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ABSTRACT

This paper presents a critical review of recent empirical and theoretical literature on information dissemination and utilization, incorporating key concepts from that body of literature into a model of effective knowledge transfer in gerontology. It assumes that the urgency and complexity of rapidly growing age-linked problems demand informed approaches to their solution. Second, the model assumes that such solutions could be met, in part, by better utilization of existing research knowledge. Third, it assumes that transfer of research knowledge in aging could be facilitated by investigating recent literature, determining what sorts of factors impede or promote that process, and including them in a set of recommendations for gerontology. These factors are discussed in terms of the knowledge resource system, the user system, and link agents. This examination of the information dissemination and utilization process concludes that neither the problem-solving model (representing the user perspective) nor the R and D model (representing the provider perspective) adequately provide for the translation of knowledge into practice. The review suggests that the linkage model provides the most promising means for securing the dissemination and utilization of new gerontological knowledge. (Author/NRB)

GETTING IT TOGETHER: GERONTOLOGICAL RESEARCH AND THE REAL WORLD

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GETTING IT TOGETHER:
GERONTOLOGICAL RESEARCH AND THE REAL WORLD

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March 1980

PREFACE

This paper presents a critical review of recent empirical and theoretical literature on information dissemination and utilization, incorporating key concepts from that body of literature into a model of effective knowledge transfer in gerontology. The effort was supported by a grant from the Administration on Aging to The Gerontological Society, for the purpose of stimulating short-term projects to be carried out in applied settings by researchers in gerontology. The Western Gerontological Society proposed the project reported here, and provided office space, resources, and collegial support for its completion.

INTRODUCTION

There are 23.5 million individuals over age 65 in the U.S. population, a figure that represents more than 11 percent of the total. While the number of individuals in the older adult age group is expected to increase by a third during the remaining two decades in this century, their proportion is expected to increase even more substantially. To meet current and projected needs of this growing segment of the population the Older Americans Act (1965) was passed, and research and development projects as well as programs and services for the aged have grown enormously. Also established by that act was the basic policy requirement that older adults should derive immediate benefit from proven research knowledge, a requirement whose fulfillment has been more difficult to secure. Although a considerable body of basic and applied research has been carried out that bears prima facie relevance to problems of aging, it is much less clear that the proliferation of aging programs and services has indeed benefitted significantly from it. As Maddox pointed out in his discussion of service planning for older adults, "Good ideas are more common than our ability to translate them into action."

This examination of knowledge transfer processes in relation to the field of aging assumes that given increasingly urgent, complex

and rapidly growing age-linked problems, informed approaches to their solution are especially needed. Second, it assumes that such needs could in part be met by better utilization of existing research knowledge. Third, it assumes that transfer of research knowledge in aging could be facilitated by investigating recent literature, determining what sorts of factors impede or promote that process and including them in a set of recommendations for gerontology. These factors are discussed below in terms of the knowledge resource system, the user system, and link agents.

GERONTOLOGICAL RESEARCH: THE RESOURCE SYSTEM

Role

The early R&D model of information dissemination and utilization, emphasizing the researcher perspective, sees scientific inquiry as a rational process leading from the development of new knowledge to its application. Good ideas will, when made public, be widely applied as potential users access them in the course of solution-oriented information searchers. High initial costs are justified by quantity and quality of social benefits as the knowledge diffuses throughout the user system.

Constituents of the Resource System:

Federal funding agencies

Private foundations

Universities

Public Research Institutes

Private R&D corporations

Major industries

Characteristics of the Resource System:

- It forms a closed social system.
- It has an internal communication network for exchanging ideas.
- Its external products are printed documents: books, monographs, journal articles, and "fugitive" literature (interim and final reports of projects, proceedings of scientific conferences, and training and technical manuals).

THE REAL WORLD: POTENTIAL USERS

Role

The later problem-solving model of knowledge transfer, emphasizing the practitioner perspective, sees scientific inquiry as stimulated and guided by needs in user contexts. Sensed needs lead to diagnosis of the situation, search for and retrieval of relevant information, selection of the most viable alternative(s), trial implementation and evaluation; effective alternatives are retained. Stress is placed on user initiative throughout the process.

Potential User Constituency:

Individual citizens (older adults and their friends and relatives, plus younger persons planning for their own later life)

Practicioners who design, plan and deliver services to older adults (community organizations and agencies, voluntary associations, small businesses and industries, labor organizations, professional groups, model or demonstration programs or projects, and government and private institutions)

Policymakers in the public and private sector

Characteristics of the User Constituency:

- It is dispersed, elusive, and heterogeneous.
- It does not have an internal communication network.
- Its major concerns have to do with maintaining an adequately functioning set of operations within some task context and/or implementing improvements in that setting.

LINK AGENTS

Role

Models of knowledge transfer suppose either one- or two-way communication between researchers and the real world, yet external products of the resource system make such exchange infeasible:

- Research documents present information in technical intradisciplinary format and language.
- Research documents do not present how-to information, operational advice.

- Research documents are so voluminous that retrieval of useful information is complicated, time-consuming and costly.
- Integrating, evaluating and selecting the most viable alternatives among what has been retrieved requires considerable scientific expertise.
- The resource system per se has no mechanism or incentive for alleviating these problems.

Models of knowledge transfer suppose that communication of a relevant idea in clear practical form to users will per se facilitate utilization, yet:

- Research outcomes often are not congruent with contexts of application because researchers do not always know what practitioners need.
- Practitioners are not necessarily motivated to evaluate such ideas and to adopt innovative changes within their operational setting.
- Given an incentive to change and an available idea, the need to adapt both the idea and the adopting institution to one another in a variety of ways during the implementation process often poses formidable barriers.
- The potential user constituency has no mechanism or capability for alleviating these problems.

Both groups of problems could be alleviated were there a social structure that linked researchers and the real world, sharing some of the features of each. Recommending that resource providers and users communicate with one another is futile unless some network embraces them both. Link agents or agencies are needed to comprise such a network.

Characteristics of Link Agents:

- Link agents should be permanent (not temporary) networks that have established patterns of communication with gerontological researchers and with the real world.
- Link agents should be able to communicate with both resource system members and potential users in language they each understand.
- Link agents should be "generalists" rather than specialists in aging, whose expertise lies in coupling appropriate resources and practitioners. Link agents should be able to access information in each domain.

- Link agents should be able to provide a variety of information services--from mass media releases that promote general awareness, to seminars that provide understanding, to problem-focused syntheses of current literature, to immediate "hot-line" style concrete question-answering, to face-to-face consultation and technical assistance.
- Link agents should be able to formulate, assess and prioritize practitioner needs and to present them in the form of research agenda to the resource system.
- Link agents should be familiar with models of implementation and with methods for overcoming common barriers to the successful incorporation of innovations in practitioner settings.

CONCLUSIONS

There is danger that gerontological research will be seriously underutilized, given the heterogeneity and dispersion of potential users in relation to the relatively small and cohesive membership of the resource system. Current literature tends to overestimate the importance of characteristics of innovative ideas and characteristics of adopting user groups in analyzing knowledge transfer. Curent literature tends to underestimate the importance of communicative media and of socio-technical problems in the adoption context in analyzing knowledge transfer. Federal funding initially favored the resource system (R&D funds) and then favored potential users (model programs, funds for innovation adoption); neither strategy has secured systematic and effective dissemination or continued utilization of research knowledge. Link agents seem the most promising avenue for facilitating transfer of gerontological research, although more direct empirical support of this thesis is needed. Link agents (more properly, agencies) must be accessible to a multiplicity of users and providers of resources. The appropriate scope of their efforts must be regional or national. Major activities of link agents should be facilitation of continuous two-way interaction and information exchange between providers and users, and facilitation of adaptive implementation of research ideas in practitioner contexts.

GETTING IT TOGETHER: GERONTOLOGICAL RESEARCH AND THE REAL WORLD

Currently there are 23.5 million individuals over age 65 in the U.S. population, a figure that represents more than 11 percent of the total (Department of Health, Education and Welfare, 1979). Moreover, while the number of individuals in the older adult age group is expected to increase by a third during the remaining two decades in this century, their proportion is expected to increase even more substantially (Glick, 1977). These changes in age distribution over the general population reflect stable long-anticipated trends toward lower birth rates and greater longevity well established in prior research (see, for example, Shanus and Hauser, 1974). To meet current and projected needs of this growing segment of the population the Older American Act (1965) was passed, and research and development projects as well as programs and services for the aged have grown enormously. Also established by that act was the basic policy requirement that older adults should derive "immediate benefit from proven research knowledge," a requirement whose fulfillment has been more difficult to secure. While it is clear that a considerable body of basic and applied research has been carried out that bears prima facie relevance to problems of aging, it is much less clear that the proliferation of aging programs and services has indeed benefitted significantly from it (cf. Ward, 1979; Segel, Boomer and Bouthilet, 1975). As Maddox (1975) has pointed out in his discussion of service planning for older adults, "good ideas are more common than our ability to translate them into action."

This examination of information dissemination processes in relation to the field of aging rests on several assumptions. First, it assumes that given increasingly urgent, complex and rapidly growing age-linked problems, informed approaches to their solution are especially needed. Second, it is assumed that such needs could in part be met by better utilization of existing research knowledge. It is undoubtedly true that many changes in the character of research undertakings could be recommended that would improve their applicability and rele-

vance, a point to be discussed in more detail later. However, it is equally clear that extant research is underutilized, that the knowledge resources of this and other nations are not being systematically and effectively transferred, adapted and applied to benefit those who are confronting advanced age (Ward, 1979; Maddox, 1975; U.N. General Assembly, 1975). Finally, it is assumed that utilization of research knowledge in aging could be facilitated by investigating previous studies of information dissemination, attempting to determine what sorts of factors impede or promote that process and to incorporate them into a set of recommendations for the field of aging.

With these assumptions serving as guides, literature was reviewed under a number of topic headings including information dissemination, knowledge transfer, research utilization, innovation, diffusion, technical assistance and consultation; the search was aided by the use of computerized retrieval systems, among which ERIC proved most helpful. In all topic areas an effort was made to locate age-related studies. However, with two exceptions--one exploratory analysis of research utilization in aging (DHEW, 1963) and a review of current technology transfer and aging (Logical Technical Services, 1976), most relevant major studies were drawn from other fields--notably education, organizational change, rehabilitation, and mental health. In addition, a large number of studies not focused at information dissemination per se but treating dissemination issues surrounding some other topic of concern were consulted. Across fields and topics it became clear that the problem is not unique to the area of aging--there are many fields in which the existing resource system contains much of value to potential users could they access and employ it (cf. Berman, 1979; Piele, 1975; Pauley, 1974; Mick et al., 1973). Consequently, the discussion of information dissemination that follows is carried out in fairly generic terms, with specific applications to aging treated mainly in the concluding sections.

While the sources surveyed offered a variety of models, stages, factors and elements in the knowledge transfer process, three molar-level components are universally acknowledged: the resources, the users, and the relationship(s) between them (e.g., Havelock and Lingwood,

1973; Yates, 1971; Jolly et al., 1978; Groot, 1971; Glaser, 1973). This review begins, therefore, by treating those components in order. However, it gives primary attention to the third, reviewing the first two from the standpoint of how they enter and affect the relationship. The concept of linking agents and/or agencies as means to expedite the relationship is then given separate consideration. The review concludes with a set of recommendations for gerontological linking activities.

