

LIBRARY FUNCTIONS, SCHOLARLY COMMUNICATION, AND THE FOUNDATION OF THE DIGITAL LIBRARY: LAYING CLAIM TO THE CONTROL ZONE¹

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As libraries prepare to convert an increasing proportion of their services to online form, it is essential that they pause to review and define the core qualities of those services; only in that way can the systematic and conscious transfer of such services to an online environment be assured. This definition of core services is especially important for academic libraries, which face special economic and political challenges. Some of the most fundamental aspects of library operations entail the existence of a border, across which objects of information are transferred and maintained. Such a parameter, demarcating a single, distributed digital library (the "control zone"), needs to be created and managed by the academic library community at the earliest opportunity. One basic objective of such a single digital research library should be to serve as an alternative publishing mechanism for specialized scholarly communication. In order to achieve that combination of the collection and the publication functions in the coming online environment, some responsibilities now performed by academic library collection development will probably need to be transferred to the faculty.

There can be little doubt by now that inexorable advances in information technology will—for reasons of economics, access, and convention—ultimately transform many aspects of information exchange, in-

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cluding especially the role of traditional information services such as libraries. Much work has been devoted in recent years to determining and proposing the qualities that need to characterize digital library services.³ In its effort to focus so intently upon what the library will become, however, the library community must take care not to lose sight of what the library has been and should remain—the qualities and values of the traditional library that constitute the service itself—for it must be a primary task of libraries at this time to ensure that those basic services provided in the traditional environment are effectively transferred to the digital library.

Identifying such core elements of library services, and making certain that these are taken into account in the ongoing transformation of information services, will not be easy—primarily because it is not always apparent which service methods or concepts now in place are simply responses to the technical requirements of the traditional, paper environment (and can therefore be abandoned or replaced in the new environment) and which of those methods and concepts form the basis for needed services that must be retained and somehow replicated in the digital library. Plans and speculations about the future of library services, therefore, need to devote more attention to defining and agreeing upon those most basic and abstract library functions in order to ensure their continued availability, regardless of changes in technology.

Academic libraries have special responsibilities and face unique challenges in preparing for and participating in the transition, not only because of the specialized nature of scholarly information but also because of the complicated culture and politics of scholarship. The role of the publisher, especially the commercial publisher, in scholarly information exchange, has become increasingly problematic in the planning and operation of academic libraries, a situation further complicated by the fact that information technology is already causing the line between these two traditional intermediary services—libraries and publishers—to blur. No planning for the academic library of the future is possible, therefore, without taking the complex and increasingly strained relationships of scholars, publishers, and libraries fully into account. While there is little question that information technology has the potential to bring substantial improvements to higher education and scholarly communication, the ability of the academic library community to achieve such gains for its students and scholars will depend directly upon its

3. Two recent and well-reasoned overviews of the probable components of the digital library have been written by Debora Shaw [1] and Peter Graham [2]. For a literature review of publications relating to the digital library, see Karen Drabenstott [3].

willingness to take unusually high risks and to assume radically new responsibilities. The purpose of this article will be to define some fundamental functions or abstract qualities of library services that must be transferred to the digital environment and then to relate those basic functions to some of the main challenges facing academic libraries as more of the information needed by academic client-users becomes accessible online.

I. Basic Library Functions

The purpose of information services, including especially libraries, is to add value to specific objects (that is, sources) of information from the perspective of (usually local) clientele. That value added is access value and is best understood temporally, in terms of access time: to increase or improve access is always to reduce access time, and the fundamental purpose of all information services has always been, and will always be, to reduce the time needed by individual client-users to gain access to that information they need to accomplish their personal or institutional work objectives.

Access value should be distinguished from content value or relevance, the relationship between an object of information and the client-user's work or interest at the moment [4]. For any user, at any point in time, we might posit therefore a single, user-specific, content-value continuum. Let us further imagine along that continuum all extant objects of information, arrayed in the order of their relative content value for that user's work or interest at that particular moment. At the front of the continuum would be that object, the content of which would best or most respond to the information needs of that user at that specific time, followed by the item nearly as much needed, and so forth—on down the continuum.

The aim of information services is always to add access value to those objects of higher content value from the perspective of the individual client-user. The most effective information services operation is the one that is able to vary access enhancement such that the more toward the front of the content-value continuum an item is located, the better will be its accessibility (which is to say, the shorter will be the amount of time the user will require to gain access to it). The order of items on any individual content-value continuum is, of course, constantly changing, as the user's knowledge evolves and as his or her work progresses. Because it would be difficult to plot the content-value continuum for any individual, and because the library must normally serve the needs of many individuals, the library must generally operate on the basis

of a more generic content-value continuum for (usually groups of) its particular clientele.

While content value is therefore a subjective perception of relevance from the perspective of the individual client-user, access value is always the result of some objective action by information services—something done to a particular object—in order to make it more (rapidly) accessible. The aggregate value of an object of information is always a combination of content value and access value, which, like yang and yin, continually affect and define each other. Not only does the high content value (however determined) of particular objects impel the library to add access value to those objects, but the library also boosts content value, makes sources more needed, and moves them more toward the front of the continuum by reducing the time required to gain access to them. To render a source more accessible to a user is to create a relationship that would not otherwise exist between that source and that user's work. The service—adding access value, reducing access time—does not simply respond to user needs and directions but also necessarily and unavoidably generates and conditions them.⁴

In considering these issues, care must always be taken not to confuse such information services with their enabling technologies.⁵ The function of the technology is to create the potential to add access value to any and all information to which that technology is applicable. The function of the service, on the other hand, is to use that technology to enhance aggregate value by adding access value to those specific objects that are inferred to exhibit high content value from the standpoint of particular client-users.

