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AN ESSAY ON THE PAST AND FUTURE (?) OF INFORMATION SCIENCE EDUCATION—II

UNRESOLVED PROBLEMS OF "EXTERNALITIES" OF EDUCATION

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Abstract—The essay examines the basic issues confronting information science education, issues that must be resolved if information science itself is to evolve in an orderly fashion. The essay is organized in three parts. In the first part definitions were considered and in a historical context the emergence, evolution and current state of information science and its education. This second part considers the problems and unresolved questions that deal with external aspects ("externalities") of information science education: (i) academic affiliation, (ii) degree levels, (iii) admission requirements, (iv) jurisdiction and (v) financing. The third part will deal with problems and unresolved questions in respect to internal aspects ("internalities") of education: (i) objectives, (ii) content, (iii) teachers and (iv) teaching. It is suggested that information science cannot prosper or even survive if concentrated action is not undertaken in the "externalities" and "internalities" of its education. A majority of the specific situations discussed pertain to North America, however, general aspects are valid for information science education everywhere. Recommendations about areas that need action are made.

INTRODUCTION

Purpose and organization of the essay

This is the second part of a three part essay dealing with education in information science. I offer this essay with the hope that it will contribute to a better understanding of the problems facing information science and information science education. The central premises are three:

(i) that the level of professional services and research activities in information science (as in any field) depend on the level of qualified personnel, which, in turn, depends solely on the level of formal, academic education in information science—this underscores the importance of the debate on information science education;

(ii) that information science education has been seriously hampered because of the lack of clarification and action in a number of problem areas (classified in this essay as external and internal aspects of education);

(iii) that information science cannot prosper, and may not survive unless substantive action is undertaken in the "externalities" and "internalities" of its education.

Three aspects of information science education are considered in this essay. Consequently the essay is divided in three parts.

In the first installment[1] I considered definitions, and in a historical context the emergence, evolution and current state of information science and its education in order to draw attention to the need for recognition of historical forces in educational deliberations.

This second part considers, in the phrase of Frederick Keppel (President of the Carnegie Foundation during the far reaching studies on education in a number of professions in the 1910s and 1920s), the "externalities" of education—problems and unresolved questions in information science education that deal with: (i) academic affiliation, (ii) degree levels, (iii) admission requirements, (iv) jurisdiction and (v) financing.

In the final installment, the problems and unresolved questions concerning the internal aspects ("internalities") of information science education, namely: (i) objectives, (ii) content, (iii) teachers and (iv) teaching, will be considered.

Summary of the first part

The first part[1] was a historical sketch offered in lieu of a more extensive and sorely needed study of the history of information science. It is clear that the first requirement for any solidly based and justified recommendations for an orderly evolution of information science education has to be an historical study and an assessment of its present state. The first part of this essay does not provide such a study, but it attempts to point out the historical elements that should be considered.

I wish to emphasize, to underscore, the necessity for historical references and an historical sense which we in information science so clearly lack. The changes, (especially technological ones) have been so rapid that we may be equating history with obsolescence. Without the historical references it is impossible to analyze forces that shaped events in information science and its education, to understand the particular interpretation of problems and the evolution of solutions, and to clarify the way things are and the way they got to be that way.

The historical part of this essay began with a survey of definitions of information science and three directions that can be discerned in information science: professional, technological and scientific; for the purpose of educational deliberations and decisions, these definitions provide a context for but not the content of information science. The origins of information science were examined in terms of three levels of (interlocked) problems that played a role in the emergence of information science: communication, literature (or public knowledge) and library (or information systems) problems. The interpretation of these problems as adopted in information science is of primary importance to educational efforts, it provides a focus for the objectives of information science education.

The evolution of professional work in information science was examined, with an outline of developments that appear to be the precursors of professional activities in the 1980s. Similarly, the evolution of scientific work in information science was scrutinized. The direction of these activities gives rise to educational questions. The last (and longest) section addressed the evolution of the academic educational efforts in information science, encompassing the predominant themes or developments in information science education in the 1970s.

It was concluded that as the 1970s are drawing to a close there are a number of trends that must be taken into account by information science education, such as:

—Continuity in the perception of *effectiveness of communication* as being the main problem orientation of information science

—Broadening of the domain of information science and a search for a clearer formulation of the *new domain* or domains.

