COMMUNICATION IN THE FIELD OF URBAN DEVELOPMENT MODELS

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The publication of two articles on land use and traffic models by Hanson (1959) and Hamburg and Creighton (1959) in a special issue of the *Journal* of the American Institute of Planners marks the formal beginnings of the field of urban development or urban land use models. Since that time the number of researchers and studies engaged in the formulation, calibration, testing and application of urban development models has expanded rapidly. These Proceedings, published nearly ten years after the original contributions to the literature of urban development models, mark a major milestone in this young but vigorous field. However, the advances reported here and elsewhere in the literature do not fully reflect the aggregate increase in information and ability for predicting the development of urban land. Much of what has been learned has yet to be reported in the literature, with the result that further advances may be retarded and the entry of new researchers in the field may be delayed.

The purpose of this paper is to examine the status of communication among researchers in this field, as a part of the larger examination of the status of the field of urban development models. Also developed here are new methods and recommendations for expanding and encouraging communication among researchers in the field and between researchers and users of urban models.

Unlike some other fields of inquiry, communication in the field of urban development models is not experiencing an information explosion, at least in the published literature. Moreover, there does not appear to be a communications problem with regard to keeping up with a rapidly expanding published literature, nor as is the case in some fields, is there a need to develop more rapid and informal methods of information exchange than the published literature provides. Rather, the problem in this field is perhaps the lack of an information explosion. The thesis examined here is that in the field of urban development models, there is needed a scientific information explosion scientific in the sense of generating publications that are detailed, rigorous, well-documented and referenced reports on research findings that collectively form a basis for new work, and information explosion in the sense of providing for full publication of the results of model development research on a continuing basis. In the course of examining this thesis, a framework for

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communication methods in science is described, followed by a review of recent communications in the urban development model field. Next, the journals presently available to this field are reviewed in terms of orientation and potential for expansion. Finally, proposed new methods of communication are examined, and recommendations for communications in this field are discussed.

COMMUNICATION METHODS IN SCIENCE

Questions concerned with communication in science are a topic of active interest to scientists in general. During the past two years, no less than five full-length articles and eight editorials, letters and reports appeared in *Science*, the weekly journal of the American Association for the Advancement of Science. Perhaps the most important of these for the purpose here is "The Future of Scientific Journals," by Brown, Pierce, and Traub (1967). For examples of general articles, also see Abelson (1966), Carter (1966), Garvey and Griffith (1967) and Margolis (1967).

Brown, Pierce and Traub develop the concept that scientific journals form a method of communication among scientists that is formal, public and orderly. Formal is defined to mean that papers appearing in journals can be cited and retrieved unambiguously. Public means that journals are available to anyone in libraries or by subscription, and that anyone can submit a paper. Orderly means that the inputs are accepted or rejected by the scientific community itself on the basis of merit. This framework for classification of communication in scientific research can be summarized by defining open communication as that communication which meets the above standards, and defining all other exchange as closed communication.

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The framework described above provides a basis for classifying channels of communication in the field of urban development models. Books, monographs, and journals constitute formal, public, and orderly communication for both researchers and users in the field. Conferences and preprints of papers distributed at conferences, such as the Annual Meeting of the Highway Research Board, provide for public and semi-orderly, but not formal communication. On the other hand, the reports of local, state, and federal agencies provide for semi-public, but neither formal nor orderly communication in the field. Finally, invisible colleges, that is, informal exchange of papers among small groups of research workers, or the somewhat more formalized information exchange groups (to be described below) are neither public nor formal nor orderly. It is noted by Brown, Pierce, and Traub that in some fields these last informal means of communication among groups of researchers are tending to disrupt well-established journal publication practices; in less developed and less organized fields such as urban development models, such practices may actually be stunting normal growth.

To determine the level of communication in the field of urban development models, the years 1964 through 1967 were selected as a sample period for the nearly ten-year period of growth and expansion. For this representative period, the status of communications has been examined by compiling a list of book, monographs and journal articles published (see Bibliography). This list, while not necessarily complete, is representative of the contributions to the literature during the period. In compiling the list, rather narrow criteria were employed for an article to be admitted, that the article reported on specific details of an urban development or land use model usually in conjunction with tests and evaluation for a particular metropolitan area. General articles on techniques and theory were thus excluded from this list. Furthermore, in order for a book, monograph, or journal article to be included, it had to meet the criteria of formal, public, and orderly communication; thus, many many reports of government agencies were excluded.

Books and Monographs

Three research groups produced four monographs during the 1964 to 1967 period. There were no books on urban development models published during this time. Two of these four monographs were issued by university research agencies, and two were publications of the RAND Corporation. The four monographs constitute communications among researchers, as contrasted with communications between researchers and users.

