CHAPTER 2

RESEARCH-EXTENSION LINKAGES: APPROACHES AND CONCEPTS

Introduction

The exchange of information is vital to the existence of societies, organizations, and other social groups. Given its importance, it is hardly surprising that this topic has received considerable research attention. It is of particular importance in agriculture, given the large numbers of people involved in this activity and its importance to society and national economies.

The literature on information exchange is divided into several strands, each emphasizing a different set of theoretical relationships or practical problems. This chapter discusses these approaches, any of which could be used to study research-extension linkages in Indonesia. I draw from them in developing the approach used in this study. I review the literature on research-extension linkages in Indonesia in Chapter 4.

Agricultural knowledge systems

Agricultural knowledge systems are complex and diverse. They involve large numbers of people and organizations involved in generating, disseminating and using information, related to multifarious tasks in crop and livestock production, input supply, produce processing and marketing, consumption, and regulation.

It should be noted in passing that agriculture is by no means unique in possessing a "knowledge system." Any field of human endeavor can be viewed in a similar way, though the agricultural arena has received the most attention. Two other areas that have attracted attention are education (e.g., Havelock 1986a:83) and industry (e.g., Silveira 1985, Rosenberg 1967). Another obvious candidate is health, though I am not familiar with the literature in this field.

Information in the knowledge system

The flow of information is vital to the smooth functioning of such systems. Without information about likely markets and prices, the producer cannot make decisions about what crops to grow and when to buy and sell. Without information about the location and size of a crop or the quality of produce, the processor cannot plan how much finished product to supply to consumers. In order to compete with each other and to maintain production in a sometimes hostile environment, producers need information about new technologies, most often developed by researchers at universities, research institutes, and private companies.

It is not possible, or even desirable, for individuals in one part of the knowledge system to maintain direct contact with all others in the system who may need information they can provide. There are many reasons for this (see Havelock's [1986b:213] example of technology dissemination). Here I focus on four that are particularly relevant to this study. They are *arithmetic*, *distance*, *translation*, and *adaptation*.

Arithmetic Imagine a farmer who has found a way of controlling a crop pest, or a plant pathologist who has developed the same technique. Information about this technique might benefit large numbers of people (farmers whose crops are attacked by the pest). The inventor cannot possibly provide information to all the farmers personally. In many countries, farmers who could benefit from the technology number in the millions, while only a handful of pathologists are at work. Some kind of intermediary -- an extension service, or a mass medium -- is necessary to duplicate information about the pest control method and make it available to the audience.

Distance Farmers and other users of information are scattered geographically. The inventor of a technology is located in one place. This means the information about the technology must be distributed (for instance, via a publication, the mass media, or training courses) so it reaches its audience.

Translation In order for an audience member to understand the information, it must be translated into terms he or she is familiar with. This may involve rewriting a research report in non-technical language, combining it with other information to show how it is relevant and can be used, and presenting it in a readily understood format.

Adaptation Audience members do not experience the same situations. It may be necessary to adapt the information to suit local social and agroecological conditions. It may even be necessary to tailor the information to suit individual farms. Usually this is done by the farmer him- or herself. But often the farmer lacks sufficient expertise to solve a problem, so an outsider's advice is needed.

Given these constraints, it is clearly impossible for a technology inventor to perform the dissemination function except on the smallest scale. To do so would mean abandoning the invention of new technologies, since there would be no time left for anything except dissemination. The mass media can help overcome the barriers of arithmetic, distance and translation, but they are not suited to adapting information to suit individual needs. Hence the need for specialized organizations to handle these functions.

In the developed world, a host of institutions has grown up to perform these functions. They include the sales forces of input and equipment suppliers, firms that specialize in market information, private crop consultants and veterinarians, agricultural magazines and broadcasting stations, and the information services of regulatory agencies. Similar organizations exist in the developing world, though these are typically much smaller and less well established than their developed country counterparts. In both the developed and developing worlds, formal and informal networks among farmers play a major role in the dissemination of information.