—Relatively high success of the methods and tools developed for the control of "information explosion" *in toto*, but a reemergence of the ever present *quality problems*, i.e. access to quality literature, quality information, and problems due to the lack of quality filters.

—Increase in the degree of *professionalization* in information services and an emergence of the outlines of an information industry.

—Shifts in the topics of *research* and emphasis in area of bibliometrics, literature studies and communication.

—Decline of *research funds and efforts*; losses in relations between research and practice, research and education.

—Changes in the nature of knowledge and skills demanded by *job markets*; emergence of new perceptions of jobs to be accomplished.

Information science education is approaching a complex intersection, if not a crisis. Despite growth and other outward signs of health, the state of information science education is not well at all. It is quite evident that a growing number of important problems and questions (outlined in this and the next part of the essay) has been left unresolved—and the pile is growing. And it is clear that the type of future of information science education and of information science itself depends on the type of attention we in the field pay to the resolution of these mounting problems.

ACADEMIC AFFILIATION

As described in the first part of the essay, the debates and conferences of the 1950s and 1960s resulted in an academic basis for information science education, rather than being based

on short training courses for subject specialists turning toward information work. But the question of precisely where information science education should be located in the academe was not resolved. As a result the courses and programs in information science are offered within a variety of academic settings (the list is based on survey of directories and catalogs mentioned in the first part of this essay and is also exemplified by papers in[2]):

(1) *Library schools*: the majority of information science programs and courses are located in library schools. The basic orientation here is by and large toward problems of information as contained in documents and communication of recorded public knowledge. There is increasing emphasis on on-line data bases and services; some schools also emphasize research work in information science. In my judgment, most of the library schools which offer information science courses are providing no more than a few superficial offerings. However, some schools do provide qualitative information science programs as a separate specialization. Some schools attempted to orient their whole program solely toward information science, while some other schools are attempting to integrate information science and library science education.

(2) *Computer science departments*: these include the second largest number of information science courses and programs. In many cases information science is little more than a euphemism for computer science. Thus, although the name is there, the content is not. However, some schools attempt to establish distinct information science orientations, which include study of a variety of information systems (business, management, communication, etc.), information retrieval, data and text processing, linguistic analysis, etc. The programs tend to emphasize hardware/software applications to these areas. Various curriculum studies of the Association for Computing Machinery (ACM) [e.g. 3] recommended programs oriented toward information analysis and information systems design.

(3) *Management and business schools*: information science courses and programs are appearing as an increasingly common part of the curricula of these schools. These programs are oriented toward information systems and information organization for management decision making and data processing. With such programs, various specializations are available, e.g. management information systems; scientific and technical information systems; information science in government and public administration, etc. The emphasis is on management related to information processing and on general (and often nebulous) concepts of information systems.

(4) *Independent information science departments*: in a few isolated instances information science education is the province of independent academic departments. These departments are oriented toward systems analysis and design, technological applications and software and engineering aspects of information systems.

(5) *Composite information services programs*: these are programs (mostly experimental so far) aimed at provision of information services in particular subjects or in given broader areas of activity. Example of a subject program: Drug Information Programs are given in conjunction between a department where information science is taught and a department of pharmacology; similarly, health sciences information programs are given in conjunction with medical schools or health centers. Example of broader activities programs: community and/or urban information programs are given in independent departments or in conjunction of various departments (e.g. social work and library schools) and are aimed toward information services to urban populace or in and to community groups. There are also attempts to combine the learning and media resources and the computer center in a university with an academic program, such as in departments or centers for information and communication studies with options as: public communications, instructional technology, information studies, etc.

(6) *Communication schools*: information science courses and doctoral theses appeared in schools of mass communication and journalism and departments of communication (e.g. human communications). These courses or thesis are oriented toward areas of information activities that are understood under mass communication. The orientation is quite different than in the schools listed above. In a way the information science offerings in these schools are also most isolated from information science courses and programs in all the other categories of schools.

(7) *Assortment of various schools*: information science courses or even programs and/or theses appeared in a number of academic departments in various universities, such as in departments of philosophy, education, linguistics, history of science, psychology—in these

instances the particular orientation of information science is colored by the academic discipline of the department.

(8) *Subject schools*: information science *courses* also appeared in various schools or departments dealing with subjects such as chemistry, medicine, engineering and assortment of sciences, where the courses are oriented toward description of information handling in the given subject.