THE RESOURCE SYSTEM

It is appropriate to begin the investigation of information dissemination literature with the resource system for historical reasons, and not because it is necessarily either the most critical component in the dissemination process or its logical starting point. Lingwood and Havelock (1977) have noted that discussions of knowledge utilization tend to reflect bipolar dimension ranging from research- or expert-oriented to practitioner- or consumer-oriented. On the basis of this literature review, it is clear that most earlier studies approached past and present information transfer activities "from the developer's side of the fence" (Perrin and Johnson, 1972), probably because that pole of the knowledge utilization continuum had been emphasized by the classic research and development model. The "R&D" model of knowledge utilization is an explicitly rational view of the process that leads from scientific inquiry to the adoption and employment of innovative outcomes. It supposes a high initial research and development cost (like an investment in the resource system) will lead to new knowledge, and will be justified by the quantity and quality of long range social benefits as the knowledge diffuses throughout the user system. Potential users are regarded as relatively passive consumers who will, when the results of inquiry are substantiated and disseminated, accept and apply them to meet their needs (Havelock, 1968b, 1969a; Berman and McLaughlin, 1974; Guba and Brickell, 1974; Human Interaction Research Institute and NIMH, 1976).

As Berman and McLaughlin and their colleagues point out (Berman and McLaughlin, 1974; Berman and McLaughlin, 1975; Berman and Pauly, 1975), a substantial proportion of federal spending for research and development was guided by the notion that a "good" idea, i.e., one

scientifically generated, supported by empirical study, and relevant to the problems of some potential user group in the population, would as a matter of course be widely adopted; all that was required was that the idea be available in some published source that could be accessed during the prospective users' solution-oriented information searches. So viewed, the resource system received primary emphasis in the knowledge utilization process as the origin of useful ideas, helpful technologies, and the like.

Without commenting on the validity of such an emphasis, it should be recognized that this view tends to be assumed in many definitions of what is to be disseminated by the resource system. For instance, "technology transfer" has been defined as "the process by which existing research is transferred operationally into useful processes, products, or programs that fulfill actual or potential private or public needs" (Jolly, Creighton and George, 1978). Technology itself has been construed as "any tool or technique, any product or process, any physical equipment or method of doing or making by which human capability is extended" (Schon, 1967). Similarly, an "innovation" is often construed as a new practice or plan adopted in response to an existing need and requiring some change in the behavior of its adopters in order to achieve desired goals (cf. Pauley, 1974). In the educational change literature generally, Berman and McLaughlin (1974) have documented the presupposition that innovations are good in and of themselves, and that failure to implement outcomes of research and development signifies the unwillingness of the user system to change.

Perhaps least presumptive in this regard is the typology devised by Weiler (1973) to characterize the research and development outcomes, the disseminable products, of the resource system. According to Weiler, three classes of products can be distinguished as follows:

- The product of most <u>research</u> is a document presenting a study.
- The product of <u>development</u> is usually a way of organizing and structuring some set of behaviors for an improved effect, but it can also include a physical product (such as a telephone amplifier), or both.

- In addition, information may be produced that is neither research nor development, but consists in accounts of what is available, what is being done--descriptive compendia.

For the purposes of this review, Weiler's typology will be employed to describe the products of the resource system, leaving the evaluation of these products as a separate issue. That is, this characterization does not assume that research products per se are necessarily innovative nor genuinely technologically helpful (in the sense of beirg responsive to potential user needs and involving real change). Further, it underscores that the primary output of the resource system is printed documentation--either descriptive accounts, or presentations of the results of research or development undertakings (cf. Human Interaction Research Institute and NIMH, 1976).

Having looked at the products of the resource system, it is next appropriate to inquire who the producers are. Producers are characterized as "experts," as "scientists," as "scholars," and as "researchers" involved in both basic and applied activities (cf. Havelock, 1968b; Yates, 1971). It is perhaps more helpful, however, to indicate their institutional affiliations. According to both Yates (1971) and Havelock (1968b), the major institutional form in which the resource system is realized is the university; Yates suggests that in this setting, basic research is conducted primarily by faculties and academic departments, while applied research is conducted within schools and institutes that have professional training as part of their aim. In addition to universities, the resource system includes research and development organizations and laboratories, private foundations, and large corporations and industries (cf. Lavin, Sanders, and Passios, 1975; Havelock and Lingwood, 1973). Finally, it is suggested by Yates (1971) that the resource system in recent years has come to be dominated by federal agencies and institutes, in part through their own intramural research activities but more importantly by funding guidelines that exert considerable influence on the nature and procedures of large scale research activities regardless of the institutional

setting in which they are carried out. The costs of the resource system are to an increasing degree borne by the federal government.

Not surprisingly, the resource system tends to be a closed network, a situation remarked by Havelock and Lingwood (1973), Lavin et al. (1975), Brown et al. (1977), and others. First of all, besides being limited to a comparatively small number and type of institutions, the resource system is geographically concentrated--40 percent of all federally funded research and development programs are located in California, Massachusetts, and the greater Washington, D.C. area (Brown et al., 1977). Second, members of the resource system (scholars, experts, researchers, scientists) fall heir to a rather circumscribed set of beliefs, concerns, norms, values and referent groups not shared by others such as practitioners and policymakers (Yates, 1971; Human Interaction Research Institute and NIMH, 1976). Third, and perhaps most important in relation to the question of information dissemination, participants in the resource system tend to communicate only within that system, i.e., only among themselves. While a number of sources have taken note of this circumstance (e.g., Brown, 1977; Human Interaction Research Institute and NIMH, 1976; Yates, 1971), it has been documented empirically in detailed studies of communication networks carried out by Havelock and his colleagues (Havelock and Lingwood, 1973; Lingwood and Havelock, 1977; Havelock, 1969b; Havelock, 1974). Research and development results and other information provided by the resource system primarily supplements the providers' own information gathering processes.

Having described the producers and products of the resource system, then, it would be well to inquire how their products are made public. According to Havelock (1968a), there are two legitimate ways for academic faculty members to dispense knowledge: through the courses taught in the academic curriculum, and through publications and presentations in professional media (journals and conferences). In either case, the products of the university component of the resource system are distributed to its own members. Professional journal publications also account for a good deal of the publication effort by members of research and development organizations and private foundations as well as some portion

of the outputs of researchers in government and industry. However, even in the "core" scientific journals it has been estimated that only half the articles are read by as many as 200 persons (Human Interaction Research Institute and NIMH, 1976). Distribution of preprints and reprints would augment total exposure, but not by a considerable margin and the recipients would most likely be resource system colleagues. Books and monographs are also an outlet for the dissemination of new knowledge, although again audiences are assumed to be relatively small in comparison to the membership of the potential user system (Human Interaction Research Institute and NIMH, 1976; Yates, 1971). Beyond publications in journals and books--documents that are in principle easy to access--is a growing body of "fugitive" literature (Greenwood and Weiler, 1972) not readily visible in libraries. Such literature comprises interim and final reports of research, development, demonstration, and model projects and programs to their funding source and others; proceedings of scientific meetings and conferences; training and technical manuals; internal documents of organizations; and the like. As Greenwood and Weiler emphasize (1972), because there is so much literature, and because it is all virtually invisible to members of the user system, these formal information resources are seriously underaccessed. While computerized retrieval systems such as ERIC, MEDLARS, and others alleviate access problems for members of the resource system, they are of significantly less value for those outside it. Many sources thus concur that, in spite of the fact that knowledge producers want to publish and indeed publish voluminously, major problems exist with respect to resource distribution (cf. Yates, 1971; Havelock, 1969b; Weiler, 1973; Piele, 1975).

The preceding discussion treats the information resource system in terms of its disseminable products, its producers, and the mode of output of its products. The last major topic of discussion in this section concerns resource-related factors that have been construed to impede or promote knowledge dissemination. Interestingly, most classic sources in the field of knowledge transfer and utilization (e.g., Glaser, 1973; Rogers, 1967; Human Interaction Research Institute and NIMH, 1976) have singled out characteristics of the system's products (i.e., character-

istics of innovative information, research and development) as the resource-related factors most strongly related to the flow of knowledge from source to potential user. Given the historical priority of the "R&D" model, which assumes that cet. par. good ideas will diffuse throughout the potential user system, it was logical to look to characteristics of innovations themselves to determine what among their features would help or hinder their widespread adoption. The extensive review by the Human Interaction Research Institute and the National Institute of Mental Health (1976) makes it evident that there has been considerable consensus regarding features of innovative outcomes of inquiry that affect their adoption, in spite of differences related to their grouping and nomenclature (cf. Rogers, 1962, 1967; Rogers and Shoemaker, 1971; Glaser, 1973, Glaser and Ross, 1971, Glaser and Wrenn, 1966; Davis, 1971, 1972; Gordon et al., 1974; and the work of Havelock and his colleagues). The most important and most consensual factors cited by these and other sources seem to be:

- Advantage: Accepting the proposed idea must be perceived as leading to some advantage for the potential user; in some way(s), the knowledge will improve the user's present situation.
- Conformity: The proposed idea must be compatible with the values of the potential user--it cannot be in conflict with established aims. Ideally it should be seen as a (partial) solution to some problem or a way of meeting some acknowledged need.
- Comprehensibility: The new information, research, or development must be understandable to the user; the easier it is to learn and act on, the greater are its chances of acceptance.
- Capability: The proposed idea must not exceed the potential user's fiscal, manpower and physical limits; it must be consistent with user resources.
- Divisibility/Trialability: It should be possible to act on new knowledge a bit at a time, and it should be possible to tell whether what has been implemented is working. As the definitions of "innovation" above pointed out, adopting an innovation implies changing the behavior of members of the adopting organization. It is easier to change parts of an organization, or some of its activities, in sequence, than to make a large scale change all at once. Thus if innovative ideas are "divisible" in the sense that they can be acted on piecemeal, they will stand a better chance of adoption. Further, if it is possible to see how each part that has been tried is working, chances of implementation are improved.

The factors described here have come primarily from case studies and from analyses of dissemination and utilization experiences of authors; very few have been examined in experimental research. Nevertheless they seem entirely reasonable. What is less than reasonable is that the set of factors refers exclusively to properties of ideas or concepts or knowledge in the abstract; it does not take into account that these abstract products have their origin in a specific professional community and their embodiment in a conglomerate of printed materials.

More recently, attention has been given to characteristics of the source as factors related to acceptance or rejection, a theme borrowed from social psychology (e.g., Hovland, Janis, and Kelley, 1953) and applied by students of knowledge dissemination (e.g., Davis, 1972; Rogers, 1967). Since it goes without saying that ideas are hardly ever accepted strictly on their own merits (McClelland, 1968; Rein, 1967; Coleman, 1973), broadening the search for resource-related factors affecting diffusion is clearly merited. Among characteristics of sources related to knowledge acceptance, source credibility is the most frequently cited (e.g., Hovland, et al., 1953; Rogers, 1967; Human Interaction Research Institute and NIMH, 1976; Yates, 1971). What makes a source credible has been variously identified. Eminence in the relevant field of knowledge is often cited as a key source factor (Human Interaction Research Institute and NIMH, 1976), but equally often it is suggested that in-person reputation as an expert among the relevant users is critical (Greenwood and Weiler, 1972). A second factor, less frequently mentioned, is social distance between the source and the potential user (Rogers, 1967). According to Rogers, knowledge dissemination is impeded as social distance increases. Havelock and Lingwood's (1973) large scale case study similarly found that dissemination and utilization is promoted by "homophily," or similarity of characteristics among sources and users. However, given the description of the resource system and its closed nature, it is unlikely that sources and users will typically be found to share many characteristics; rather, most studies have found considerable social distance between them (e.g., Archibald, 1968; Yates, 1971; Frankfather, 1977). In fact, the requirement that the credible source be perceived as eminent or expert virtually guarantees considerable

social distance and concomitant prestige differences between source and user, a contradiction not addressed in the literature.

Finally, increasing attention has been given to characteristics of the medium in which knowledge is disseminated as factors that can promote or impede its flow independently of the intrinsic merits of what is being communicated. It is media characteristics that in fact seem to pose most impediments to knowledge transmission. It has already been noted that the most frequent medium for the transmission of knowledge is printed scientific reports addressed primarily to members of the resource system. As such, the medium has been subject to a great deal of critical scrutiny. For convenience, criticisms will be grouped here into three categories: language and format; orientation and content; and integration and evaluation.