Integral to the function of information services in general, and of libraries in particular, therefore, is the fact that value is not added to all objects of information but, rather, only to a subset of objects, namely, those located (or in need of being located) toward the front of the (usually generic) content-value continuum. This situation is a reflection or consequence of the very nature of value—at least in the “value-added” sense that I am using the term here—for such value is always relative or differential: to add value (for example, accessibility) to something is always concurrently to reduce the value of some other related thing. It is therefore never possible, in the kind of situation we are considering, to add value to all (related) things (that is, to all objects of information), for to do so does not change the relationship of those things to each other—and it is primarily on the basis of that relationship that value

4. I have previously referred to this syndrome as the “utility loop” [5, p. 96].

5. For an extended philosophical discussion of the relationship between technology and the work it does, see the treatise by Don Ihde [6], especially the three chapters (2–4) on the “phenomenology of instrumentation.”

is gauged. To add value to everything, in other words, would be, in this particular sense, to add value to nothing, because it would leave unchanged the relationship of all the objects to each other. To add value to certain objects of information, therefore, always necessarily entails a reduction in the value of other objects. Therein lies the dynamic of selection, which is the core operation of all information services.

Essential to the conduct and definition of information services, therefore, is the concept of a boundary. Information services entail the transfer of an object of information, usually through the application of some form of technology, across a boundary, by which action that object is distinguished or "privileged" (that is, given a special status) with respect to other objects. The service is defined, in other words, on the basis of the opposition between what is inside and outside that boundary. All information services, including especially library services, are subject to—and comprehensible only in terms of—this imperative of circumscription.

As the enabling technologies used to provide information services become increasingly based on computer-mediated telecommunications, it is essential not to lose sight of this defining imperative. In the traditional paper environment, libraries have used location—the movement of information objects across the physical boundary of the local library—as a primary means to add value to such targeted (usually paper) objects. This emphasis on location has been possible because the amount of time required to transport information from one location to another has significantly affected access. In an electronic environment, storage location is to a great extent eliminated as an access factor: all (online) objects of information are in general equally accessible (accessible at the same speed, in the same perceptible time), regardless of where those units are stored. This removes the temporal differentiation that in the traditional paper environment has served as the principal mechanism for access value enhancement. While electronic information technology has, to be sure, added significant gross access value to all online objects of information in relation to all objects in traditional formats, such technology also, when applied without mediation, effectively "devalues" information in online form, in the sense that it subtracts rather than adds differences: it has the potential to move everything—which, as we have noted, is equivalent to nothing—across the service boundary. (To move all objects across the boundary, in other words, is to leave the access relationship among all objects unaffected, so that the accessibility of all objects in relation to each other remains the same.) In order to consider whether and how library services should respond to this evolving condition, and to examine the difficulties academic libraries face in making the transition to the online era at a more practical level, I will draw

some conclusions about the traditional methods and motivations of information services in more detail.

II. Service Operations and Rationale

The Process of Importation

The first phase of access-value enhancement is necessarily importation: the movement of an object across the service boundary so that the attention of client-users can be focused on it. Let us stipulate that this process of importation normally consists of three phases: decision, negotiation, and transfer. In the decision phase, the determination is made to import; this decision is always based on some form of acknowledged expert judgment; while such a decision can be made by the individual user, it is more usually (and probably more effectively) made by some agent of the user. In the traditional library this function is carried out by collection development staff; selectors, acting as agents for local clientele, scan the information universe and decide on the basis of their knowledge of subject trends and client needs which information objects are more potentially valuable for local use and should therefore have their accessibility enhanced through physical proximity. The second phase of the process of importation involves negotiation with the information proprietor, which usually includes some form of payment. The third phase is the physical transfer of the item across the boundary, which, in the traditional environment, is usually the local library building. Once imported, the objects can then be acted upon in various ways within the library (for example, referred to by cataloging and reference, stored systematically) in order to distinguish them from each other and to boost further their local utility or attraction. We should draw a fundamental distinction, therefore, between the process of importation, which moves the item across the boundary, and the "postimportation" action subsequently taken by the library once the object has crossed the boundary. In terms of the online environment, importation may be understood as being somewhat equivalent to the creation of the database (which may, of course, also include remotely located objects), while postimportation services might be viewed as something more akin to the design and application of the manipulating software or search engine.

For most information services, this process of importation is generally the same. Publication provides a further example. Publication is the transfer of the object from outside to inside the parameter of the document.⁶ It is by the inclusion of certain information (or by the exclusion

6. For some original ideas on the relationships between the concept of the book and that of the library, see Chartier's investigation of the term "bibliothèque" [7, pp. 69-94].

of other information) that user attention is focused, access value added, access time reduced. As in the library, the process of importation consists of the same three phases. The decision phase is the responsibility of the editorial board or staff: on the basis of their expert judgment, certain objects are determined to have potentially greater content value and their access is therefore enhanced through publication. By relying on such expert judgment, the time needed by the user to separate objects with higher content value from objects inferred by experts acting as agents for client-users to have less value is substantially reduced. In the negotiation phase, the publisher then deals with the proprietor, who is usually the author. The third phase, the physical transfer, may be seen to consist, in traditional publishing, of printing and distribution.

The Social Ethic

Information services are defined and distinguished not only by their operations but also by their social goals and motivating values. At least since José Ortega y Gasset presented his controversial paper on the future function of libraries in 1934, the library profession has been frequently uneasy and occasionally confused about some of the political and ethical implications of its core operation, selection.⁷ Ortega, it will be recalled, not only took the position that "there are too many books" but was also of the opinion that many of these "are useless and stupid" [9, p. 153]. Librarians of the future, therefore, should be "held responsible by society for the regulation of the production of books" [9, p. 153]. The future role of the librarian must be "as a filter interposed between man and the torrent of books" [9, p. 154]. Ortega also foresaw—and clearly had little patience with—charges of censorship: "Let no one offer me the foolish objection that such an organization [of book production] would be an attack upon liberty. Liberty has not come upon the face of the earth to wring the neck of common sense. . . . The collective organization of book production has nothing to do with the subject of liberty" [9, p. 153].