Agricultural extension

Often the largest organization in an agricultural knowledge system is the extension service. In the developed world, extension is just one of many competing sources of information for farmers. In the developing world, however, the frequent lack of such suppliers gives the extension service a vital role in the dissemination of new technologies and in the solution of farmers' problems. Extension services field large numbers of personnel: their numbers are rivaled at the lowest levels only by village government officials and school teachers.

In most of the developing world, the idea that agricultural extension must have close ties with formal research is relatively new (Kaimowitz 1991:101). Much early extension work was based on the idea that there was already a sufficiently large body of existing technology, both locally and abroad, that could be used to improve production, without having to ensure that the latest research findings reached the extension personnel. Colonialism meant that research activities focused on export crops and a few expatriate and elite indigenous farmers. Until well after the Second World War, research was largely confined to developing new crop varieties and to soils research, while extension was often coercive and included numerous other unrelated activities (Sims and Leonard 1990:44).

More recently, extension began to be seen as a bridge between research and farmers -- a bridge to bear a one-way procession of newly developed agricultural technologies and policy directives on their way to be utilized by farmers. The task of extension personnel was to translate these technologies and directives into terms farmers could understand, then to persuade as many farmers as possible to employ them.

The one-way, top-down view of extension has now been replaced by a more balanced view -- at least at academic institutions. But the dissemination of research-based technologies to farmers is still a major task of extension, and indeed should remain so if public agricultural research institutions continue to function.

This does not mean that the dissemination of research findings is -- or should be -- the only task of extension. Much of the advice an extensionist gives farmers draws on an already existing body of knowledge, based on both formal research and farmers' experience. A great deal of extension work consists of facilitating organization by and communication among farmers. Close ties with research are not necessary for such activities. In any case as Albrecht et al. (1989:185) point out, formal research has often failed to develop solutions to local problems, and other sources of innovations may also be useful.

Research-extension linkages

Nevertheless, the importance of strong linkages between research and extension is now widely recognized (Baxter and Thalwitz 1985:42-48). But there have been far fewer studies of this link than of that between extension and users (Compton 1989:126). This is true in the developed world also (Feller 1986:283, Feller et al. 1984:45-47). In the United States and elsewhere, the topic of research-extension linkages has fallen between investigations of the research system, such as Busch and Lacy's (1983) study of U.S. agricultural scientists' research priorities, and assessments of extension services, such as that by Warner and Christenson (1984). Indeed, some recent texts on extension still pay little attention to research-extension ties (Albrecht et al. 1989:185; Van den Ban and Hawkins 1988:26-33)

There has been a recent surge in interest in extension systems worldwide, and in research-extension linkages in particular. This has followed the pioneering work of Lionberger and Chang (1970) in Taiwan, and Nagel (1980) in India. It was given a major boost by a conference at Cornell University in 1980 (Compton 1992), and a series of dissertations at Cornell in the 1980s (Dhandhanin 1984, Hussein 1986, Lakoh 1986, Lupanga 1986, Malik 1988). It has been further fueled by the activities of INTERPAKS (the International Program for Agricultural Knowledge Systems at the University of Illinois) (INTERPAKS 1983-91), and a major review of research-extension linkages by ISNAR (the International Service for National Agricultural Research, in the Netherlands) (Kaimowitz 1990). In addition, a series of World Bank publications has looked at the Training-and-Visit system the World Bank has promulgated in numerous countries, including the focus of this study -- Indonesia (e.g., Feder, Lau and Slade 1985; Feder and Slade 1983; Cernea, Coulter and Russell 1985). Table 2.1 lists some of the recent literature on extension and research-extension links worldwide.

