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## Whole Environment Research on Distributed and Collaborative Digital and Non-digital Networked Libraries in Scotland



*The Centre for Digital Library Research at Strathclyde University is described and set in the context of a range of Scottish initiatives and projects, including the Scottish executive's own 'Digital Scotland'. Work is ongoing in a number of areas ranging through interoperability in distributed catalogues and related dynamic landscaping via the integration of standards-based collection descriptions databases, regional and national digital library and learning environment initiatives, and other topics such as subject-based interoperability, electronic books design, small communities electronic journals publishing, and a range of related strategic and policy issues. The Centre's aim is to have a Scottish and UK focus, whilst also contributing to international research efforts in the area. Its work to date is characterised by an aim to study the whole environment in which distributed and collaborative digital and non-digital libraries are developing rather than dealing with individual facets in isolation.*

Erforschung von digitalen und konventionellen Verbundbibliotheken in ihrem Umfeld

*In diesem Artikel wird das Centre for Digital Library Research an der Universität von Strathclyde beschrieben und in Zusammenhang gesetzt mit einer Reihe von anderen schottischen Initiativen und Projekten, darunter auch das von der schottischen Regierung betriebene „Digital Scotland“. Das Centre ist in vielen Bereichen tätig. Sie reichen vom Recherchezugriff auf verteilte Kataloge bis zu den damit verbundenen Oberflächen, die sich den Benutzern anpassen durch die Einbindung von standardisierte Aufnahmen verwendenden Datenbanken, von regionalen und nationalen digitalen Bibliotheken und von Initiativen zum Lernumfeld. Es behandelt aber auch Themen wie inhaltlicher, gegenseitiger Zugriff, das Layout von elektronischen Büchern, die Publikation von elektronischen Zeitschriften kleinerer Arbeitsgruppen und weitere Fragestellungen mit planerischer und politischer Dimension. Das Zentrum konzentriert sich zunächst auf Schottland und Großbritannien, möchte aber auch internationale Forschungsbemühungen unterstützen. Ziel der bisherigen Arbeit war es, digitale und konventionelle Verbundbibliotheken in ihrem Umfeld zu untersuchen und sich nicht auf individuelle, isolierte Aspekte zu konzentrieren.*

Les bibliothèques virtuelles et traditionnelles dans son ensemble et en collaboration

*Le „Centre for Digital Library Research“ de l'université de Strathclyde s'insère dans le contexte d'une série de projets écossais dont celui du Gouvernement, le „Digital Scotland“. Cette entreprise touche divers domaines tels que l'interactivité des catalogues de recherche par le biais de l'intégration des bases de données des collections existantes mises en place par les bibliothèques nationales et régionales, ainsi que divers autres programmes allant d'un moteur de recherche par vedette-matière à des ouvrages numérisés, des journaux électroniques locaux et enfin des renseignements sur les politiques et stratégies concernant ces projets. Son travail, en effet, a jusqu'à présent eu pour principal objectif d'étudier dans son ensemble et en collaboration les bibliothèques virtuelles et traditionnelles, plutôt que de se concentrer sur un projet unique et isolé.*

### Background

Digital library developments in the UK date back to 1990 and the purchase of a networked version of Science Citation Index for all universities through a national site licence. The growth of such networked data services, the Follett Report and the electronic libraries programme have all been fully described elsewhere<sup>1,2</sup>. Strathclyde University<sup>3</sup> in Glasgow was an eager participant in several of these ventures, developing services such as BUBL<sup>4</sup>, managed by Strathclyde since May 1991, and undertaking research such as the CATRIONA project<sup>5</sup> which heralded an ongoing interest in interoperability in distributed systems at the institution.

In the late 1990's political developments in the UK led to a much more devolved form of government, closer to the

German federal model than to the old centralised British state. One consequence of this was the realisation that much of Scotland's future health would depend on the development of a knowledge economy and that univer-

- 1 Rusbridge, C.: The UK Electronic Libraries Programme. In: D-Lib Magazine, December 1995. <<http://www.dlib.org/dlib/december95/briefings/12uk.html>>.
- 2 Law, D.: The development of a national policy for dataset provision in the UK. Vol. 1 (1994) pp. 103-116.
- 3 See <<http://www.strath.ac.uk/>>.
- 4 See <<http://bubl.ac.uk/>>.
- 5 D. Nicholson and M. Steele: CATRIONA: a distributed, locally-oriented Z39.50 OPAC-based approach to cataloguing the Internet. In: Cataloguing and Classification Quarterly, V. 22 Nos. 3/4 (1996) p. 127-142.

sity research would be an underpinning feature of this. Much interest was shown in developments in smaller countries such as Singapore and Finland<sup>6</sup>, which were seen as role models for the emerging Scottish economy. Further the new Scottish government announced from its creation that it would seek to establish a „digital democracy“<sup>7</sup>.

Again in the late 1990's, the Joint Information Systems Committee (JISC<sup>8</sup>), a UK national agency responsible for Higher Education Networking and Services proposed that every institution should have an information strategy. Strathclyde was an early adopter of this proposal and was one of the first institutions to develop such a strategy. This had and continues to have wide ramifications for teaching and learning, but one focus was recognised as the provision of digital library services.

Within Scotland itself there is a vibrant information science sector. Although only two universities (Robert Gordon<sup>9</sup> and Strathclyde) have longstanding classic departments of information science with the function of training librarians, at least four more have departments or groups working on elements of the information sector<sup>10</sup>. In addition the National Library of Scotland (NLS)<sup>11</sup>, the Scottish Library and Information Council (SLIC)<sup>12</sup>, and the Scottish Confederation of University and Research Libraries (SCURL)<sup>13</sup> have been keen proponents of digital libraries and research and have a history of working collaboratively in these areas. For example, SCURL and the NLS were instrumental in bringing about the digitisation of the Statistical Accounts for Scotland (1791-99 and 1834-45)<sup>14</sup>, with SLIC subsequently assisting SCURL and the NLS to meet the cost of service maintenance, and SLIC, who advised the Scottish Executive on aspects of its Digital Scotland<sup>15</sup> initiative, sought and obtained advice from SCURL, the NLS, and others when compiling its recommendations<sup>16</sup>. There is a wide recognition that in a small country moves towards significant resource sharing will be essential and the spirit of co-operation is particularly evident in this area, as many of the projects described below will illustrate.

