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Trends in Knowledge Organization Research

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ABSTRACT: This paper looks at current trends in knowledge organization research, concentrating on universal systems, mapping vocabularies and interoperability concerns, problems of bias, the Internet and search engines, resource discovery, thesauri and visual presentation. Some problems facing researchers at the present time are discussed. It is accompanied by a bibliography of recent work in the field.

Introduction

This paper examines current trends in Knowledge Organization research, concentrating in particular on the literature that has appeared in journals and conference proceedings in the past five or so years. In addition, attention is paid to whether the circumstances of today are really totally different from any of previous ages. In conclusion, the questions of whether the problems being faced and the solutions being sought are unique, or if the researchers of today are simply part of a continuing chain of those concerned with organization and retrieval, attempting to get the information that people want to them as quickly and effectively as possible, will be examined.

Summary of trends

Five years ago a paper was prepared for the American Society for Information Science and Technology (ASIST) Classification Research programme and subsequently published in *Knowledge Organization* (McIlwaine & Williamson, 1999). It presented a survey of the then current research environment comprising monograph publications, conference papers, journal literature, principally as identified by the principal bibliographical listings of Library and Information Studies (LIS) and the Internet, over the ten year period from 1988-1998. The major headings under which was "classified" research were universal classification systems, cognitive processes, thesauri, structure and relationships, terminology and natural language processing (including cluster analysis, semantic classification and automatic indexing). At much the same time Birger Hjørland and Hanne Albrechtsen did a similar survey and identified three prevailing themes: the academic disciplines as the main structural principle, the fiction/non-fiction distinction and the appropriate analysis in online retrieval systems; and they uttered a plea for a change of direction towards a semiotic approach, based on an understanding of intertextuality (Hjørland & Albrechtsen, 1999). Although some work has been undertaken based on modern linguistic concepts, as is shown later, this has not really been the dominating thrust of research. In terms of general headings of topics under which research may be grouped, not a great deal has changed in the intervening five years, as the titles of sessions at both general International Society for Knowledge Organization (ISKO) conferences and the reports on those of local chapters demonstrate (e.g., Beghtol, 1999). The development of classification throughout its history up to the present time has also been clearly and helpfully traced by Smiraglia in a recent issue of *Library Trends* (Smiraglia, 2002).

Interoperability has become a favourite topic, interpreted in various ways by various people, to embrace the ability of systems to talk to one another, or

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to switch from one subject retrieval system to another. This latter emphasis has led to interest particularly in mapping one information language onto another. The call for interoperability between systems in every sense has, in turn, led to a call for the improvement of the standards used, and there has been some work in this area, especially in the standards for thesaurus construction, both monolingual and multilingual, new editions of both of which should see the light of day in the current year. Another area where interest has increased in the past quinquennium is in the advances made towards devising systems for automatic classification and in the use of artificial intelligence as a means of retrieval. Above all, the preference for the thesaurus over systematic classification remains triumphant, and this has great implications for those who are interested in retrieval and the organization of knowledge. All these interests are dominated by the endless quest to make retrieval of information in a Web-based environment easier. Several summaries of applications of controlled vocabularies (including classifications) have been compiled, usually as the adjunct to specific research projects, such as DESIRE, and are maintained on the Web (e.g., http://www.lub.lu.se/metadata/subject-help; http://www.public.iestate.edu/~CYBERSTACKS/).

Universal systems

Work continues on the major general systems, classification schemes and subject headings such as *Library of Congress Subject Headings* (LCSH) and the specialized languages for particular fields such as Medicine (Medical Subject Headings [MeSH]) and Art (Art and Architecture Thesaurus [AAT]). A new edition, the 22nd, of the *Dewey Decimal Classification* is due for publication in July 2003. It may well be the last time that the scheme appears in its now familiar four volumes, with the increase in use of WebDewey, and the ease with which the classification can be updated in an electronic format. This instant updating facility, while excellent for maintaining currency, increases the problems of those applying the classification and trying to maintain consistency. The *Library of Congress Classification*, similarly, is rapidly becoming available on the Web, a far more manageable way of handling such a vast enterprise than the former 56 volumes. The *Universal Decimal Classification (UDC)*, likewise, is available in English via *UDC online*, (http://www.udc-online.com) while CD-Rom versions exist in Spanish (http://www.udcc.org/aenor.htm#cd), in Japanese and English (http://www.infosta.or.jp) and in Czech

