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## ARTICLES

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# **Survey of the Providers of Electronic Publications Holding Contracts with Spanish University Libraries**

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## Abstract

This article describes a qualitative analysis of the electronic scientific contents distributed by the main providers of electronic publications subscribed in the Spanish academic libraries. The purpose of the analysis was to define the providers' global coverage, access architecture, search benefits, interface characteristics, functionalities and services of added value.

## 1. Objectives and Methodology

Over the last few years, the first studies about suppliers of electronic publications have begun to appear. They have focused for the most part on evaluating the use of such publications by the academic community. Examples would be the recent work by [Tenopir](#) (2003) and, in Spain, that directed by [Urbano](#) (2004). Some of these studies, like those by [Pullinger](#) (1999) and by [Eason, Richardson and Yu](#) (2000), provide detailed information about the influence of contents, their coverage and relevance, and about the technical aspects that affect access and use.

The authors of this article have carried out two [previous studies](#) (2004), in which an individualized analysis was undertaken of two providers of electronic content. These were the ScienceDirect package from Elsevier and Wiley InterScience from John Wiley and Sons.

The specific aims of this article lie in the area of comparative evaluation of the coverage of information distributed by five electronic content packages widely used by Spanish university libraries: [Emerald](#), [Kluwer Online](#), [ScienceDirect](#), [SpringerLink](#) and [Wiley InterScience](#). Aims also include analysis and evaluation of the characteristics of providers' interfaces and their various functions and added-value services, in order to acquire trustworthy information on the nature and quality of these systems.

The study was undertaken within the framework of a research project financed by the [University of Leon](#) for the years 2004/2005. The chief objective of this research project has been to gain an overall knowledge of the provision of electronic information, and its distribution and use by the academic community so as to allow universities and their libraries to negotiate with the large multinationals in the publishing sector on the basis of objective criteria on quality and utilization.

The work mentioned previously permitted testing of the validity of the methodology proposed. This establishes indicators that evaluate not just the extent of the materials provided, but also the access structure, characteristics of the interface, functions and added-value services.

The process of evaluation was organized around four parameters (A – D below), within which there were a number of grouped indicators as sub-parameters:

### A) Extension of contents

- *Horizontal Coverage*: Volume of electronic publications.
- *Thematic Coverage*: Collections of scientific disciplines.

- *Vertical Coverage*: Retrospective reach of the contents.

## **B) Access Structure**

*Access Control Systems Used*: Passwords, IP address authentication, digital certification and privileged users (superusers).

*Search and Navigation Performance*: The levels and fields for searches, retrieval language, record of searches, browsing or navigation categories, fields with hypertext links, granularity of searches, and so forth.

*Presentation of Results*: Descriptive data, criteria for ordering results and possibilities of ordering them, formats of publications, display of associated graphs and pictures, and similar.

A variety of queries were carried out so as to gain knowledge of the power of the retrieval tools, the range of simple and advanced search forms, the depth of the initial search, the relationships between the products distributed and the specific retrieval tools for some materials (reference works, laboratory manuals and so on). The authors registered as users of the systems that required registration, in order to have access to capabilities restricted to registered users.

## **C) Characteristics of the Interface**

*Design*: Correct display, suitable layout for information, highlighting of elements, use of intuitively understandable forms and the like.

*Ergonomics*: Characteristics and capacity for selection of items, speed and reliability of download and printing of entries, languages available and possibilities for personalizing the access page.

*User-friendliness*: Syntax of messages, error messages, nature and suitability of user guides and help systems, possible system tips, and so forth.

The searches carried out were used to evaluate the characteristics of the interface and its suitability for users, particularly registered users. Error messages were induced and the help systems were reviewed.

## **D) Functions and Added-value Services**

*Licensing Modes*: Transparency of information and applicable law, contract availability for publications independently of subscription to the printed format, types of licence, guarantees offered to the licensee, rights to back issues,

policies for digitizing, safety and privacy of data, multi-site use and access from outside the institution.

*Functions:* User registers, quotation systems, keyword notification services, quotation alert functions and linking techniques used.

*Added-value Services:* Teaching packages, new item sections, service to librarians, service to authors, integration with library services, standardization, statistical reports, and similar services.

A user profile was created to check requests for alerts and to check the Data Subscriber Interface. For the remaining points we have used the information presented in the licence held and offered by the firms on their central websites.