The implementation of the information strategy at Strathclyde required the appointment of a Director of Information Strategy who would serve on the senior management team of the University. Late in 1998 the University appointed a former librarian to the post with a wide portfolio covering the library, academic computing, administrative computing, media services and educational systems (a mixture of training, networked teaching and the creation of a virtual university). Internally the welding of these disparate elements into a focus for change has proceeded. Externally it was soon agreed that the opportunities which existed nationally and internationally and the existing track record in research would best be developed by the creation of a research centre based on digital libraries.

### CDLR – Centre for Digital Library Research

Several bids were made to a number of funding agencies to expand or extend existing work (BUBL was continuing, CATRIONA II<sup>17</sup> had just finished, and the CAIRNS<sup>18</sup> distributed catalogue project was ongoing<sup>19</sup>). Swift success with some of these, together with the consequential recruitment of staff then allowed the formal

announcement of the Centre for Digital Library Research<sup>20</sup>. Initially based in the Library but with a base in the Department of Information Science, it has progressively shifted more towards the academic side of the University and currently has a staff of 13 undertaking research on a spread of digital library issues ranging from the eboni project<sup>21</sup> which is studying the relationship of the design of electronic books to information intake by their readers<sup>22</sup>, through INSPIRAL<sup>23</sup>, which aims to identify and critically analyse the issues around linking virtual learning environments and digital libraries<sup>24</sup>, to HILT<sup>25</sup>, which is looking at interoperability issues in the area of subject terminologies<sup>26</sup>. At the same time the ethos of Strathclyde (created as a technical university) has always been towards near-market research. The founder's charter describes it as „a place of useful learning“ and this has always coloured its view of the type of research required, a fact echoed by the CDLR's aim of combining „theory with practice in innovative ways with the aim of being a centre of excellence on digital libraries issues“, and reflected in the number of CDLR projects which aim to do useful research with a view to practical outcomes.

From its inception, the CDLR has focused its research efforts on factors affecting the development of digital li-

6 See <<http://www.scotland.gov.uk/digitalscotland/international.htm>>.

7 See <[http://www.scottish.parliament.uk/welcoming\\_you/ff5.htm](http://www.scottish.parliament.uk/welcoming_you/ff5.htm)> and <<http://www.scottishparliamentlive.com/mainchamber.html>>.

8 See <<http://www.jisc.ac.uk/>>.

9 See <<http://www.rgu.ac.uk/>>.

10 See Johnson, Ian M.: Library and Information Education and Research in Great Britain. Some observations on the current situation and speculation on future trends. In: *Bibliothek. Forschung und Praxis* 24 (2000) 1, pp. 27-35.

11 See <<http://www.nls.uk/>>.

12 See <<http://www.slaite.org.uk/Slic/slichome.htm>>.

13 See <<http://scurll.ac.uk/>>.

14 <<http://edina.ac.uk/StatAcc/>>.

15 See <<http://www.scotland.gov.uk/digitalscotland/Default.htm>>.

16 Organising Information: A Report for Digital Scotland (available on SLIC web-site soon).

17 Nicholson, D.: University management of locally-created electronic resources: the CATRIONA II project. In: *The Electronic Library*, 17 (4) August 1999. p. 247-255. ISSN 0264-0473.

18 <<http://cairns.lib.strath.ac.uk/>>.

19 Dennis Nicholson et al.: CAIRNS that go clump in the night. In: *Library Technology*, Vol 3 (5), November 1998. Also available electronically: <<http://cairns.lib.gla.ac.uk/article.html>>.

20 See <<http://cdlr.strath.ac.uk/>>.

21 See <<http://cdlr.strath.ac.uk/projects/projects-eboni.html>>.

22 Monica Landoni, Ruth Wilson and Forbes Gibb: Looking for guidelines for the production of electronic textbooks. In: *Online Information Review*, 25 (3) 2001.

23 <<http://inspiral.cdlr.strath.ac.uk/>>.

24 F. Çuna Ekmekçioğlu and Sharron Brown: Linking online learning environments with digital libraries: institutional issues in the UK. To be published in LIBRI, issue no. 4, December 2001.

25 See <<http://hilt.cdlr.strath.ac.uk/>>.

26 Dennis Nicholson, Susannah Wake and Sarah Currier: High-level Thesaurus Project: Investigating the Problem of Subject Cross-searching and Browsing Between Communities. In: Twelfth International Conference on New Information Technology: Global Digital Library Development in the New Millennium (NIT 2001), Beijing, China, 29-30 May, 2001. pp. 219-226.

braries in a context in which non-digital resource collections are still deemed to be of value, and has done so on the assumption that much of this development will occur in a distributed and collaborative environment. Some of the detail of its work has been documented in two earlier papers, the first covering developments during the first year of the Centre's life<sup>27</sup>, the second<sup>28</sup> covering year two. This paper is an update of these earlier works and completes the summary of developments to October 2001.

### Whole Environment Research

Much of this work takes place within discrete projects and initiatives, each of which focuses upon one or a few facets of the total environment in which the development of digital (and non-digital) libraries takes place. Factors such as the research or development issues prominent at a particular point in time, the interests of both funding bodies and the community in general, and the requirements of scientific rigour, all demand such an approach. Of equal importance, however, is the need for research and development outcomes to be relevant, practical, and appropriate, and this, in its turn, demands a more holistic strategy. As a consequence, it is true to say that what characterises the work of the CDLR to date is an aim to study the whole environment in which distributed and collaborative digital and non-digital libraries are developing – to study individual facets certainly, but to do so with the explicit intention of improving our understanding of the whole (developing) environment.

This has a number of implications for the context in which the Centre must pursue its research, the minimum requirements being:

- a rich technical and issues matrix that mirrors, as far as possible, the complex inter-relationships evident in the developing environment itself,
- associated collaborative community involvement to ensure that a similarly representative and relevant human and inter-organisational matrix is also available for study and able to influence outcomes and implement research recommendations,
- agreed overarching community-based aims as regards the developing digital and non-digital libraries environment – aims that direct research activities on an ongoing basis and adjust with time in line with the results of these activities.