Journal Articles

Fourteen researchers or research groups produced 23 journal articles during the 1964 to 1967 period. Three university groups contributed 5 articles, four government agencies contributed 8 articles, and six consultants and private research institutes contributed 10 articles. The articles were distributed by type of model as follows[.] (a) residential location models, 13; (b) population and employment location models, 5; (c) retail location models, 4; and (d) industrial location models, 1.

Six journals were included in the survey for articles on urban development models. The journals, with the number of articles appearing in the 1964 to 1967 period, are as follows: (a) Journal of the American Institute of Planners, 8 (all in the May 1965, Special Issue); (b) Highway Research Record, 10; (c) Traffic Quarterly, 2; (d) Land Economics, 2; (e) Papers, Regional Science Association, 1; and (f) Journal of Regional Science, 0.

Journals in other fields, particularly geography and statistics were excluded from the survey because of the limited time available. Of the above articles, about half were communications among researchers in the field, and the remainder were communications between researchers and users.

Closed Communication

Although no attempt was made to survey the huge volume of closed commu-

nication during the 1964 to 1967 period, the following comments are suggestive of its quality and quantity. The Annual Meeting of the Highway Research Board and to a lesser extent the Annual Meeting of the Regional Science Association provided for important conference-type communication. In most cases, preprints of papers given at these meetings were available either at the time of the meeting or, upon request, from the author after the meeting. In addition to these public conferences, a number of private conferences were held including the annual meetings of the Land Use Evaluation Committee of the Highway Research Board at which important model development issues were discussed, and the Seminar on Models of Metropolitan Land Use Development held at the University of Pennsylvania in October 1964. Both the public and private conferences held in this field have provided important channels of communication among researchers; discussions of models at such meetings often appeared later in published form.

A huge volume of local, state and federal government reports, including reports by consultants, were produced during the survey period in the form of official reports, working manuals, and staff papers. While a large percentage of these reports has been available to a select number of researchers working in the field, their distribution to a somewhat larger group of interested researchers and potential contributors was extremely irregular. In addition, the quality of these reports tends to be uneven in that many were not intended to be distributed beyond the agency for which they were prepared; also, in many cases, reports on model research are mixed in with substantive issues and problems relating to a particular planning area, reducing their value as communications with other researchers.

A limited number of reports were published by the Federal Government through the U.S. Government Printing Office and the U.S. Department of Commerce during the survey period. In addition, the Clearinghouse for Federal Scientific and Technical Information was established during the period to reproduce and distribute reports submitted by a variety of government agencies and government contractors In particular, the unclassified reports of all defense research agencies and contractors are deposited in the Clearinghouse. At present, the feasibility of depositing metropolitan planning reports prepared by local governmental agencies and their consultants in the Clearinghouse is being examined in a demonstration project being conducted by the American Institute of Planners. Such a development would make available a large volume of reports on a selective basis. However, the problem of the quality of the reports and their orderly review remains to be resolved.

Finally, invisible colleges, or informal exchange of papers among individual researchers, have undoubtedly also been a rather important means of communication in the urban development models field for many researchers during the survey period. In addition, several indexes and information services have come into being during the past four years. Chief among these are the Highway Research Information Service and the Science Citation Index prepared by the Institute for Scientific Information (1965). Such services have an important contribution in the more mature areas of transportation and urban research; however, in this field the literature is so small that the benefits of such information services will probably be negligible for some time to come.

STATUS AND POTENTIAL OF VARIOUS MODES OF COMMUNICATION IN THE URBAN DEVELOPMENT MODELS FIELD

One possible explanation of the relatively small number of articles published during the past four years is the lack of available journal capacity. Although it may be widely believed that this is not the case, it is nevertheless useful to review the status of the several journals available to the field of urban development models to determine any potential problems of this sort. This review is divided into two sections, the first dealing with communication among researchers, and the second concerned with communications between researchers and users of the research. Each journal is examined for the quality of its refereeing system, its publication lag from submission of manuscripts to their publication, and the available capacity for expansion of the number of articles on urban development models.

COMMUNICATION AMONG RESEARCHERS

At present, there are two established journals available for publication of results of model research. One of these, the *Highway Research Record*, is clearly at present the leading journal for researchers in the field. It has, in conjunction with the Annual Meeting of the Highway Research Board, an excellent refereeing system, and considering the delay from the Annual Meeting itself, an acceptable publication lag; in this regard, a delay of 12 months is typical. As the number of papers in the field submitted each year to the Highway Research Board increases, there is a reasonable expectation that the *Record* can be expanded to accommodate the increased volume.