Table 2.1 References on agricultural extension and research-extension linkages worldwide.[a]

General		**Organization-level studies**	
Albrecht et al. 1989, 1990		Agudelo and Kaimowitz 1989	Colombia
Arnon 1989		Busch and Lacy 1983	U.S.A.
Axinn and Thorat 1972		Cernea, Coulter and Russell (eds.) 1985	Bangladesh, India, Indonesia, Pakistan, Sri Lanka, Thailand
Compton 1989			
Hornik 1988		Ekpere and Idowu 1990	Nigeria
INTERPAKS 1983-92		El-Zoobi 1988	Pakistan
Kaimowitz (ed.) 1990		Engel 1990	Colombia
Lionberger and Gwin 1991		Eponou 1990	Ivory Coast
Rivera and Schram (eds.) 1987		Feller 1986	U.S.A.
Rivera and Gustafson (eds.) 1991		FFTC 1981	E and SE Asia
Swanson (ed.) 1984		Fivawo 1987a	PR China
Van den Ban and Hawkins 1988		Fivawo 1987b	Fiji
		Fivawo 1987c	Kenya
Individual-level studies		Hildreth 1965	U.S.A.
Anyawu 1982	U.S.A.	Kaimowitz 1989	Colombia
Curvo 1983	U.S.A.	Lionberger and Chang 1970, 1981	Taiwan
Gidley 1977	Australia	McCorkle and Esslinger 1992	Brazil, Indonesia, Kenya, Morocco, Peru
Hussein 1986	Indonesia	Ortiz et al. 1991	Guatemala
Lupanga 1986	Tanzania	Sigman and Swanson 1984	Worldwide
Mundy 1989	U.S.A.	Snyder 1987	West Africa
Nagel 1980	India	Warner and Christenson 1984	U.S.A.
Seegers and Kaimowitz 1990	(review)	Wyckoff 1965	U.S.A.

[a] For references on research and extension in Indonesia, see Chapters 3 and 4.

In many countries until recently, it made little sense to talk of research-extension linkages, since both research and extension institutions were so weak that there was nothing to link. Growth in both sets of institutions, however, has given rise to a new concern -- how to ensure the smooth communication of information between them.

The research-extension linkage is similar in many ways to the situation of the plant pathologist and the farm discussed above. The same four constraints apply: Extension personnel are numerous compared to researchers, they are geographically scattered, they require information in a different form from that provided by researchers, and they face different sets of environmental and social conditions.

Just as extension services have begun to evolve as links between research and farmers, another set of job roles and institutions has developed to link research and extension. These include extension subject-matter specialists, research communication departments, and extension media production units.

Subject-matter specialists

In the United States, the functions of agricultural research, teaching and extension are combined in a single institution in each state: the land-grant university. The research-extension linkage is personified by extension specialists at these universities. While each state has its own organizational variant, these persons are generally based in the university's academic departments and have faculty rank. They may hold full-time extension appointments or combine this work with teaching or research. Their task is to collect, interpret, and translate information pertaining to their field, and to disseminate it to end-users -- directly, through county extension personnel, or via the mass media. They also provide feedback to their researcher peers on field problems, and may perform research themselves to help solve those problems (Mundy 1989:2).

In most of the developing world, research, extension and teaching are the responsibilities of different institutions: research institutes, extension agencies, and universities. It is thus not possible to replicate the U.S. system (even if this were desirable) without massive and disruptive institutional change. Another model must be sought.

In the Training-and-Visit extension system promoted by the World Bank in numerous developing countries, the role of linker is performed by extension subject-matter specialists (SMSs) (Benor and Baxter 1984:33-38). These are usually based not at research institutions but at provincial and district extension offices. Like their U.S. counterparts, it is their role to seek and translate information and to disseminate it to field extension agents. They are expected to divide their time roughly equally between three tasks:

- Visiting farmers' fields to monitor problems and to check whether recommendations are appropriate and are being adopted by farmers.
- Training field agents in technology recommendations.

- Maintaining contact with research.

The SMSs are to maintain contact with research in four main ways:

- Participating in monthly workshops that are also attended by researchers.
- Visiting research stations to meet researchers in their own specialty field, use library facilities, and observe experiments.
- Receiving formal training from researchers.
- Conducting trials on farmers' fields, and analyzing them jointly with researchers.