### Community-based aims

If outcomes are to be relevant, practical, and appropriate, research and development must take place in the context of community agreement as to aims. At time of writing, formal mechanisms to facilitate agreement on community requirements (see 8. below) have only just been implemented and in-depth discussions on precise aims and objectives have yet to take place. There is, however, a reasonable level of agreement amongst most key players on the Scottish scene on the need to further the development of a coherent virtual learning, information and research landscape for all Scottish citizens that will readily inter-operate with similar systems in the UK generally, in Europe, and beyond. There is also what might be called a dominant assumption, based on work over a number of years in this area in Scotland, that

such a development will be based on the following building blocks:

1. Scottish distributed union catalogue based on the embryonic CAIRNS service that aims to:
  - be cross-sectoral and cross-domain in scope, encompassing libraries from the HE, FE and public library sectors, for example, and also information and learning services from the museums and archives domains,
  - cover both hard-copy and electronic resources, but offering both hybrid and selective approaches,
  - offer selective landscaping for users driven by an integrated collections database (for example, at present the system can dynamically generate subsets of the total distributed catalogue according to subject strength and region, but the aim is to extend this to allow restriction to services relevant to particular types of user or different domains or sectors).
2. User landscape control for staff through a mechanism that will allow staff across Scotland to manage their own data in the collections database, functionality being developed within the SCONE<sup>29</sup> project.
3. Associated collaborative collection management agreements co-ordinated through joint use of the same collections database.
4. Eventual extension of the landscaping mechanism to make the system adaptive to every kind of user (primary school students, for example, may require an entirely different facilities and terminologies to secondary school pupils or, indeed, University researchers).
5. Reliable constituent service interoperability through adopting international standards, particularly in respect of metadata and protocols such as Z39.50.
6. An agreed co-operative infrastructure to facilitate the sharing of common services, skills, resources.
7. An independence of approach in constituent services, and individual sectors and domains – in particular through encouraging the development of local, sectoral, or domain based portals able to utilise collaboratively developed and maintained central services and data.
8. Co-ordination at a human and inter-organisational level through the Confederation of Scottish Mini-clumps (COSMIC<sup>30</sup>), a particular focus being the compilation of a joint research and development plan which will clarify community aims in some areas and add detail in others.

Whether this approach will persist in the long term will be determined by the community itself, working – initially, at least – in the context of the COSMIC joint R&D plan, and informed by ongoing collaborative research

27 Nicholson, D.: Researching and Developing Virtual Scotland – A Perspective from the Centre for Digital Library Research. In: *The Electronic Library*, 18 (1) February 2000. p. 51-62. ISSN 0264-0473.

28 Law, D. and Nicholson, D.: Digital Scotland, the relevance of library research, and the Glasgow Digital Library Project. In: *Program*. 35 (1) January 2001. p. 1-14. ISSN 0033 0337.

29 See <<http://scone.strath.ac.uk/>>.

30 See <<http://CoSMiC.cdlr.strath.ac.uk/>>.

and development efforts in Scotland and elsewhere. For the present, however, it is a reasonable guide to the preferences of the community, and is accordingly the context for much of the Centre's research and development work.

### Collaborative Community Involvement

Community involvement is important to ensuring relevant, practical, and appropriate outcomes not just because it allows the community to influence the research and development process but because, in the context of the development of a distributed learning, information and research service for all Scottish citizens, collaborative community involvement is a vital element in the creation, subsequent maintenance, and future development of the envisaged service and, as such, is itself an element of the research environment the Centre is studying. Facilitating such involvement has therefore been a primary CDLR concern over the whole of its short history, and has been pursued through the creation – with others – of COSMIC, through the development of a Scottish co-operative infrastructure, with COSMIC as a key element, and through the SLIC-funded Scottish Portals Initiative.

Its importance was first recognised in the CAIRNS distributed catalogue project, a collaborative project supported by SCURL and managed by Glasgow and Strathclyde Universities. The following passage from a paper<sup>31</sup> summarising the outcomes of the project and sketching out paths for future development provides an insight into why the view developed:

„Human interaction between clump<sup>32</sup> members at a number of levels is as essential to interoperability as things like Z39.50 itself and cataloguing standards. This, in turn, will only work efficiently if the group is relatively small. In CAIRNS, this is seen as implying the need to work both with bodies serving particular sectors, regions, and other groupings, such as SCURL, ALF<sup>33</sup>, and particular domains, such as SLIC or SMC<sup>34</sup> or SCA<sup>35</sup>, but also an organisation like CoSMiC that will enable inter-sectoral, inter-domain, and other levels of co-ordination to take place.“

At the current state of development at least, and possibly even beyond that, it is the CAIRNS experience that good levels of interoperability within the clump require good communications at the human level. This is true both in respect of creating an interoperable system in the first place and in maintaining it. It may be the case in the future that everyone is applying the same cataloguing and indexing standards, and using systems that index in similar ways, implement Z39.50 in an identical fashion, communicate information about what information is where in a record, and so on, but until that is true human interaction is needed to ensure that interoperable systems are created and maintained. Even in the longer term this seems likely to be true in some areas, and is, in any case, likely to be required for other elements of the co-operative process, such as collaborative collecting and control of portal landscapes. The belief in Scotland is that we are just about the optimum size at the national or macro level but still require further devolution to sectoral, regional or domain level to ensure good human interaction in this respect. COSMIC is thus designed to allow these levels of interaction, echoing

both the variable landscaping possibilities of the dynamic clumper, the requirements of a flexible approach to collaborative collection management, and political, financial, and geographical realities. We believe that a combined regional, sectoral and domain-based approach at these various levels is also the best way of ensuring that the system develops and is maintained along lines appropriate for, and hospitable to, the various user groups likely to use the clump.

COSMIC was set up during CAIRNS with support from the various Scottish regional library co-operatives (ALF, SESLIN, Grampian Information, TAFLIN) and others such as the University of the Highlands and Islands and the Glasgow Digital Library project. A confederation of independent organisations, services and projects working together to foster and sustain co-operation between Libraries, Archives, Museums, Electronic Learning Services and others actively engaged in building and developing ‚virtual Scotland‘, it now has additional support from SLIC, SCURL, the National Library of Scotland, and SCAN. It is one part of the developing Scottish co-operative infrastructure (SCI) shown in diagrammatic form in table 1 below, the other aspects being:

- a CAIRNS-based distributed Scottish union catalogue with a dynamic landscaping mechanism driven by an associated collection descriptions database and potentially capable of generating virtual portals for member organisations where this is desired,
- a SCONE-based collection descriptions database with staff updating facilities and collaborative collection management support, aiming in time to be one part of a cross-searchable collections system that also includes independent archives (SCAN) and, in time, museums collections databases,
- central co-operative support for distributed, otherwise independent, Scottish portals based on these core services.