This position naturally clashed with the modern American library's view of itself as the ultimate guarantor of intellectual freedom. Perhaps the most energetic attempt to reconcile Ortega's radical views with the library's traditional opposition to censorship in any conceivable form was Lester Asheim's 1982 essay "Ortega Revisited" [10]. In that essay, which has been called with some justification "one of the most tortured pieces of writing in library literature" [11, p. 17], Asheim concluded after long and intricate argumentation that, while librarians must select

7. For a discussion of the standard ethical issues relating to selection, see Robert Hauptmann [8, pp. 23–25 and 67–70].

in order to counteract information overload, they should never "prescribe." The fallacy of Asheim's position is obvious: because importation always and necessarily entails exclusion, selection is inevitably a form of "prescription." Selection renders some information more accessible than other information and, thus, biases the user's perceptions. Selection effectively shifts certain objects to the front of the content-value continuum. It is in fact impossible to enhance access without influencing user perceptions and research directions and, indeed, exercising such influence is precisely the key service that libraries—and all information services—have to offer.

A much more modern, sophisticated, and applicable discussion of the significance of exclusion is to be found in Richard Lanham's book *The Electronic Word*. There Lanham argues that, because economics is the optimization of scarce resources, and since information—in the electronic age especially—is no longer scarce but is rather overabundant to a point of excess, what we need is not an economics of information but, rather, an economics of attention [12, pp. 227–57]. The future of education (of which information services may be viewed as a central part) must therefore be to assist the client-user to focus his or her attention on those objects of information most needed at any particular time. The function of the service is in fact to intervene in the search process in whatever capacity is required to ensure that the scarce resource of the client-user's attention is put to the best possible use. A primary purpose of the boundary, across which objects are (or are not) imported, is to facilitate that service. The client-user must and normally does trust the expert judgment that drives the decision phase of that importation and effectively excludes vast portions of the universe of information from the client-user's view. Selection—filtering, to use Ortega's word—far from being an ethical transgression, therefore, is (and always has been) the core service; indeed, the greatest ethical transgression the library could ever commit would be to avoid selection—that is, not to prescribe.⁸

The real ethical question we must ask, therefore, is not whether someone other than the user should effect selection, and thus affect what the user reads and learns—for that must always be the case (even if that "someone" is the designer or programmer of some mechanism operated by the user); what we must ask, rather, is what the basis or motivation for such selection *ought* to be. It is only in the answering of that question that the social ethic of the library is clarified, for it is through

8. The resourceful user can, after all, always search the broader universe also and make, in effect, his or her own selection decisions—and it is indeed one responsibility of the library to provide such a side door to that universe, which in the traditional library is a primary purpose of interlibrary loan.

that ethic that the library must continue to distinguish itself, regardless of changes in the technical environment, from other information services.

The answer should be, and is, fairly simple. If the motivation for selection is entirely (or at least primarily) in the client-user's interest—if the true goal of the selection is bibliographical, or pedagogical, or in some sense epistemological—then such selection should always be ethically acceptable and justifiable from the library perspective. In the same way that the teacher in the classroom steers the student to particular knowledge, the information service has the responsibility for guiding the user to certain information. But if the selection is undertaken primarily in the interest of someone other than the client—in the interest of the proprietor of the information, or in the interest of the intermediary, agent, or selector—if the selection is done for political reasons or for reasons of personal or corporate financial gain—then such selection must be considered ethically unacceptable to the library and should be disparaged and resisted.

One key to the library's ability to uphold social ethics is the library's normally nonprofit status. Regardless of changes in the technical or economic environment, the library's purpose must remain not commerce but service, and its objective not revenue production but access enhancement. The basis for any fees levied by the library on the client community must be not what the market will bear but, rather, what the services cost—and it must be a primary goal of the business side of the library operation to keep those costs to an absolute minimum. Costs are, to be sure, always limiting; but if and when those costs become a substantial impediment to access, then it is without question one of the library's highest ethical responsibilities to find or to create the means to reduce those costs in order to ensure that public access to information can be safeguarded and enhanced.

In the process of importation, the ethically proper place for exclusion is therefore always in the decision phase, for it is in that first phase that expert judgment, however defined or assigned, is brought to bear. In the academic library context, what is needed to support local teaching and research is assessed or represented by that expert judgment; while one may disagree with individual selection decisions, one cannot disagree with the necessity that such judgments be made and, therefore, that certain materials be excluded. That is different, however, from the kind of exclusion that takes place in the second or third phases of the process of importation: when material defined by expert judgment as needed by the client community cannot be made accessible because the stipulations—often in the form of prices—by the proprietor in the negotiation phase are consistently beyond the resources of the information

service provider, then that form of exclusion becomes in effect an ethical challenge to the nonprofit provider working for the public good.

III. Approaching Conflicts

As information services move increasingly online, libraries must expect to encounter several areas of friction, some of which are likely to have significant implications for the future of information services. I want to define two general types of these coming conflicts, which I will call the minor and major contentions.

The Minor Contention

As I have suggested elsewhere, it behooves libraries to accept or adopt a fundamental distinction in information service structure between delivery and mediation [5, 13]. While delivery is that service responsible for the transport and maintenance of information objects without respect to their content (in the paper environment, the main library delivery services are acquisition, circulation, interlibrary loan, preservation, and many systems functions), mediation is that service intended to assist the client-user in gaining access to objects of information with a specific content needed for a specific purpose (in the paper environment, mediation services are mainly cataloging, reference, and collection development). All of these functions will doubtless merge and recombine into new functions as libraries proceed into the online age, but the fundamental distinction between delivery and mediation will remain.