The second established journal available to this field, the *Journal of Regional Science*, has had no articles on urban development models during the past four years, but has published several important articles in the allied field of urban travel models. This journal mainly emphasizes theory and models of urban and regional location and development, and is a somewhat more academically oriented journal than the *Highway Research Record*. The journal has an active refereeing system, and at present has a good publication lag, on the order of 10 to 12 months. The management of the *Journal* recently has announced an expansion from two to three numbers per year. The *Journal of Regional Science* has the potential of becoming one of the major journals for this field, particularly for the more technical publications.

Several other established journals should be mentioned under this category considering their past contributions to publications in this field, and their future potential for publishing one or two articles per year. Included in this group are Land Economics, Economic Geography, the Annals of the American Association of Geographers, and the Papers of the Regional Science Association.

During the past year, four new journals were inaugurated in the general field of urban activities and transportation research, each of which has excellent potential for contribution to communication among researchers in the urban development model field. These journals are *Socio-Economic Planning Sciences, Transportation Research, Journal of Transportation Economics and Policy,* and *Transportation Science.* Certainly with the addition of these journals, as well as the two established journals discussed above, there can be no question about the availability of journal capacity in this field.

Communication Between Researchers and Users

There are at present three journals serving the function of communication between researchers and users in addition to the *Highway Research Record* which clearly fulfills this function as well as the role already discussed. Perhaps the major journal for communication between researchers and users is the *Journal of the American Institute of Planners*. In particular, special issues of the *Journal* in 1959 and 1965 have had a significant impact on the general field of planning. This journal has a highly developed refereeing system, and is generally regarded as having an adequate to good publication lag. The *Journal* probably has only limited growth potential for this field inasmuch as its main orientation is towards a large and varied membership. However, it can be expected to publish a few quality articles written mainly for the purpose of communication with users of urban development models.

A second journal also well established in the urban transportation planning field is *Traffic Quarterly*. This journal is well known for its rapid publication of manuscripts, although the quality of the articles published tends to be somewhat uneven. The journal probably has somewhat limited growth potential for this field, although there is clearly an opportunity for a continuing flow of well-written articles. A third publication, the *Journal of the Urban Planning* and Development Division of the American Society of Civil Engineers publishes general articles of minor interest to this field at present, but has a good growth potential for contributing to communications in the field. It is somewhat hampered by a limited distribution, mainly to civil engineers, but it could provide a useful service, particularly for urban and state engineering departments.

Journal capacity for communication between researchers and users is evidently quite adequate at this time, and will continue to improve and to expand through the submission of high quality manuscripts. There is, therefore, no apparent need for new journals to serve this function at the present time. However, in the next three to five years, there may be an opportunity for a monthly journal of a technical nature similar to the weekly *Science* for reports, review articles, abstracts and news and comment in the field of urban and transportation planning research. The recently announced Design Methods Group *Newsletter*, founded "to fill the communications gap in the dissemination of information on the methodology for solving large scale design problems as they occur in the context of urban systems" may serve this need. Such a journal could make a large contribution to communication in the urban development models field.

STATUS OF NEW METHODS OF COMMUNICATION IN SCIENTIFIC RESEARCH

Coincident with the expansion of information and the number of journal artucles and books being published in several fields of science, there has been expanding interest in possible new methods of communication. The relevance of several proposed new methods of communication for the field of urban development models is now reviewed.

Information Exchange Groups

A possible means for increasing communication among researchers is the establishment of an information exchange group (IEG) that would institutionalize the existing informal exchange of papers in manuscript form. In such a program, an agency such as the Highway Research Board would reproduce in preprint form and distribute to a select group any paper submitted by a member of the group.

The establishment of such a group would permit rapid communication (with delays of perhaps two months) among researchers in this field. Communications would include brief reports, technical memos, as well as papers prepared for publication. Membership in the group would be subject to careful selection because of the cost of the endeavor and the requirement of active participation.

There is considerable experience to draw on for evaluating the effectiveness of an IEG for urban development models, and it is useful to review it briefly here. Seven information exchange groups were formed in an experimental program recently concluded by the National Institutes of Health. The program was initiated in 1961 with one group consisting of 56 members that circulated ten preprints. Six more IEG's were added in 1964 and 1965. In 1966, the seven groups included 3,625 members, and 1.5 million copies of preprints were circulated. A continuation of this growth trend for the program for another two years would have resulted in a membership in the established IEG's of as many as 14,000 with a distribution of perhaps 30 million copies of preprints; see Abelson (1966). Recalling that the program was only experimental, the National Institutes of Health discontinued the program in early 1967.

An interesting and spontaneous evaluation of the program is recorded in the Science Letters Section, in late 1966; for further information, see: "IEG's. Some Evaluations," *Science* Letters (1966a); "Information Exchange Groups to be Discontinued," *Science* Letters (1966); "International Statement on Information Exchange Groups, *Science* Letters (1967). Several authors wrote that the information exchange group was a useful procedure particularly in the early stages of its existence, but that a decrease in quality of papers accompanied the expansion of the groups. It was also noted that the exchange stimulated local seminars to discuss the papers circulated.