The SLIC-funded Scottish Portals Initiative is the current focus for the development of both the SCI and its various constituent parts, including COSMIC. It aims to co-ordinate a co-operative standards-based approach to building and maintaining a coherent virtual landscape for learning, information, and research in Scotland encompassing participating web-based services in the Archives, Libraries, Museums, and public service domains by working with member organisations to:

- facilitate their use of centrally co-ordinated data and services in the creation of institutional, regional, sectoral, domain-oriented, and other ‚local‘ portals,
- reduce duplication of effort and expenditure through promoting and supporting:

1. collaborative e-resource cataloguing based on the use of OCLC's CORC service. Membership will be free for low-medium level users whose institutions are not already CORC members,

31 Nicholson, D. et al.: Towards a Scottish Portal: The Past, Present, and Future of CAIRNS. In: The New Review of Information Networking. Vol. 6, 2000, pp. 17-35.

32 A ‚clump‘ is a group of cross-searchable catalogues.

33 Ayrshire Libraries Forum.

34 Scottish Museums Council.

35 Scottish Council of Archives.

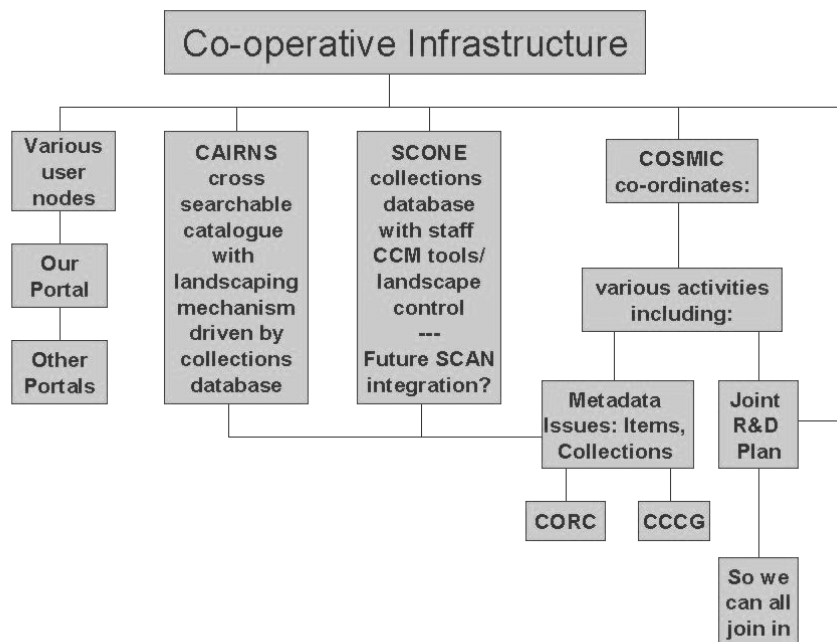


Abb. 1 Scottish Co-operative Infrastructure

2. collaborative collection development, collaborative maintenance and use of core service addressing, directory, and collection description data through the SCONE and SLAINTE based SCAMP service or through the development of similar services in other communities (e.g. the Scottish Archives Network SCAN service or a similar product arising out of the Scottish Museums Council's Collections Audit),
  3. collaborative use of common software facilities where these exist,
  4. collaborative staff training, support, and information services,
- promote inter-service interoperability through agreeing and maintaining common or inter-compatible metadata, indexing, and terminology standards,
  - create and maintain a co-operative infrastructure for Scottish information services,
  - agree a joint research and development plan, with sectoral and domain-specific sub-divisions, and jointly support applications to funding bodies by member organisations wishing to work on parts of it on behalf of the group,
  - co-ordinate inter-organisational activities through COSMIC,
  - maintain a web-site and a cross-domain e-mail discussion list (specifically <scotslink@jiscmail.ac.uk>) with a Scottish focus. (Scotslink is a ,news and views' e-mail discussion list for all Museums, Archives, Libraries, and Electronic Services staff with a Scottish base or focus. An early topic of concern is expected to be the co-operative provision of ,seamless access' to distributed learning, research, cultural, and public information resources whatever their form or location).

COSMIC and the SCI now provide the human and inter-organisational level integration required to underpin the

CDLR's many co-operative projects and allow and encourage the community to influence the research and development process. They also provide a context in which collaborative community involvement itself can be researched and developed, a fact already being exploited by a number of CDLR projects (see below).

### A Rich Technical and Issues Matrix: CDLR Projects

As will be evident from the list of building blocks listed under 1 to 8 above, the envisaged distributed, internationally integrated, collaborative learning, information and research landscape for all Scottish citizens is a complex beast. Related research and development is thus best conducted in a context that mirrors, as far as possible, the complex inter-relationships evident in the

developing environment itself and the Centre has taken steps whenever possible to create and develop such an environment, partly through its choice of projects, partly through proposals that identify inter-relationships between projects and aspects of projects as key facets of the research problem for which funding is being sought. A brief look at the current CDLR projects and initiatives will help illustrate this.

### ASPECT

ASPECT<sup>36</sup> aims to create a digital archive of ephemera from the first Scottish Parliament election. A relatively small locally-funded initiative associated with the Glasgow Digital Library project (GDL – see below), ASPECT is concerned mainly with the creation and presentation of digital content but raises interesting technical and wider issues when the need to integrate it into the GDL, with other local content services, and with the Scottish scene generally is considered. Questions raised include:

- whether to create metadata at site level, election date level, political party level, or individual digital object level, keeping in mind possible current and future relationships to other services,
- consequent relationships to landscape building mechanisms in both the GDL and the wider Scottish scene described and accessed through CAIRNS and SCONE (see below),
- how this political collection of recent interest might act as a modern day lead in to the Victorian parliamentary papers learning environment proposed under VISCONT (see below),

36 See <<http://gdl.cdlr.strath.ac.uk/prototype/aspect/>>.

- given the availability of other text-based materials relating to devolution, and the possible importance of ASPECT in Scotland, could the learning and research environment proposed in VISCONT be profitably utilised in building a more significant resource based on the ASPECT materials?

## BUBL

BUBL is a Web-based information service offering selective access to quality Internet resources covering all major subject areas, plus a specialist LIS service. Now over ten years of age – old for an internet service – BUBL is moving into a new era. Technical and other issues here include those relating to human level considerations posed by the need for training and information service support for the staff of a distributed digital and non-digital library system and questions arising due to the need to integrate the BUBL LINK catalogue of internet resources into a distributed catalogue of digital resources in Scotland. Some examples here are:

- How must BUBL's existing support for LIS professionals be adjusted to encompass a more interactive relationship relevant to the growing distributed digital and non-digital scene and become more inclusive in a cross-sectoral sense?
- What metadata adjustments are required to ensure Z39.50-based interoperability with other digital collections, particularly in respect of the GDL and digitisation content projects and the question of the possible need for changes in subject terminology to ensure interoperability?
- How can the various BUBL subject and class browse interfaces so popular with users be retained in an era where the underlying catalogue is distributed?

