dedicated and having knowledge of a particular subject field that needs to be communicated, the intermediary or field worker should also be knowledgeable about the interaction between knowledge, its users and their environment. To avoid pitfalls and focus on strong points in the communication process, intermediaries should be able to understand

- the development process

- the role of information in the development process

- how the modern information system, as well as the IKS function

- the focus group's information handling skills

- the communication mechanisms of the IKS

- how information should be managed within the development process

- how focus groups should be involved in their own development

- how information should be packaged for a focus group in a particular situation

Should we wish to better equip field workers to transfer scientific information to rural communities more effectively, it seems obvious that the abovementioned list of requirements should be

included in their training. In fact research (Meyer 2002) is already in progress to determine the viability to design a curriculum, which will add value to the training of field workers who are instrumental in the boundary crossing of science when it comes to rural development.

9   CONCLUSION

I trust that this presentation convinced you that people in rural communities are exposed to information from both the modern and the indigenous knowledge systems. Naturally this implies that the communication of science requires the crossing of cultural boundaries between oral and literate cultures. Crossing of these boundaries requires from those involved in development projects a thorough knowledge of the information behaviour of people used to the oral tradition and knowledge of the communication mechanisms of the indigenous knowledge system. This discussion also attempted to prove that it is possible to merge information from both systems by using the communication mechanisms the potential users are familiar with. Knowing the challenges of both systems means knowing how to cross the boundaries more effectively. Field workers who are crucial in the crossing of boundaries need to be properly trained.

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