SMSs are recognized as a vital but still weak link in the research-extension continuum (Hussein 1986:417; Padmanagara 1985:137; Pickering 1985:167; Wirasinghe, Weerasinghe and Fernando 1985:101). Problems include lack of sufficient specialists, poorly qualified personnel, irregular or inadequate training courses, distraction by administrative and other functions, and lack of interaction with research.

Linkage institutions

Two institutions aimed at linking research and extension are relevant to this study. These are research communication departments and extension media production units. The former are located within the research institutions. Examples are the experiment station information offices at U.S. land-grant universities, and the information units of research institutes in Indonesia (see Chapter 4). They typically publish research bulletins and annual reports, stage exhibitions, produce press releases, and engage in public relations work.

Extension media production units are located within the extension institution. They perform similar activities to the information offices, but produce media materials to inform local extension personnel and for these personnel to use in serving their clients. In Indonesia, the provincial Agricultural Information Centers (AICs) perform this role.

Causes of poor linkages

Along with a recognition of the importance of research-extension linkages has come an increasing awareness that they are a problem. Numerous causes of poor links have been proposed. A short list includes the administrative separation of the research and extension functions, complex institutional structures, status differences between scientists and extension personnel, the geographical distance between them, different time horizons, different motivations and personal orientations, different educational levels and other personal characteristics, lack of accountability to clients, lack of resources and infrastructure, lack of relevant research results, institutional rivalries, inadequate planning and coordination, lack of research continuity, researchers' unwillingness to take unconventional actions, failure to involve small farmers in research planning and implementation, researchers' ignorance of local knowledge, and their neglect of long term social and ecological effects (Albrecht 1989:186; Arnon 1989:786-787; Martínez Norgueira 1990; Kaimowitz, Snyder and Engel 1990; Padmanagara 1985).

Most of the literature refers to poor linkages either as an organizational difficulty (to be dealt with by making the appropriate adjustments in organizational structures or operations), or as due to characteristics of the interrelationships among individuals in those organizations (to be dealt with through appropriate hiring, training and incentives). Table 2.1 lists references that use the two approaches.

The organizational view (almost by definition) tends to ignore the constraints communication faces at the individual level. The individual view, on the other hand, has tended to push the blame for poor communication onto the shoulders of individual researchers and extensionists: they do not communicate because of mutual jealousies, differing motivations, etc. This view has also tended to ignore the constraints researchers and extensionists face in attempting to communicate.

Communication between researchers and extension personnel can occur through two broad groups of channels: direct and indirect. By *direct* channels here, I mean those where the extensionist receives information directly from the researcher through interpersonal contact or through publications, correspondence, etc., authored by the researcher. *Indirect* channels have some intermediary who translates the research findings into another form before they are communicated to extensionists. Training courses given by professional trainers, ministry instructions, and magazine articles are examples of indirect channels. The intermediaries include research and extension administrators, subject-matter specialists, trainers, and journalists.

Both direct and indirect channels are constrained by factors outside the control of the individual researcher or extensionist. Through no fault of their own, researchers and extension personnel in developing countries very rarely meet -- because of the large numbers of extensionists in comparison to researchers, the vast distances separating them, and the lack of funding for such meetings. Thus, high levels of interpersonal communication are not possible. Direct mediated communication is also difficult because of bureaucratic regulations (see Chapter 4), inadequate distribution of research publications, insufficient

funding, the lack of suitable publications as vehicles to carry findings, and the lack of incentive for researchers to communicate with extension personnel. Indirect contacts suffer from similar funding and organizational constraints.

In such a situation, the information sources available to an individual extensionist are highly constrained. These constraints, as well as extensionist's personal characteristics, will help determine which sources the extensionist uses.

This study is premised on the assumption that individual extension personnel are key actors in determining the flow of information from research to extension. Research supplies a range of information to various audiences, including extension. Extension personnel in turn select from a smorgasbord of information sources -- including research -- and pass this information on to their clients. Which sources the extensionists select depend on various factors that may or may not be under their control, including the constraints described above. This study aimed to find out which factors affect the choice of information sources used by Indonesian extension specialists.