The emphasis on topics taught and the general orientation of information science education differs considerably from one category of academic environment to another—as a matter of fact the differences are clear and significant. If a subject is taught within different academic settings it is almost inevitable that differences will appear. Obviously some differences are natural and healthy. It is also clear that excessive similarities are stifling. However, profound educational differences diminish the cohesion and coherence of the whole subject. Even a greater cause of concern should be the fact that information science education in each of these settings is proceeding independently and on its own, without regard of what is going on elsewhere. Thus there are too few signs of information science education maturing into a cohesive whole, as called for and noted by SWANSON[4]. Even though some of these emphases and orientations are experimental, and some are clearly onto the wrong tracks and doubtful extentions, there is a lot to be learned from each. The ideal information science program is likely to be one that succeeds in integrating most of the fruitful orientations from these different categories of academic homes.

Furthermore, the intensity and depth of educational efforts in information science varies tremendously—from one or two courses in information science at many schools to twenty and more at a few. There is little uniformity of treatment even among the schools in any one category; the differences evident even in the program catalogs are considerable and almost incredible, for instance, even between the 63 library schools that have information science courses (including 20 or so that have programs).

However, despite being dispersed in different academic settings, information science is not being absorbed by these various schools and departments; to the contrary, something else is happening. Library schools used to be library schools. Now, in ever increasing numbers, they are schools of library and information science, or of information services or some variety thereof. Many of the deans of library schools consider themselves information scientists. Computer departments were computer departments, now some of them are computer and information science (or sciences) or information systems departments; the theme of information systems is greatly increasing in computer departments. Many management schools are professing their orientation toward information, information processing and the theme of information systems/services. Similarly, the theme of information systems or services is now manifest in education for a variety of subjects. Thus, at least judging from surface *cosmetics*, information science education is not being subsumed by its academic homes. It appears to be gaining in prominence. There may be at least two reasons for this. First, information is an increasingly important resource in modern societies. Thus, problems of information processing, management and utilization are receiving greater attention in a number of subjects, and these changes indeed may be a reflection of social conditions and needs; on the other hand this may reflect only the act of jumping on an information bandwagon. Second, there exists in many subject areas a search for scientific respectability and in many schools for academic respectability; inclusion of "information" or "information science" seems to be a tactic to gain a "scientific" mantel.†

There is a need to address and resolve a number of questions:

—Why is there such a proliferation of academic homes for information science education?

—What effect does this proliferation have? Does it help or hinder (or neither) the development of information science?

†To elaborate: a science cannot be built around a system or institution or around a machine. A science has to be built on the basis of a study of the behavior of a phenomenon. Thus, there cannot be a library *science* or a computer (or computing) *science*, any more than there can be a hospital science or electrical generator science—but there can be a medical science or study of electricity. There is a notion that there can be a science built around the phenomenon of information, that information is a possible subject of scientific inquiry; thus, the switch toward information, at least in name.

—It is conceivable that this proliferation indeed did help development of information science—ideas came from different directions—but, now that information science, or information systems or information services courses and programs are springing up all over, is there a dissipation?

—Is it conceivable that the themata of information systems that are appearing in various educational settings will affect the subject of information science negatively? Will this pull the field apart and break the cohesive bonds that are weak anyhow? Are the centrifugal forces growing stronger than centripetal, i.e. is the subject of information science becoming more fragmented or more cohesive?

—What would be the way to achieve a certain degree of cohesion or even integration between information science courses and programs in different academic settings? Can "ideal" and basic aspects of emphasis and orientation from any or each of the settings be specified in order to serve as some sort of a norm of what a program in information science should incorporate?

—What would be the most appropriate setting for information science education? Should there be more efforts to go it alone—to promote establishment of independent information science departments?

—What are the reasons for the increase in the number of academic disciplines and departments in the 1970s that are taking up information and aspects of information science as their orientation? Is it a fad, search for scientific and academic respectability, or does it represent a real substantive, basic shift? Is it a reflection of change into a postindustrial society? If so, what logical and planned education reactions are appropriate? What alternatives are open to information science education?

DEGREE LEVEL

Information science education in North America is offered almost exclusively at the graduate level. It began at the Master's level and has expanded to incorporate Ph.D. studies, following the model used by education in library science and other professions such as medicine and law in North America. In a few isolated instances information science *programs* were offered at the undergraduate level—these experiments did not take, so far. However, undergraduate information science *courses* did appear, and are continuing, in computer departments and, sporadically, in one or two other academic departments. But in general, undergraduate education in information science did not gain a foothold and never gained wider consideration.