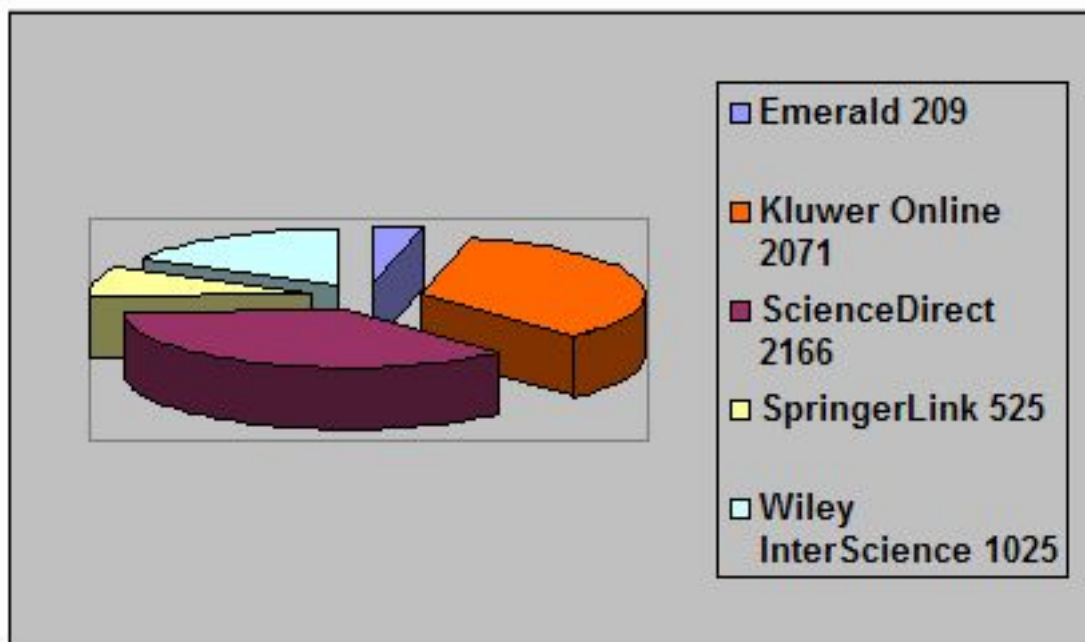
Exploration of the electronic packages was undertaken during the first half of 2004 and was revised during the month of September. For evaluation, the subscriptions taken out by the University of Leon were used, with the exception of Kluwer, which was investigated through an open access route.

Browsing or navigational access by alphabetic order, theme and type of product routes, and via the listings given in information intended for librarians, was used in the case of the Elsevier and the Wiley and Sons packages.

## **2. Horizontal Coverage**

The overall digital content available from the various suppliers was tallied up, including serial publications, electronic books, reference works, laboratory manuals and databases.

ScienceDirect and SpringerLink have a section for series of related books, which for the purposes of this work were considered as individual works.



Kluwer Online and ScienceDirect stand out in contrast to the other providers because of their extensive offerings of electronic content. Wiley InterScience is a particularly good illustration of the three chief platforms for access to electronic materials on scientific and technical topics: digital journals, reference databases, and electronic books. Emerald concentrates on serial publications.

Springer's list is striking, as in its 30 collections of books there are no fewer than 2,537 individual publications. The number of electronic books available from Kluwer, at 1,210, is also relatively large. To a lesser degree, this is also true of ScienceDirect, whose 8 series of books run to 961 individual volumes, while Wiley InterScience has more than 500 on offer. This state of affairs is a consequence of the distribution policies of the publishers themselves, who have the preprints and the necessary technology to make use of the advantages of the electronic format for distribution of contents. Nonetheless, the current characteristics of digitized monographs suggest they are seen more as a complement for the firms' print publishing activities than as a bid to move fully into e-books, exploiting the special features that such products can bring. This is a burgeoning sector that requires progressive acceptance by the academic community. Note should be taken of the section relating to reference works in the lists of Kluwer, Science and Wiley. The last of these three rounds out its materials with laboratory manuals and reference databases. ScienceDirect similarly also distributes databases. From their homepages Emerald, Science and Springer allow easy differentiation of contents available with the specific licence held, those items for which the institution has or does not have a subscription. Materials for which there is a subscription usually provide access to the full text, while non-subscribers only have access to reference details or summaries. As the University of Leon holds no licence from Kluwer Online, it is not possible to determine if this is true for that provider. It is also difficult to determine the full-text contents provided by Wiley InterScience when employing the browsing access routes offered to users from Wiley's web site.

For e-books and reference works at the University of Leon what is provided is limited

solely to tables of contents, prefaces or introductions, and chapter summaries. In the case of serial publications, digitized content not limited to academic papers but also of editorial comments, book reviews, and the like is highly preferred.

It should be noted that the language coverage for the material from all five providers is almost exclusively English, with a small amount of German and French.

### 3. Thematic Coverage

Identification of titles and their attribution to a single theme class so as to evaluate the presence of the various academic disciplines for each of the packages of contents is extremely complex.