and English (http://www.udcc.org/czech.htm). Work is advanced on a Russian online version and plans are in progress for the production of a multilingual online version. Both DDC and UDC continue to make their organization more appropriate to the 21st century with the constant imposition of more facet analysis; not always an easy task, especially with DDC where so many compounds have been enumerated. UDC, in addition, pays close attention to reflecting hierarchies strictly in its notation, to a much more rigorous extent than DDC. There has been a considerable amount of literature reviewing current applications, projects and the potentiality of the "traditional" classification schemes for retrieval from the Web. (Robbins, 1999; Degez & Masse, 2000; Elrod, 2000; Marsh, 2000).

In terms of subject headings, LCSH dominates and the existence of *Classification Plus* together with the *Catalogers desktop,* again until the end of 2002, made this an extremely manageable tool for cataloguers (Roper & Pennell, 2001). The free availability of the Library of Congress's authority files over the Web is an additional major asset. It is interesting to note that even some distinguished specialist institutions are changing their practices in the interest of standardization; the Victoria and Albert Museum Library in London, for example, which was one of the founder participants in the Getty project that resulted in the *Art and Architecture Thesaurus* is now changing to LCSH. One noteworthy project to simplify the complex syntax and rules of application of LCSH so as to make the subject headings more adaptable to the needs of Web retrieval, while retaining their very rich vocabulary is the FAST project – Faceted Application of Subject Terminology, which was initiated in 1999 by the Subject Access Committee of the American Library Association (ALA). This separates LCSH headings assigned to records in WorldCat into four facets – Topical, Geographic, Period and Form – and has created a new subject scheme for metadata which is easy to maintain, apply and use (O'Neill & Chan, 2003).

The existence of these popular tools in machine-readable format is a major advantage for editorial purposes. There is, however, a tendency on the part of all the organizations responsible for producing them to have devised systems that work well for maintenance, and then adjust these systems for use by others. But the person working in a bibliographic services division has different needs from the person involved in editing and maintaining these tools, in just the same way as the user either of the Web or of a library catalogue has different needs from the in-

dexer, which this practice ignores. The downside of these formats is that because they are easy to use, there is a growing conviction that the work of the indexer is routine rather than something requiring good training, skill and practice, as well as subject knowledge. The popular interest in automatic classification is the logical result of this misguided conviction. There is also the problem of maintaining consistency, because the ability to make changes immediately rather than at regular, well publicized intervals, leads to different practices in different environments.

Mapping vocabularies and other forms of interoperability

The search for a universal information language acceptable to all seems to be a thing of the past. Rather, nowadays there is interest in mapping one information language onto another. There are many examples, usefully summarized in the paper given by Lois Mai Chan and Marcia Lei Zeng at the International Federation of Library Associations and Institutions (IFLA) in 2002 (Chan & Zeng, 2002). The favoured "standard" to which such systems are mapped is the *Dewey Decimal Classification* (Saeed & Chaudry, 2001). The Czechs are working on the daunting task of mapping UDC numbers onto Dewey ones and the Germans are similarly mapping the Regensburg classification onto DDC. A survey of practices in several countries was the subject of a special issue of *Bulletin des bibliothèques de France* in 2001 (Classements, 2001). Similar work is being undertaken with subject headings, for example mapping between LCSH and DDC (Vizine-Goetz, 1996). The need for an "umbrella" classification to link libraries of digitized music for the blind led to the decision to use the UDC as a common classification for the convergence of Internet-based catalogues (Adcock, 2001). The Wilson indexes, some not far from a hundred years old, now that they are available online and it is possible to switch imperceptibly from one to another, have been working on the production of a megathesaurus on to which they can map the 12 different vocabularies used for their printed indexes (Wilson, 2002; Kuhr, 2003). A similar, though less ambitious project, has been undertaken with integrating three Chinese thesauri using an automated vocabulary switching system with greatly improved search results, but it should be noted that this is in the more restricted subject area of the social sciences (Zhang & Hou, 2000), while Elsevier have provided a combined Embase and Medline database with automatic mapping of thesaurus terms between EMTREE and MeSH (Shimuzu, 2002).