In their model of influence on technology transfer, Jolly, Creighton and George (1978) propose the language and format of information documentation as the first formal factor. Their review of related studies, as well as the extensive review of knowledge transfer by the Human Interaction Research Institute and the National Institute of Mental Health and the survey of potential users of educational research information conducted by Greenwood and Weiler (1972), concur that the language and format of scientific reports is typically not useful for practitioners. These sources pinpoint many characteristics such as extremely technical intradisciplinary terminology, reporting style (lengthy texts that begin with a conceptual framework and literature review, go on to descriptions of procedures, analytic methods, and statistical results and interpretation), and failure to highlight features of interest to potential practitioners, translate implications of the research for them, and make clear from the beginning what are the important conclusions to be learned from the work. Such documentation is rarely accompanied by examples or illustrative materials, let alone easily grasped summaries. In short, information presented in such a medium cannot communicate to anyone who does not have an extensive background in science and research (cf. Rogers. 1967; Glaser and Taylor, 1969; Gordon et al.. 1974; Ward. 1979; Havelock, 1969a). With respect to ameliorating the communication problem, several sources (e.g.. Glaser. 1973; Rogers. 1967; Rogers and Svenning, 1969;

Greenwood and Weiler, 1972; and Caplan, 1970) suggest that the single best improvement would be to build in some sort of face-to-face, telephone or other interpersonal interaction channels--that the print medium, by itself, is just not up to the task of effective and timely communication of research results in useful form for practitioners. In contrast, personal communication has been found highly successful. The print medium, secondly, need not be maintained in its present style. Havelock (1969a), Glaser and Taylor (1969), and others have advised that review drafts be circulated to a sample of practitioners and revised on the basis of their comments before final texts are printed. Finally, it has been proposed by Gordon et al. (1974) and Yates (1971) that technical writers, skilled in presenting research results to wider educated lay audiences, could be employed to improve the language and format of dissemination reports.

A second area in which the documents produced by the resource system have been given critical attention has to do with their orientation and content. In this area, the single most frequently cited barrier to utilization is their "glaring lack" of "operational advice" (Greenwood and Weiler, 1972). Often it is not the writer's interest or intent to draw out practical implications of the research, suggest applications or point out its problem-solving potential; consequently the documented knowledge seems irrelevant or impractical to the would be user (cf. NSF, 1969; Ward, 1979; DHEW, 1963). Recommendations for alleviating this barrier to dissemination include, first, presenting information with a multidisciplinary orientation--a multidisciplinary orientation would at least facilitate looking at problems from the multiple perspectives that are usually brought into play in applied settings (cf. Glaser and Taylor, 1969). Another suggestion involves constructing from each document a series of very brief, readable reports each focused at one particular decision point or practical problem (Human Interaction Research Report and NIMH, 1976; Glaser et al., 1967). And a third suggestion, partly overlapping with the second, is to include translations of practical consequences together with how-to-do-it information (Ward, 1979; DHEW, 1963). However, as Yates (1971) and Greenwood and Weiler (1972) note, it is not necessarily the case that all research has significant, prac-

tical and useful bearing, and that when it does drawing out those consequences is not necessarily a simple matter of translation. Finally, studies by Glaser et al. (1967) indicate that when research results adhering to the recommendations presented here are widely distributed to potential users the effectiveness of the communication is improved--but it does not have nearly as much impact as would be expected (the main observable effect is that the "user" cites the information in a subsequent speech).

The third area of media characteristics related to knowledge dissemination has to do with the integration and evaluation of the documents generated by the resource system. It has been noted that they comprise a voluminous body, particularly when both regular library acquisitions (books and periodicals) as well as "fugitive" literature are included. The existence of so much printed material is forbidding to the potential user, for a number of reasons. First, while the Department of Health, Education and Welfare's study (1963) of knowledge transmission and aging suggests that it is helpful to have the same information repeated in many places, most sources (e.g., Yates, 1971; Ward, 1979) find the research literature highly repetitive but not cumulative. They find dozens of piecemeal studies ostensibly treating the same issue but not in a coordinated manner, employing different samples, different techniques, different analytic tools--so that integrating the research reports and drawing a coherent body of knowledge becomes an overwhelming problem even for the specialist, let alone the potential user. It is, further, difficult to identify, locate and acquire amid all the printed material, a single report or set of reports that will be potentially useful for a particular problem (Weiler, 1973)--the world of information is complex, practitioners often lack information retrieval tools, and it is often very costly and time consuming to undertake the search and retrieval process even for those who have the requisite skills (cf. Greenwood and Weiler, 1972; Havelock and Lingwood, 1973; Human Interaction Research Institute and NIMH, 1976). As a partial remedy for these problems, the sources consulted most commonly suggested that it would be extremely helpful to have brief, periodic readable reviews providing an updated synthesis of literature

relevant to given topics. In addition, Weiler's work (1973) underscores the necessity that such integrations be evaluative in nature. Weiler points out that among the many outputs of the resource system, some proportion are not of much practical utility; some proportion are not reliable; some proportion are not state-of-the art; and some proportion have not been validated. However, all the printed information in the resource system appears to have equal value, so potential users would have to read widely, sift, screen, and make a variety of discriminations they are not trained to make. What is needed, Weiler concludes, are syntheses of the literature that present the best state-of-the-art information and an evaluation of its validity and generalizability to practical concerns. Such reviews are not currently available to potential users of research knowledge.

The description of factors affecting dissemination completes the account of the resource system. Resource system relevant factors affecting dissemination fell into three categories, depending on whether they characterized the content of knowledge, its source, or its medium. Early studies of dissemination tend to emphasize the former, probably because of the assumption implicit (at least initially) in federal research and development funding that good new ideas would of themselves naturally diffuse throughout the user system. Consequently, the content of the innovations produced by research and development efforts became the focus of attention in inquiries attempting to understand why some were disseminated and utilized more readily than others. This review, however, found that media factors probably exert more influence than content factors on the dissemination and utilization of knowledge, and their influence is counterproductive. Media barriers to dissemination and utilization include technical intradisciplinary language and format of presentations and an orientation that does not emphasize operational advice, problemsolving or decisionmaking together with the fact that such documents comprise an enormous nonintegrated corpus that is difficult to access, organize, synthesize and evaluate. Given these barriers it is not surprising that "innovations do not just spread automatically" (Glaser et al., 1967).

Many of the sources reviewed either explicitly or implicitly blamed the resource system for media barriers to the spread of knowledge, and their recommendations for alleviating these problems sometimes assumed that resource system members should undertake to remedy them. However, it should be recalled that individuals in the resource network--scholars, scientists, researchers--are not trained, expected or paid to produce practical readable texts for lay audiences and would receive no professional recognition for doing so. As Havelock (1968b) noted, legitimate outlets for such individuals outside the university classroom are the technical journals of their disciplines; such publications are what contribute to their professional advancement and it is even possible that popular nontechnical products would be negatively viewed by their peers, jeopardizing their status as eminent or expert knowledge sources. These contraints notwithstanding, it is further dubious whether members of the resource system would be competent at extracting the most significant applications, determining effective operational procedures, and casting them into viable user language and format. Not only may scientists and researchers lack such capabilities, but they may also lack the requisite familiarity with practical problem domains, the contexts of potential utilization. In any event, it is clear that approaches to the issue of knowledge dissemination and utilization should not exclusively focus on the resource system, but must take the practitioner into account.

THE USER SYSTEM

It is appropriate, then, to turn next to the user system, examining the issue of knowledge dissemination and utilization from that perspective. As noted earlier, Lingwood and Havelock (1977) maintain that approaches to this issue fall along a continuum ranging from user-oriented to provider-oriented. The "practitioner pole" of that dimension (cf. Perrin and Johnson, 1972) is emphasized by the discussion in this section, an emphasis regarded by many sources as much warranted and long overdue (e.g., Jolly et al., 1978; Perrin and Johnson, 1972; Groot, 1971; Berman and McLaughlin, 1974). If the early R&D model of knowledge transfer represented the provider perspective, the user perspective may be said to be represented in the "problem-solving" model of that process (Lingwood and Havelock, 1977). The problem-solving model (most frequently described in the terms of Havelock's formulation) assumes that the user's needs are the starting point rather than the destination of research. Innovation, or the generation of knowledge through scientific inquiry, is seen as a part of a problem-solving process within the user system reflecting a sensed need, diagnosis of the situation, search for and retrieval of information useful in formulating and selecting a relevant innovation, and trial and evaluation of its effectiveness. Stress is placed on user initiative (Havelock, 1969a; Havelock, 1974; Lingwood and Havelock, 1977; Human Interaction Research Institute and NIMH, 1976; Guba and Bickell, 1974).

The major change represented by the user-oriented problem-solving model is in the nature of the communication between the resource system and the user system. Analyses of dissemination based on the research-oriented R&D model in the main assumed a downward one-way flow of information, from the source of new knowledge to potential users. According to Groot (1971), such an analysis involves at least three sorts of erroneous assumptions: it first oversimplifies development as a one-dimensional simple transfer of "knowledge" from those who have it to those who do not; second, it assumes the missing element in utilization delays is simply information, but that all clients have the same action rationale; and third, it assumes the provider knows what the user needs. The problem-solving model, in contrast, provides

for a two-way or n-way communication, insuring user participation in the dissemination process (Gordon et al., 1974; Lavin, 1972).

Such a change, in turn, is reflected both in broader definitions of old terms and the introduction of new terms to characterize the spread of knowledge. For instance, Perrin and Johnson (1972) construe technology transfer as "a user- or need-oriented exchange...." Further, both the Ogden and Miesumeci (1977) study of technical assistance and the two-volume review of educational information dissemination by Radnor et al. (1977) define dissemination as a four-stage process. Only the first stage, called "spread" by both sources, is characterized as a one-way outflow of information. Remaining stages involve successive increases in levels of user participation: "exchange," the second stage, is a dyadic or polyadic communication process; "choice," the third stage, has to do with use of the resource system to facilitate rational review and selection among R&D outcomes; and the fourth stage, "implementation," has to do with making use of the resource system to facilitate the adaptation of the chosen alternative to the user context and its incorporation as part of the ongoing system. In these accounts, dissemination is clearly viewed as interactive and as directed by user needs. Terminology coined to underscore this new view includes "feedforward," defined as the communication of practitioner needs for or reactions to R&D outcomes to the resource system, either to influence future research or to provide evidence of the impact of previous research (Radnor, et al., 1977). Similarly, the term "infusion" is used to represent the complement of "diffusion," or the activity of information-giving by the client (Groot, 1971). Finally, Berman and McLaughlin and their colleagues (e.g., Berman and McLaughlin, 1974, 1975, 1976, 1978; Pauly, 1974; McLaughlin, 1975) not only stress the user perspective but suggest that most analyses--even those based on the problem-solving model--are unrealistic about the role of information per se within practitioner settings. They argue that since innovative ideas require adaptation to local requirements, while the adopting institutions concommitantly must change to meet the demands of the new policy, both the nature and the outcome of knowledge utilization attempts are determined by

the complex and little understood process of "implementation." But implementation surely involves a host of factors in addition to those pertaining strictly to information transfer. Consequently, they urge that giving exclusive attention to preadoption information communication patterns is misleading to begin with, and that knowledge dissemination and utilization studies should place far greater emphasis on post-adoption implementation processes in the user context.