By the "minor contention," I mean to refer to those conflicts that will take place within particular types of information services, such as libraries. Library administrators must be conscious of and prepared for the corrosive potential of these conflicts, because they can seriously impair the ability of libraries to achieve their broader objectives. The minor contention will be as a rule a direct consequence of some form of disintermediation—which is, we should always bear in mind, inevitably a special form of mediation; this is because disintermediation often requires someone or something to enter into the space between the sender and receiver (writer and reader) in order to create or provide some mechanism or procedure that will allow the sender and receiver to link more directly than has been possible in the past.⁹ Often disintermedia-

9. The fact that disintermediation is a special form of mediation is perhaps what has led to the optimistic view that, as "we disintermediate information transactions, the idea of [and presumably the need for] the information intermediary, paradoxically enough, expands" [14, p. 793].

tion entails the creation of a mechanical link, empowering the receiver to establish connections that could previously be done only through the assistance of human mediation, which was more costly for the institution and more confining for the receiver. (Some reference services now performed by staff, for example, will very probably be performed in the future by expert systems.)

Much of the responsibility for creating such mechanisms that permit disintermediation belongs to delivery services. The difficulty that will inevitably arise will be that some of the functions that could be circumvented or potentially marginalized through such disintermediation will be essential mediation services (such as reference or cataloging). Delivery services, in other words, will through disintermediation begin to assume or replace some of the key operations of mediation services. If library management does not aggressively intervene, delivery services will almost certainly eventually come to view their primary objective in the library as the reduction or elimination of mediation services, while mediation services will understand their main function (always, of course, in the interest of the user) to defend themselves—and to counterattack. The result could well be a political and functional schism that has the potential to impair or even to paralyze library operations—at precisely what could be the most critical period in the whole history of library services. If allowed to run its course, this “minor” contention will cause the library to become so preoccupied with its own internal relationships that it will lose the ability to look beyond itself and to compete in broader arenas with other information services.

Mediation services must be protected, therefore, in an increasingly online environment, for they not only link the library to its primary clientele, they also provide—or facilitate the application of—the essential expertise needed for postimportation services. At the same time, however, as services move increasingly online, some forms of disintermediation, especially in the area of collection development, should be anticipated and even supported: academic libraries should be prepared to take the risky step of increasingly relinquishing to their expert users significant aspects of the core service function of selection. For reasons that will become clearer below, therefore, one of the most far-reaching manifestations of disintermediation—at least for academic (and special) libraries—should be the return to the user community of what once was a user function, namely, the decision-making authority for the creation of the collection. It is important also to bear in mind, however, that this assumption of major selection responsibilities by the user community (in the case of academic libraries, by the faculty) will render the maintenance of links with those faculty through the agency of mediation services all the more essential.

The Major Contention

The other category of conflict in an increasingly online environment, what I will call the "major contention," will have even wider implications for the future of information services and knowledge production because its outcome will determine the effectiveness, competitiveness, and perhaps even the continued existence of some forms of information services, including key aspects of library operations. Unlike the minor contention, which pits different operations in the same information service organization against each other, the major contention takes place between different information service agencies that have fundamentally the same clientele but that operate on the basis of different service goals. Certainly one of the most visible and critical arenas of the major contention will be the conflict that must necessarily and unavoidably arise in an online environment between academic libraries and those commercial publishers that concentrate on the publication of highly specialized, scholarly information.

Readers of the professional library literature are, of course, long accustomed to the heated but still relatively civil disagreement between academic libraries and commercial publishers in the paper environment.¹⁰ Such conflicts are the source of many of the more problematic forms of exclusion noted above, namely, those that take place not in the first ("decision") phase but rather in the second ("negotiation") phase of the process of importation. Academic libraries sense that they are paying more and more to acquire less and less—an especially troublesome circumstance, considering that much of the specialized material they purchase is a product of the labor of their own faculty.

In wrestling with these problems, academic libraries are perhaps gradually coming to understand that there are values other than access enhancement that can be added to objects of information—values that most libraries, however, would not consider contributions to the aggregate value of any information object. Such values are confusing to libraries because they serve not the reader but the writer; their purpose, in other words, is not so much to promote scholarship as it is to enhance the reputation of the scholar. While libraries, because of their identification with the reader, naively assume that the subject of a work is its topic, publishers survive and flourish by recognizing that the true subject or reference of any work is, at least in part, its author—and that

10. The best summary of the current situation remains Anthony Cummings [15, especially pt. 1]. The most important effort to combat these conditions to date is certainly the joint work of the Association of American Universities and the Association of Research Libraries [16]. For more detailed discussions, see the electronic *Newsletter on Serials Pricing Issues*, back issues of which are archived at URL <http://www.library.uwa.edu.au/libweb/sers/serprice.html>.

a primary function of the publication is to facilitate the competition for scholarly status among individuals and institutions. The chief mechanism of such value added is the hierarchy of publishing vehicles that obtains in every discipline.¹¹ To publish in a certain journal (or in a certain series or with a certain publisher) that is relatively high in that hierarchy brings to the author a kind of proactive prestige, not because of any intrinsic quality of the item itself but, rather, because of the known value of items previously published by that same journal (series, publisher). In the highly competitive life of the academy, such status by association is of inestimable value—it is what much success is defined by and what many careers are made of. Because the worth of an item cannot be easily or quickly assessed at the time of its publication and because the evaluation of highly specialized scholarship is difficult in any event, even for specialists in the field, the value of the publication is at least partially inferred from the reputed value or utility of other items previously accepted and published through the same editorial process. The successful publisher understands this mechanism and invests consciously over time in a journal or series in order to build up the reputation required to bestow such status by association—and for that investment the publisher expects a significant return.

In recent years, however, the prices of such specialized scholarly publications have become in some cases so excessive that they now certainly constitute the single most substantial impediment to scholarly communication: academic libraries can no longer provide access, in the paper environment, to the materials many of their client-users must have in order to do their work, because libraries' (reasonably increased) budgets cannot keep pace with the escalating prices charged—especially by a few key commercial publishers [19]. The plain fact is, therefore, that the current system of scholarly information exchange is no longer working—and the scholarly community is approaching a major information crisis.