Apart from Wiley InterScience, it is impossible to determine correspondences between contents and thematic categories. Wiley InterScience alone provides a complete attribution of items to a single category. Kluwer does this only in the case of books. The remaining providers do not make it possible to discover the principal ascription to a class for each item; indeed it is very frequently the case that one and the same title is listed in several classes.

While linkage of publications to various thematic categories is intended to aid users in their searches, it would be desirable for librarians to be given a thematic organization that does not have overlaps, until a system is worked out to aid access without spreading materials over too many classes or creating confusing expectations.

For the reason just given, the count by categories for Emerald, Kluwer Online, ScienceDirect and SpringerLink shown in the tables below is much higher than the real total shown in the indication of horizontal coverage.

Tables 1 - 5 show the data that the five providers indicate on their homepages.

Following each table are some findings from our evaluation for that particular provider.

**Table 1: Emerald**

<b>THEMATIC CATEGORIES</b>	<b>WEBSITES</b>
Accounting, Auditing and Accountability Journals	9
Continuing Professional Development	21
Education	6
Engineering and Materials Science	17
Environmental Management	4
Food and Nutrition	3
General Management	21

Healthcare Management	10
Hospitality and Services Management	6
Human Resource Management	25
Information Management	14
Library Collection Development and Management	10
Library Management and Information Services	16
Library Technology	18
Logistics and Supply Chain Management	7
Marketing	15
Operations and Production Management	13
Police Management	3
Public Sector Management	13
Quality Management	14
The Built Environment	7
Training	8

The use of 22 categories for a fairly limited set of items like Emerald's might perhaps be seen as overkill. The thematic labels used generally seem very specific and this makes it difficult to divide up their contents. It should be noted that 12 categories include the word "management". This is the term which best defines the materials offered by this provider, specializing in management and to some extent also in economics, education and librarianship.

**Table 2: Kluwer Online**

<b>THEMATIC CATEGORIES</b>	<b>WEBSITES</b>
Arts	3

Astronomy/Astrophysics/Space Science	22
Biological Sciences	207
Business Administration	70
Chemistry	140
Computer and Information Science	175
Earth Sciences	80
Economics	126
Education	89
Electrical and Electronic Engineering	68
Engineering	109
Environmental Sciences	80
Humanities	41
Law	38
Linguistics	35
Materials Science	69
Mathematics	157
Medicine	254
Operations Research/Management Science	42
Philosophy	134
Physics	78



Psychology	212
Social Sciences	155

In the case of Kluwer, the thematic categories used are not the same for serial publications as they are for books. Since it is impossible to establish perfect equivalences, Table 2 shows only the categories that the publisher used for journals, among which it is plain that there is a great deal of overlap. As was true of the previous distributor, the number of thematic classes seems very high, at 23. Moreover, the labels representing them are not of equal weight; sometimes they are very general, like Social Sciences, while others are much more specific, like *Electrical and Electronic Engineering* or *Operations Research/Management Science*.

The greater number of serial publications is concentrated in the areas of *Medicine*, *Psychology* and *Biological Sciences*. Middling categories relate to *Computer and Information Science*, *Mathematics* and *Chemistry*.

**Table 3: ScienceDirect**

THEMATIC CATEGORIES	WEBSITES
Agricultural and Biological Sciences	177
Arts and Humanities	39
Biochemistry, Genetics and Molecular Biology	297
Business, Management and Accounting	126
Chemical Engineering	84
Chemistry	137
Computer Science	141
Decision Science	46
Earth and Planetary Sciences	118
Economics, Econometrics and Finance	107
Energy	56

Engineering	216
Environmental Science	100
Immunology and Microbiology	103
Materials Science	156
Mathematics	86
Medicine and Dentistry	536
Neuroscience	127
Nursing and Health Professions	59
Pharmacology, Toxicology and Pharmaceutical Science	92
Physics and Astronomy	134
Psychology	155
Social Sciences	190
Veterinary Science and Veterinary Medicine	22

If the search categories presented on the ScienceDirect website are considered, it becomes evident how much overlapping there is, with a figure 60% higher than the real total previously noted in the section on horizontal coverage.

First and second places are held by the categories *Medicine and Dentistry* and *Biochemistry, Genetics and Molecular Biology*, respectively, while the thematic class *Agricultural and Biological Sciences* is also noteworthy. In the light of these results, it is clear that ScienceDirect fundamentally concentrates on material in the nature sciences and the health field.

There is a significant distribution of materials over pure sciences (*Chemistry; Mathematics and Physics and Astronomy*, for instance), applied sciences (*Chemical Engineering, Computer Science, Energy, Engineering, Materials Science*, and others) and social sciences (*Business, Management and Accounting; Economics, Econometrics and Finance; Psychology; Social Sciences*, and so on).