Another form of interoperability, and one which formed the subject of an all day workshop organized by the Classification & Indexing Section of IFLA, together with the CILIP(S) Cataloguing and Indexing Group at the IFLA general conference in Glasgow, 2002, is the development or adaptation of retrieval systems beyond their original purpose of indexing written materials. The development and rapid growth of the Internet has in turn stimulated interest in the retrieval of information of every kind within one and the same system. Not only must different formats be considered (librarians have always had to handle these to some extent, whether illustrations, photographs, film or realia) but there has been a growing realization in recent years that all the information professions need to collaborate to make their holdings available. This has led to greater converse and collaboration between librarians, archivists and museum curators, the latter two professions historically being less developed in the subject retrieval area than those trained in a library environment; and collaborative projects between the three to make information available are being undertaken both in Europe (Maier, 2002; Penzo Doria, 2002) and in the US, the Colorado project being one example (Garrison, 2001; Garrison, 2003).

Bias

There is some concern among those involved with Knowledge Organization to attempt to eliminate bias in classification. Rebecca Green in her keynote address at the 7th ISKO general conference in Granada demonstrated this clearly (Green, 2002), and the interests of others, such as Hope A. Olson, also lie in the problems of bias. Green demonstrated the problems of words which have different interpretations in different societies or environments – one example she used was of terms relating to the family as understood in the West as against an African understanding of terms such as brother, sister and cousin. Olson's interests lie more in the problems of gender and of ameliorating systems generated in a male dominated world of a century ago which was responsible for many of the retrieval tools still used everyday. Bias is almost inevitable, and indeed may, at times even be useful, though more often in a specialized context, for example, Religion. Geographical bias, again, can be helpful, provided the system is being used in the context towards which it is biased. The search for a universally accept-

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able system, however, rejects the acceptability of bias, even if that universal system is one linked to others, as is the case with, say, Regensburg mapped onto DDC – Dewey is not particularly noted for highlighting German interests above American, for example.

Internet and search engines

Success or failure in searching the Web is heavily dependant upon the search engine used. The problem of the space occupied by the information that is potentially accessible through it is a major challenge. Currently available search engines tend to be successful when the request is reasonably simple and the vocabulary is that of everyday. As ever, the difficulties begin when one tries to make a classification a tool that is universally applicable. The sort of information that was supplied regularly in the past in a reference library, like telephone numbers or addresses, bus, train or air times, and so forth, can easily be retrieved. But as soon as a specialized query or technical vocabulary is used, the search engine begins to fail, and either one scores hundreds or thousands of hits, many totally irrelevant, or else one gets nothing.

Searching can be improved by those who understand how these things work, and know how to limit and refine searches, but this is not true for the great majority of users of the Internet. This is an area of research where there is great current activity, and one approach is to use an "active classifier," rather than the more usual passive one, though the findings confirm the impression that as soon as a general environment is involved, the problems become intractable (Greiner, Grove, & Roth, 2002). Another suggested solution is to use a Web crawler that looks for links to more content by compiling an index or database of words and URLs. The University of Michigan has been conducting research along these lines on the basis of a so-called "accidental thesaurus" and has achieved considerable sophistication (Wiggins, 2002).

OCLC (Online Computer Library Center, Incorporated) undertakes considerable research in this area, attempting to use the best of the "traditional" approaches to enhance organization and retrieval in the modern era. It is doing this in particular with its CORC (Cooperative Online Resource Catalog) project which is exploring the use of automated cataloguing tools and library co-operation to create a database of Web resources, with librarians applying traditional practices and principles (selection, description and classification) to improve end-user access to Web materials. A special issue of the *Journal of Internet Cataloging* was devoted to this in 2001 (*Journal of Internet Cataloging* 4, 2001). (OCLC, 1999; Noble, 2000; Hickey & Vizine-Goetz, 2001)

Resource discovery

The major task that occupies researchers at the present time is the improvement of ways in which to access the World Wide Web (WWW). The solutions being employed have their roots in Artificial Intelligence (AI) and predate the Web by more than a decade, but the technology of the 1980s originating in the work of Gerard Salton and others is being revisited in the pursuit of improved efficiency. The use of "Fuzzy logic" for the design of linguistic information retrieval systems, so as to improve the cognitive aspects of the retrieval activity is one such application (Blanco, Martin-Bautista, Sánchez, & Vila, 2002; Wu, 2002) and another is the use of neural networks in IR applications, especially for the building of models for multilingual IR systems or for building knowledge maps for visual retrieval interfaces. Probablistic reasoning and evaluation including the techniques of clustering (Khoo, Ng, & Ou, 2002; Polanco, 2002), are other ways in which projects are applying it for retrieval purposes. Many of the techniques being employed are not new to librarians, though they may be called by different names, and this is a matter which calls for dialogue between information specialists and computer scientists.