## CAIRNS and the Scottish Portals Initiative

CAIRNS as a project has now finished and an embryonic distributed catalogue service is now supported. This encompasses most Scottish university catalogues plus other services such as GDL, BUBL LINK, SLAINTE<sup>37</sup>, the National Grid for Learning (Scotland) database, and the National Library of Scotland databases. SPI, described fully earlier in this paper, is essentially a CAIRNS follow-up project aiming to co-ordinate a co-operative standards-based approach to building and maintaining a coherent cross-sectoral and cross-domain virtual landscape for learning, information, and research in Scotland. Technical and other issues arising here are almost without number but include:

- standards issues relating to encompassing museums and archives services into a distributed catalogue at both item and collection description levels,
- issues relating to building a co-operative distributed digital resources catalogue based on OCLC's CORC service (the CDLR has a subscription to this which OCLC has agreed to let other Scottish services use and which SLIC is funding),
- relationships between co-operative cataloguing through CORC and collaborative collection development through the SCONE SCAMP gateway (see below),
- how best to deal with human level issues relating to interoperability (CAIRNS has already done some

community based research in this respect through it's the CIGS cataloguing standards group which not only agreed standards within the SCURL organisations but also taught CAIRNS valuable lessons about facilitating interoperability through human level interaction),

- a raft of issues relating to community building in general through COSMIC and the co-operative infrastructure described earlier,
- issues relating to encompassing XML-based services into the distributed catalogue.

## Digital Information Office

Strathclyde University's Digital Information Office<sup>38</sup> (DIO) is responsible both for the professional management of electronic resources created within the University and the co-ordination of University-wide interest in commercially acquired electronic information resources. Arising in part from the pre-CDLR CATRIONA II<sup>39</sup> project, the DIO is funded to

- manage electronic resources created or purchased by University,
- create a metadata repository and associated service interface,
- identify or develop related standards and policies; e.g. IPR guidelines,
- further the commercial exploitation of locally created resources (e.g. digital course materials or research papers),
- co-ordinate the university wide purchase of electronic information,
- create an 'information culture' in the University through awareness raising and training.

Technical and other issues are again numerous but include:

- developing a collection development policy encompassing both locally created and purchased electronic information,
- encouraging other institutions involved in the GDL to adopt similar policies,
- integrating the DIO database of local resources into the distributed GDL catalogue based on CAIRNS Z39.50-based technologies,
- working with other institutions in the context of the Open Archives Initiative.

## EBONI

EBONI<sup>40</sup> – Electronic Books ON-screen Interface – is an 18-month project funded by the JISC/DNER. It aims to develop a set of recommendations for publishing educa-

37 A service run by the Scottish Library Association and the Scottish Library and Information Council – see <<http://www.slainte.org.uk/>>.

38 See <<http://dio.cdlr.strath.ac.uk/>>.

39 Nicholson, D.: From Information Technology to Information Culture: The CATRIONA II Project and Strathclyde University's Digital Information Office. Managing the Digital Future of Libraries, Moscow, 18-19 April 2000. In: Russian Digital Libraries Journal Vol. 3 (2000) Issue 3. Available electronically on the conference web-site at: <<http://www.rsl.ru/tacis/2000/200003/nicholson/nicholson.en.html>>.

40 See <<http://eboni.cdlr.strath.ac.uk/>>.

tional works on the Web which reflect the needs of academics and a diversifying population of students throughout the UK. This will be achieved through an evaluation of texts which are found to be representative of approaches to the design of learning and teaching material on the Internet. Issues of interest here include:

- What can EBONI teach us about service interfaces in CAIRNS, GDL, ASPECT, VISCONT, and so on?
- What can it teach us about interface requirements in the SAPIENS electronic journals project (see below)?
- What can it teach us about users and user evaluation of screen-based services and packages?

### Glasgow Digital Library<sup>41</sup>

The Glasgow Digital Library (GDL) is a city-wide initiative funded initially by the Research Support Libraries Programme<sup>42</sup> in the UK and aims to create a collaborative, cross-sectoral, digital collection that will be of significant value, both to researchers in Glasgow, and to researchers elsewhere with an interest in Glasgow-oriented or Glasgow-based research collections. Dependant on CAIRNS technologies for its distributed catalogue, the GDL is seen by the Centre as potentially being our 'Digital Scotland in microcosm' in that it aims to be cross-sectoral and cross-domain and to serve every type of (Glasgow) user. It has also spawned various other mini digitisation projects such as ASPECT, the SCRAN<sup>43</sup>-funded digitisation of samples from Springburn Community Museum<sup>44</sup> and historical material on 'Red Clydeside', with the latter also being extended with a New Opportunities Fund grant. Technical and other issues of interest related to the GDL include:

- human level co-operative mechanisms at a metropolitan area level, including issues related to cross-sectoral and cross-domain organisations and issues relating to co-operation between competing organisations (the GDL currently comprises the three Universities, ten Further Education colleges, and the Public Library Service in Glasgow),
- metadata issues relating to aggregating and disaggregating electronic materials from FE colleges, universities and the public library as required,
- the use of the CAIRNS landscaping mechanism to dynamically generate the GDL sub-set of the larger distributed catalogue and also offer a GDL specific look and feel,
- interface issues relating to the need to serve different user groups of varying age, interests, and educational level,
- policy and strategy issues relating to the creation and maintenance of a large digital library aiming to serve all users in a large metropolitan area,
- collaborative collection development issues in the same context,
- authentication and access control issues for purchased materials and valuable materials not offered free to non-GDL institutions.

### HILT

The HILT<sup>45</sup> – High-Level Thesaurus – project is a one year project jointly funded by the JISC and the RSLP. The purpose of the project is to study and report on the

problem of cross-searching and browsing by subject across a range of communities, services, and service or resource types (Libraries, Museums, Archives, the DNR, clumps, the DNER, the RDN, bibliographic databases, numeric data, and others) – to research the problem, analyse and document its exact nature in detail, determine whether it can be solved and, if so, how, and attempt to reach a consensus on the issue across the various communities, services and initiatives identified by the project as stakeholders. HILT is at the draft final report stage at the moment. It found a strong consensus across the Archives, Electronic Services, Library, and Museums communities in favour of a more practically focused follow-up pilot project that would develop, and accurately determine the full costs and benefits of, a networked, user and machine responsive, interactive route map (see diagram in appendix A) to the terminologies used by the communities and the relationships between these terminologies. This outcome echoed the project's own findings and is the basis of its main recommendations<sup>46</sup>. HILT arose out of the SCONE project which had issues to address relating to subject-based interoperability within and between distributed catalogue systems such as CAIRNS, M25, RIDING, and Music Libraries Online<sup>47</sup>, and between the collection strengths database driving the CAIRNS dynamic landscaping mechanism and the subject schemes in use in services within its landscapes. Technical and other issues here include:

- determining the best subject approach to take when aiming to integrate CAIRNS and its subject-based collection strengths database with the new SCONE named collections database (see below),
- determining how best to cater for and service Scottish terminologies in the context of the proposed interactive route map should it be implemented,
- if the HILT recommendations are implemented, determining how best to integrate the proposed interactive route map into the Scottish distributed catalogue service and its dynamic 'clumping' or landscaping mechanism,
- ensuring ongoing community involvement in the maintenance of subject schemes used in Scotland and in the maintenance of agreed standards in the various sectors and domains.

