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Knowledge organisation for a new millennium: principles and processes

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Keywords

Knowledge management, Knowledge processes, Internet

Abstract

All Web sites can be viewed as portals through which users have access to other parts of the Internet, but those Web sites whose primary objective is to guide users through the Internet, such as those of the search engines, shopping bots and other bots, and subject gateways, have a particular responsibility for facilitating the communication process. Those who take responsibility for supporting access to information in electronic environments must support all three stages in the organisation of knowledge, including selection, organisation, and the often neglected de-selection. To be successful and to encourage users to identify with specific portals, and exhibit some loyalty as a member of the portal's community, portals need to formulate a clear mission, and define some of the parameters of the community they are in the process of creating. Any processes or tools associated with the organisation of knowledge need to be appropriate to the needs of this community.

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Introduction

The final years of the twentieth century have been widely heralded as the dawning of the knowledge age, an era in which organisations and communities are deluged with knowledge, information and data. The effective harnessing of these is essential to the continued success and existence of the organisation or community (Drucker, 1993; Senge, 1990; Nonaka, 1994, 1995). Exponential expansion of telecommunications network capacity, coupled with widely accessible desktop computing, have empowered those with a message to communicate. Individuals, businesses, public sector organisations, governments, pressure groups, and a host of other special interest groups, have embraced the Internet as a channel for establishing and maintaining contact with members of communities, organisations, and customers. The onus is on the customer, citizen, consumer, employee or professional to filter and evaluate this information. These users feel bombarded with an array of messages. Compared with, say, 20 years ago individuals, organisations and society experience:

- more information, communicated from –
- a greater range of sources, through –
- a wider range of channels, many of which have –
- faster response and turnaround times.

Competitiveness and effectiveness of individuals, organisations and societies are increasingly dependent on their information processing and knowledge creation capacity, which means that there is a greater focus on individual, organisational and societal competencies in relation to communication, information processing and knowledge creation.

The ever-present need to structure information has become more pressing. Koniger and Janowitz (1995), in their article entitled "Drowning in information but thirsty for knowledge", remind us that:

> Information is only valuable to the extent that it is structured. Because of a lack of structure in the creation, distribution and reception of information, the information often does not arrive where it is needed and, therefore, is useless (Koniger and Janowitz, 1995, p. 6).

A similar sentiment is reflected in the title of a recent publication from the Office for Humanities Communication on the use of

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 217–223

networked bibliographic sources. Their report is entitled *Knowledge Lost in Information*. Hiom and Huxley (1996) express concern that the sheer enormity of information available and the corresponding lack of organisation of this information can prove an effective barrier to potential users.

The resolution of this chaos is in the interest of both those seeking to communicate messages, and those seeking to receive messages, or to retrieve specific information. Users need to take responsibility for learning how to ask the right question:

> The basic "information problem" revolves around the fact that the inquirer knows enough to know that he or she needs information, but doesn't know enough to ask the "good" questions that would produce the needed information (Keefer, 1993, p. 336).

Hill (1997) addresses the matter of the skills associated with critical thinking and problem solving in an information system. These include thinking (planning and organising), acting (browsing and searching), integrating (differentiating and monitoring), transforming (extracting), and reaching resolution (decision making and reflecting). These are the skills that are essential to learning in a knowledge age, and suggest that performance as searchers is a microcosm of learning performance in a host of other environments. Hill also suggests that, if users are to be successful in finding information on the Web, they must adapt their models of information retrieval systems to match the structure (or lack of structure) inherent in this environment.