Expert systems and natural language processing are two major areas of Artificial Intelligence of current interest (Panagrahi, 2000). Natural language processing, although it is now over twenty years since it was first employed, still has limitations. It is expensive and it inevitably is limited to only one language, that language normally being English. But within these very real constraints, it works. Clearly, it would be an impossible task to index the entire Internet manually (as well as being pointless) therefore interest is inevitably going to focus on ways of improving text retrieval.

The objective of natural language processing is to process words so that they are amenable to retrieval, so this leads naturally on to the development of automatic indexing, employing more sophisticated techniques to improve quality, such as weighting and correlation of terms. Natural language processing can be used for automatic indexing when special algorithms are deployed to decide which terms within a text are important. The use of linguistic markers to clarify query formulation and text semantic analysis

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is the basis of the RAP (Research, Analyze, Propose) project (Naït-Baha, Jackiewicz, Djioua, & Laublet, 2001), while frame semantics have received attention in several projects notably those conducted by Green (Green, 2000) and Bean (Bean & Green, 2003). Widad Mustafa el Hadi has done much work on the adapting of natural language techniques to the retrieval of information, especially in a multilingual environment (Mustafa el Hadi, 2000; Mustafa el Hadi, 2002). Natural language search engines are of particular interest in France where much research in this area is currently being undertaken.

The major shortcomings of automatic indexing are the cost involved and its monolingual nature. This is where automatic classification enters the arena. It is not cheaper, but it does rise above language barriers, though it is clearly too sophisticated and too expensive to be used in search engines. It has, however, had considerable success when applied as part of a search engine. A useful summary of projects in this area has been provided by Erzsebet Toth (Toth, 2002). Automatic classification, again, is not a new idea. Ten years ago Lund University Library and the National Technological Library of Denmark launched the Nordic WAIS/World Wide Web project (Ardö, 1999). Five years later, in 1998, the DESIRE II project (http://www.lub.lu.se/desire) – Engineering Electronic Library System (EELS) matched text with thesaurus terms. The results were subsequently linked automatically to classifications, and the experiment was reasonably successful, with the proportion of automatic classifications compared to classifications achieved by intellectual output being between 57% and 66% (Ardö & Koch, 1999).

One of the most successful attempts at automatic classification is the GERHARD (German Harvest Automated Retrieval and Directory); (http://www.gerhard.de) which is particularly noteworthy as it is based on German rather than English language Web resources. The GERHARD system is a fully automatic indexing and classification system for the German WWW for integrated browsing and searching, with the added enhancement of having a trilingual (German, English and French) interface (Moller et al. 1999).). Another example is the EU-funded Renardus project (Becker & Neuroth, 2002; Koch, Neuroth, & Day, 2003), which is a cross-browsing feature based on DDC to improve subject searching across a set of heterogeneous European gateways. OCLC is experimenting with automatic assignation of classification numbers. The SCORPION research project (http://orc.rsch.oclc.org:6109/) was launched by them in

1998. Like GERHARD, it uses linguistic and statistical methods and the SCORPION software is built on a searchable database, constructed from the data files of DDC (Hickey & Vizine-Goetz, 1999). Another OCLC project uses the Library of Congress Classification as a knowledge base for automatic classification, mapping subject headings from WorldCat (Godby & Stuler, 2003).

Closely linked to automatic classification is the use of classification structures developed in expert systems which are nowadays looked at as ways of organizing knowledge and indexing, and are known as ontologies. This is not really another creature. An ontology can be used as a retrieval device, just like the traditional classification, but it is confined to usage when retrieving digital materials. Ontologies resemble classifications in that they define concepts and relationships in a systematic manner, but they are superior in their ability explicitly to specify the semantics and relations and express them in a manner that is understood by the computer. Even traditional tools, such as DDC, or a hybrid of a bibliographic classification and a thesaurus can be used as the basis of an ontology (e.g., Saeed & Chaudry, 2002; Qin & Paling, 2001; Qin & Chen, 2003).