### INSPIRAL

INSPIRAL<sup>48</sup> (INVeStigating Portals for Information Resources And Learning) aims to identify and critically analyse the issues around linking virtual learning environments (VLEs) and digital libraries. The outcomes of

41 See <<http://gdl.cdli.strath.ac.uk/>>.

42 See <<http://www.rslp.ac.uk/>>.

43 See <[www.scran.ac.uk/](http://www.scran.ac.uk/)>.

44 See samples at <<http://gdl.cdli.strath.ac.uk/prototype/springburn/>>.

45 See <<http://hilt.cdli.strath.ac.uk/>>.

46 See Nicholson, D. and Wake, S.: Interoperability in Subject Terminologies. To be published in the New Review of Information Networking, 2002.

47 See <<http://cairns.lib.gla.ac.uk/links.html>>.

48 See <<http://inspiral.cdli.strath.ac.uk/>>.

this project are expected to feed into a range of other CDLR projects, informing on issues such as:

- the creation of the proposed VISCONT learning and research environment (LRE),
- the relationship between this environment and the digital library environments developing in the GDL and elsewhere in the CDLR,
- issues that relate the work of the Digital Information Office in regard to the creation and ongoing maintenance of locally-created electronic course materials to the GDL and, indeed, the electronic services of Strathclyde University Library,
- landscaping requirements of users in VLEs and digital libraries.

## SAPIENS

SAPIENS<sup>49</sup> (Scottish Academic Periodicals: Implementing an Effective Networked Service) aims to assist smaller Scottish publishers whose journals are not yet available online, by providing server space, technical support, a high-profile gateway and various value-added services, and thus removing some of the barriers to entry into the electronic environment. The project has only just begun but is expected to teach much in relation to such issues as:

- user requirements in respect on electronic journal interfaces (possible links here with EBONI),
- the problems and economics of electronic publishing in minority subject areas,
- the potential for improving the economics of such enterprises through global exposure over the global internet (lessons which may well assist other services with a Scottish focus),
- the potential for – and economics of – electronic journal publishing to support small communities in Scotland (Digital and Non-digital libraries support staff, for example).

## SEED

The SEED<sup>50</sup> (Scottish Executive Education Department) project aims to aid researchers by adding existing subject descriptions of research collections to the Research Collections Online (RCO) database, establishing a means to keep the data current, and extending this data to include collections held in public libraries and elsewhere in Scotland. Issues of interest here include:

- the adequacy – proved within SEED – of the collection description schema used in the HE-focused SCONE project to adequately describe collections in public libraries,
- the integration of SLIC's manual annual exercise to gather information for the hardcopy publication, Scottish Library and Information Resources, with the attempt to build on the early work of SEED and SCONE to add Scottish collections to the SCONE named collections database,
- the potential for supporting this updating exercise on the web in future years through a development of the SCONE SCAMP gateway.

## SCONE

SCONE (Scottish Collections Network Extension) is an RSLP-funded Scottish collaborative collection management and collection description project. SCONE is developing the CAIRNS gateway by adding a Scottish collections finding service and also offering staff a portal to manage collaborative collecting. An extensive project web site is in place<sup>51</sup>, offering, amongst other things, access to:

- the Scottish Collections Access Management Portal (SCAMP<sup>52</sup>), which offers a range of tools and facilities for collaborative collection management and is developing an embryonic mechanism to allow staff across Scotland to update or add descriptions of their own collections,
- the Scottish Collections Database<sup>53</sup> which describes about 3 000 Scottish 'named' collections, including some from the public libraries sector identified within SEED with help from SLIC.

Technical and other issues here are again too numerous to list in full, but include:

- the integration of the CAIRNS landscaping mechanism into the new SCONE collections database and (ultimately) the integration of this into the SCAMP updating mechanism,
- a range of associated granularity issues and their implications for navigation at various levels in the CAIRNS service (and sub-sets such as the Glasgow Digital Library) or its future incarnation after integration into SCONE, related metadata, screen design, user help, and service terminology,
- a range of issues relating to non-labour-intensive methods of measuring the strength of subject collections, of describing these helpfully in associated metadata, and of utilising this in the most helpful way in generating screens for users,
- integrating the SCONE collections database with other similar databases in other domains or other parts of the UK or the world (will these be cross-searched using Z39.50, for example, at a higher hierarchical level within services like CAIRNS?),
- various subject-related interoperability issues described above under HILT,
- widening the scope of the CAIRNS dynamic landscaping mechanism to generate sectoral, domain, and user-type landscapes (amongst others).

## VISCONT

VISCONT<sup>54</sup> will research, consolidate, digitise and provide access to original material relating to social, political and economic conditions, events, people and actions from the Victorian era and develop contextual information to supplement and enrich this material. The materials will be intelligently and interactively embedded in a single, multi-level, timeline-based, learning and research environment allowing progressive learning and

49 See <<http://cdlr.strath.ac.uk/projects/projects-sapiens.html>>.

50 See <<http://seed.cdlr.strath.ac.uk/>>.

51 See <<http://scone.strath.ac.uk/>>.

52 <<http://scone.strath.ac.uk/scamp/index.html>>.

53 <<http://scone.strath.ac.uk/Service/Index.cfm>>.