While the sources reviewed here differ with respect to particular features of the information dissemination and utilization process, they evidence a general shift in focus to the user. All see the user as a problem solver, and construe knowledge transfer as a solution-oriented interaction with the resource system initiated by the user. The user system is, however, less easy to characterize than the resource system. As Brown et al. (1977) note in their study of the transfer of energy conservation technology, the set of potential clients is "dispersed" and "elusive," a situation also characteristic of potential users of aging research. It thus seems helpful, following the practice of another energy knowledge transfer study (Spak and Shelly, 1978), to describe potential users in three "target groups": 1) Individual citizens may be consumers of information; in relation to aging research, individual users would include those who are currently older adults, relatives and friends of older persons, and younger people planning for advanced age (Trager, 1976; Ward, 1979). 2) Often, however, the user is not a member of the population to be served but rather is a practitioner or practitioner group involved in designing, planning and delivering services to that population (cf. Guba and Brickell, 1974; Troll and Olsen, 1978; Yates, 1971; Weiler, 1973). In this category are community organizations and agencies, voluntary associations, small businesses and industries, labor organizations, professional groups, model or demonstration programs or projects, and government institutions--anyone engaged in providing goods or services to older adults (Ward, 1979; Brown et al., 1977; Lavin et al., 1975; NSF, 1969). 3) Finally, a third important class of potential clients are the policymakers, decisionmakers in both the private and public sector (Yates, 1971; Spak and Shelly,

1978). Besides local, state and national government branches and agencies, Spak and Shelly (1978) suggest it would be well also to include "influential" major industries or institutions--those whose policies directly or indirectly can have a substantial impact on the outcomes of the population to be served (e.g., health insurance companies).

As this discussion indicates, the potential users of new research information about aging are quite diverse--a comment that quite likely holds for clients in almost any field of knowledge. It is evident, further, that users comprise a body very different from the resource system in a number of ways. First, it has already been noted that users have different norms, values, and referent groups from information providers (Human Interation Research Institute and NIMH, 1976; Greenwood and Weiler, 1972). While it would be difficult to characterize user groups as a whole, the problem-solving model of dissemination and utilization suggests one important commonality that often distinguishes them from knowledge providers--they want fast, practical, reliable answers to pressing questions that originate in a context of application. Thus potential users often distrust the products of the resource system, finding them irrelevant or unintelligible. As Greenwood and Weiler (1972) remark, "innovative practitioners turn to printed sources of information only with reluctance." The discrepancy between provider and user worlds may in fact lead to "misunderstanding" and "mutual recrimination" (Yates, 1971), with clients insisting that researchers do not know what their daily problems are and have nothing to say that helps with decisionmaking while researchers lament that practitioners do not understand or appreciate their efforts (cf. Human Interaction Research Institute and NIMH, 1976). Given discrepant norms, values and referent groups, a second sort of difference has also emerged, and that is a status difference. In general, resource providing groups have higher status than resource using groups (Archibald, 1968; Frankfather, 1977), so that in the common view practitioners are regarded as less smart than providers; while practitioners oftentimes have an excellent working understanding of aging, their skills and wisdom are not given recognition, respect

and support (Troll and Olsen, 1978; Human Interaction Research Institute and NIMH, 1976).

Finally, Havelock (1968a) discusses a third major difference related to the institutional bases of resource providers and users. The resource system, it will be recalled, has the university or the academically-oriented research organization as its primary institutional form. In contrast, according to Havelock, the client system has two principal institutional patterns: 1) Professions consist of independent operators in private practice, bound together in a reference group with some sort of membership prerequisites (e.g., psychologists, physicians); they are primarily oriented to providing service, and are dispersed throughout the community. 2) Bureaucracies are organizations characterized by division of labor, leadership structures, and interdependence. While Havelock's approach is addressed generically to the issue of knowledge dissemination, it is not clear that this account applies precisely to the area of aging. That is, users and providers of gerontological knowledge definitely are not similar in social structure, as Havelock's work would suggest. But while Havelock's description of the resource system aptly characterizes providers of information about the aging, the description of the user system gives it even more coherence than in fact it seems to have. It leaves private individuals out of account entirely and--while most other practitioner categories can be comprehended under the general rubric of "bureaucracies"--this designation does more to obscure than illuminate the heterogeneity of the intended target groups (see above). In fact, it seems more appropriate to conclude that while resource providers constitute a cohesive system or closed network, resource users do not seem to constitute one at all, at least in the field of aging.

The preceding discussion reviews the nature of potential users. Were the description of users to parallel that of the providers of resources, the next topic for discussion would be the way in which users participate in the information dissemination and utilization process, that process now being construed at minimum as a two-way interaction partially guided by practitioners. However, while recent

literature is replete with references that support the importance of understanding the user's role in knowledge transfer, few models of the communication of new knowledge actually incorporate such a role (cf. Jolly et al., 1978). Perhaps this finding is not surprising given that users have been seen not to comprise a well organized system whose activities within a model of dissemination and utilization could readily be given a coherent description and focus. It has further been noted (Gordon et al., 1974) that very little research has been done on diffusion within the complex user system, and virtually nothing is known about features of existing communication patterns within the user side of the picture. Even more distressing, virtually nothing is known about communication lines that extend from practitioners to the resource system, despite the fact that the problem-solving model seems to assume at least that user needs are communicated to knowledge providers.

While no systematic body of data maps user communications to the resource system, there exists considerable doubt about whether such communications occur at all and if so whether they are productive. Havelock's work (1968b), for instance, suggests that users and providers of research information do not share a social system that encompasses them both, and consequently it is unlikely to find patterns of communication between them (the latter presupposing some joint social structure). Confirming this thesis, Groot's investigations (1971) conclude that no mechanisms exist for disseminating institutions to get feedback from practitioners. Similarly, survey efforts undertaken by Greenwood and Weiler (1972; cf. Weiler, 1973) support the view that the resource system has no ongoing procedures for receiving and reacting to communications from potential users; when users in fact attempt to access research information in the course of their problem solving activities, they find the resource system passive and unresponsive. Thus while the problem-solving model of dissemination and utilization gives needed emphasis to the practitioner perspective, that perspective is not well represented in the current state of knowledge transfer. That is, the model is more prescriptive than descriptive.

The treatment of user system factors that are thought to impede or promote information dissemination and utilization, then, must begin by conceding that this process is already much impaired by the absence of a mechanism for carrying out the desired two-way communicative interactions between users and providers. Traditionally, accounts of user system innovativeness distinguish between characteristics of persons and characteristics of settings that influence adoption of new ideas (e.g., Human Interaction Research Institute and NIMH, 1976; Guba and Brickell, 1974; Rogers and Svenning, 1969; Gordon et al., 1974). Relevant personal characteristics, not surprisingly, are those associated with the capability to use innovative ideas and the willingness to accept change in one's organization, two of four "informal" factors in the comprehensive and well-documented model of knowledge transfer proposed by Jolly et al. (1978). Among personal characteristics, demographic attributes have received the broadest empirical support; highly innovative individuals are frequently found to be more educated, financially better off, and younger than their less innovative counterparts (Rogers, 1962; Lippitt et al., 1967; Rogers and Svenning, 1969). In one study, however, Lippitt et al. (1967) found that older individuals were also comparatively innovative, with individuals in the middle of the age distribution evidencing most traditional behavior.

Perhaps because little can be done to modify demographic variables, more research attention has been given to psychological attributes that promote or impede knowledge transfer; these attributes are, however, less consistently identified across the sources reviewed. Most sources found "confidence" or "self-esteem" to be positively associated with innovativeness (e.g., Lippitt and Fox, 1967; Lippitt et al., 1967; Human Interaction Research Institute, 1976). Conversely, need for stability as well as feelings of threat, insecurity and fear of criticism have been found to impair risktaking and receptivity to innovation (e.g., Gordon et al., 1974; Havelock, 1969a; NSF, 1969; Lippitt and Fox, 1967). Finally, individuals most receptive to new information have been found to be open rather than dogmatic, to be more achievement-oriented and less affiliation-oriented than their

peers, and both to perceive themselves and be perceived by others as nonconformist or even "deviant" (Rogers and Svenning, 1969; Rogers, 1967; Lippitt and Fox, 1967; Halpin, 1962; McClelland, 1969).

These generic psychological attributes are of interest to the extent that social science innovations require for their implementation changes in attitudes and values as well as behaviors. However, of greater seeming relevance are social psychological variables more closely linked to practitioner status in a particular area. Included in this category, most importantly, is a sense of professionalism (e.g., Lippitt et al., 1967; Berryman, Bikson and Bazemore, 1978; Human Interaction Research Institute and NIMH, 1976). Perhaps as concommitants of professionalism, extensive peer contact, exposure to information sources, and perceived leadership in the peer group have also been identified as factors that promote innovativeness (Gordon et al., 1974; Lippitt et al., 1967; Rogers, 1962; Rogers and Svenning, 1969). On the other hand, a "cosmopolitan" orientation and extensive contact outside the practitioner's particular social system have been associated with innovativeness as well (e.g., Human Interaction Research Institute and NIMH, 1976; Rogers, 1962; Rogers and Svenning, 1969; Gordon et al., 1974). Finally, as the review of knowledge transfer carried out by the National Institute of Mental Health and Human Interaction Research Institute (1976) makes clear, successfulness in the field is a factor whose predictive impact is ambiguous. On the one hand, successfulness seems required for the sense of security, confidence, and opinion leadership that are said to promote innovativeness; however, those who are successful feel little need to change, as the problem-solving model of dissemination would imply.

Although characteristics of individuals in the user system may influence level of receptivity to new ideas, characteristics of the potential adoption setting have a great deal to do with whether they are actually utilized. But, while there is substantial concensus regarding the overall significance of institutional characteristics in the knowledge transfer process (e.g., Berman and McLaughlin, 1975; Human Interaction Research Institute and NIMH, 1976), there is much

less agreement when it comes to identifying and organizing those factors as well as evaluating their impact (Guba and Brickell 1974). For the purposes of this review, it seems best to organize factors that promote or impede knowledge transfer into those that are relatively long-term characteristics of a setting and those that are relatively situational (i.e., that interact with a given innovation), discussing the most consensual first.

Among the standing characteristics of institutional settings, some are widely agreed to have a positive influence on innovation. One such characteristic, clearly specified institutional goals, is mentioned or presupposed by virtually all sources as a key positive element (e.g., Glaser, 1973; Berman and McLaughlin, 1975; Halpin, 1962; Rogers, 1967; Glaser et al., 1967). A second strongly influential factor, widely discussed, is the extent to which the organizational ethos and reward structure promote change and self-renewal (see reviews in Jolly et al., 1978 and Human Interaction Research Institute and NIMH, 1976; v. also Glaser, 1973; Yates, 1971). While most sources discuss considerations internal to organizations, some emphasize the political pressures for and against change in the external community in which the organization is embedded. For example, Pauly (1974) underscores political pressure as a major pro-innovation force in central cities, because city service organizations ar. typically under public obligation to show responsiveness to identifed needs; and efforts at problem-solving and innovation become a solution to these sorts of political problems. Lippit and Havelock (1968), however, warn that while it is evident that outside support is needed for risk-taking actions by institutions, "what is still not known is what types of support for adoption efforts are needed for what types of innovation in what types of social contexts."

A third significant factor, undoubtedly closely related to reward for change, has to do with the attitude and leadership style of the principal actor in the organization (e.g., Berman and McLaughlin, 1975; Glaser, 1973; Havelock, 1969a; Glaser and Ross, 1971). With respect to attitude, Berman and McLaughlin (1975) note that the active support by the "'gatekeepers' of change" in an institution critically affects the behavior and commitment of staff involved in the adoption of new practices; attitudes of administrators, decisionmakers and higher-ups in effect tell the staff

how seriously they should take new objectives and what sort of priority should be given to utilizing new information (cf. Rogers and Shoemaker, 1971; see NSF, 1973, for a discussion of the relative impact of gatekeepers in different organizational roles). Besides attitudes, leadership style has been identified as an important organizational factor in a number of studies (see review in Human Interaction Research Institute and NIMH, 1976; v. also Berman and McLaughlin, 1975). From these studies, it is clear that extensive participation by all relevant organizational staff both in identifying and solving problems and in attendant decision-making processes is conducive to change; rigid authoritarian structures, in contrast, retard innovation (Berman and McLaughlin, 1975; Glaser and Ross, 1971; Rogers, 1967; Gordon et al., 1974; Lippitt and Fox, 1967).