But, as ever, as soon as the human element is removed, the system has to depend on matching and it can only match what it has been programmed to match. The success of such enterprises is generally greater in a specific field of interest, such as Medicine, rather than when the whole of knowledge is involved. This is where the people interested in artificial intelligence become involved because they are interested in building systems that will perform this task. There is great need for further interaction between the computer scientists and information scientists in this regard, because the computer people are very busy discovering what the library professionals have known for years, and giving concepts well understood by the library professional community, like facet analysis, categories, and so forth, new labels and using terms familiar to the information world with a different meaning, and this does not help the interchange of ideas.

Terminology

The problems raised by bias, mentioned above, are closely related to many of the studies that people are making of terminology. The use of technical versus lay vocabulary, the order in which terms occur, coping with changes in terminology and multilingualism

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all have generated recent literature. The last, however, does not appear to be so widely investigated as some of the other aspects, and this seems to me to be a major failing. The assumption that the whole world speaks English is frequently made and again. It was disappointing that at ISKO 7 in 2002, held in a non English-speaking country with a number of participants whose native language was not English, nevertheless the problems of multilingualism and the non-English speaker were not given the emphasis that they might have received, with only a handful of papers addressing this issue. Not everyone speaks English, and it is inefficient to use a foreign language for information retrieval because there are inevitably going to be confusions, and even those whose native language it is use different terms for the same concept, depending upon what part of the English-speaking world they come from.

One interesting project that is being developed between four national libraries in France, the United Kingdom, Switzerland and Germany is the MACS project (MacEwan, 2000; Landry, 2001; Freyre & Naudi, 2003) which attempts to set up equivalents between subject headings languages, so as to enable subject access across the catalogues of the collaborating institutions, while allowing the searcher to use English, French or German, according to preference. This is an area that deserves greater attention than it has yet been given. Although one or two papers at Granada did touch on this: examples include the Hermes service sending news items to subscribers of a digital newspaper, which provides for the use of two languages, English and Spanish; the paper by Hur-Li Lee and Allyson Carlyle which outlines an examination of a worldwide sample of 41 databases, in four languages, English, German, Spanish and Chinese (Lee & Carlyle, 2002); and the use of UDC as a switching language between different languages (Frâncu, 2002). (This last is something that will be greatly enhanced with the projected multilingual edition of the UDC.) Romanization is part of the same problem and script-handling and the representation of concepts originally expressed in non-Roman alphabets, especially Chinese, has generated some interest (Arsenault, 2000; He, 2000; Wang, 2000).

Thesauri

Mention of terminology leads naturally onto a consideration of the thesaurus, the tool most beloved at the present time for information retrieval. This preference is very understandable – words must be used

for retrieval, and even those brought up to believe that the classification scheme is the most universally acceptable retrieval tool because it can rise above linguistic barriers, realize that in order to access a classification, one needs to use the index, and therefore rely on words. Conversely, it is not always understood that for a thesaurus to be a really effective retrieval tool it must be based on a classification and that a properly worked out systematic display, preferably one that is available for the user to consult should he or she wish to do so, is an essential complement to the thesaurus. However, the use of a structured vocabulary, rather than reliance on keywords, is universally acknowledged to be more successful, and has also been found to have good retrieval results for objects and visual materials in addition to verbal information (Tam & Leung, 2001). Hungary has actually achieved the creation of a general comprehensive thesaurus which is now used by the national library and several public libraries, and other countries are attempting similar undertakings (Ungvary, 2001).

It was mentioned above that the standards for thesaurus construction were presently undergoing revision. The British Standards Institution (BSI) has a committee working on updating BSI 5723 (BSI, 1987; ISO, 1986; NISO, 1993) *Guidelines for the establishment and development of monolingual thesauri* and the IFLA Classification and Indexing Section has been working for the past 2 to 3 years on a revision of the *Guidelines for the establishment and development of multilingual thesauri* (BSI, 1985; ISO, 1985; Riesthuis, 2003).