Why does the academy, which is the primary producer and consumer of scholarly information, find itself in this position? Clearly there are many reasons, but one of the most critical is that, for reasons having little if anything to do with either content or access value, but everything to do with individual and institutional status, the academic community insists on treating every published item generally the same—regardless

11. Hierarchies are clearest and probably most relevant among scholarly journals. For a review of methods used in establishing such hierarchies, see Ralph Weisheit and Robert Regoli [17]. The extent to which articles in a journal are cited has, of course, much to do with the journal's perceived place in the hierarchy. For the sciences, annual citation frequencies are provided by the Institute for Scientific Information in their "journal impact" reports [18].

of its potential use level. Highly specialized, low-use materials (that is, having relatively few readers) are published in more or less the same way as potentially high-use items: the methods used to produce and exchange scholarly publications, in other words, are fundamentally the same as those used to disseminate the latest bestseller. It may be, in fact, that one of the key rewards that scholars seek and receive for their (often highly specialized, low-use) work is for that work to appear and to be exchanged like every other work—to be treated as if it were in effect heavily used—and such treatment forms perhaps the essence of the elusive value added by scholarly publishers. Because the true content value of the highly specialized publication is difficult to ascertain, that value is implied by treating it and making it appear externally identical to previous works of accepted value or utility.

One of the most serious errors academic libraries could make at this time would be to assume that advances in information technology will change any of these relationships or solve any of these problems—or to imagine that the advent of electronic publication will not only bring down publishing production costs but also that such savings will then be passed on to customers in the form of lower prices. To begin with, it must be understood that prices will not decrease simply because publications move online. While publishing costs may indeed decline by moving publication online, commercial publishers have no incentive whatever to pass those savings on to library consumers in the form of reduced prices.

Information technology, we must always bear in mind, does not promote access: it rather promotes control. That control can be used, of course, to promote access, but it can also be used to constrict access, and we would have to be blind indeed to what has occurred in commercial scholarly publishing over the past twenty years to imagine that technology will be used by commercial information proprietors for any purpose other than to increase revenue as rapidly as possible. If, moreover, such increases in revenue can best be achieved through a decrease in access, if demand can best be enhanced by making needed information scarce, then there can be no question that the commercial proprietors of that information will begin to make use of the new technology to do just that.

Reappropriation

Libraries have recently become much enamored of the potentials of outsourcing, that is, hiring agencies outside the library to perform operations previously performed by the library. Although relatively few opportunities to outsource yet exist, more outsourcing services will doubtless evolve as demands increase, and libraries will rely increasingly on

such outsourcing, whenever it is cost effective to do so. If an individual library were to realize, however, once having outsourced a particular operation, that it would be significantly more cost effective for the library to perform such work again itself, then the library would, needless to say, resume that responsibility immediately. It is time now to recognize that specialized scholarly publication has been one of the most long-standing instances of outsourcing in the academic community. The excessive prices that academic libraries are now experiencing, mainly at the hands of commercial publishers, should be sufficient to convince libraries that such outsourcing is no longer cost effective and that the time has come to take whatever steps are necessary to reappropriate that function.

Technology will provide libraries with the ability to exchange scholarly publications much more effectively. But, as already noted, if institutions, led by libraries, do not use such advances in information technology to achieve that reappropriation, then that same technology may well be used (by publishers) to restrict access in the interests of a different service ethic. One of the primary objectives of the academic library community must be, therefore, to provide effective leadership and to develop practicable business plans to bring about what amounts to a new form of disintermediation, in which scholars are more acceptably able to exchange information and to establish reputations without the mediation of large commercial publishers. Only by accepting that goal explicitly and aggressively at the outset of the online revolution can the academic library continue to play a prominent and beneficial role in research information services—for in a primarily online environment, either the library or specialized publishers will provide that fundamental service, but not both. The only questions that remain to be answered, therefore, are, (a) How do libraries identify that specialized scholarly information—that material at the low end of the use spectrum—for which the academy should assume publishing responsibility, and (b) How can the major value added by publishers, that is, the prospective status by association, deriving from the relative reputation of individual journals, series, or publishers, be replaced?

IV. The Control Zone

This discussion has led us to two clusters of potential problems, the resolution of which will be a prerequisite for the successful insertion of library services into an increasingly online environment. At the more abstract level, the capacity of the network to supply almost anyone with almost any online object, at almost any time, in almost any place, at

almost the speed of light is at odds with fundamental precepts of library services embodied in what we have labeled the imperative of circumscription. This disparity has not been readily recognized, partially because there is a tendency to confuse the network, which is a technology, with the digital library, which is a service. The network is not a digital library. We cannot sit back and imagine that what is on the network is in the digital library [20, p. 82]. A library, digital or otherwise, is always a highly selective subset of available information objects, segregated and favored, to which access is enhanced and to which the attention of clients/users is drawn in opposition to objects excluded.¹²

In addition to these more abstract issues, it must also be concluded that, from the practical standpoint of the academic library community, the publishing practices and objectives that significantly impede scholarly information exchange in the traditional environment have the potential to become even more damaging to scholarship and higher education in the online environment. The more key information becomes available online, moreover, the less need there will be for some forms of mediation. The chances are, therefore, that the need for two separate mediation service categories—libraries and publishing—in highly specialized areas of scholarship will diminish so that only one will eventually prevail. For these reasons, it is essential for the academy to reappropriate responsibility for formal scholarly information exchange.