54 See <<http://cdlr.strath.ac.uk/projects/projects-viscont.html>>.



research for all – schoolchildren, researchers, students, lifelong learners, the retired, and so on. Further, a variety of access points will enable users easily to locate complementary resources either within VISCONT, other projects in an associated larger consortium led by the British Library, or elsewhere on the Internet, and will also lead users into VISCONT from other projects with material linked either in time or by topic (e.g. Red Clydeside is not contemporary with the VISCONT content but does have links to its subsidiary topics such as labour and trade unions, housing and health). Technical and other issues of wider interest here include:

- the design, creation and ‘mechanics’ of the learning and research environment itself, which may well have lessons to teach about other possible learning environments based on other digitisations,
- metadata requirements for the intelligent aggregation of digital objects – landscaping screens dynamically from metadata at the content level, perhaps from distributed sources,
- the interface requirements of various user groups (the initial intention is to offer different access levels to pupils of various ages, FE or HE students, academic researchers, residents interested in their communities, politicians, families, and journalists),
- dynamic landscaping for these groups based on metadata describing suitability of levels of content for the various user types,
- intelligent inter-site navigation at a variety of levels.

As will be clear from the various notes above, this summary of inter-relationships is by no means exhaustive. However, it should illustrate the importance attached in the CDLR to the whole environment approach referred to earlier, and go some way towards showing the degree of success attained in this area to date. If our research and development outcomes are to be relevant, practical, and appropriate, the technical and issues environment in which we operate must mirror the richness and complexity of those aspects of the world at large we study. So far we have made good progress towards this end, but the process is, and will be, ongoing for the foreseeable future – a key facet of our preferred holistic approach that will continue to develop as the Centre itself does.

### The Path Ahead

Of the projects listed above, only INSPIRAL, SEED and HILT are expected to end this year, and there is some possibility that HILT and SEED will spawn funded follow-up projects. We can, moreover, confidently expect the outcomes of all three to feature in ongoing work, an inevitable and wholly welcome consequence of our conscious attempts to focus on inter-related projects and issues. INSPIRAL outcomes, for example, should help guide our work towards the creation of a VISCONT learning environment that integrates intelligently with external digital libraries, and the work of SEED and HILT will influence our attempts to integrate CAIRNS and the older collections strengths database at its heart with the newer Scottish named collections database developed under the SCONE project.

The remaining projects each have deliverables and milestones to meet in the next six to nine months, but it would be neither practical nor particularly illuminating to

go into each one in any detail here. However, the following brief outlines of some of the highlights of issues likely to be tackled in the near future should give a flavour of what lies ahead:

*The Scottish Portals Initiative* will be pushing forward on a number of fronts with a view to taking forward the aim of creating a co-operative standards-based approach to building and maintaining a coherent virtual landscape for learning, information, and research in Scotland encompassing participating web-based services in the Archives, Libraries, Museums, and public service domains. Aiming (in some cases through seeking additional funding) to move towards:

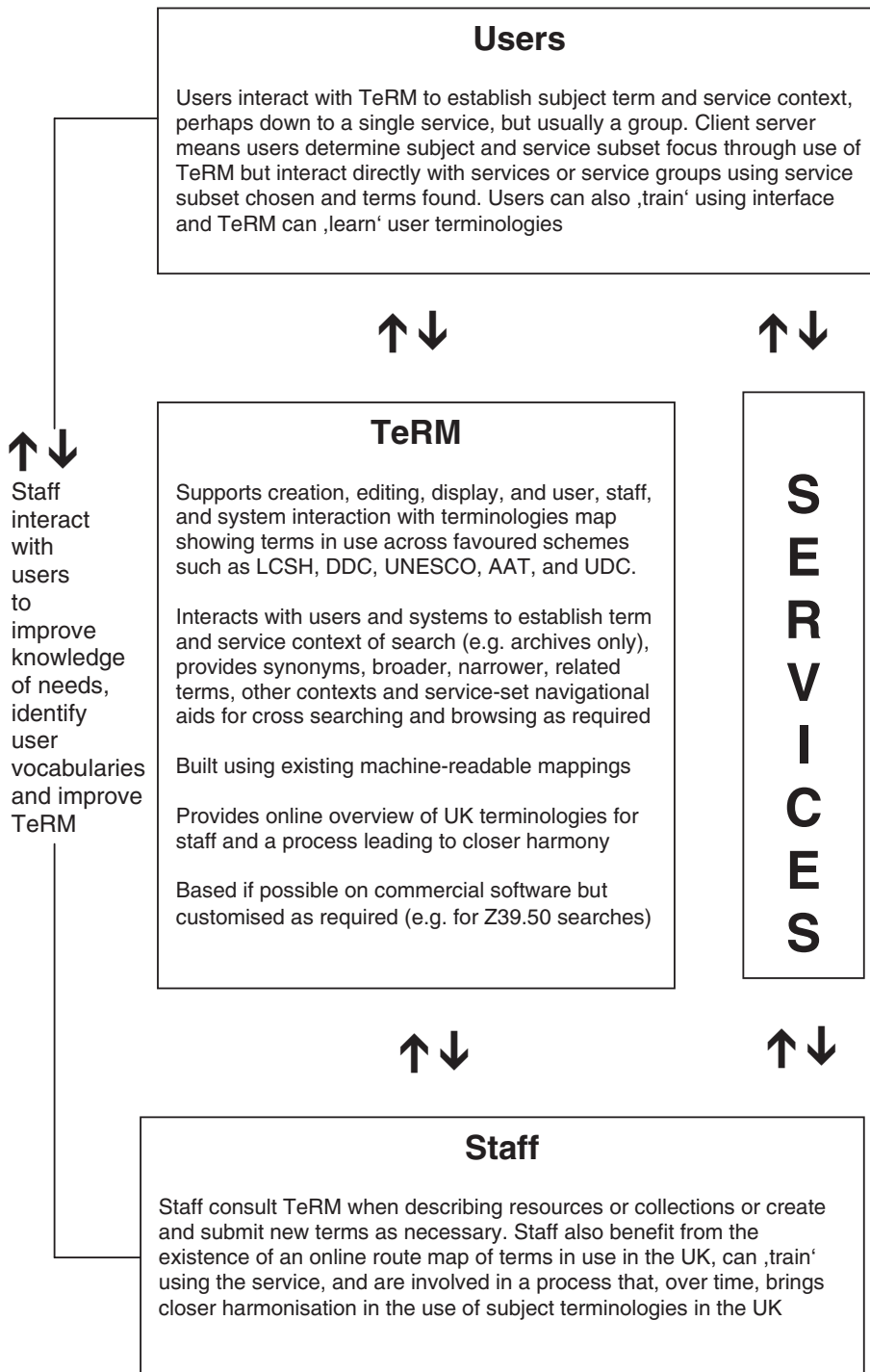
- a harmonisation of subject schemes based on the results of HILT in various services seen as key elements in the initial implementation of this landscape,
- the integration of CAIRNS into the new SCONE named collections service following this harmonisation of schemes,
- the creation of a single Scottish portal based on SCONE/CAIRNS, SLAINTE, BUBL LINK, and other services, again following the subject schemes harmonisation process,
- the development of an embryonic Scotland-wide shared cataloguing co-operative for electronic resources based on CORC,
- the incorporation of co-operating New Opportunities Fund digitisation projects into the landscape (e.g. East Dunbartonshire Public Libraries digitisation of local studies collections),
- the development of the SCAMP staff portal and the promotion of collaborative collection development by this means,
- the firming up of plans to facilitate and support the use of centrally co-ordinated data and services in the creation of institutional, regional, sectoral, domain-oriented, and other ‘local’ portals.