The development of specialized thesauri has been encouraged through a number of projects, many of which are looking at very small parts of the whole of knowledge. The Finns are working on a multilingual 'European Language Social Science Thesaurus' as part of the larger language independent Metadata Browsing of European Resources (LIMBER) project, based on the *Humanities and Social Sciences Thesaurus*. But there are those who throw doubts on the feasibility of current forms of multilingual information access, emphasizing the impossibility of a thesaurus being "all things to all men" (Jorna & Davies, 2001). A thesaurus-related research project more ambitious in scope, is the HILT Project (http://hilt.cdlr.strath.ac.uk/) based at the University of Strathclyde in Scotland where work has been undertaken over the past two years to produce a High Level Thesaurus, or a sort of super-thesaurus to link indexing languages to one another so as to achieve interoperable subject access, or cross-searching and browsing distributed services

amongst the archives, libraries, museums and electronic services sectors (Wake & Nicholson, 2001a,b; Wake, 2003; Nicholson, 2002).

A refreshingly practical look at the problems of thesauri has been presented at several ISKO conferences by Stella Dextre Clarke, one of those on the BSI team revising the standard for monolingual thesauri. She highlights the difficulties encountered by the layman in accessing information through professionally-designed indexing languages (Dextre Clarke, 2002) and also the lack of any quantitative, practicable techniques for comparing information retrieval performance (Dextre Clark, 2000). Useful aids for those who wish to construct thesauri have been compiled by Leonard Will who has mounted a list of available software on his webpage at http://www.willpower.demon.co.uk/thessoft.htm and evaluative articles on such packages have appeared in the literature (Shiri & Revie, 2000; Shiri, Revie, & Chowdhury, 2002; Martinez & Leiva, 2001) but one always needs to offer a word of warning about total reliance on such automated aids. They are extremely valuable, especially in checking that one does not make the same term both a narrower and a related term, which can easily be done, but they cannot replace the human brain, especially in the assignation of Related Terms (RTs).

Visual presentation

Another aspect of retrieval which has been given some attention in recent years is the actual way in which information is presented on the screen. The Cataloguing Section of IFLA has for some years been examining the visual displays for OPACs,(Online Public Access Catalogs) and this element has also been highlighted in several recent conference papers. The effectiveness of Web-based OPACS in comparison with their conventional predecessors is Charles Hildreth's interest (Hildreth, 2000), and Carlyle has also done research into catalogue displays (Carlyle & Summerlin, 2000). Another project looking at the nature of searching and browsing on OPACs and their display effectiveness is the "CATHIE" experience (Ihadjadene and Bouché, 2000). The need to build upon the experience and exploit the skills of traditional librarianship in facilitating browsing, rather than just the location of specific items in digital collections has also been emphasized (Joint, 2001).

Commercial environment

A more recent trend in knowledge organization research has been the attention paid to the needs of the commercial environment. This has been greatly stimulated by the growth of the Internet, and it was notable that a couple of years ago Amazon.com was advertising in the professional library press for qualified classifiers to work on a system for their online book supply service. The needs of the commercial world have featured in recent conferences. Barbara H. Kwasnik reported on two projects, one for eBay.com, a web-based auction service for millions of users and items and another in which she examined the Amazon.com methods of knowledge organization. She is interested in the issues of information organization and retrieval in large, active commercial websites and reported her findings at Toronto (Kwasnik & Liu, 2000) and Granada (Kwasnik, 2002). Marthinus S. Van der Walt has similarly looked at the problems in the South African commercial environment, concentrating particularly on the needs of small and medium sized enterprises (Van der Walt, 2002).

Problems in current trends

An examination of the literature and of contributions at conferences, even those intended for a general audience, such as the IFLA general conference, quickly reveals that the majority of activity in the field is generated from the academic environment. It is teachers in universities together with their research assistants who produce the majority of the literature. The other major player in the field is the large corporation with the funding to maintain a strong research and development programme, of which OCLC is probably the best known, though by no means the only example. Large businesses, such as OCLC, Elsevier or the Wilson Company have the manpower and the financial backing to maintain a well thought through and consistent research programme (Vizine-Goetz, 2001). This is not always the case with universities.

