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# SPEIR: Developing a Common Information Environment in Scotland

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## Structured Abstract

**Purpose:** To report on the work of the SPEIR project and indicate its relevance beyond the Scottish information environment. SPEIR was funded by the Scottish Library and Information Council to identify, research, and develop the elements of an internationally interoperable *Scottish Common Information Environment* (SCIE) for Library, Museum and Archive domain information services, and to determine the best path for future progress. A key focus was to determine the distributed information infrastructure requirements of a pilot Scottish Cultural Portal being developed in parallel with the SPEIR work, building on existing pilot initiatives such as the CAIRNS distributed catalogue and landscaper, the SCONE collections database, the SCAMP staff portal and an embryonic organisational infrastructure based on the Confederation of Scottish Mini-cooperatives (CoSMiC).

**Methodology/Approach:** A series of practical pilots were undertaken. These were underpinned by relevant desk and field research and conducted within an overarching holistic approach to developing the distributed environment.

**Practical implications (if applicable):** Key outcomes included the creation of a single upgraded integrated service incorporating an extended distributed catalogue, collections database, and landscaper, the creation of a pilot distributed digital library, the development of open-URL based facilities to permit portals to incorporate 'canned searches' of the catalogue, the collections database, the SDDL, and other compatible services, an illustrative pilot Scottish terminology mapping service, and various organisational infrastructure and professional support improvements.

**Originality/value of paper:** The embryonic technical and organisational infrastructure reported may provide a model for other small countries (or regions within larger countries) seeking a coherent approach to the development of an interoperable information environment.

**Keywords:** Common Information Environment, Interoperability, Organisational infrastructure, technical infrastructure, Library Cooperatives, Scotland

## Introduction

The primary focus of this paper is the development and maintenance of a coherent, globally interoperable, distributed information environment in a small, culturally distinct, geographical area (Scotland), operating within a larger political unit (the United Kingdom). The paper will be of interest to professionals concerned with any aspect of the creation of an integrated global information environment, but the specific concern is with related technical and organisational infrastructure requirements in a small nation (or a geographical unit of similar size within a larger nation). The focus of the work was a project called Scottish Portals for Education, Information and Research (SPEIR), funded by the Scottish Library and Information Council (SLIC). Major background elements were UK-level initiatives on the development of a coherent information environment for Higher and Further Education by the Joint Information Systems Committee (JISC, 2004) on the one hand, and on the creation of a UK-wide common information environment on the other (Miller, 2004a; 2004b). Key assumptions

underlying the work were that local interoperability at various levels is a vital component of global interoperability, and that infrastructural issues entailed in the development and maintenance of an interoperable information environment are organisational as well as technical.

SPEIR ran from February 2003 to September 2004, and was managed by the Centre for Digital Library Research at Strathclyde University (CDLR, 2004). With SLIC's agreement, community stakeholders were represented in the project by the Confederation of Scottish Mini-Cooperatives (CoSMiC), an organisation whose members include SLIC themselves, the National Library of Scotland (NLS), the Scottish Further Education Unit (SFEU), the Scottish Confederation of University and Research Libraries (SCURL), regional cooperatives such as the Ayrshire Libraries Forum (ALF), and representatives from the Scottish Museums Council and from the Scottish Archives community.

Background information on SPEIR, including the project plan, dissemination activities, and reports of the joint CoSMiC Task Group and SPEIR Steering Group can be found on the project web-site at <http://speir.cdlr.strath.ac.uk/>. There is also supplementary information in publications covering the project and associated issues (Dunsire and Macgregor, 2003a; Macgregor, 2003; Nicholson, 2003b; Nicholson and Macgregor, 2003). Background information on CoSMiC can be found at <http://cosmic.cdlr.strath.ac.uk/>, with CoSMiC and SPEIR inter-relationships covered at <http://cosmic.cdlr.strath.ac.uk/ci/currentinitiatives.htm> and [http://cosmic.cdlr.strath.ac.uk/cosmic\\_resources/resourcesmenu.htm](http://cosmic.cdlr.strath.ac.uk/cosmic_resources/resourcesmenu.htm).