The advantages and disadvantages of the general model adopted by information science education (i.e. on the graduate level alone, without a direct subject counterpart on the undergraduate level) are well known. The prime advantage is the possibility to build upon a diversity of subject backgrounds and toward diversity in subject applications. The prime disadvantage is this very diversity—little or no subject knowledge pertaining directly to the subject of study can be assumed to be universally held by those entering the programs. Thus, education in information science really has to start from scratch. The initial phases of graduate education in information science are on a basic (even undergraduate) rather than advanced level. Consequently, the length of graduate study, rather than the degree level itself, has become an issue. In medicine and law the prolonged program of study is widely accepted. In library science, with one year for a Master's degree in most schools, the disadvantages of diversity among entering students is very serious. Information science programs have similar problems. Namely, most programs on the Master's level are one year in length, thus experiencing a very serious time squeeze and resulting in less than comprehensive programs. Some programs have switched to a two year period of study, but this is by no means a trend. The subject knowledge in information science plus the amount of necessary background knowledge needed for its absorption, cannot be covered properly in one year's time, especially if the programs starts from scratch. Time has become the enemy of adequate education in information science.

One further problem stemming from the same educational model pertains to the usual conflict between professional (i.e. more practical) and academic (i.e. more scholarly) orientations in graduate education. Obviously, it is desirable to have a balance, but this is often

difficult to achieve. In some subjects distinctions are made between academic and professional degrees; in other subjects practical studies (e.g. internships) are added to the degree studies to add practical, professional experiences. These distinctions are blurred in information science education, but the professional/academic conflict does exist. It is probably best exemplified by the lack of clear connections between the Master's and Ph.D. studies.

The degree structure of information science education does raise a number of unresolved and partially resolved questions, such as:

—Should information science education be pursued only on the graduate level? Or should an undergraduate education in information science be sought as well? Should we encourage undergraduate experiments?

—Is one year in length for a Master's degree and adequate time period to cover all that is needed for an adequate information science education? If not, how can the problem be resolved? How can a coexistence of programs of different lengths (1 and 2 year) be justified?

—How can the conflicts between professional and academic orientation in information science education be resolved? Should the Master's only be a professional degree? Should there also be an internship period of study? Or should there be also an academic Master's degree as well?

—What should be the relations between the Master's and Ph.D. degrees? If hypothetically the Master's is a professional degree how can we make fruitful connections to a Ph.D. degree which *is* an academic degree?

—When information science is taken as a program of specialization within a degree in another subject, how is this to be recognized? How should different orientations in information science education be recognized? Can relations between different orientations be established? How?

—If recognition is considered, should a *Master's and Ph.D. degree in Information Science* be the only recognized degree in the subject on that level? Or should degrees in other subjects with specialization in information science be recognized as well?

ADMISSION REQUIREMENTS

At least partial resolution of the previously discussed problems of degree levels (particularly time problems in Master's education and professional/academic conflict) is possible if attention is given to the admission requirements. Namely, these problems can be resolved in part if a possession of certain subject knowledge becomes a pre-requisite for admission to information science programs. However, no uniform admission requirements for the various programs in information science exist. Nor is there agreement on what the subject requirements should be. Nor does a full and rationally stated argument exist on why any given subject background should be a requirement. The concern with admission was exemplified only through a number of declarations (as opposed to studies) on what the requirements should be.

It has often been suggested that for admission to a Master's program in information science a student should have a background in science, or more specifically in computers, mathematics, statistics and/or systems analysis, but in reality this was not enforced anyplace and particularly not in library schools. Reality was just the opposite. Students entering information science programs tend not to have these "most useful" backgrounds and it is hard to attract students with such backgrounds to information science programs.†

Another aspect of admission requirements pertains to the quality level in previous studies and/or professional achievements. Clearly, everyone is in favor of admitting only students of the highest quality. But there is little evidence available on how the quality criteria are to be followed, or if any higher achievements in previous studies are at all actually and consistently enforced as admission requirements to any information science program. For instance, scores on the Graduate Record Examination (GRE) of student entering information science programs are not available for comparison. As little as GRE scores indicate, they tell something.