As was true of the previous providers, it seems questionable to have such a large number of categories (24), some of them are semantically very close. It might be confusing to users when similar or identical materials are spread over too many

headings. The same title is, in many cases, repeated in three or even four categories. Likewise, there are inconsistencies in the labels used for categories, some being very extensive (*Social Sciences*) and others – the majority – being very specific (*Energy*, *Decision Science*). This specificity of denominations forces the use of double and even triple names for the thematic labels, which does not precisely contribute to the coherence of the system proposed.

**Table 4: SpringerLink**

THEMATIC CATEGORIES	WEBSITES
Chemical Science	56
Computer Science	50
Economics	34
Engineering	64
Environmental Sciences	46
Geoscience	63
Law	6
Life Sciences	143
Mathematics	81
Medicine	198
Physics and Astronomy	78

The number of categories used by Springer, a total of 11, seems more suitable, and they fit their contents better, as well as having wide, clear names as labels. Only the category *Law* has a rather limited amount of content on offer. By contrast, the materials for *Medicine* and for *Life Sciences* are noteworthy in extent.

Paradoxically, it is striking that this provider has a large number of serial publications not assigned to any thematic category, and so inaccessible to browsing by topic or subject area.

**Table 5: Wiley InterScience**

THEMATIC CATEGORIES	WEBSITE S
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Business	50
Chemistry	213
Computer Science	17
Earth and Environmental Science	28
Education	11
Engineering	240
Law	3
Life Sciences	128
Mathematics and Statistics	49
Medicine	155
Physics and Astronomy	13
Polymers and Materials Science	86
Psychology	31
Social Sciences	1

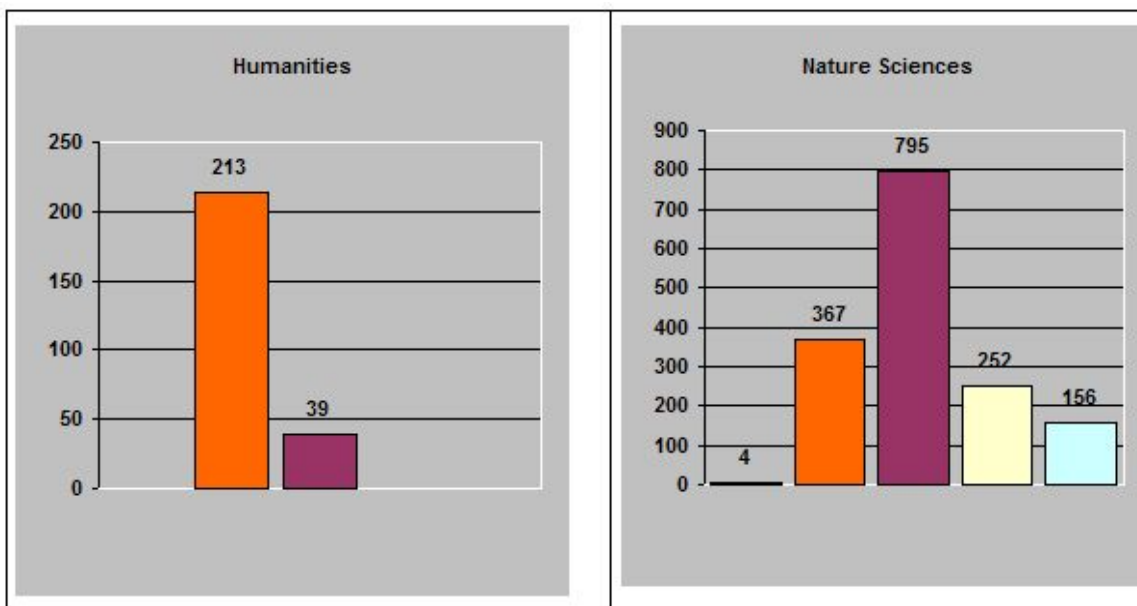
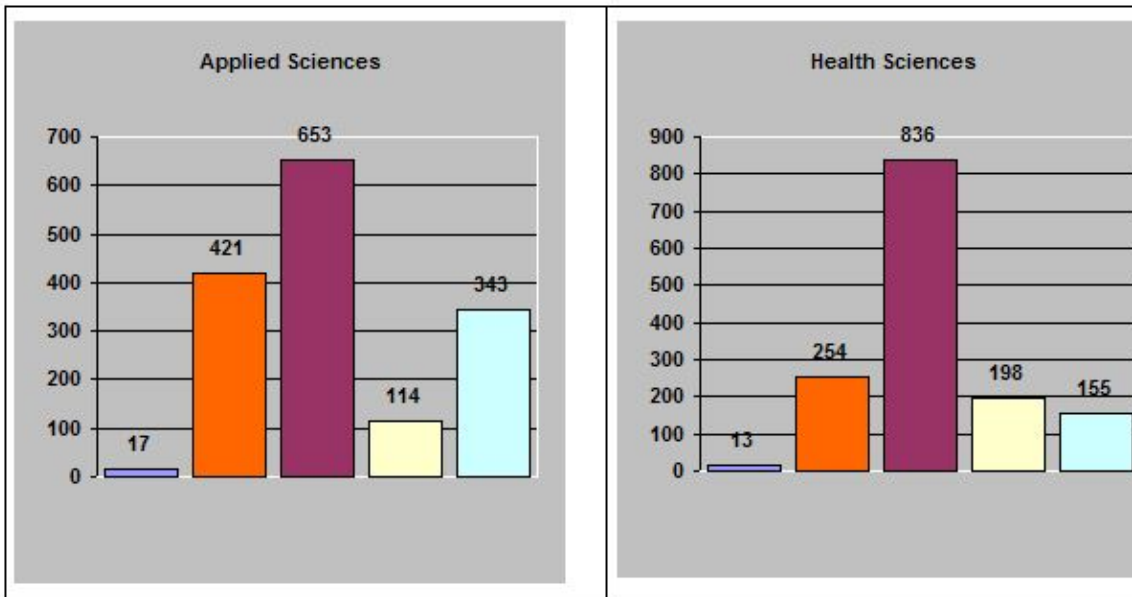
Wiley establishes 14 thematic categories, grouping materials relating to social sciences, pure sciences, applied sciences and nature and health sciences, and having no contents in the humanities. These categories are subdivided hierarchically into subcategories, visible from browser access routes at the provider's site.