While users must take some responsibility in the partnership, communicators need to recognise that their message will not be received unless they take responsibility for participating in the organisation of information. Many organisations and others have recognised the value of "infomediaries" in this process. Search engines, such as Yahoo, Excite and Altavista act as portals through which users can be directed to selected and sometimes evaluated Web sites. An Internet portal is a Web site that provides an entry point to the Internet with value added services such as directories, searching, information news, and links to related Web sites. The home pages of Internet service providers, such as Tesco and AOL, have also become portals, by default, since they are the sites through which consumers enter the Web. These portals all have a commercial focus, and a commercial purpose. Other portals, described as vertical portals or niche portals, have been designed for specific user groups. These groups may be defined by interest in a specific subject, or through their association with a given organisation. Some, such as Amazon.com and Travel.com, are the home pages of significant e-tailers. Others have been developed through government initiatives, often within the context of the library and information community. Many of these are "public service" portals, funded through public finance to support communities. In the UK, the Joint Information Services Committee (JISC) funded the establishment of a series of subject gateways as part of their eLib programme (Mackie and Burton, 1999). These subject gateways concentrate on sites of relevance to users in UK higher education. Examples are SOSIG for the social sciences, EEVL for engineering, and biz/ed for business and economics. Under the Resource Discovery Network (RDNet) development programme these subject gateways are currently being expanded to have more general subject coverage, and to meet the needs of other groups beyond the academic community (Robinson and Bawden, 1999). Within organisations, intranet portals, with search capabilities, organised directory-based content, news and links to related Web sites, can be an important knowledge management tool. While portals offer access to sets of Internet sites, every Web site that extends to several pages also needs to organise the information that it presents to its users.

This article identifies key principles of the organisation of knowledge that have been tried and tested in those organisations that have a long and honourable history of organising knowledge, the library and information community. The principles of communities, user orientation and standardisation and networking are explored. The processes associated with the organisation of knowledge are identified and their execution in an electronic environment is discussed.

Principles of the organisation of knowledge

Libraries, producers of bibliographic databases, indexes, information managers and

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 217–223

others have a long tradition during which they have developed significant skills in the organisation of knowledge. The twentieth century has seen both the theory and practice associated with the tools for the organisation of knowledge, such as classification schemes, and alphabetical indexing languages emerge, and evolve. The principles that have guided the development of theory and practice in the organisation of knowledge are: communities, user orientation, and standardisation.

Communities

Libraries, whether they be public libraries, academic libraries, or workplace libraries have always been established to serve a community. Through user studies, service delivery, committees, involvement with stakeholders in the community and other interaction with the community, the needs of the community for information, documents, education and recreation are established. On the basis of this user information, financial, human and information-based resources are deployed to optimise the "value" that the library offers to the community. So, for example, each library has a different selection of books and other documents, and the relative deployment of human resources in the delivery of services to specific parts of their community is designed to reflect the communities' needs. Similarly, producers of databases, publishers and others who organise knowledge embedded in the production of documents and databases ensure that they understand their marketplace, and the type and format of information that is likely to cultivate and maintain a loyal customer base.

Portals could be viewed as the electronic equivalent of the agency that tailors document access and information service for specific communities. The nature of communities associated with different portals will vary with the type of portal, and it may be that the processes associated with community development for commercial, as opposed to "public service" or internal organisational portals, may differ. However, the imperative to develop a community is clear. Public service needs to be offered to an identifiable community for resources to continue to support the portal. Commercial portals need to be convinced that their Internet activities are having a positive effect on awareness, reputation, and trade. But, most portals do not yet have a stable community.

Are users experiencing confusion and information overload because they are still going through the process of associating themselves with communities? The creation of communities cannot be left to chance. Portals and others need to take the lead in defining their desired communities. E-organisations need to go beyond defining the relationships and nature of relationships that they seek to forge with customers, to taking a lead in the definition of the culture and values of the community they are seeking to create. This definition will assist consumers to identify with a community to which they can contribute, and two-way relationships can be established between the organisation and its customers, and between customers.

In the struggle for establishment and survival it is easy to forget that the characteristics of communities define the not only information and services that they need, or will accept, but also the way in which that information needs to be organised.

User orientation

In the design of access points, index terms, search keys, and, more traditionally, headings, the principle of user orientation and reference to the user's cognitive and semantic frameworks has been long established. AACR when making recommendations concerning names as access points recommends that where an author or corporate body is known by more than one name, the predominant name (in the literature) should be used, even if, in the case of a person, that name is a pseudonym (Rowley, 1994a). The only exception to this practice is when a corporate body has changed its name. Literary warrant or basing subject access on the literature of a subject is a well-established principle in tools which organise by subject. Tools such as the Library of Congress List of Subject Headings select terms for inclusion on the basis of common usage.