A fourth characteristic of organizational climate frequently associated with utilization of new knowledge is staff morale and cohesiveness (e.g., Berman and McLaughlin, 1975; Lippitt and Fox, 1967; Gordon, et al., 1974; Glaser and Ross, 1971; Rogers, 1967; Havelock, 1969). In addition, open communication, both horizontally and vertically through formal as well as informal channels, has been found to enhance innovativeness in organizations (Gordon et al., 1974; Lippitt and Fox, 1967; Glaser et al., 1967).

Besides the long-term institutional factors described above, a number of other characteristics have been widely studied but have not yielded conclusive findings. Affluence of the organization has been found by some researchers to have a significant positive effect on innovation (e.g., Pauley, 1974), and to be minimally important by others (e.g., Berman and McLaughlin, 1975). More disturbingly, institutional size, hierarchical centralization, and division and specialization of labor have been found in some studies to affect innovativeness positively and in others, negatively (e.g., Pauley, 1974; Lippitt et al., 1967; Gordon et al., 1974; Rogers, 1967; Havelock, 1969a; Bennis, 1971). These discrepancies are in some measure alleviated by taking into accout matters of degree; an organization must be sufficiently large, well-organized, and complex to undertake the implementation of change; on the other hand, overly large and centralized bureaucracies, especially where rigid division and specialization of activities make inter-unit communication difficult, are not readily amenable to implementation of change. It must, however, be

acknowledged that the literature is less than conclusive regarding these variables (cf. the review in Human Interaction Research Institute and NIMH, 1976).

Finally, while long-term institutional factors evidently have a substantial impact on the knowledge transfer process, the extensive study of innovation carried out by Berman and McLaughlin and their colleagues (e.g., Berman and McLaughlin, 1974, 1975, 1976, 1978) concludes that successful knowledge transfer is most strongly affected by the interaction of a strictly situational set of characteristics that surround the implementation of an innovative idea. Designating this set of characteristics the "implementation strategy" employed by an institution, Berman and McLaughlin describe four features as critical for success.

- o Adaptive planning: While institutions undergoing change do well to avoid extremes of under- and over-planning, outcomes of innovative efforts were found to depend more on quality than quantity of planning. Adaptive planning, or planning that occurred continuously and flexibly through the implementation period and that sought both to modify the innovative idea to meet needs and requirements of the local setting while altering that setting in light of the objectives for change produced best results. Ideas and adopting institutions need to be mutually adapted to suit one another.
- o Staff training keyed to the local setting: As with planning, training is effective on the basis not of quantity but type. Effective training was found to be tied to the specifics of operation, to the practical dny-to-day problems of implementing an innovative idea. Concrete how-to-do-it workshops were most successful to promoting knowledge transfer.
- o Local development: Innovative ideas always require some strictly local decisions about their implementation, and may well require use of new materials, methods, techniques, and the like. Local development or modification of these components was found to lead to more successful implementation than were attempts to incorporate an entire "package" of procedures developed extramurally.
- o Critical mass: A critical mass of participants in a given setting appears necessary so that those attempting to put new ideas into practice will not feel so isolated or unappreciated. The involvement of a critical mass of organizational personnel will build support and morale, establishing an institutional norm for change (so that participants will not feel like deviants in the local setting).

Although few other sources have investigated knowledge transfer from such a situational perspective and none have employed the "implementation strategy" construct, it has been generally acknowledged that practical barriers to change in a given setting often overshadow user acceptance of innovative ideas in determining whether new knowledge will be utilized (e.g., Glaser and Ross, 1971; Spak and Shelly, 1978).

This account completes the examination of user system factors that promote or impede the dissemination and utilization of new information. Such factors were grouped into two major categories representing characteristics of individuals and characteristics of user organizations. While characteristics of individuals seem appropriate for predicting receptivity to new information, an apparent prerequisite for successful dissemination, it is characteristics of the adoption setting that seem to be most important in predicting actual utilization of new information. As Berman (1979) remarks, many local institutions are willing to adopt changes but are simply "unable to implement innovations effectively." Returning to the problem-solving model of knowledge transfer which initiated the review of the user system, then, it is likely that the successful transfer of resource system products to practitioner domains has effective two-way communication as a necessary but not sufficient condition; the completion of such transfers also requires that potential users be able to implement the concepts communicated, transforming them into viable solutions for recognized local problems. Thus from the user perspective it seems that the major barriers to effective dissemination and utilization are the absence of viable two-way communication links with the resource system and the absence of effective implementation strategies for adapting resource system products to identified local problems.

LINKING USER AND RESOURCE SYSTEMS

Examining the information dissemination and utilization process has led to the conclusion that neither the problem-solving model (representing the user perspective) nor its predecessor, the R&D model (representing the provider perspective), adequately provides for the translation of knowledge into practice. Instead, the review indicates that researchers and practitioners tend to be engaged in "relatively self-contained" pursuits (Yates, 1971) without a viable mechanism for insuring that valuable products of the resource system will be located and adapted to benefit potential users. A more successful system of exchange among resource providers and users must be devised, then, if current and future cohorts of older adults are to derive "immediate benefit from proven research knowledge" (v. p. 1, above).

The seriousness of the "adoption time-lag" is underscored in the review of knowledge transfer conducted by the National Institute of Mental Health and Human Interaction Research Institute (1976). Commenting that the problem of knowledge transfer emerges from dual efforts to maintain what has already been achieved and to improve on it in the interest of enhancing the quality of life, they urgently call for more effective ways to meet these needs in a rapidly changing world. Corroborating this concern, a 1973 National Science Foundation study of adoption-lag documented the amount of time required for ten innovative processes, products or techniques to move from the point of conception to the point of implementation (in the sense of acceptance in the user domain). Intervals varied from 6 years for the video tape recorder to 32 years for the heart pacemaker, the mean duration being 19.2 years. Similarly, studies reviewed by Jolly et al. (1978) indicate that it may take up to 30 years for a new technology to diffuse through a worldwide industry. Finally, when it is recalled that social science innovations may be even more difficult to implement because they often impinge on practitioner values and behavior repertoires, the importance of efforts toward improving exchange between user and resource systems is clear.

Renewed attention to the process of information dissemination and utilization has focused on linking user and resource systems so that ideas generated by the latter can be realized in the former. Thus, dissemination

is defined straightforwardly by Herlig (1977) as "bridging the gap between research and practice." Greenwood and Weiler (1972) put the problem this way: the starting point is that an author has created a written product that contains an idea(s); the end point is that someone is able to find the product and use the idea(s); the question is how to facilitate this transfer. A similar focus is manifest in Jolly et al. (1978), who describe transfer of technological information as a "planned effort to move technology from the source to the user." Likewise, Shuelke and Bond (1978) define such transfer in terms of the "integration of people, hardware, and software for moving technology from one point in time and space to another."

This new emphasis on linkage replaces previous more abstract discussions of the transmission of knowledge per se or the nature of problem-solving with more concrete attention to questions of how best to arrange interactions between persons or groups so that newly developed resources can be put into use. These questions seem to be primarily directed toward two types of issues. First, much recent work addresses parameters of communication. For example, Lavin (1972) introduces his conception of linkage with a review of semiotic theory, contending that previous work on information transmission has attended to the syntactic and semantic dimensions of language, ignoring entirely the pragmatic dimension. But the pragmatic level of language, Lavin points out, is classically recognized as the level that explains its "effective contents" for a reader/hearer. Consequently, Lavin's own model of information transmission begins with the establishment of a relationship between a communicator and a client (potential user); it supposes that the communicator will take into account the adequacy of the client's existing state of information, and will attempt to provide new information that is relevant, nonredundant, and relatively noise-free. Sharing this perspective, Schuelke and Bond (1978) suggest the importance of distinguishing "knowledge" from "information," noting it is the latter that is transmitted. They believe that concern for the transmission of information, or "knowledge messages" (cf. Havelock, 1969, 1967), represents a paradigm shift in dissemination and utilization theory. Consequently, they frame their viewpoint with a discussion of "mediaforms," a construct that includes attention to the influence of media

in messages, to the attitudes, values and orientations of the parties to a communication, and to the role of persons as "knowledge packages," as well as varied aspects of information technology.

The second type of issue toward which a considerable body of recent work in knowledge transfer is addressed has to do with promoting utilization, or with developing viable general implementation strategies. For example, the concept of knowledge diffusion proposed by Gordon et al. (1974) has as its goal the communication to practitioners of organized and relevant knowledge in a form that "maximizes the probability of correct and efficient use." Their four-stage model ends with methods for increasing the "adoption capacity" of potential users. Similarly, Hildebrand's three-part model for linking research to practice includes information gathering and analysis, diffusion management and training, and "local implementation." Here the last two stages centrally involve the coordination of resource persons and organizations plus a variety of informational media to help adapt innovations to local settings in which they can become self-sustaining. On-site development and conduct of implementation strategies is stressed as the key to successful translation of knowledge into practice.

In terms of the previous review of the resource and the user systems these new emphases generated by the interest in linkage seem to result in a dual set of recommendations. These complementary recommendations, summarized below, reflect many important concerns raised in the discussion of the R&D and problem-solving models of knowledge transfer.

RECOMMENDATIONS

RESOURCE SYSTEM	USER SYSTEM
o Improve the communicative media in which knowledge is embedded (make them interactive and user-oriented).	o Improve the organization, retrieval and evaluation of need-relevant information.
o Make informational contents problem-focused and practical, providing operational guides.	o Develop viable implementation strategies for adapting new ideas and local settings to one another.

Taken together, these recommendations imply that new efforts to link research and practice should involve ameliorating information delivery capability on the one hand and information retrieval and selection capability on the other. Further, they imply that linkage of resources and users requires instituting mechanisms for drawing sound, practical inferences about how to use new knowledge in practitioner settings, and for developing adaptive implementation procedures in those settings.

The review thus far offers three choices for the location of interventions aimed at carrying out the recommendations for improved linkage of research and practice: the resource system, the user system, or some intermediary system to be introduced specifically for that purpose. Not surprisingly, the literature concerned with providing models of knowledge transfer that address more adequately the problems of communication and implementation described here can be construed as taking just such an approach. That is, some sources are primarily interested in means of shoring up the information delivery capability of the resource system; others mainly treat modes of improving implementation strategies in the user system; and still others seek to develop a conception of the nature and function of an intermediary, or linking, system not located within either. The first two approaches can be construed as revising the R&D model and the problem-solving model of knowledge transfer, respectively.

Guba (see Clark and Guba, 1965; Guba and Brickell, 1974) and Yates (1971) are representative of those who advocate a revised R&D model of information dissemination and utilization. That is, both sources contend that, at least within the field of education, prior approaches to knowledge transfer have not worked effectively; but both believe, on the basis of a review of available models, that the R&D approach with some revisions remains the most viable. Innovation, then, is properly initiated by the resource system, whose responsibility it is to transfer new knowledge to the user system. But Guba and Yates share the view that the transfer process is not complete until adoption occurs (where "adoption" is defined as the time it takes for an innovation to become standard practice in a user setting). Consequently, their revisions of the R&D model give considerable importance to communication and implementation processes. Yates especially emphasizes improvement in communication between resource and

user system members through the following recommendations.

- o First, the resource system must employ technical writers who both understand research methods and also appreciate the needs and capabilities of practitioners.
- o Written communications from the resource system must be supplemented by other forms of dissemination such as lectures, demonstrations, and--ideally--by cooperation between researchers and practitioners in the application of research findings.
- o Practitioners must be provided with a wider knowledge of research methods through professional training and in-service courses.
- o Finally, implementation of the preceding recommendations implies that a number of "middle man" roles be filled. It will be necessary to recruit and define responsibilities for communicators, demonstrators, evaluators, and so on.