Both of these basic problem clusters have a single solution: it is time—past time—for the academic library community to begin work on the creation and management of a single, virtual, distributed, international digital library, a library that has (conceptual, virtual) boundaries, that defines its service operationally on the basis of the opposition between what is inside and outside those boundaries, and that bases that service

12. To be sure, all information on the network—most electronic information generally—is divided into files and databases, which have some parallels to discrete library collections, but the tendency, culture, and objective of the network is, in a sense, to ignore just such divisions or to view them at most as inconveniences to be overcome technically whenever possible. That is perhaps one of the primary considerations of the Networked Information Delivery and Retrieval (NIDR) project of the Coalition for Networked Information. Because the work of this group is at this time still underway, it is risky and improper to draw conclusions about the group's purpose, but it does appear that such work presumes that network users want to view the entire content of the network as a kind of single, giant, digital library, the complete content of which can be ideally searched simultaneously. The authors of the NIDR report also clearly acknowledge and understand, however, the threat of massive information overload, so that balancing those two potentially contradictory concepts is perhaps one core challenge to that project: on the one hand, everyone seems to want to see everything, and on the other, there is far too much for anyone to see. At the time of the writing of this article, the draft of the first chapter of the NIDR report is available by ftp from [ftp.cni.org/CNI/projects/NIDR](ftp://ftp.cni.org/CNI/projects/NIDR).

on the traditional social ethic that has motivated all library operations in modern times. The academic community must consider, in other words, the creation of a control zone. Such a control zone should be understood as something that is technically and conceptually separate from the open zone. The open zone, the network at large, should remain free and unfettered as much as possible by standards and structure—the wild frontier of cyberspace, so highly prized and closely protected by those rugged individualists who work and roam there, where one can do what one wants, say what one wants, change what one wants. Creativity is indeed at least partially dependent upon such an absence of constraint. But when an object of information is moved across the boundary from the open zone into the control zone, then that should be done with the understanding that the library community takes certain responsibilities—and makes certain guarantees—for the quality and accessibility of that object indefinitely.¹³

The most fundamental and far-reaching implication of the imperative of circumscription is that the universe of information has never been and should never be considered the library's responsibility. To be sure, intelligent electronic agents need to be developed and should be used by individuals to explore that universe—the open zone. But the basic, on-going responsibility of the library must be to assume control of a systematically selected subset of that universe and to ensure that such a subset remains stable and accessible over time. That epistemologically and ethically essential function of the library in the world of primarily paper information must be retained and strengthened as society moves increasingly into the online information environment.¹⁴

Components

One of the most pressing responsibilities of library services, therefore, must be to begin to consider and define the characteristics of such a control zone—or more generally to identify those qualities of, or rela-

13. L. Costers, building on the experience of Dutch research libraries, has come to somewhat similar conclusions. He describes a three-layered digital library structure: the first layer consists of objects the particular library maintains itself, the second layer refers to objects maintained by cooperative partners, and the third layer is viewed to be the uncontrolled network at large [21].

14. Some projects are already underway to create a digital library by amalgamating the digital work of several libraries. One of the broadest of these is the National Digital Library Federation (NDLF), a consortium now being hosted by the Commission on Preservation and Access. This group will develop different digital collections on aspects of U.S. history, which are intended ultimately to fit together into a single, linked, distributed collection. The hope is that such linkages created by the NDLF will eventually be used by other groups and enterprises to create a growing library of digital materials [22].

tionships among, information objects that the user can depend upon when the library community has taken responsibility for them. If it is the case, in other words, that to move an item into the control zone is to add value to it, what exactly is that value added?

1. Core definition.—As already noted, the library does not simply respond to the need for core material (objects at the front of the content-value continuum) but also actually creates core material by boosting its accessibility. This value enhancement is even more effective in the online environment. If the control zone functions successfully, objects moved into it will be defined as core—in the (as always, temporal) sense that they will be read before other information is read, so that such other information will be understood on the basis or from the standpoint of that core information. Communication and understanding require a commonality of knowledge. Agreement about significance or novelty depends on such common understanding. Far from discouraging exploration of the wild frontier of the open zone, therefore, the control zone will encourage such searching by providing a basis for assessing information found in the open zone—and ultimately perhaps for determining and endorsing the admissibility of some of that information to the control zone.

2. Particularization.—For purposes of evaluation and retrieval, units of information need to be differentiated or particularized. The author, when available, should take responsibility for highlighting certain parts of the text, so that the reader or searcher will know that, at least from the standpoint of the writer, the publication is intended to add to the knowledge of those subjects. Beyond the kind of tagging that can be done increasingly automatically, and which we must expect will eventually take the place of routine cataloging, some kinds of special cataloging action—the creation of metadata that refers to the object without highlighting selected parts of its content—will remain necessary. At least two new forms of metadata, in my opinion, will need to be included in any pointers or surrogates referring to objects in the control zone. The first is use level. In the same way that libraries can now track circulation, it must be possible to track the history of the use of information units in the control zone. In an online environment, the use of all objects can be tracked, regardless of their location, and such use can even be differentiated by user group. It should be possible to ascertain which items have been read (or at least retrieved) by experts (for example, members of academic departments in the field), which have been read by scholars in other fields, which have been read by students, which by the public at large, and so forth. This feature is a key component of

the economics of attention: deciding what to read, and in what sequence, should be at least partially a response to the relative "significance" of objects, as defined by the number and type of readers who have previously accessed them.

The other new identifier that should be considered for inclusion in any records of objects in the control zone should be the work level. This identifier should differentiate information objects by their level of difficulty or specialization and should indicate to the reader in effect how much he or she needs to know about the topic in order to make use of that particular object. The audience at which an object is aimed needs to be designated, in other words, so that the user, who is deciding what to access, can make that decision based on his or her own level of knowledge. This identifier as well is an essential function of the economics of attention. Working with writers to identify accurately the work level should become an essential responsibility of the library.

It is now possible to return to the questions posed above in our discussion about the institutional role in online publication: (a) How should the academy determine which types of publications it should reappropriate responsibility for publishing, and (b) How can the proactive status now supplied by the reputation of individual journals, services, or publishers of specialized information be replaced in an online environment?