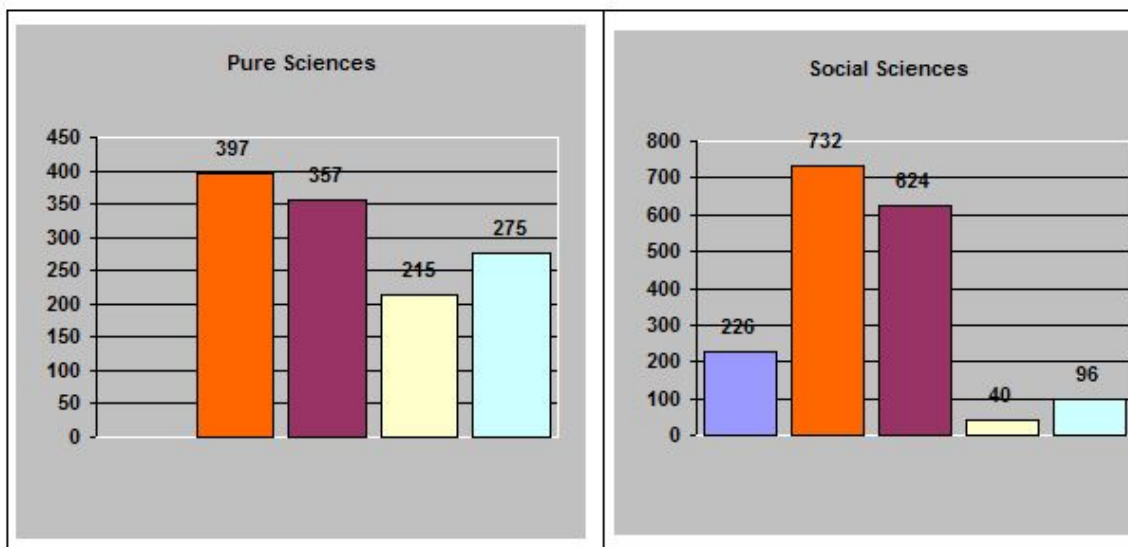
Just four thematic classes: *Chemistry*, *Engineering*, *Life Sciences* and *Medicine* represent almost 72% of the total materials. Three categories can be seen as of middling size in terms of volume of content: *Business*; *Mathematics and Statistics* and *Polymers and Material Sciences*. Since this last class is very specific, it seems even more noteworthy how many items it contains, in particular the number of electronic books.






The contents of five other categories are clearly very limited: *Computer Science*, *Education*, *Law*, *Physics and Astronomy* and *Social Sciences* together represent no more than 4% of the total Wiley offerings.

The grouping of chief classes and the use of better balanced labels seems appropriate, since it copes with categories that are sometimes very general and sometimes very specific. It might be possible to see use of the category *Social Sciences* as inconsistent, as it has just one item under a heading that covers a very broad semantic area. This class might have been used to group together the three items of Law, the 11 items of *Education* and maybe even the 50 of *Business*.