While Yates underscores the need for improved communication procedures, Guba (v. especially Guba and Brickell, 1974) gives major attention to means of assisting implementation in the user setting. Specifically, Guba proposes a "negotiation" process whereby potential practitioners become "affiliated" with the innovation and its disseminators. Negotiation begins with interested user system members, and is carried out by consultants or technical assistants capable of representing some product of the resource system. When the consultants or technical assistants have won the allegiance and confidence of potential practitioners, then actual implementation work can proceed. Key features of Guba's recommended implementation strategy are local adaptation of R&D products and on-site training with continuous follow up. It would seem then, that Guba'a revised R&D model, like Yates' version, requires recruitment of individuals capable of playing intermediary roles in the diffusion of resource system products to local settings.

A contrasting orientation is provided by Groot (1971) and by Jolly and Creighton and their colleagues (Jolly, Creighton, and George, 1978; Creighton, Jolly, and Denning, 1972), who represent a revised problem-solving model of knowledge transfer. Creighton, Jolly, and Denning (1972) insist that, given equal resources, an effective transfer mechanism in

the user organization will produce a "higher coefficient of knowledge utilization" than one lodged within the provider system or in a third organization placed between supplier and user. Groot's review likewise concludes that a problem-solving approach to information dissemination and utilization emphasizing user needs is most promising. However, both sources envision important alterations of the previous model. With respect to formal factors influencing knowledge flow, for example, Jolly, Creighton, and their colleagues propose that the resource system should make needed improvements in the language, format, organization, and other features of research documents to facilitate communication with users; they also suggest changes in the way R&D projects are developed, recommending that potential users be included in their planning, execution, and interpretation. They also point out, as an informal influence on knowledge flow, the importance of individuals in user organizations who serve as de facto linkers, coupling their institutions to the larger environment and acting as opinion leaders or gatekeepers for new ideas.

Groot's (1971) recommendations are comprehended in what he calls a "dischronic" problem-solving model that underscores a series of two-way interactions and exchanges needed for development and utilization of knowledge. From Groot's standpoint the salient feature of the diachronic model is its requirement that any component in the resource or user system be able to initiate communication by sending or by seeking information, the process being intentionally circular. He contends, however, that not enough attention is typically given to communications from users to providers for purposes of information seeking and especially for purposes of information providing. In his view, mechanisms for systematically receiving and responding to such communications need to be introduced into the resource system. In order that developed knowledge be directly useful for solving problems in the practitioner setting, he suggests, potential users must be real participants in research decisionmaking. Detailed recommendations about mechanisms for instituting dischronic exchanges between users and the resource system are not given.

The development of an intermediary system to bridge the gap between users and the resource system, as suggested by Havelock, Lingwood, Lippitt, and others, is a third potential remedy. As the National Institute of

Mental Health and Human Interaction Research Institute (1976) point out, "of all the suggestions for obtaining research utilization, the establishment of a linkage mechanism in the form of a change agent or agency is the most strongly advocated by many writers." After indicating why such an approach seems most promising, especially for linking gerontological research and practice, that model will be discussed in more detail. There seem to be three sorts of reasons why the incorporation of link agents or agencies is a valuable approach to knowledge transfer.

Turning to the summary of recommendations near the beginning (p.29) of this section, it is first of all dubious that the resource system is either willing or able to carry them out. That is, nothing in the extant skill repertoire or reward system of researchers promotes an orientation toward communicating in brief, practical terms to lay audiences, especially in other than standard media. (It is not clear, for example, how simple brochures, how-to-do-it lectures, or in-service training sessions would appear on professional vitae, how they would be received by tenure and promotion committees, and so on. Nor is it evident that, were a researcher inclined toward such activities, he/she would be a particularly effective communicator with these media.) It is further questionable, supposing that issues of communication per se could be resolved, that researchers can or should direct their attention to solving problems or improving practices in user contexts. This is not to argue that researchers do not solve problems, but rather that their activities are properly addressed to problems different from those that arise with respect to adapting innovative ideas and particular institutional settings to one another on a day-to-day basis. (Again, it is not evident that it would be a wise and efficient investment of effort to recruit researchers to carry out such tasks; their skills and interests may thereby be misplaced.) In sum, there are many reasons for believing, given the nature of the resource system on the one hand and the kinds of needs that generate the demand for more effective linkage on the other, that researchers are not best suited to fulfill them.

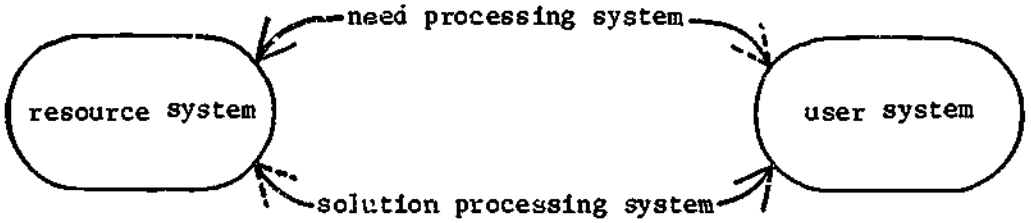
Unfortunately, it is also equally improbable that such needs could or should be filled by members of the user system. Particularly in the area of gerontological knowledge, the number and diversity of potential user-entities make this suggestion infeasible; a substantial proportion of user

groups could not afford the investment in research-related activities entailed. Moreover, it is not at all evident that solving local problems with newly developed research information is the orientation of most practitioners. It seems likely that most user system members direct their activities primarily toward operating a good program, delivering a quality product, or carrying out an efficient set of procedures--in short, they aim at accomplishing the tasks that meet their organizational objectives and not at problem solving per se. Only when there is reason to believe either that the objectives are not being met, or that there exists a better way of carrying out the tasks, is problem-solving likely to be undertaken. Consequently, for most user groups it would be a relatively inefficient investment of effort and skill to develop an in-house capability for designing needs assessments and carrying out state-of-the-art searches for research information. Similarly, it is not evident that most practitioner groups can or should attempt to develop the capacity to evaluate such data and to draw concrete application guidelines from the operationalizations of research constructs, mastering adaptive implementation strategies. The advanced level of research expertise necessary for becoming proficient in such matters is not likely to be sought by most practitioners--particularly when only a small proportion of the resource system's products are relevant, valid, and replicable in any given applied setting and when only a small proportion of the user system's activities are appropriately allocated to "problem-solving" of this sort. In short, it is doubtful that linking research to practice should be the responsibility of practitioners.

The third major sort of reason why neither the user nor the resource system should take on the primary linkage function is that the two systems do not share a social structure, do not participate in a common communication network, and do not have the same norms, attitudes, values or referent groups. It is unlikely under these circumstances that either group will be an effective intermediary. It is unlikely that either group will be a trusted and respected information source for the other, or be regarded as genuinely, knowledgeably, and especially, equally representative of the perspectives of both systems. Consequently, since all the suggested revisions of information dissemination and utilization processes require developing and training individuals to serve identifiable linking functions, it

seems desirable that link agents not be located within the resource or the user system but rather be affiliated with some intermediary system not identified exclusively with either. Concurring with Herlig's (1977) conclusion, there are virtually no data about linking agents and there is no concensus that even if sufficient they are necessary to achieve effective dissemination and utilization; but enough research evidence is available to show that the link agent model is a promising one snd that the others are not.

The model of knowledge transfer recommended here, then, involves a link agent or link agency serving as an intermediary between resources and potential users. Features of that model have been generated primarily by looking at factors that have been found to promote or impede information dissemination and utilization in studies of other models. While the names of the intermediary roles or agencies vary and suggest slightly different concepts (e.g., Glaser, 1973; Lippitt, 1965; Rogers, 1962; Havelock, 1969), the model is typically described in terms of Havelock and Lingwood's (1973) formulation (cf. Human Interaction Research Institute and NIMH, 1976). That is, the linkage model may be accounted for in terms of the two previously-described components--the user system and the resource system--together with a "need processing" system (represented, as below, by means of an arrow leading from the user to the resource system) and a "solution processing" system (represented as an arrow from the resource to the user system):



Here, both encircled systems are seen as problem solving systems, while those designated by arrows represent the dialog between them. The model reflects recommendations for diachronic two-way communications, but fails to capture some urgently suggested changes regarding who says what to whom. That is, the model would be better amended to involve bi-directional arrows expressive of user participation in all phases of the research process both by giving "feedforward" (e.g., suggesting agendas for applied or basic research) and by providing external validity information about innovative conceptions supplied by the resource system and implemented in practitioner settings. Second, the model would do well to expand attention beyond problem-solving to include within linkage the generic functions of networking, interaction, and dialog oriented toward a variety of ends in addition to the resolution of user needs by the resource system. With these alterations in the linkage model assumed, it is appropriate now to investigate the characteristics and functions of linking systems.

As indicated in the previous discussion, there is not a great deal of organized empirical information about the nature of link agents and activities, since this model of knowledge transfer has not yet been widely attempted or evaluated (cf. Ogden and Miesumeci, 1977). Perhaps the best historical precedent for current conceptions of research-practice linkage is the agricultural extension agent, cited as a successful example by a great many sources (e.g., Herlig, 1977; Radnor et al., 1977; Brown et al., 1977; Rogers, 1967) and specifically recommended to the Administration on Aging in the Department of Health, Education and Welfare's (1963) exploration of research utilization in that field. However, while all sources who considered use of the agricultural-type field agent as a dissemination and utilization strategy assessed it favorably, the factors that accounted for its success are generated primarily by retrospective analysis rather than by experimental evidence. Recently at least two demonstration projects have attempted to incorporate that strategy, one oriented toward providing the rural educator with innovative practices in education (Lindsay, 1972) and the other aimed at transferring results of federally funded research and development to business and industry

(Brown et al., 1977). Both programs included an evaluation component, but since the research design was not experimental, these projects do not provide conclusive information about the characteristics of link agents and their effects on the knowledge transfer process. A third source of information about characteristics of link agents comprises studies of factors that promote or impede dissemination and utilization in other approaches to knowledge transfer; by considering their conclusions, it should be possible to infer what characteristics link agents or agencies should have in order best to serve that function. Consequently, characteristics of link agents/agencies in the discussion below are inferred from retrospective analyses of agricultural extension agents, from current nonexperimental demonstration projects, and by analogy from studies of other approaches to knowledge transfer.

Among the characteristics of effective intermediaries, their status as permanent versus temporary has received considerable attention (e.g., Havelock, 1968a, 1968b). On the one hand, linking activities for which data have been collected are typically of a temporary nature, such as conferences, short courses and in-service training projects. In fact, the joint study by the National Institute of Mental Health and Human Interaction Research Institute (1976) concludes that "the collaboration of research scientists and practitioners in joint research projects appears to provide the greatest potential for maximum utilization of research findings." Any such project would likely be a temporary alliance, created to last for the duration of a project. On the other hand, as Havelock notes, permanent intermediaries may be needed to assist in planning and initiating temporary collaborative systems (1968b). Given the separateness of researcher and practitioner worlds, Havelock's observation is most likely correct. Moreover, many sources suggest that linkage needs to be continuous--questions that need to be answered prior to adoption decisions, for example, differ from questions that need answering at different points in the implementation of an idea, and long-run incorporation into the institutional setting may require still further consultation. In fact, regular long-term connection with the resource environment is a recognized practitioner need. To insure effective utilization, then, as well as to

facilitate temporary researcher-practitioner collaborations, a permanently existing link agent or agency seems to be required.

A second feature of link agents or agencies, and the one which is perhaps most widely recognized, is that they must provide face-to-face interaction with knowledge seekers and knowledge providers (Rogers, 1962; Havelock and Mann, 1968; Caplan, 1970; Glaser, 1973; Brown et al., 1977; Herlig, 1977). As Herlig (1977) points out, the data indicate a need for direct interpersonal exchange because dissemination has been shown to demand two-way communication and because person-to-person contact is empirically demonstrated to be the most effective communication medium--especially as the issues and the knowledge sought increase in complexity. Publications can be useful in creating awareness and in supplementing the work of linking persons, but thus far neither printed documents nor computerized information sources have been able to fulfill complex interactive communication and problem solving needs.