Research in the academic arena these days tends to be either government supported or dependant upon a usually short-term grant from a business which most often has a specific job that it wants done. The two DESIRE projects and RENARDUS were all European Union (EU) funded, and it is good that the EU is prepared to provide money for such undertakings and to appreciate their importance. HILT was funded by the British Government as part of a series of grants for short-term projects (RSLP). Applying for

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research grants is extremely time-consuming and can also be very depressing since there are inevitably far more applications than the resources available can fund and, however urgent retrieval techniques and their development are in the age of the Internet, they do not always prevail against other computer or management related projects.

A greater problem lies in this word "project." Much of the research that is undertaken is short term, given the fact that the maximum period for which funding is likely to be granted is probably in the order of two years, and often a six month pilot project is the first step, which may not be followed up by further support. This results in a number of small projects, often devised to solve one particular and frequently domestic problem, even if they are dressed up to look as though they have wider significance to encourage support. An integral part of this is that the findings must be published and ideally also presented at conferences.

The existence of such "quality control" imposed by governments in the form of Research Assessment Exercises and the like, which have a far-reaching impact on the activities of an academic department, being tied as they inevitably are to state funding also encourages the "publish or perish" mentality. The result is a host of small enterprises all undertaken, written up and then forgotten, rather than any centralized collaborative plan on the part of what is in reality a fairly small community of those interested in and skilled at the organization of knowledge. Bodies such as ISKO, the current interest in Knowledge Management and the existence of channels of communication such as conferences, seminars and discussion lists and enterprises such as NKOS (Networked Knowledge Organization Systems) (http://nkos.slis.kent.edu/), again originating with OCLC, which attempts to draw together work across our area of interest, all are working in the same general area and towards the same objectives. It must be a goal for ISKO to attempt to draw together all this expertise and hone it into a more collaborative and fruitful enterprise, before the computer scientists dominate the world of retrieval completely. This is a noteworthy contrast to some forty years ago when the Classification Research Group, consisting originally almost entirely of practising librarians, met regularly and generated a solid theoretical base.

At times, it seems as though today's problems are unique and that the amount of information to be organized is overwhelming. Denis Diderot and Jean le Rond d'Alembert and the Encyclopaedists in the 18th century felt the same, and they were not alone. The natural historians of that generation, in particular, were busy trying to organize knowledge:

> Amassing the material was simple, however, compared with the problems of processing it to serve the needs of science. Names were cumbrous for the most part, usually consisting of a long string of Latin words which attempted to epitomize the features of the species, and difficult to memorize in consequence; and as it was still far from easy for naturalists to keep in touch with one another and to exchange specimens and books it repeatedly happened that the same species had different names bestowed upon them by different authorities. To add to the chaos, hardly any two persons observed the same system of classification. Inventing systems, indeed, might be said to have been one of the century's fashionable amusements... (Allen, 1976, pp. 38-39)

This has a familiar sound! A universal solution has been sought for generations. No fewer than 116 artificial languages were produced between 1880 and 1914 and none of them was thought successful (Waquet, 2001). Indeed, the long tried and tested Latin language was retained for a further fifty years as the language of both scholarship and the church, at least as a means of communication at scholarly conferences between participants who spoke minority languages. Vatican II spelt the end of the use of Latin in the Roman Catholic Church, though it is still one of the languages in which the newspaper *L'Osservatore Romano* is published weekly. No-one today would think of using Latin as the language of communication at an international conference – nowadays it would most probably be English that was the favoured language, but because it is so much more flexible than Latin and has comparatively few grammatical rules and lacks a clear and comprehensible structure, it is also much less successful as a means of communication between those who are not native speakers. No one for well over five hundred years was a native speaker of Latin, which is partly why it retained its position. Millions of people are native speakers of English, but millions of others are not and they lack the ability to understand in full the meaning of what is conveyed. So, maybe the use of a systematic arrangement, whether called a classification, an ontology or a taxonomy, linked with a verbal system, preferably multilingual, such as a thesau-

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rus is what should be striven for. This brings together all the strands, from linguistics, artificial intelligence, so-called "traditional" systems, the thesaurus, the problems of interoperability and multilingualism and the physical presentation for the user touched upon in this brief survey. It is clear that there is no single solution, or there would not be so many disparate undertakings. But, above all the end-user should not be lost sight of – for he or she is the final target of all these undertakings, a fact that sometimes seems to be overlooked in the higher and more abstruse realms of research in Knowledge Organization.

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