Approaches to studying information flows

Uses and gratifications

The uses-and-gratifications approach to studying the mass media views the audience as actively choosing and using media, rather than passively consuming and responding to them. It sees media use (or information flow) as a function of the receiver's needs and his or her perceptions of the ability of information sources to fulfill those needs (Katz, Blumler, and Gurevitch 1974:20). Thus, if you seek entertainment, you will watch those television programs you think will provide entertainment rather than (say) education or news.

A problem with uses-and-gratifications research is that it mixes units of analysis. Your need for entertainment is a unitary characteristic dependent on your personality or some attribute pertaining to you. But your perceptions of a medium or program to provide entertainment are not characteristics of you alone. Rather, your perceptions describe the relationship between you and the medium or program. This mixing of units of analysis dilutes the usefulness of uses and gratifications in predicting information flows among a range of sources.

The uses-and-gratifications approach fails to take into account other aspects of the source-receiver relationship. For instance, it assumes that audience members have easy access to the information source -- a reasonable assumption for television news in the United States, but not for agricultural information in Indonesia.

Uses and gratifications generally assumes that the audience member has free choice in media selection and exposure, and is free to determine the gratifications sought. Neither of these assumptions is necessarily valid for organizational information flows. If you are watching television, you can choose whether to watch, what to watch, and why to watch. You have a wide range of possible gratifications, including surveillance, correlation, entertainment, and cultural transmission (Katz, Blumler, and Gurevitch 1974:23), relaxation,

to forget, companionship (Palmgreen and Rayburn 1979:163), keeping up with current events, finding out about government officials, and so forth (Palmgreen and Rayburn 1982:571). But extension specialists *ought* to seek information about agricultural technology in order to perform their jobs. Their possible sources and gratifications are constrained by this (McGuire 1974:168). While the uses-and-gratifications approach can include situations where a person is required to seek information, is likely to be of limited explanatory power for such a case.

Finally, uses-and-gratifications research has been largely confined to studies of the mass media, though recently it has been applied also to interpersonal and other non-mass media information sources (e.g., O'Keefe and Sulanowski 1991:9).

These problems do not mean that I could not have used the uses-and-gratifications approach in this study. But they did lead me to seek a more appropriate model.

Information seeking

Like uses and gratifications, the information seeking paradigm also assumes an active audience, one in which people seek information rather than are fed it. Unlike uses and gratifications, however, it includes constraints to information flows such as accessibility and choice. While much information seeking research focuses on unitary rather than relational variables, the approach does not require such a focus. And the information seeking approach is as applicable to non-mass media as to mass media.

Much of the information seeking literature tries to identify characteristics of individuals or of their situations that affect their information seeking styles. This is not the focus of this study. Rather, I aimed to identify the reasons receivers use certain sources rather than others. The literature focusing on the costs and benefits of different sources (e.g., Atkin 1973) is thus more germane to this study. I discuss it in more detail in the section on source-receiver relationships in Chapter 5.

Social interaction

A large body of literature exists on information and innovation diffusion (Rogers 1983). Labeled the "social interaction" model by Havelock (1969, 1986a, Havelock and Lingwood 1973:274), this approach focuses on the attributes of innovations and the characteristics of adopters as determinants of the spread of an innovation (Rogers 1983). Innovations that possess certain characteristics (trialability, compatibility, observability, etc.) are expected to spread faster than those with the opposite features. And audience members who are better educated, have higher social status, are more intelligent, and who are more cosmopolite (and a host of other characteristics) are more likely to adopt than those without such features (Rogers 1983:260-261).

Studies on communication channels within the diffusion paradigm have focused on channel use by different categories of adopters and at various stages in the adoption-decision process. It has been generally found that the mass media and cosmopolite

channels are more important than interpersonal and localite channels among early adopters and in the first stages of the adoption process (Rogers 1983:197-202). Beyond the interpersonal-mass media distinction, however, this branch of diffusion theory is of little use in predicting which of several channels will be used.