†These facts were confirmed many times in the discussions of the Special Interest Group on Education for Information Science at Annual Meetings of the American Society for Information Science. However, solid data for these conclusions do not exist.

A number of questions are begging answers:

—Does the lack of admission requirements with respect to subject background help or hinder the subject of information science (i.e. is the diversity in background of entering students actually helpful in the long run, or does it hinder study because it forces less rigor and reduction of the depth of study of some topics to the lowest common denominator)?

—Should there be universal admission requirements for entrance to information science programs? If so, what subject background should be required and why? If not, what will be the long term effect?

—For those that do not have background in the "most useful" subjects (science, computers, mathematics, etc.), should the entrance requirements include taking "remedial" courses in these areas? How should this be provided for?

—How should students from "most useful" background subjects be enticed to enter programs in information science?

—What is the quality of students entering information science programs? If low, how can it be raised? Or should the matter of quality be forgotten, particularly because it is politically sensitive at present?

JURISDICTION

Universities and other academic institutions are evaluated by bodies which have legal authority and jurisdiction to impose standards, examine the institutions and grant accreditation. A number of the educational programs in given subjects in such institutions are further accredited by professional or similar bodies that have jurisdiction limited to that subject area. Thus, in the same university we may have departments or programs that are accredited only by virtue of the fact that the university is accredited, and others that have additional accreditation in their subject area. There are subjects (such as medicine) in which education is not acknowledged at all if it is not accredited by a national professional body. Such professional bodies ultimately gain the power to accredit from the government by a process which is complex, cumbersome and requires continuous compliance with a number of criteria.

Since the objective is quality in education, the process of accreditation, however cumbersome it may be, is worthwhile. In a number of instances and subjects the accreditation process has resulted in a higher quality of education, but this has not always been so. The intentions usually are proper, but the results are often mixed. Nevertheless these jurisdictional powers over accreditation are positive and necessary. Without them, there would be chaos in education. While it is true that education in given subjects can prosper without being specially accredited by some professional body in that subject and that it can rely on accreditation of the institution or department where it is housed, it is also true that the quality of professional education in a number of subjects in North America has been profoundly affected by jurisdictional involvement of professional associations, medicine and law being the prime examples. For these reasons accreditational jurisdiction for information science education should be given careful consideration.

In North America there are no professional associations or any other bodies that accredit education in information science *per se.* Thus, there are no specific standards for information science education. Moreover, there is no specific monitoring of the quality, curriculum, coverage, faculty, facilities, etc. of information science programs. The American Society for Information Science (ASIS) debated the issue of accreditation in the 1960s[5], but there was no plan and no attempt by ASIS to gain accreditation powers. Subsequently, the issue died, and has not been revived in the 1970s. Association for Computing Machinery (ACM) also debated the issue, but it does not have plans to seek accreditation powers. Why is there so little interest in seeking jurisdiction over information science education? It seems reasonable to assume that the complexity of the process breeds reluctance, "Who needs it; we are doing well without it, thank you".

As a result the jurisdiction over information science education in the U.S.A. and Canada varies from one type of school or department where it is housed to another. In library schools (where most information science programs and courses are located) programs are accredited by the American Library Association (ALA) Committee on Accreditation (COA) on the basis of Standards of Accreditation 1972 (and previously the earlier 1951 Standards). Although they do

not pertain specifically to information science, there should be no substantial quarrel with ALA Standards. There is, however, a problem with the process and subsequent results. The problem is simply that the quality of many graduate programs in library schools are unacceptably low as GRADUATE programs in GRADUATE professional schools. Historically, quality is the Achilles heel of library education.†

From 1973 to 1976 all previously accredited library schools in North America underwent the process of reaccreditation and some unaccredited schools were also examined in accordance with the new 1972 Standards (the process was surveyed by R. BIDLACK)[13]. There is no evidence that the quality problem was alleviated (67 schools underwent the process, 64 were accredited) during this latest round of accreditations. The situation seems to be still the same as noted by Shera ([9], p.492): "The Committee on Accreditation ... has not come to grips with fundamental issues regarding standards and their application. ... It has tended to accredit "from the bottom" rather than "from the top ", thus focusing attention to the minimum rather than the optimum. ... Library school accreditation doesn't scare anybody, except of course, those who see what it may be doing to the profession". The following question must be asked: If the ALA process of accreditation does not work well for quality in library education proper, how can it be meaningful for education in information science?