A third feature, virtually derivable from the previous two, is that link agencies or institutions, rather than agents or individuals, are needed. Only independently existing institutions can supply the need for face-to-face communication between user and resource systems on a long-term basis and facilitate short-term collaborative efforts (Lavin, 1972; cf. Farr, 1969; Logical Technical Services Corporation, 1976). Further, given conclusions based on studies of knowledge transfer in education (e.g., Greenwood and Weiler, 1972; Lindsay, 1972; Hildebrand, 1971; Piele, 1975), such institutions should be at least regional in scope if not national. That this conclusion holds especially true for dissemination and utilization of information in aging is evident given the high degree of concentration of resources on the one hand, and the extreme dispersion of the user system on the other. It is tempting to argue that direct interpersonal communication could best be provided by link agencies located in geographic proximity to users. However, the infeasibility of that option is immediately clear on considering first, that it would entail an unwieldy fractionalizing of the links (virtually recreating many of the problems of the user system) and second, that it would be an unduly costly and redundant

system. On the other hand, it means that provision of direct interaction will require advances over the classic modus operandi of the agricultural extension agent.

Consequently, a fourth feature of linking agencies is that they should establish multi-media approaches to two-way knowledge transfer. It is already clear from the previous discussion in this section that linking agencies should have one foot, as it were, in the resource system and the other in the user system, partaking of the norms, values, skills, and referent groups of both (cf. Havelock, 1969a; Lavin, 1972). Only by satisfying this requirement can a linking agency serve as a communication vehicle that is neutral in its orientation to researchers and practitioners and therefore acceptable to both. Moreover--and equally important--only by satisfying this requirement is the linking institution able to communicate effectively to users and providers of resources in media appropriate to their needs and capacities. While it is not practical here to attempt to enumerate all the media suggested in the literature for carrying out interactive knowledge exchange, it would be well to indicate their variety:

- In an age when people are used to rapid communications, many sources (e.g., Spak and Shelley, 1978; Greenwood and Weiler, 1972) urge linking institutions not to forget the value of the telephone. Telephone questions and answers can provide for direct, two-way interaction and, especially, for fast turn-around. Ideally, a toll-free number for a telephone information link should be established by an intermediary agency.
- The use of two-way interactive television, perhaps combined with high-quality videotapes, and ideally combined with a live facilitator, can provide a low cost and effective means of transmitting state-of-the-art information to relatively large audiences of potential users (cf. Spak and Shelley, 1978; Berryman, Bikson, and Bazemore, 1978).
- A multiplicity of methods are available for helping provide information specifically matched to a user context, including in-service training, on-site visits by researchers to practitioner contexts and by practitioners to demonstration or project sites, exchange visits among practitioners working comparable tasks, and consultation or technical assistance oriented to adaptive implementation strategies (e.g., Berman and McLaughlin, 1975; Guba and Brickell, 1974; Lavin et al., 1975; Ogden snd Miesumeci, 1977).

- Providing printed documents that synthesize and evaluate relevant research, that are brief, and that are focused at translating research procedures into operational advice (e.g., Weiler, 1973; Greenwood and Weiler, 1972) would vastly improve utilization of existing knowledge. Further literature addressed to common issued in adaptive implementation and how to resolve them should be developed for practitioners (e.g., Segal et al., 1975; Berman and McLaughlin, 1975).

Finally, it would appear that linking agents and their institutions should be generalists rather than specialists (cf. Piele, 1975; Herlig, 1977), for a number of reasons. In the first place, the link agent has to be able to communicate with a variety of practitioners in different sorts of contexts as well as with researchers representing a multiplicity of disciplines. Consequently, while link agents must be well versed in both research procedures and in problems of practical implementation, their language must be generic rather than specialized. For the same reasons, in the second place, link agents must know how to access specialized resources in a variety of disciplines (where resources are broadly construed to include persons and projects as well as printed documents). Their knowledge, then, should not be specific to a particular area in aging; rather, link agents need very special knowledge about information retrieval across the disciplines involved in aging.

There are a great many additional characteristics of linking agents and intermediating activities described in the literature, along with extensive skill taxonomies and multi-stage models. However, regarding these details, there is considerable speculation and noticeable lack of consistency. For example, Far West Laboratory provides a five-step linkage model (1971) and Lippett produces a seven-step model (1962), while Lavin (1972) and Havelock (1973) both produce six-step models--although the six steps are not identical. Moreover, a review of relevant literature conducted by Ogden and Miesumeci (1977) netted, after elimination of redundancies, no fewer than 400 different suggested linkage skills. Given that there exists very little in the way of empirical information on which to base decisions for a precise account of the nature of linkage (cf. Crandall, 1977; Hall and Alford, 1976; Sieber, 1974; Ogden and Miesumeci, 1977), it seems best not to attempt a rigid definition. Rather, it is appropriate to conclude with Herlig

(1977; cf. Ogden and Miesumeci, 1977) that it is better at this stage to avoid over-specification of the linkage construct, not developing a detailed model and task description. Not only would such an effort exceed available knowledge, as Piele (1975) points out, but it could perhaps do more harm than good. That is, it is at least clear that for different kinds of questions, at different stages in the dissemination and utilization process, different kinds of roles and different sorts of activities may be required of linking agents (Piele, 1975). Changing situations, problems, and resources will all impact on their function. It thus seems wisest to set general goals for linkage and describe major kinds of activities required for their fulfillment, assuming that effective intermediaries will develop on-line ways of adapting extant resources to particular settings. As Lindsay (1972) comments, "if there is anything the project has learned, it is that there is no one way to proceed."

With this precept in mind, then, Lingwood and Havelock's (1977) discussion of linkage provides a concise generic description of its goal: the establishment of "complex interactions" between resources and practitioners that "continuously facilitate and promote mutual information exchange and helping activities with respect to significant practice needs." This description captures the two kinds of issues to which improved efforts at knowledge transfer must be addressed, specifically issues related to communicative interaction and issues related to adaptive implementation (see the table of recommendations in this section, above). Activities of linking institutions, accordingly, can be organized around the fulfillment of this two-part goal.

With respect to information and communication activities, it is necessary to begin by acknowledging that link agents must establish two-way communications between users and providers of resources. While this principle has received widespread acceptance in the literature and most current models of knowledge dissemination involve such exchange as a structural feature, few precedents exist for actually carrying out the systematic transfer of information from users to providers. On the other hand, it has been established that there are at least two types of information that should regularly be transferred from the former to the latter. First, the resource system needs to be regularly informed about how research or devel-

opment products are faring in applied settings; such information is typically called "feedback" (Lavin, 1972; Groot, 1971). For such feedback to be effective, however, certain qualifications need to be added to the general recommendation. It is important that information about applications be presented in the language and format that is familiar to researchers. That is, linking institutions must recast positive and negative results, areas of indeterminacy, and areas of revision in terms that are meaningful to the members of the resource system, a recommendation often made when researchers are communicating with practitioners but hardly ever mentioned when the direction of communication is reversed. Should this qualification not be met, feedback is likely to be ignored. In addition, feedback should be synthesized across contexts of application whenever possible. That is, the linking institution should be in broad touch with the user system and should be in a position to develop feedback reports that summarize the experiences of a number of practitioner groups who have tried variants of an essentially similar innovation. Action on this second half of the recommendation will undoubtedly face some serious problems because the user system is so widely dispersed, because it does not have a well-organized horizontal communication network, and because user contexts and evaluation methods differ so broadly. On the other hand, it is not uncommon that innovative ideas become "popular" and--often with the encouragement of federal funds--a number of user organizations undertake adoption efforts more or less at the same time. Among them will be major user organizations and/or those with a reputation for innovative practices. In these situations, a linking institution that has one foot in the practitioner domain and systematically and self-consciously keeps in touch with the state of the art among users is likely to be able to elicit and synthesize feedback.

A second category of information that the resource system should regularly receive from the user system, for which the terms "feedforward" and "infusion" have been coined (Groot, 1971; Radnor et al., 1977) concerns the suggestion of desired future research and development. Typically, this recommendation is framed in terms of user needs--practitioner problems for which there is no current solution should be forwarded to the resource system as research and development targets (cf. Groot, 1971). It would

be well perhaps to broaden the recommendation to include any user-initiated request for knowledge, whether or not the knowledge is immediately related to a significant practice need. In this way, user system expertise might prove of broad benefit in the design of resource system undertakings. Again, it would be well to underscore the importance of the linking institution's efforts not only to transmit such information, but to formulate it in terms that will be apprehended by resource system constituents as research and development proposals. User-system-generated proposals, then, should be cast as research and development problems or research and development funding agendas, depending on whether the intended audience is R&D institutions or private and public funding sources. Moreover, with respect to practitioner-initiated information of this second type, it is also desirable for the linking institution to develop methods for synthesizing it. It is likely that suggestions for future research and development elicited from a number of practitioner groups will be varied, only partially overlapping, and not organized. The linking agent needs to combine, organize, and prioritize user-based proposals.

The second direction of effective information transfer to be established by the linking institution is from the resource system to the user system, a subject that has received considerable attention in the literature (see the discussion of the resource system, above). Matters of communicative style and format have already been treated in previous sections of this review, where the importance of an appropriate user orientation was stressed. It was also determined that, for conducting communicative transactions with practitioners, a direct interactive medium is critical. Consequently, the linking institution must be in a position to provide some person-to-person exchange. In addition, the value of a multi-media approach was underscored, with recommendations for including a mix of media such as interactive television and videotape as well as more traditional vehicles such as conferences, site visits, seminars, and printed documents. Consequently, the discussion that follows will focus on the objectives to be accomplished by a linking institution in transferring information from providers and users.

First, linking institutions must have the capability to efficiently search for, locate and retrieve desired informational resources (Lindsay,

1972; Gordon et al., 1974; Groot, 1971). In such efforts it is important not to construe the notion of resources too narrowly. For instance, Schuelke and Bond (1978) point out that persons can be regarded as "knowledge packages"; being able to locate members of the resource system whose expertise is specifically relevant to a problem area for purposes of question-answering, consultation, and the like is a requisite. Similarly, it is advisable for a linking institution to be able to contact research institutions that have ongoing projects relevant to significant practitioner interests, and to know of exemplary practitioner institutions whose experiences in implementing innovative programs could be of value for other practitioners. In addition, it goes without saying that link agents must be fully familiar with methods for searching the literature in an area of interest (including the "fugitive" literature) and must be able to access it when necessary.

The next end to be served by link agents transmitting information to the user system concerns the organization, integration, and evaluation of what has been retrieved (Weiler, 1973; Greenwood and Weiler, 1972). It has already been pointed out that, even when only printed documents are taken into account, the resource system's products are voluminous. Moreover, they are piecemeal, often inconsistent with one another, and of uncertain practical value. Consequently, considerable efforts must be expended to synthesize them. Perhaps the initial step toward organization takes place when the link agent translates practitioner questions into key words and subject topics before commencing an information search. However, what has been retrieved will undoubtedly encompass much that is redundant and irrelevant, while critical contents must be provided with a useful conceptual structure or narrative. In this process, a variety of sources will have to be integrated to produce a single outcome, with inconsistencies either eliminated or acknowledged and explained. Finally, some sort of evaluation should be undertaken. Not all research outcomes are of equal value: some are demonstrably more reliable; some provide greater evidence of validity; and some are arguably more generalizable. Practitioners will require assistance by linking institutions in judging the probable value of alternative research ideas (cf. Hildebrand, 1971; Mick et al., 1973).