Within this overall context, the *Glasgow Digital Library* will be attempting develop a demonstrator of its own proposed distributed catalogue and associated browsing interfaces based on appropriate Z39.50 compliant databases at the Centre and across the city. Depending upon their own stage of development at a particular point in time, these may include:

- a database of Glasgow-related electronic resources,
- Strathclyde University’s DIO database,
- existing catalogues of digital collections in the City, including BUBL LINK and the National Grid for Learning (Scotland) database,
- the databases of various digitisation projects at the CDLR, including VISCONT, ASPECT, Red Clydeside, and Springburn Community Museum,
- the databases of similar projects across the city, including Glasgow University’s ‘Glasgow’s Story’, and Glasgow Caledonian’s Centre for Political Song and Glasgow Public Library’s ‘Virtual Mitchell’ collections.

Work will also be taking place to share electronic resource cataloguing through joint use of CORC and to develop associated collaborative collection development policies and procedures in conjunction with SCONE. It is also hoped to make progress towards the goal of dynamically generating the GDL ‘mini-clump’ from the total Scottish distributed catalogue based on associated collection descriptions.

### Appendix A. Interactive Terminologies Route Map (TeRM) Diagram



Note: Examples can be seen at <www.wordmap.caom> with <www.oingo.com> and <vivisimo.com>.

With help from the DIO and others, *SAPIENS* will begin the process of:

- examining the case for a centralised Scottish electronic journal service which might enable and encourage smaller publishers to make existing and new journals available in electronic form,
- designing and build a demonstrator service, which will deliver current journals from a representative selection of publishers via a common gateway,

- developing and launching an operational service, together with a marketing strategy to ensure that it is self-sustaining within a year of the end of the project.

*SCONE* will be building on its links with two other RSLP funded projects working in similar areas; Research and Special Collections Available Locally (RASCAL) at Queens University Belfast and Mapping Wales at the University of Wales Aberystwyth. All three of these projects aim to improve resource discovery in order to enable researchers to access relevant collections. Together these three projects have formed a *Celtic Collections Group* so that they might develop a shared approach to the implementation of the RSLP/UKOLN collection description schema and pursue other common interests.

*COSMIC* will begin work in a number of areas, including the creation of a joint R&D plan for its various cross-sectoral and cross-domain member organisations. This list of possible entries for inclusion will give a flavour of what is likely to be covered by the plan:

- mini-clumps and dynamically generated virtual gateways to COSMIC member organizations?
- standards and guidelines and automation or upgrade plans,
- collaborative Collection Management – regional and similar focus

- but with national co-ordination through COSMIC,
- the *SCONE* gateway,
- strategy for Scottish Material,
- strategy for lifelong learning in Scotland,
- library and information plans,
- other areas of common interest – e.g. Collection Development Policies,
- cross-domain co-operation at regional, national and other levels,

- inter-access policies,
- a common library card scheme,
- resource sharing in Scotland,
- interoperability.

Note that this list is not complete, it is an initial list for discussion only.

*VISCONT* will begin to create a single, richly interwoven, multi-level, learning and research environment based on a timeline, focusing on six topics:

- housing,
- the National Health Service,
- industry and the work place,
- Labour and trade unions,
- transport,
- education.

Within this overall context, it will aim to deliver:

- a web-based service providing digitised content not available elsewhere on the Internet,
- new perspectives, through content untouched and unread for over a century, on events that occurred and people who lived during the Victorian era,
- opportunities for a range of learners and researchers, including HE and FE students, schoolchildren, life-long learners, and other citizens to discover materials to assist them in their current area of study, or provide new areas of study and to do so in a user-friendly environment,
- a progressive learning and research environment that allows initial interest to develop into 'deep' research,
- the opportunity for people to see how key political actions were recorded and how they related to historical events in their communities,
- materials which developers of curricula, coursework, and syllabi can refer to, use, exploit and otherwise integrate into the learning patterns of their students,
- links to audited resources of interest, providing people with „discovery paths“ through historical, social, economic and political information pertaining to the period in question,
- links to and from a range of other web-sites, covering related materials, for example a ‚community museum‘, with a range of pictures covering the six *VISCONT* themes for the appropriate period,
- links to and from more recent events where appropriate.

Like the rest of the projects mentioned above, *VISCONT* will develop in the context of the total environment being built at the CDLR.

### Concluding Remarks

The CDLR at Strathclyde University is a relatively new research centre, based in Glasgow in Scotland. Its focus is on issues surrounding the creation, development, maintenance and management of digital libraries and on related matters of strategy, policy, interaction at a human and inter-organisational level, and integration with online but otherwise non-digital libraries. Although built around research and development interests in these areas at dating back to the early 1990's, the Centre itself is only in its third year of operation, but has already built up a solid set of externally-funded research and development activities and is playing a key role – with others – in the development of a distributed and collaborative

digital library and learning environment in Scotland. A critical element of the institutional commitment to „useful learning“ is an unswerving commitment to work with key national stakeholders in developing relevant and operational rather than theoretically perfect but unimplemented systems. In line with the Centre's aim to have a Scottish and UK focus, whilst also contributing to international research efforts in the development of digital libraries, much of its work has very practical relevance to the Scottish and UK scene, but also has wider relevance, as evidenced by the interest it has already attracted across Europe (Germany<sup>55</sup>, Croatia<sup>56</sup>, Spain, Greece<sup>57</sup>, Portugal), the US<sup>58</sup>, and the world generally (Russia<sup>59</sup>, China<sup>60</sup>). A key characteristic of its work to date is a holistic and inclusive approach to the issues in this field, an approach believed in the CDLR to be important to ensuring relevant, practical and appropriate research and development outcomes. With the much-heralded information age still in its infancy, the Centre comes into being – particularly in the Scottish context – at a vital juncture. There is much work to be done in its chosen field and – at the moment at least – the future looks hopeful, interesting, and – dare we say it – even exciting!

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