So as to discover the essential theme of the materials distributed by the five enterprises under study, it seemed best to regroup their categories into six thematic areas: Natural Sciences, Pure Sciences, Health Sciences, Social Sciences, Applied Sciences and Humanities. The *Life Science* categories of SpringerLink and Wiley InterScience, having mixed contents, assignable to Natural Sciences or to Health Sciences, were put under the first of these two headings.





	Emerald		Kluwer Online
	SpringerLink		ScienceDirect
	Wiley InterScience		

From the charts above it is quite evident that the five providers of electronic contents studied are for the most part multidisciplinary. However, they basically offer publications from the areas Natural Sciences, Health Sciences and Social Sciences. In contrast, the presence of the Humanities in the packages analysed is limited, this being a field represented exclusively in the Kluwer and ScienceDirect lists.

If the area of Humanities is left out of account as having only a token presence in this supplier's range, the extent of thematic coverage offered by ScienceDirect certainly stands out, being noteworthy even in the area of Pure Sciences, which is the field having the smallest number of items. The primary orientation of this provider is towards Natural Sciences and Health Sciences.

Kluwer brings a considerable contribution to all of the thematic areas. This would be even more apparent if e-books had been separately counted. As for serial publications, Kluwer has particular strengths in Social Sciences, while the extensive range of books on offer from this supplier is mostly in the areas of Applied, Pure and Health Sciences.

The thematic range offered by Wiley InterScience is balanced, having almost a hundred publications even in the area in which it is most limited, Social Sciences. It is particularly strong in the field of Applied Sciences, fundamentally because of its large number of e-books in these disciplines. This provider lacks any Humanities materials. Emerald is quite different, being almost exclusively concerned with the distribution of materials in the Social Sciences, mainly in Economics and Information Science.

SpringerLink, on the other hand, has no involvement in the area of Social Sciences, being strongest fundamentally in Natural, Health and Pure Sciences. Nonetheless, this distributor does have a large number (1,800) of single or monographic publications in the Applied Sciences in its series of books.

## 4. Vertical Coverage

It is not easy to achieve an exact account of the start dates for the publications offered. This is because in some instances there are materials without dates and at other times there are discrepancies in the dates cited. This is made even more difficult by the coincidental complexity of the history of the periodicals involved: there are journals that have ceased publication; back issue files; journals that have changed names, been subdivided, incorporated or merged; and other complications.

The materials offered by ScienceDirect are noteworthy for their long chronological range, with some of its serial publications going back into the nineteenth century. This is also true of "The Lancet" available from Elsevier, with a starting date of 1823, and of the "Journal of the Franklin Institute" from Pergamon, running back to 1826. There is a significant number of titles with coverage back into the 1940s, 1950s and 1960s, for example the journal "Biochimica et Biophysica Acta" from Elsevier, with contents from 1947 onwards. Despite all this, Elsevier's incorporation *en masse* of journals really begins with the 1990s, particularly after 1993. The year 1998 marked a turning point for this distributor's range.

A major increase of the availability of electronic materials during the 1990s is also noticeable for the remaining providers. Specific years are crucial for their introduction in certain instances. Thus, 1994 is a key year in the case of Emerald, while the peak year for the journal ranges of SpringerLink and Wiley InterScience was 1996. For Wiley InterScience, 1996 was the start date for more than 55% of the total number of open publications it offers.

The core year for serial publications for Kluwer Online was 1997. In this firm's extensive book range, which includes publications from 1987 onwards, the high point was 2002, with a total of 520 publications.

The currency of the collections for Wiley InterScience and to a lesser degree for ScienceDirect and Springer Link is evidenced by the large numbers of materials they hold that were published between 2000 and the time of our evaluation.

## 5. Access, Interface and Functions

### Access Structure

A positive view was taken of systems that could recognize Internet Protocol numbers (IPs) for access. Passwords are required only if one desires to log on as a registered user, a feature that is not provided by Emerald. For their part, Emerald, Springer and Wiley all allow access via *Athens login*. For Wiley InterScience, there are superusers accredited for the ArticleSelect service.

The five providers we evaluated permit searching of contents by indicating thematic categories for browsing or navigation. While the basic fields almost always have hypertext links, some suppliers use them more widely than others. In the case of Emerald, links extend to the classification and keywords, and Springer offers an interesting anchor or one-click point redirecting users to a range of possible links or "linking options".

It was seen as positive if systems had simple and advanced search forms, the latter so

as offer a larger number of combinations and limit results by fields. On this point, the search forms for ScienceDirect stand out, being complemented with a Quick Search box.

No major differences are to be noted among the search fields offered. For their part, the retrieval languages for the products considered had a full range of search tools: Boolean and proximity operators, expansion, ranking, and so forth. With the exception of Emerald, the systems that have a search history require the user to be registered, and they do not allow for session histories.