The third objective that informational exchanges with practitioners should serve is to provide straightforward operational guides. That is, link agents should be able to help translate research and development reports into practical, how-to-do-it advice (cf. Weiler, 1973; Greenwood and Weiler, 1972). It has already been indicated that the most common impediment to research utilization is the lack of some specific technical knowledge; while practitioner organizations are often willing to change and have come to accept innovative ideas, they often lack the know-how to apply them and have nowhere to turn for assistance (cf. Berman, 1979; Spak and Shelley, 1978). It is in the area of concrete operational procedures that printed information most urgently needs supplementation by direct interactive contact with an information source. In many cases, the link agent will be able to answer users' questions on the basis of available literature; in cases where this is not possible, it should alternatively be possible to locate and establish an exchange with a researcher who has the appropriate expertise (cf. Spak and Shelley, 1978). In either event, users will probably require sustained dialog with an information supplier in order to arrive at the needed practical or technical answers to applications questions. Finally, the varied array of media as well as modes of combining and delivering them for purposes of coupling users with resources (see above) should be fully exploited by linking institutions.

The other major goal of linkage has to do with helping users develop adaptive implementation strategies, although it is somewhat arbitrary to distinguish dissemination activities from activities that facilitate utilization. For purposes of convenience, that distinction is made here along the lines suggested by Emory and Pino (1976) and by Berman, McLaughlin, and their colleagues (e.g., Berman and McLaughlin, 1974, 1975, 1978). Both sources suggest that providing general information, and even special technical information that may or may not be adopted by an organization, is an activity that differs in nature and focus (and perhaps in content) from the kind of assistance that is provided to an organization that has already made an adoption decision and is in process of attempting to install the chosen innovation. As Groot (1971) notes, information is a necessary but not sufficient condition for utilization of resource system products. Facilitating adaptive implementation, then, is construed here to include

interactions conducted by link agents with users that are directed toward resolving post-adoption problems that concern incorporating a research or development product in a particular setting. It is assumed that linking institutions can and should develop a solid understanding of common implementation problems in practitioner settings and a variety of methods for their resolution (cf. Piele, 1975; Segal, 1975).

Adaptive implementation will be discussed briefly in terms of five components that the literature consistently associates with successful utilization of research and development products. The first among them is need assessment or diagnosis, an activity that logically precedes detailed information search. It has been noted that perception of problems is often the motivation for seeking new information by practitioners (see the discussion of the problem solving model, above). However, the "problem" is frequently an experienced hitch in daily operations, or a "felt" but not diagnosed need, or the awareness that there are other (and perhaps better) methods for accomplishing the same tasks. Thus, the linking agent, beginning the job of coupling users to appropriate resources, must be able to assist users first of all in formulting, analyzing, and prioritizing needs. For this purpose, the linking institution should develop a general needs-assessment capability and link agents familiar with practitioner settings must help fit these methods to concrete contexts. The goals of the user organization should dominate this process. In fact, it has been recommended that one way to prioritize user needs is on the degree of centrality to user organization goals together with the number of the organization's target population to be affected were the need to be remedied (Rogers, 1962; Egan, 1975; Peterson et al., 1978; Fleming, 1978).

The need assessment should enable users, with the assistance of the link agent and the information generated by searching the resource system, to select an innovative alternative that can reasonably be expected to improve the organization's ability to carry out its work. The most important outcome of this process is that users do in fact view the new knowledge as a problem-solving device, as a conception that will positively assist the organization in performing its tasks; that is, users should "internalize" the innovation (Piele, 1975; Pauly, 1974; Berman and McLaughlin,

1975) and actively desire to pursue it as a part of their own goals (Rogers, 1962). Piele (1975) finds such internalization one of the most important predictors of successful implementation. In addition, Berman and McLaughlin (1975) emphasize the importance of having a "critical mass" of practitioner staff committed to the implementation process; while support from the institutional hierarchy is requisite not only at the initial adoption stage but throughout the effort, it is vital also to secure support for the new conception from those who will have to carry it out.

A third component of successful implementation in which a link agent could be instrumental includes technical assistance, staff training, and the development of local procedures or materials. Piele's extensive study (1975) reports that the availability of technical assistance outweighs any intrinsic feature of an innovation in predicting its successful utilization, a point similarly underscored by the work of Belden (1977), Troll and Olsen (1978), and Berman and McLaughlin (1975, 1978). With respect to technical assistance, these sources unanimously cited the necessity for providing how-to guidance, concrete operational instructions, geared to the local setting. Not uncommonly, technical assistance is provided by an outside expert whose knowledge is so removed from the practitioner context that it seems abstract, difficult to apply, and of dubious value (Troll and Olsen, 1978; McLaughlin, 1975); such "assistance" is typically viewed by practitioners as a waste of time. Instead, it is suggested by McLaughlin (1975) and Piele (1975) that regular and frequent contact with technical assistance oriented primarily toward staff training and development, where practitioners "learn by doing" under the guidance of a consultant familiar both with practitioner settings and the innovation to be implemented, will be most effective. In fact, Piele's research indicates that it is sheer frequency of contact (rather than quality) that is most strongly associated with efficacy of technical assistance. McLaughlin's work focuses more specifically on staff training, where frequent sessions both prior to and during the implementation process facilitate its success; in particular, McLaughlin finds that the most helpful sessions involve problem-sharing by practitioners and recommends cross-site exchanges if two or more institutions in reasonable geographic proximity are implementing similar programs.

Finally, the attempt to make use of new knowledge may well involve the introduction of new procedures or materials into a setting, another potential focus for technical assistance. Adaptive implementation turns on local development of methods, materials, techniques and the like to insure that they fit the practitioner context.

The fourth component of adaptive implementation, closely related to the third, is flexible, continuous and participatory planning and decisionmaking. It has already been noted that innovative ideas are not self-executing, and that in the implementation process both the institution and the idea must be modified to achieve a good fit. Berman and McLaughlin (1975, 1978) give careful attention to such reciprocal alteration, pointing out that it is a continuous venture requiring on-line planning, frequent reassessment and resolution of difficulties, and perhaps even adjustment of institutional objectives as well as project revisions. These kinds of decisions must be made on a day-to-day basis, and the sequence of such decision points over time is termed by Berman and McLaughlin (1974) the "path of implementation." Berman and McLaughlin's work provides empirical support for the conclusion that attempts rigidly to adhere to an initial plan exactly as given, or uncompromisingly to follow a conception inherited from an external source without altering its design, is likely to produce failure; the innovation will be found not to work. In contrast, when the innovation is continuously modified to meet features of the environment in which it is embedded, its chances for success are much improved. Further, their extensive research on innovation in education leads to the conclusion that the participation of practitioner staff in such decisionmaking is a key factor in successful implementation. Staff involvement in planning and decisionmaking will, in turn, require a modification of management style in sharply hierarchical institutions with a top-down decision structure. With respect to this component of adaptive implementation, the link agent serves primarily as a process facilitator or organizational consultant with special knowledge in the area of management of change.

The last component of implementation to be treated here is the design and installation of a meaningful evaluation plan. While a

number of sources mention this task as one that might be aided by a link agent (cf. Herlig, 1977; Belden, 1977; Piele, 1975), a few give it much attention. It should nevertheless be said that there are at least three functions that an evaluation effort can serve: an evaluation should indicate to the practitioner institution how well the new project is faring; the evaluation may be required to account for or to secure public funds; and the results may be informative to the public in general as well as to other practitioners and to the resource system. Nevertheless, as Fleming (1978) remarks, practitioners often are unfamiliar with assessment procedures and lack models for evaluation designs (cf. Peterson et al., 1978). A link agent with some knowledge of basic evaluation methods, then, could prove very helpful to a practitioner institution attempting to evaluate an innovative undertaking. Such knowledge, like the knowledge required for facilitating on-line staff decisionmaking, is not intimately connected with the substantive content of any innovation but rather with the procedures that accompany all such efforts.

The preceding discussion has summarized five areas in which link agents might act to promote the second major goal of linkage, i.e., helping users develop adaptive implementation strategies. It should be noted that while the components vary in terms of how much substantive knowledge they presuppose, even the one that requires the most--technical assistance, training, and development--does not require that link agents be content experts but only that they be able to access such individuals if the need arises. Rather, link agents must have special knowledge about the process of managing change, common difficulties and strategies for overcoming them, and methods for assessment. Further, if link agents make users aware of the adaptive implementation process while facilitating it with respect to a particular change, that awareness should generalize to future utilization efforts as well. In this way, link agents can help increase an institution's capacity for improving its own performance (Berman and McLaughlin, 1978).

The role of linking institutions or agents has been developed in terms of activities related to a two-part goal comprising knowledge

exchange and knowledge utilization. Numerous sources in the knowledge transfer field have provided lists or descriptions of skills that link agents need in order to carry out the activities related to this complex goal. As with the detailing of linkage models, the exhaustive enumeration of linkage skills seems premature given the absence of systematic empirical support. Rather it seems more appropriate to suggest, given the kinds of activities that link agents will be expected to undertake, that at least three classes of skills will be requisite. First, because linkage requires establishing and maintaining relationships with researchers and practitioners that lead to trust and that enable the link agent to act as a process facilitator, a strong set of interpersonal skills will be needed. Second, it is evident given the knowledge exchange objectives the linking institution will have to fulfill that link agents will have to possess information management and communication skills. Finally, substantive or cognitive skills (in research procedures, in a content area such as aging, and in organizational development) will be requisite in order to assist in knowledge utilization. It is, of course, not necessary that a single individual possess all classes of skills--link agents may well work in teams or with consultants outside the linking institution to accomplish a specific linkage task.

The preceding discussion provides an account of the linkage model, a description of what link agencies could do, and a reasonable justification for concluding that this course is currently the most likely to lead to maximum dissemination and utilization of research knowledge in aging. But it is probably a costly alternative. Consequently an important remaining question is how the cost is to be borne. Currently federal research and development funds typically carry a dissemination requirement of some sort, and resource system institutions budget such activities in project proposals. However, such dissemination is not usually effective in reaching the user system. It would be well, then, for resource system organizations to subcontract some of their dissemination efforts to linking agencies or to employ link agents as consultants. Because linking institutions already have established networks of communication with both researchers and practitioners,

they should be able to carry out wide dissemination efforts with little start-up time or money and should be more effective communicators than researchers themselves. Ideally recipients of the information will bear part of the cost as well. A more difficult question concerns covering the cost of adaptive implementation efforts. While private for-profit organizations might be expected to pay for training, consultation and technical assistance, and while such assistance might be built into funds for implementation of innovative or model or demonstration projects or programs, it is likely that many user groups in the field of aging will fall in neither of these categories. Interestingly, very little federal support has thus far been provided for utilization (as opposed to dissemination--only about .25% of all research and development money is allocated for this purpose, (Schreter, 1979.) Consequently it would be wise to encourage a policy change toward the support of adaptive implementation efforts. Finally, among the studies of linkage that collected data related to the self supporting potential of such systems, the conclusion was negative--it is unlikely that linking institutions can pay for themselves. It is feasible that methods be developed to pay for the actual delivery of linking services of either an informational or consultative nature; but it is unlikely that such institutions will be able to cover costs of staff and capability development. On the other hand, if such institutions do not receive public support it is likely that a great deal of research and development will remain seriously underutilized.

In summary, the treatment of relationships between researchers and users first provided a model of their linkage and then reviewed relevant literature in order to determine what the generic characteristics of the linkage system should be. A two-part goal for linkage was established, involving the facilitation of both communicative interaction and adaptive implementation; key activities for the fulfillment of each aim were specified. However, this discussion primarily for reasons of lack of data, leaves many important issues unaddressed. Such questions include the nature of professional and interpersonal qualifications that should be required of link agents; the agencies best suited to carry out this function with respect to

gerontological research; the amount of time and level of funding probably needed to develop and deliver linking services; how such services should be supported; and the expected significance of the gain to older adults and the practitioner establishment with which they come in contact. On the other hand, the review clearly indicated that these questions notwithstanding the linkage model provide the most promising means among those available for securing the dissemination and utilization of new gerontological knowledge.

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