The pursuit of common or predominant usage is not always straightforward. It can lead to the use of two different names, or terms for the same concept, person or organisation, as usage changes over time. Common usage can only be established with reference to a community or a literature. If different terms are used by different communities (as in soccer in American English, and football in UK English) there may be more than one form of common usage

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 217–223

within a global community. Also, for new organisations or concepts, the common form of name may not be established. The relevance of these issues for the global and changing medium of the Internet is evident, and the problems may be considerable, but this does not remove the need to recognise that users will not locate concepts under terms with which they are not familiar.

In addition, many concepts cannot be represented by one-word terms, and common usage may therefore vary (e.g. mites as carrier of disease; country life in Wales). Similarly, there are a number of organisations for whom users may not be able to formulate a search term that is likely to lead to efficient and effective retrieval. Examples might include: the Second Northwest European Irrigation Conference; the Senate of the US Congress; and the name of their local education authority. Such phrases cannot always be effectively searched through keyword-based interfaces and their indexes.

Most subject-based tools offer both alphabetical access (through natural language terms) and hierarchical access through a series of related concepts. Classification schemes have been the primary mode of offering access to related subjects. The traditional classification schemes were hierarchical in nature, as are the menu structures embedded in many Web sites. As the quantity of knowledge has grown, the limitations of hierarchical schemes have become evident. Specifically, cross-classification, or the possible location of a given topic in more than one place within the structure, is common; this means that users may move down the wrong hierarchy and never locate the item since it has been placed elsewhere in the menu hierarchy. Links can help to alleviate this problem, but only if designers are alert to the potential problem. Hierarchical schemes tend to get set in stone, and new subjects do not always fit into existing hierarchies; difficult decisions then arise as to when to revise the hierarchy to better accommodate these new subjects. Many of the menu-based hierarchies do not use a classification notation, but rather use natural language terms to represent subjects; this could be described as the alphabetic-classed approach (Koch, 1997). While this approach initially appears to be accessible to users, in traditional environments it was superseded many years ago by direct entry (under the alphabetical term that describes the subject), because the string of terms that users need to manage for effective retrieval becomes too unwieldy. This approach may have a future in the Internet environment, provided that users can be appropriately supported in their navigation, but its limitations need to be recognised.

Standardisation and networking

In stark contrast to the focus on individual communities and customisation, one of the great successes of the global library and information community is the extent of its international networks and networking activity. These support the exchange of bibliographic data and documents as well as a host of other services. These have only been achieved through an infrastructure that embeds a number of widely adopted standards. Fuelled in the early years of this century by the economic imperative associated with sharing of cataloguing effort and resources, libraries started to adopt standards promulgated by national agencies, such as the Library of Congress, and the British National Bibliography. After a long period of evolution, and facilitated by the opportunities offered by developing information technology, a raft of standards associated with the organisation of knowledge achieved a considerable degree of global acceptance. Key among these standards are the Anglo-American Cataloguing Rules, MARC (Machine Readable Cataloguing), the Dewey Decimal Classification, the Library of Congress Classification and Subject Headings, the ISBD (International Standard Bibliographic Description), and more recently the Dublin Core (as a standard for metadata). The details of these standards are not important to the argument in this article, but the collaborative and consultative processes that led to their creation and their continuing revision are, as is the fact of their existence. While they are not applicable to every environment, or user group, they act as a point of departure and a model, and establish a context in which there is sharing of expertise and perspectives in relation to the organisation of knowledge.

The use of these standards also leads to standardisation in the interfaces that are offered to the library user. This facilitates users in:

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 217–223

- searching effectively across a range of different libraries and databases, so that search skills learned in one environment are transferable to other environments;
- locating documents or information on the basis of citations in other sources.

Processes

The process of the organisation of knowledge involves three stages: selection and evaluation, organisation, and re-selection or "weeding". User communities appreciate assistance with selection and evaluation. Further, selection and evaluation are a continuing process; information is not included in an archive or collection for all time, but must be re-evaluated to assess whether it has been superseded, or ceased to be of interest to the community.