Among the "advanced techniques" for retrieval it was considered of interest if there was an application of stemming techniques, and that use was made of similarity tools in Kluwer Online, Wiley (Related Articles) and Emerald (Key Readings). This last distributor permits limitation of a search by means of content indicators (Originality, Practical Implications, Readability and Research Implications) as well as typology markers (Bibliographical Review, Survey, Comparative Evaluation, Case Study, Theoretical Study and others). In ScienceDirect of note are the specific features intended for seeking chemical and mathematical formulae or searching for personal and place names. As for retrieval by concepts, Emerald provides auxiliary terminological tools, making use of subjects, classification and a reverse index of keywords. Kluwer, for its part, employs a controlled or restricted keyword list for indexing and retrieval of contents.

Positive weighting was given to distributors with positional search boxes, adapted to the point that the user has reached, with an eye to limiting searches to within one publication, to the given volume, or the like. The systems considered here have individualized search engines for those cases in which there is provision of differentiated products: reference works, laboratory manuals and even databases. We considered it an advantage if there were possibilities for ordering results that the systems offer to users, with Wiley standing out through the use it makes of relevance, chronological order of appearance, and title, and with Kluwer adding the possibility of ordering by authors. All the products have both short-form and full-form presentation. The variant forms of information contained in the latter are exploited most effectively by ScienceDirect and by Wiley.

The format most often used for full-text documents is portable document format (PDF). On formatting ScienceDirect stands out because it offers up to five different types of end-user presentation, and it also has a high percentage of documents in hypertext mark-up language (HTML). Individualized treatment of graphs and images, the quality of which can be crucial in some areas of academic endeavour, was positively valued. Finally, only Kluwer incorporates the percentage of relevance attained in the results it gives the user.

### **Characteristics of the Interface**

In general, screens are acceptably readable, with appropriately contrasting colours, use of layout and indentation to facilitate reading, and suitable fonts and sizes for text. The organizational elements employed by all systems also seem appropriate, with icons or buttons that are sufficiently identifiable.

The use of check boxes and of drop-down menus in the forms offered to users was



viewed positively, as was avoiding the direct use of range operators or qualifiers, which normally lead to greater complexity and can cause errors. We also recognize the indisputable usefulness of showing the search strategy employed and of highlighting in the results the specific terms used in the search. The second of these techniques is not in use by Emerald and Wiley.

The ergonomics sub-parameter took into account the facilities for customization available to the system administrator and the possibility of individual personalization of the interface, usually done through user profiles. The widest range here is offered by Kluwer, which allows personal choices for the output formats: typeface, colours, order of elements, and so on, all without need for individual registration.

Matching users' needs in the selection of items was felt to be acceptable and user-friendly in all five systems. Kluwer Online stood out because it has a specific form to use (Search PLUS Navigator) to modify ordering, presentation, and other features. In contrast, interfaces did not provide Spanish-language access. Points were won here by ScienceDirect for offering some of their user guides in several languages, and by Kluwer, which had some limited parts of the interface available in Spanish.

The suppliers that offer higher-grade capacities for export and download, for example by having formats intended specifically for library managers, are those that, at the time of investigation, suffered most from occasional slowness of access, this being the case for Kluwer and ScienceDirect.

With regard to the sub-parameter for user-friendliness all providers performed well relative to the indicator referring to the layout of information in differentiated blocks: formal description of the journal, authors, title, abstract, and so forth. A positive view was also taken of generalized and contextualized help support, which all the systems had to a greater or lesser degree. The user guides, tutorials and frequently asked questions of ScienceDirect stand out among these. However, the various systems' error messages are less well done and seldom are comments displayed to users to indicate possible typing errors or to suggest at least some change to fields when searches are unsuccessful.

### **Functions and Added-value Services**

We consider it necessary for Spanish libraries to be able to have licence agreements drawn up in Spanish and covered by Spanish law when it comes to clearing up any disputes that might arise. Yet Kluwer and Springer have their contracts in English and the legislation applicable to their licences is German and Dutch respectively. For its part, Wiley makes its licences subject to American law.

A positive view was taken of a good range of types of licence and the possibility of access to materials in ways complementary to, or independent of, publication on paper, as is the case of E-Choice at ScienceDirect. It is worth pointing out that publishers like Wiley are currently considering distribution of their materials in a form suitable for personal digital assistant devices (PDAs). All the providers considered had options for pay-per-view. Among the models used for this, attention should be drawn to the novel vouchers or tokens for superusers from Wiley InterScience. If these are used on a publication up to an amount equivalent to 115% of its price, then it is automatically included by the supplier in the using establishment's licence.

In most cases, the guarantees offered to licensees can only be described as limited. Kluwer's commitment has led it to deposit its files at the Online Computer Library Centre (OCLC). The obligation accepted by the distributors to continue providing access to their collections of earlier issues is reasonable, and they have stated policies for back-number files. Guarantees on security and privacy of data are expressly stated by all of the firms.