Three aspects of diffusion research are especially useful in the study reported here.

- Diffusion studies have pointed to factors which affect the flow of information between individuals. People who are *homophilous* (similar to each other) communicate more frequently than those who are heterophilous (different) (Rogers 1983:274). And change agents who can *empathize* with their audiences are likely to be more effective than those without this ability (Rogers 1983:321). While I use neither homophily nor empathy in this study (for reasons outlined below), they are important because they show that communication between a source and a receiver is affected by the relationship between them rather than (or as well as) by factors pertaining to the source or receiver alone. Homophily and empathy alert us to other characteristics of this relationship that may determine information flows.

- Diffusion research has indicated the importance of the *strength of weak ties* (Rogers 1983:295). These are infrequent contacts that can nevertheless be extremely important in providing someone with new information. Research-extension linkages may well be of this nature: contacts may occur seldom but be very useful when they do occur.

- The diffusion paradigm has investigated the spread of innovations through a population. It focuses attention on the speed of diffusion and provides a vocabulary with which to describe this.

Network analysis

Growing out of early work on sociometry, network analysis has been used to extend the diffusion paradigm just described. This approach studies the flow of information among nodes (people or organizations) in a network (Rogers and Kincaid 1981, Rogers 1983:293). Information flow is measured between each node and all others (or with the most important partners only) to identify patterns of communication and key individuals.

While it has great utility for studying information flows among individual farmers and extension personnel, network analysis has two drawbacks for the type of research I wanted to perform. First, for impersonal channels such as the mass media, it is difficult to distinguish the source from the channel (Rogers 1983:197). Network analysis requires that all nodes be true sources rather than source/channel combinations. And second, network analysis typically ignores the type of channel used. It groups together all channels from a single source as the measure of information flow from that source, and makes no predictions about which channel will be used.

Research, development and diffusion

This approach is somewhat confusingly named in view of the label "diffusion" often attached to the social interaction perspective, described above. Havelock (1969:11/6) describes it as seeing innovations as developed through basic and applied research, passing through a development and testing stage, before being packaged and marketed to users. It focuses on the research, testing, and adaptation activities that precede an innovation's emergence rather than the process of spread within the audience, which is the main topic of the social interaction (viz. "diffusion") paradigm.

This perspective is represented by the Coughenour-Lionberger and Meehan-Beal models (Lionberger 1986, Lionberger, Pope and Reddy 1979:13, Meehan and Beal 1977, Beal and Meehan 1986). In agriculture, it recognizes that researchers, extensionists and farmers must communicate with one another. But it does not predict which channels are used for such communication.

Problem solving

The problem-solving model focuses on the user's needs and actions to satisfy those needs (Havelock and Lingwood 1973:276, Havelock 1986a:89). It sees users as formulating needs, seeking and retrieving information that may help solve the needs, and then fabricating and applying solutions. The role of the change agent is to assist in and guide this process rather than to direct it.

The problem-solving perspective focuses attention on users, their situations and needs, and on user participation in decision making. But it ignores the fact that users may lack the information or resources needed to initiate and carry through the change process. And it fails to provide a clear strategy for change agents to disseminate findings among a user population, especially to those unable to solve problems themselves (Havelock 1986a:91).

Linkage

Havelock (1986a:98 and 1986b) develops the concept of "linkage" to subsume aspects of the "social interaction," "research, development and diffusion," and "problem solving" perspectives described above. He see linkages as the two-way communication ties between information providers and users. Havelock's formulation is particularly useful for describing the processes that must take place if an item of technology developed in one place is to be applied in another. But it suffers from two shortcomings for the purposes of this study:

- A "linkage" is conceptualized as being two-way -- though not necessarily using the same channels (Havelock 1986b:218). But previous research in Indonesia and elsewhere has shown that extension-to-research flows are very tenuous (Hussein 1986:435). I discuss this further in Chapter 5.