The first question can be at least partially answered through the declaration of the work level. If the acknowledged work level is strictly scholarly—if the publication is written by a scholar for other scholars, and its understanding depends on highly specialized knowledge—then that work should be considered for publication by the academy. Scholarly communication and progress depend, as noted above, on the favored treatment of highly specialized, scholarly publication; if such scholarship does not receive special support—if it is allowed to compete in the open market with other works for publication—then its low potential use either deters its publication entirely or substantially increases the cost of that publication, as is now happening in the paper environment. Research libraries, after all, already significantly support scholarly works in the paper environment; because the research library acts for the user, often without consulting the user directly, and makes its selection decisions on the basis of potential rather than actual utility, the research library community creates what is in effect an artificial demand for scholarly publications. If the publication of scholarly information depended on real demand—on direct purchase by individuals—much truly scholarly publication (that is, refereed) would probably be too expensive to appear at all. In creating a control zone, the academy would therefore merely be extending that practice of special support to its logical conclusion by assuming direct responsibility for the publication

process itself. The institution should take full responsibility for moving specialized scholarly publications into the control zone and maintaining them according to standards agreed on by the scholarly community. Anything not specifically intended for an exclusively scholarly audience should remain the responsibility of the commercial sector, which is and will continue to be much better equipped to publish higher-use information than the academy.¹⁵

And now to the second question: how to compensate for the loss of that prospective prestige—status by association—that derives from publishing in individual journals or series. If, through the creation of a control zone, many individual specialized journals or series are successfully eliminated, how is that prestige to be supplied and measured?¹⁶ The answer to that question is to work with scholars to replace such prospective status with much more accurate retrospective tracking of actual use by different user communities, which would be a primary purpose of use-level metadata. This arrangement would be admittedly a kind of marketplace approach to status—an extension of the practice of assessing the value of publications through citation—but it can be done in an online environment much more quickly and accurately. All publications moved into the control zone should enter with equal status and potential and should then compete in the control zone for the reader's attention. Those publications that have higher use will also have greater prestige, and it will be that higher use, rather than the reputation of previous publications by other authors, that should serve to gauge the relative status of objects in the control zone. Actual use will of course condition subsequent use: since users will decide what to read at least partially on the basis of previous use, it will be the readers—especially expert readers—who appropriately create status and prestige for specialized scholarly publications.

3. Maintenance.—Once an item is installed in the control zone, the user must expect to be able to locate it there indefinitely. Since certainly not all information in the control zone will be published by the academy,

15. Since my writing of this article, the Association of Research Libraries has published a discussion on electronic publishing that took place on the Internet, in which some similar ideas were presented. See especially Stevan Harnad's emphasis on the distinction between specialized (which he calls "esoteric") publishing and more general publishing [23, especially pp. 11 and 26].
16. The alternative view is that journals will simply shift online and that the hierarchies now in place will remain. This would appear to be an earlier position taken by Stevan Harnad [24]. Needless to say, that would leave intact most of the problematic economic and cultural relationships that obtain in the paper environment and is something very different from the idea of a control zone.

effective contracts with the information proprietors will be needed. On the technical side, retention will require continuous recopying (what we now call "refreshing") of the online information, to ensure that its access is not impaired as a result of degradation over time or as a consequence of hardware or software upgrades. Such maintenance will be a major responsibility of our future preservation programs.¹⁷ And finally, from a bibliographical perspective, systematic methods for moving information into less accessible locations—perhaps even offline into paper archives—must evolve in order to avoid what would otherwise inevitably become serious congestion; if the control zone is to function efficiently, the library community will need to concern itself, in other words, with the creation of the online equivalent of weeding or remote storage, the purpose of which must be to make some units of information less (that is, more slowly) accessible than others.

Another important responsibility of maintenance is authentication. Much has been written, especially by Peter Graham, on this requirement [25, 26]. Once an object is admitted to the control zone, the user must be able to depend that the content of the object is, to the extent possible, exactly as the author intended it to be, that is, "authorized." While an item encountered in the open zone may have been subject to any manner of influences or alterations, an item maintained in the control zone must always be, by definition, the unaltered original. Any citation of an object therefore should always be to that copy or version that resides in the control zone. Needless to say, this requirement would not prohibit the author of the original work from producing new editions, but it does mean that each edition must be defined by the author as finished before it can be admitted to the control zone.

4. *Certification.*—I considered earlier the essential role of expert judgment as the basis for the first phase of the process of importation. In research libraries, the responsibility for exercising such judgment currently resides with collection development, and in the case of publication the equivalent function is performed by editorial boards. One of the most important conceptual goals that academic libraries need to pursue as information becomes increasingly available online should be the elimination of the distinction between academic library collection building and specialized scholarly publication. A primary rationale for the cre-

17. A paper titled "Preserving Digital Information," written by the Task Force on Digital Archiving of the Commission on Preservation and Access and the Research Libraries Group, distinguishes between "digital libraries" and "digital archives" and proposes a "national archival system"—which does bear some resemblance to aspects of the proposed control zone. An initial draft of this paper is presently (September 1995) available at URL <http://www-rlg.stanford.edu/ArchTF/Draft-Report>.

ation of the control zone must be to bring about the fusion of those two traditional acts of expert judgment—editing and collection building. To move an object into the digital library that is the control zone must be equivalent to publishing it. Any object in the control zone should be by definition published. Anyone reading anything that has been admitted to the control zone must be able to do so with the understanding that the item has been subject to editorial scrutiny—and, at least in the case of specialized scholarly information, that it has been accepted by peer review.

This fusion of collection development and some forms of publication is one of the main reasons the academic library needs to begin to return responsibility for collection building to the faculty as more and more scholarly information becomes available online. Because admission to the control zone will be a new form of publishing, that admission must be in the hands of some network of editorial boards—and those editorial boards must consist of the scholars who, for the most part, make up college and university faculty. This requirement will lead unavoidably to an array of management and coordination questions, because structures will need to be established for scholars to assume expanded editorial responsibilities around the country and around the world. To assist this work, scholarly societies should probably receive and assume a much broader range of responsibility than they have had in the traditional environment. The academic community will need to develop detailed procedures and criteria for decisions on importation (and possibly also on excision or electronic remote storage), but the benefits deriving from this work will be well worth the effort invested in it, for it will transform the role of the scholar and the communication of scholarship.