However, the arguments against the program were considerably more pronounced and convincing First, there was a tendency towards shoddy, unrefereed manuscripts. Second, after the expansion of a group, publication time through the IEG was equal to or greater than the normal journal publication time for a first rate short article; therefore, the preprints and the journal articles begin arriving at the same time. Third, it was suggested that the long delays in journal publications are often due to manuscripts of doubtful scientific value and to poorly written articles and not to any inherent problems with the journal publication system itself. Finally, there were a few comments on why the great rush in communication anyway, as if publication four to six months sooner would change the course of scientific research.

The experience of other fields with information exchange groups suggests that if the field of urban development models desires to become more rigorous and thorough in its communication, the formation of an IEG could be detrimental to this objective.

Individual Publication of Articles

As an alternative to the information exchange group, a new journal distribution system has been proposed by Brown, et al (1967) in "The Future of Scientific Journals." The authors propose that journals stop binding papers into issues and instead, distribute to each subscriber a stream of papers, abstracts and titles specifically selected to meet his personal and perhaps frequently changing desires." The authors develop a careful analysis of the present journal system including concepts of relevance and coverage of the stream of articles that an individual receives. A detailed proposal for a computer-based indexing and distribution system is also presented.

An information system and primary publisher of scientific reports, Communications in Behavioral Biology, initiated a computerized journal similar in concept to the above proposal in January, 1968; see *Science* Letters (1968). The journal consists of two primary sections—abstracts and indices of articles, and original articles. All articles are published as singles, prepunched for insertion in binders. Articles are preindexed using a hierarchical index, processed and printed, and are immediately available as preprints. The abstract and index section of the journal allows readers to select articles of interest, or readers may request that all articles in selected index categories or by selected authors be sent to them, either as preprints, or a month later in final form. The abstract section publishes abstracts of accepted articles in over twelve leading U.S. and foreign biological journals. A journal distribution system such as the one described has considerable appeal. Not only does it improve one's ability to keep up to date with the highly relevant literature, but it also provides the journal article in a form that is convenient for use in research, as well as for filing and retrieval. The publication of journal articles in this form would certainly encourage the use of published articles in day to day research.

Communication Via Computers

The third area of new methods of communication is the use of computer terminals for communication among researchers. EDUCOM, the Interuniversity Communications Council, is currently encouraging technological progress in communications, and evaluating effectiveness and costs of academic communication; see Miller (1966). The kinds of advances being advocated by EDUCOM and similar organizations include the use of computer terminals to exchange computer programs and data and eventually to publish reports and articles. The potentially rapid development of this field merits the full participation and monitoring of individuals and organizations concerned with urban development models.

RECOMMENDATIONS AND CONCLUSIONS

The major thesis of this paper has been that the field of urban development models requires a rapid but careful expansion of its open literature in order to successfully continue advances in urban development models and related techniques. The status of communications during a typical period has been examined, together with the capacity of journal communication in the field. In addition, new means of communication have been reviewed. Based on these analyses and reviews, and drawing from the experience of other fields of science, it is urged that researchers in the urban development model field accept and espouse the basic communication system of science, that is, a formal, public, and orderly system of journal communication, that, in turn, generates a more permanent literature in the form of books. How can such a recommendation be implemented?

First, a major responsibility lies with the universities, particularly as the research efforts of planning agencies and consultants during the past ten years are more and more assumed by university research personnel. University researchers must by their own example lead the way to this proposed scientific communications system both through complete and rigorous reporting of their own research and through the synthesis and detailed review of the past ten years' advances. Furthermore, the universities must accomplish this goal by teaching the coming generations of scientists to accept responsibility toward information and communication, not grudgingly and with half heart, but fully and constructively.

Second, planning agencies, consultants, and research institutions must report full and rigorously on the application of methods and models, development of new techniques, and their current problems and requirements for new methods. These reports must be made in the open literature or through documents available in the Clearinghouse for Federal Scientific and Technical Information or similar means.

Third, funding agencies such as the Department of Transportation and the Department of Housing and Urban Development should adopt scientific criteria in the organization of research programs, award of contracts, administration of research, and the form of research products. In this regard, public reports through the regular literature should be one form of contract reports on research studies, instead of confidential reports to the agencies. This procedure would increase the quality of research through regular refereeing procedures already established, as well as making research readily accessible. In this regard, the grant and contract awarding procedures developed by the National Institutes of Health and the National Science Foundation certainly deserve serious study as models for funding research projects.

Finally, professional and academic organizations including the Highway Research Board, American Institute of Planners, Regional Science Association, and the American Society of Civil Engineers need to set a new level of standards to promote fuller reporting of research and methods development, and to consider more carefully their own vital publication roles.

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