Further questions to be asked:

—There is no direct accreditation of information science courses and programs—is this the best state of affairs, because it gives freedom for experimentation? But what penalty does the field pay for its education not being regimented by accreditation? By not having standards?

—If direct accreditation of information science programs should be sought, what standards are appropriate? What process will ensure adherence to the optimum rather than minimum standards?

—Who should be the accrediting body? If any one body or organization undertakes accreditation for information science education how can it establish a cooperation of a variety of organizations and schools that are involved in information science education? Should ASIS, as the society most directly concerned with the field and subject, take the burden of accreditation? How to convince membership to support this? And the information science educators to work for it?

—In view of the complexity of the issue of certification in general, should certification of information scientists be considered at all? What is lost without certification? What is gained with certification? If there is a certification, how in the world will it be enforced?

FINANCING

Financial problems and education go hand in hand; the competition for funds internally (within institutions) and externally is fierce. But the problems are more acute for newly developed subjects and programs such as information science, if for no other reason than because they do not have the same level of acceptance and cannot yet easily follow the well worn paths of budget handling and justification as well as the traditional departments and programs. Justification has to be stronger, more convincing, more elaborate and well documented. The new programs have to prove themselves in competition with traditional programs and work at that proof much harder, in much the same way as the new kid on the block. The more stringent demands for justifying and evaluating new programs may not be fair (at least by comparison with the demands on traditional programs) but these are facts of life. Maybe these demands are all for the best because they serve as an evolutionary selection mechanisms.

Justification and evaluation of information science education is the key to financial support.

†The first library school, established in 1884 by Melvil Dewey, was removed after two years from Columbia University by the Trustees because of questions of quality and appropriateness of being in a university[6]. The famous Williamson report[7] in 1923 was devasting in its judgment of the quality of library school faculty. The recommendations were primarily oriented toward raising the quality of library schools as academic institutions—the long term impact of the report was great, but the results were mixed[8]. More recent studies of library education by SHERA[9], BOAZ[10], WILSON[11], HOUSER[12], and others have addressed the theme of quality or improvement of library education in various ways; they have discussed and documented this as a persistent and significant problem, above and beyond the usual anti-intellectual snipings at professional education in general and library education in particular.

This has to be accomplished on a national (and international), as well as institutional, level by documenting, (i) that indeed it is responding to a *social need* and a performing socially useful functions and (ii) that it is cumulating knowledge as an *academic subject.* For support of university based programs *both* of these aspects have to be demonstrated and both criteria fulfilled. Unfortunately in the rush of developments in information science the case for justification and evaluation of its education seems to have been forgotten. It is no wonder that the financial difficulties are a major problem of information science education everywhere.

A comprehensive information science program requires considerable capital and maintenance outlays for technical and laboratory facilities (computer access, software, telecommunication access, terminals, data capturing and display equipment, reprographic equipment, etc.). Similar outlays for technical facilities are required in all professional education, for without these there is no education. But as yet, such expenditures in information science education are not accepted by universities as a regular educational expense, that is, in the same way as are outlays for laboratories in engineering or medicine or for computers in computer science, etc. To date no universal and effective way has emerged for financing the technical facilities needed for training and research. Without adequate facilities, education and research in information science has to suffer.

In the past few years information science education and the emerging information industry have established direct and relative close connections, particularly in library schools. On-line data base producers and vendors are providing special rates for education in on-line access and searching. It is a two way street: on one hand education is supported by industry, and without such support there would be much less on-line educational use because of costs, and on the other hand, information science programs are turning out future users of the industry's services, and future professional workers in the industry. The direct support is necessary and direct connection should be encouraged, but, frankly, the information science programs are becoming too dependent on the largesse of information industry. Subsequently the programs are becoming too much oriented toward responding to the *immediate* needs of the industry, and thus toward education for yesterday's skills, which in the long run isn't good for the industry either. There is a need for a balance. Furthermore, even with all the special educational rates, education in on-line data bases is becoming financially prohibitive, given that it is to be done beyond mere demonstration. The cost of a few hours of on-line access for each student multiplied by the ever increasing number of students wanting to take these instructions tends to exhaust already strained budgets. The addition of laboratory fees is an unattractive and even prohibitive alternative to students. No satisfactory financial solution for on-line education has yet been found. Although this particular problem is characteristic of the late 1970s, we may expect that the future technological applications will result in similar financial problems in education. With rapid changes in information technology and in its applications, the problems become more critical and the associated financial problems are becoming worse rather than less critical. And yet the educational programs have to go on and provide education in technological applications related to information resources and services. The question is: but how?