Selection and evaluation

Libraries have well-established tools and processes that support the selection of information resources, and collection building to meet users' needs. The shift towards "libraries without walls", and the associated emphasis on access rather than archives, does not mean that the need for unique "collections" and selection has declined, although it may mean that the nature of such collections and their stability is changing. Information professionals are necessary to act as information gatekeepers for communities (Britten, 1995). All portals in electronic environments need to establish criteria for the inclusion of information, links and other resources, and to select material on the basis of those criteria (Cooke, 1999). Whether that selection can be performed without human intervention, and on the basis of computer algorithms which determine selection on the basis of Web site content is probably a debate that will run and run (see Rowley, 1994b). Also, another fruitful area for research is the extent to which the selection takes place at the time of the search, or prior to the search. Portal communities will rely on the portals to direct them to reputable information sources, and suppliers of other products. Links to unreliable, non-existent or poor quality sites will reflect on the reputation of the portal. From a user's perspective this is probably the first era in which it has become more necessary to discard knowledge, than to hoard it.

Organisation

The compilation of information into documents converts information and data into public knowledge. Each document has an embedded structure. Bibliographic databases and indexes add a further layer of structure that assists users in the identification and location of documents. Such compilations have always used a set of data to represent documents, otherwise known as the document description, and other data as search keys or access routes. These metadata, as they are known in Internet environments, act as a substitute for the original document, and can support both humans and computers to achieve more effective retrieval (Armstrong, 1997; Dekkers and Dempsey, 1998). The document description is used to identify a document, and to make it possible to match the metadata to an individual document. Some descriptions also include abstracts or summaries, which provide a more complete picture of the nature of the document. Similar approaches are used in search engines that use metadata to represent Web sites, as a basis for the retrieval of those Web sites, and data that should characterise Web sites are displayed for the user to peruse in response to a search (Furner, 1996). These data need to allow unique identification of the Web site, to ensure that each Web site is only listed once, and to offer information that allows the user to decide whether to visit the Web site for further perusal of its contents.

The identification of specific documents has always been by headings or search keys, in the form of authors' names (including organisations' names), alphabetical subject terms, classification notation, and title. These approaches have been discussed in more detail above. The important point here is to emphasise that these various approaches are used to allow users different routes to the documents and information that they are seeking. In addition, both direct searching, when a searcher is seeking a specific document or subject, and browsing, where the user is still defining the purpose of the search, must be supported.

De-selection and weeding

An important element in the organisation of knowledge is the discarding of knowledge that is redundant, has been superseded, has become misleading, or in some other way no longer meets the needs of the community.

Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 217–223

Search engines take responsibility for removing Web sites which are no longer active, but other information providers may not be as diligent in attending to the currency of their information. Nevertheless, an oft quoted challenge for those seeking to support users in their navigation of the Web (such as the managers of subject gateways and other portals) is the lack of stability deriving from the autonomy vested in Web site managers with respect to changing the content of their sites. One of the central concerns associated with electronic data is the responsibility for the creation and maintenance of some kind of archive of volatile electronic documents and other information resources. Libraries that have traditionally performed an archival function are being challenged in this role. Electronic journals are an important case. Continuing access to the back-runs of a journal for a given library community depends on the existence of a current subscription. The key issue is who has responsibility for de-selection for a specific community, and how can they best execute that responsibility? The answer to these questions requires reflection on both criteria and processes.

Conclusion

Three key principles of the organisation of knowledge need to be heeded by all of those agencies that expect to communicate a message to their communities, whether those communities be groups of customers, employees, members of a regional community, or members of an educational community. All Web sites can be viewed as portals through which users have access to other parts of the Internet, but those Web sites whose primary objective is to guide users through the Internet, whether the motive is "public service" or profit, have a particular responsibility for facilitating the communication process. The twentieth century has witnessed many generations of information systems, and associated approaches to the organisation of knowledge. The three principles that emerge from this evolutionary process are:

(1) Knowledge needs to be organised for communities.
(2) In designing tools to support the organisation of knowledge, the guiding principle must be that of user orientation and predominant usage.
(3) Standardisation and networking provide infrastructures, which facilitate effective and efficient access to information and documents.

These principles need to be considered alongside the stages in the processes associated with the organisation of knowledge. Those who take responsibility for supporting access to information in electronic environments must support all three stages in the organisation of knowledge, including selection, organisation, and the too often neglected de-selection. To be successful in the organisation of knowledge to the extent that users will identify with their portal, and exhibit some loyalty as a member of the portal's community, portals need to formulate a clear mission, and to define some of the parameters of the community that they are in the process of creating. Any processes or tools associated with the organisation of knowledge need to be appropriate to the needs of this community.

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Journal of Knowledge Management
Volume 4 · Number 3 · 2000 · 217–223

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