• Havelock does not develop, nor does the linkage concept readily lend itself to developing, a testable model to predict the level of information flows reaching a receiver from a source (such as a book, training course, or newspaper). The linkage concept is thus of limited use in predicting why a receiver should use one source rather than another.

Somewhat confusingly, Havelock (1973:294) uses the term *linkage* to refer to another concept also: "the existence of person-to-person contacts where two-way communication was taking place." This is the meaning I adapt for use in this study and refer to as *Familiarity* (see below).

Checklists of information flow determinants

Several checklists of characteristics have been proposed to explain the amount of communication between individuals, group, or organizations (Glaser, Abelson and Garrison 1983). Perhaps the best known is the "A VICTORY" formulation (Davis 1971, Bedell et al. 1985). A VICTORY is an acronym standing for the seven elements in the list: *A*bility, *V*alues, *I*dea, *C*ircumstances, *T*iming, *O*bligation, *R*esistance, and *Y*ield. This checklist has been widely used in evaluating the acceptance or rejection of innovations by organizations.

However, the A VICTORY formulation is of limited use for this study for several reasons:

• It refers to organizations rather than individuals or publications.

• It presupposes that a known innovation (or group of innovations) is under study and tries to discover reasons for its (their) spread or failure to spread.

• It does not attempt to explain the *choice of sources* by *individuals* for obtaining information on *a range of topics* over an extended period (Mundy 1989:20).

• Negative attributes are grouped together as Resistance, even though they may be better seen as negative aspects of other elements (such as lack of Ability).

Havelock and Lingwood (1973:294) provide a more useful checklist for this purpose. Labeled the "HELP SCORES" model, it is suggested as "a set of project or change variables as a schema for diagnosing problems in the communication of new knowledge or innovations *from any source to any receiver*" (Glaser, Abelson, and Garrison 1983:33-34; emphasis added). The ten items in the list are *H*omophily, *E*mpathy, *L*inkage, *P*roximity, *S*tructure, *C*apacity, *O*penness, *R*eward, and *S*ynergy. Note that Linkage as used here is different from the linkage concept described in the previous section.

I discuss the individual factors in more detail in Chapter 5. However, we should note here that this model is particularly useful for this study because each factor can be seen as a characteristic of the dyadic link between two individuals -- and as potentially affecting the information flow between them. Each of these variables can be positive (leading to higher information flow) or negative (resulting in less flow).

Havelock (1969) developed seven of the factors in a review of 4000 studies on knowledge utilization, Havelock and Lingwood (1973) later added another three (Homophily, Empathy and Energy) as a result of Rogers and Shoemaker's (1971) work on innovation diffusion.

The HELP SCORES model has not received much attention in the literature, and this is only the third empirical test of it I have been able to find. Havelock and Lingwood (1973:295) themselves used the HELP SCORES factors as a basis for coding oral interviews with staff members of the U.S. Department of Labor. Their coding sheet provided positive and negative instances of each factor. They did not develop a series of questions to measure them.

The only attempt to develop a series of survey questions to measure the HELP SCORES factors was a study I conducted of communication between extension specialists and researchers at Iowa State University (Mundy 1989). This study represents a continuation of this line of research, expanded to include non-personal as well as personal sources.

It is unclear why the HELP SCORES model has received so little attention in the literature. One possible reason is the influential volume by Glaser, Abelson and Garrison (1983). In an attempt to reconcile several lists of factors proposed by various authors, Glaser and colleagues (erroneously, I believe) equated the HELP SCORES concepts with those in the A VICTORY formulation. The A VICTORY list thus survived, while the HELP SCORES model sank from view. For the reasons outlined above, I chose to use the HELP SCORES model in this study.

Summary

It is possible to use a number of different approaches to study research-extension linkages. I choose to select concepts from several different approaches for this study. While I base the model I develop in Chapter 5 on Havelock and Lingwood's (1973) HELP SCORES list, I also draw on the information seeking and social interaction ("diffusion of innovations") approaches.