What agencies will assist the academic library in working with scholars to achieve these goals? To be sure, academic computer centers must play a key role, for nothing can be accomplished without their technical expertise and political support. Academic libraries must also link much more effectively with library schools because radical changes in library operations and values can be achieved only through radical adjustments in training, indoctrination, and research. But academic libraries must also and above all work ever more closely with their university presses. Indeed, in the case of the presses, our links must go beyond mere alignment. The sooner that libraries can, in fact, convince the university administration (not to mention the university presses themselves) that the presses and the library are in fundamentally the same business of scholarly information exchange—and the sooner the library and the press can be amalgamated into a single administrative unit—the sooner the academy can get about its business of moving academic information services into the online era. Many universities have committed a major

error in trying to force their university presses to become self-supporting. This policy has resulted in the presses identifying increasingly with—and adopting the values of—commercial publishers. University presses need to be subsidized by universities because scholarly communication must be the responsibility of the scholarly community. And the funding for such subsidy should probably come in the long run, at least in part, from what has been the academic library's acquisitions budget.

5. *Standardization and coordination.*—Everything in the control zone needs to be presented and accessed according to the same protocols. This requirement, too, will entail significant administrative and technical coordination. Such standardization must be a major responsibility of and prerequisite for the control zone—as it has always been ultimately of all information services. Only through standardization, moreover, can virtuality be achieved, so that the entire digital collection occupying the control zone appears to the end user as a single database. It is unlikely that the academic community, or even the international library community, would be able to manage such extensive coordination on its own. Some intermediary agencies or businesses will need to develop in order to facilitate such an exchange. It is in this area that we find at least one online equivalent of the vendor, linking a multiplicity of organizations—in this case academic institutions; such vendors would admittedly look less like Yankee Book Peddler than like the Research Libraries Group, but the fundamental function of interconnection remains the same.

The publication of specialized scholarly research—the composition of the control zone—should ideally be carried out without any money changing hands among institutions. With the assistance of university presses as part of the library system, each institution needs to use some of that funding now used for the purchase of library materials to mount certified, specialized scholarly publications on its own servers. It could be, for example, that the responsibility of the institution should be to mount the publications of its own faculty (once those publications have been accepted through the standard national or international refereeing process), or it may be that the institution would provide access to publications on a particular subject for which that institution has assumed responsibility, or the selection of publications may be based upon some other division of responsibility that has been negotiated among institutions. In return for an institution mounting and maintaining that database of specialized scholarly publication and making it accessible to all other institutions, the users at the institution should have free access to similar servers at all other institutions. This goal is admittedly an

ideal, which would no doubt be difficult to achieve in the real world, but it is to my mind the only reasonable and responsible method to exchange specialized, low-use, scholarly information in a primarily on-line environment.

The Compromise of Regionalism

While future access to scholarly information will depend directly on the academic library community's resourcefulness and willingness to provide the leadership necessary for the academy to assume—or reappropriate—responsibility for specialized scholarly publication, it is essential also to bear in mind that such publication will remain only a subset (albeit an important one for the academic library) of the total publication output. Even if the academy succeeds, therefore, in its quest for reappropriation, there will remain a large publishing industry in the online environment that will continue to flourish by publishing higher-use materials of all kinds—and it is conceivable that some of those publications might also be candidates for the control zone. I have been envisioning the control zone as if it were to be a single, monolithic, international, virtual library, and indeed such an open and omni-accessible database should be the academy's ideal objective. But it is also clear that, from a business perspective, such an objective is probably impractical—and if libraries set their sights so unrealistically high, they stand to undermine from the outset any effort to create such a single, coordinated digital library as the control zone. Some form of "regionalism," that is, the creation of private regions in the control zone, will therefore probably be unavoidable—because some commercial publishers will continue to own the content of some publications and will survive and prosper through the sale of that content. Some higher-use publications will need to compete with each other in the open market—unlike specialized scholarly publications—if publishers are to remain willing to invest the capital needed to bring such publications into existence. Although the sale of one copy of such a publication to the entire control zone may be an occasional option, with all libraries paying a share, the chances of such arrangements are probably small in all but a few cases. Such publication will depend, therefore, on some kind of regionalism in the control zone, so that publishers can sell to more than one customer.

There will be other reasons as well for building into the control zone a capacity for private regions—most notably the fact that different academic institutions have different levels of resources (or apply their resources in different ways) and use those differing resource levels and decisions as a means to compete with each other. Some institutions will inevitably provide their users with more or superior information services than other institutions, in order to attract better faculty, students,

and funding support. If that is to happen, private regions will be unavoidable. These regions, however, must still be part of, or directly linked to, the control zone, using the same access protocols, so that the local user will not need to distinguish between private and public regions. One would hope, however, that in the long term, the real arena of competition among institutions could shift from the importation process—that is, what data are made available to local users—to the postimportation process—that is, how such data, once made available, are accessible and manipulable by local users. Let academic institutions compete, in other words, by developing increasingly sophisticated search engines and software; that would be a much more equitable and effective method than the denial of access to the information itself.

V. Conclusions

If the optimum information service consists of equal and undifferentiated access to all extant objects of information, then libraries will indeed rapidly become antiquated and superfluous as information becomes increasingly available online. But if the walls that have enclosed libraries for millennia have served not merely to keep the rain off the books but have also responded to an elemental bibliographical and epistemological need, what I have been calling circumscription, then the bounded, systematically selected collection will remain the ultimate and quintessential research instrument. The creation of a single, vast and virtual, digital library along the lines of the control zone would facilitate the coordinated access that libraries have for so long sought in the traditional environment but would retain the structure and function of the bounded collection. As long as the client-user, moreover, continues to have access to the open zone, and as long as libraries do not fall into the trap of imagining that providing access to that open zone is somehow their responsibility, then the library will succeed in transferring its fundamental service functions into the electronic environment—despite the current network user community's general aversion to control in any form. There is, in any event, little alternative. Either the academic library community agrees on its core contributions, and then takes whatever steps are necessary to ensure that it is able to continue to make such contributions in online circumstances, or the academic library needs to accept and resign itself to the fact that it is primarily a product of a waning information environment and should neither expect nor prepare to continue to play a major role in higher education and scholarly information exchange.

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