Educational finances in information science are affected by a number of factors, such as the slackening of research support (because education and research in information science was so closely connected); by the changes in general support for education and particularly for newer educational programs; by changes in support by information industry; by changes in available student aids; by changes in technology and its applications, etc. In general, the financial circumstances of information science education are constantly changing, greatly affecting educational offerings from year to year and rendering long-term planning virtually useless.

Questions to be asked:

—Why were there so few efforts to justify fully education in information science, particularly on a national and international level? And to document its social role and academic place? Can adequate financing of information science education be secured without such full justification and evaluation? Or can it be secured just on the basis of a belief, as in education for so many other subjects? How can such a belief be created?

—Are there any general methods that information science education can use for effective financial competition with other (and particularly older and traditional) subject programs and departments?

—What kind of facilities are indispensible for education and academic research in in-

formation science? How much do they cost? What effect do they have on information science education and related research?

—How to obtain financing for such facilities? What is the role of universities in financing the facilities? What is their duty, if they aspire toward housing a program in information science?

—What is the role of information industry in the financial (and other) support of information science education? How to resolve the current financial crisis in education for on-line resources and services? And the future financial problems stemming from anticipated changes in information technology and its applications?

—What are the effects of generally inadequate and chaotic state of educational financing, and of inadequate facilities? On graduates? On research? On field as a whole?

CONCLUSION

An attempt is made in this second part of the essay to classify the problems of information science education as they pertain to the external aspects of education. Namely, questions were raised that need to be addressed in relation to:

(1) *Academic affiliation*

—Effects of the *proliferation* of academic homes for information science education

—Differences in *themata* of education in different academic settings and the effects on the cohesiveness of the subject as a whole

—Possibility of isolation of the *basic themata* appropriate for any setting

—Consideration of the "*most appropriate*" academic home for information science education

—Consideration of *independent* information science departments or schools

(2) *Degree Level*

—Effect of offering information science education almost solely on the *graduate level*

—Determination of adequate length of graduate studies, particularly adequate *time period* needed for the master programs

—Exploration of possibilities for *undergraduate education* in information science

—Resolution of conflicts between *professional and academic degrees* and programs

—Recognition of information science education when taken as *specialization* within another subject

—Consideration of the *Masters and Ph.D. degrees in Information Science* being the only recognized degrees in the subject

(3) *Admission Requirements*

—Effect of the lack of generally accepted *admission requirements* to information science programs

—Desirability of some *universal* admission requirements

—Specification of the "*most useful*" subject background(s) for entrance in information science programs

—*Enticement* of students with such backgrounds(s) to enter information science programs

—Considerations of the *quality level* of students entering information science programs

(4) *Jurisdiction*

—Effect of the *absence* of *direct accreditation* of information science programs and subsequent absence of educational standards

—Desirability of having *accreditation* for information science education

—Selection of an appropriate *accrediting body*, if accreditation is deemed desirable, as well as gaining wide support for the process

—Adequacy of the present *accreditation process* in relation to quality graduate education, particularly in library schools

—Desirability of *certification* of information scientists

(5) *Financing*

—Effects of the lack of efforts in *justification and evaluation* of information science education on the financing of such education

—Consideration of general methods for effective *financial competition* with other subjects and programs

—Securing capital and maintenance outlays for adequate *facilities* for education and academic research in information science

—Responding to recurring *financial crises* due to changes in information technology and applications

—Effects of *financial instability* on educational offerings and planning

All of the problems outlined above should be studied in greater detail and the alternatives explored in order to provide a framework for rational decision making and experimentation. Considerable variation in decisions and outcomes may be tolerable, and even healthy and more, rather than less experimentation is needed. However, there is also a need for more cohesiveness in information science education as a whole. Advocating attention to the "externalities" of information science education is not advocating regimentation—it is advocating badly needed cohesion, coherence and consistency. Are information scientists even aware of the magnitude of these problems? The resolution of the problems requires an awareness and support of people working in any and all aspects of information science. It will be very hard, if not impossible, to deal effectively with internal aspects of education (as treated in the last part of this essay) if the problems with external aspects are not addressed.

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