In what they provide, suppliers have progressively included access routes complementary to what is available through an establishment's intranet, so that researchers can gain access to electronic materials from off-campus locations. With respect to the sub-parameter relating to analysis of functions, it is necessary to point out the unusual case of Emerald, the sole provider not to make use of user registers. For the other suppliers of material, added-value services are largely tied to user registration. ScienceDirect is to be distinguished from the others, because its quotation system indicates articles that have cited the one being viewed and offers quotation alerts on this information. All the suppliers have notification or alert services. The linking techniques employed make use of the digital object identifier system (DOI) and CrossRef. Additionally, Wiley participates in CrossRef Search using Google technology.

The indicators making up the final sub-parameter show that all the suppliers perform adequately. All parts of the serial publications on offer are in electronic form, not just the academic articles in them. Production of teaching materials packs is facilitated and sections showing newly available items are offered. The provision of specific services for librarians and for authors is more uneven. Because of their added value, the Library Connect programme from ScienceDirect and the portals with information for thematic specializations at Emerald deserve particular notice.

ScienceDirect is particularly good with respect to the indicators for integration and standardization, presenting logos, search boxes and explicit facilities for linking with the online public access catalogue (OPAC) of the institution. It works with SGML/XML document type definitions (DTDs) for mark-up of documents and with other similar standards, such as MathML and XLink. Only ScienceDirect and Springer state that they participate in the [COUNTER](#) programme for gathering statistics.

In light of the results obtained for the three parameters established, it is clear that all the suppliers perform adequately on the technical aspects that affect access to the content they offer.

The evaluation of interfaces was in general good, from which it may be inferred that meticulous attention has been paid to their design and to an intuitively understandable user-system interaction.

In some cases there is room for improvement of features relating to access structures, primarily in relation to certain indicators under the sub-parameters for search and navigation capabilities and for presentation of results. While all providers allow searching on various fields and use basic operators, some do not permit recording of the history of searches and, with the exception of Emerald, there is no session history recorded.

It is the final parameter, functions and added-value services, where the differences from one supplier to another are at their greatest. The provision of added-value

services (course packs, news, and the like) is adequate, as are the variety of access routes (such as the availability of off-site use, pay-per-view modes, and so on). In contrast, the biggest deficiencies are to be seen in the functions sub-parameter, in those indicators relating to the quotation systems in use and to the possibility of requesting quotation alerts.

The results obtained by ScienceDirect are to be noted, since, besides being the clear leader in the functions and added-value services area, ScienceDirect also brings together a powerful search engine, a flexible interface and a wide range of choices for display.

Wiley Interscience is noteworthy for holding the second place for all of the parameters. The good results for Kluwer's interface, and the correctness and balance of Emerald for all the parameters evaluated should likewise be mentioned.

## **5. Discussion**

The evaluation of materials presented above makes it feasible to note the extensive general coverage, density per subject and long back runs of ScienceDirect. The analysis likewise points up the striking position of Kluwer, even more so in the area of electronic books. The horizontal coverage of information is similarly considerable in the Wiley InterScience package. These products, like Springer's, are encyclopaedic in nature, neglecting only the area of Humanities, present solely in Kluwer and, to a lesser degree, that of Science. By contrast, Emerald stands out because of its specialization and orientation towards social sciences.

The thematic organization for most of the suppliers considered could be improved. Only SpringerLink presents categories that are adapted to its contents under clear and self-explanatory labels. A smaller number of thematic classes for Emerald, Kluwer Online and ScienceDirect might be a better option, with subdivision into subcategories where necessary, the solution that Wiley InterScience successfully adopts.

It would be desirable for suppliers of packages to provide more trustworthy information about the contents covered: publications available, subjects to which they are assigned, what their retrospective reach is, whether they are complete texts or abstracts, formats available, and other points. It is difficult for licensees to check on these matters, which are critical matters for licensees in the contractual relationship being established.

It seems appropriate to recommend the introduction of terminological tools to aid in carrying out conceptual searches, which are not satisfactorily covered simply by the use of keywords. The organization of results might in addition give priority to integrating solutions derived from similarity and clustering techniques.

Similarly, some aspects relating to standardization could be improved, as also the use of statistical reporting on the basis of the COUNTER model, essential for management of the collection by licensees.

It is necessary to carry out further studies complementary to the work reported here, so as to investigate the academic relevance of the electronic materials on offer, the overlap between providers and the facilities for access and functions provided by each of the systems. Such investigations into their quality, together with others covering the data on use of the products of electronic information suppliers, would be an essential

empirical contribution to the international debate on the way academic periodicals will be acquired by the university libraries of the future and play a central role during the renegotiation of licences.

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