## **Aims: A Common Information Environment for Scotland**

In general terms, the project was charged with the further development of the 'Scottish Co-operative Infrastructure' (Nicholson and Macgregor, 2003), building on existing pilot initiatives such as the CoSMiC organisational infrastructure (<http://cosmic.cdlr.strath.ac.uk/>), the CAIRNS Z39.50 distributed catalogue and landscaper (<http://cairns.lib.strath.ac.uk/>), the SCONE collections database (<http://scone.strath.ac.uk/service/>), and the SCAMP staff collections management portal (<http://scone.strath.ac.uk/scamp/>). Specific aims were to:

- Conduct basic research into the distributed information infrastructure requirements of a Scottish Cultural Portal pilot (Winch, 2003) and a related proposal to integrate a number of public library Z39.50 enabled catalogues into CAIRNS.
- Develop associated pilot facilities by enhancing existing facilities or developing new ones;
- Ensure that both infrastructure proposals and pilot facilities were sufficiently generic to be utilised in support of other portals developed by the Scottish information community.
- Ensure the interoperability of infrastructural elements beyond Scotland through adherence to established or developing national and international standards.

Since the Scottish information landscape is taken by CoSMiC members to encompass relevant activities in Archives, Libraries, Museums, and related domains, the project was, in essence, concerned with identifying, researching, and developing the elements of an internationally interoperable *Scottish Common Information Environment* (SCIE), and of determining the best path for future progress.

## **Key Objectives**

Within these general aims, a range of specific objectives were agreed, the most significant of which were the following:

- To act as a pilot 'interoperability focus' for the SCIE with a view to ensuring interoperability within the portal environment at all levels, including, in particular, technical standards such as Z39.50, metadata standards and terminologies.

- To prepare a specification for a pilot terminologies server and implement illustrative facilities, drawing on the work of the JISC-funded HILT Project (Nicholson 2002; Nicholson 2003a, 2003c; Shiri et al 2004)
- To specify an extension of existing pilot facilities in the embryonic SCAMP staff portal with a view to providing a multi-domain mechanism for professionals involved in building and sustaining cultural 'collections' to collaborate online.
- To design alternative 'look and feel' themes for associated infrastructure elements in the CAIRNS, SCONE and SCAMP pilots.
- To conduct research and development work to permit facilities in the co-operative infrastructure like CAIRNS, SCONE and SCAMP to serve as central facilities and data sources, not only for the Cultural Portal Pilot but for other similar portals in future.
- To establish and report on the best mechanisms for exploiting OCLC's CORC shared cataloguing facility (now Connexion) for collaborative working and standards assurance in both the Cultural Portal Pilot and Public Libraries, with particular reference in the latter case to its use in the collaborative cataloguing of internet resources (Connexion, 2004).
- To identify digital and non-digital collections relevant to the Cultural Portal for SCONE.
- To determine requirements and working mechanisms for the seamless integration of a significant number of Public Library catalogues into CAIRNS and the web enabling of the catalogues.
- To take similar action in respect of the integration of Public Libraries into related initiatives such as the SCONE collections facility, the CAIRNS collection strengths landscaper, and the SCAMP collection description and collection strengths updating facilities.
- To determine requirements and working mechanisms to allow any proposed Public Library portals to utilise data held centrally in CAIRNS and SCONE and to encompass, where possible, Cultural Portal elements in a similar way.

## **Methodologies**

The methodology employed combined an overarching holistic approach to developing the whole distributed environment with a series of practical pilots underpinned by appropriate desk and field research.

### *A 'Whole Environment' or Holistic Approach*

The project intentionally built on and integrated concurrent and historical work carried out in a range of other relevant projects - work funded by a variety of funders (SLIC, Scottish Executive, JISC, SHEFC, E-Lib, RSLP, the British Library) and initiated by a range of organisations (SLIC, SCURL, the NLS, CoSMiC, CDLR). This was done partly of necessity – because of the need to build on existing embryonic services such as CAIRNS and SCONE, and to integrate Scottish developments with those elsewhere in the UK and internationally – and partly as a deliberate strategy that views a 'whole environment' or 'holistic' approach to developing the distributed information landscape as essential to the successful creation of a coherent and stable infrastructure with ongoing cross-community support (Nicholson & Macgregor, 2002; Law et al, 2002).

On the research front, this strategy means studying every facet, not in isolation, but in the context of the whole distributed environment (and vice versa), and considering interaction in both local and distributed environments at every operational level from the technical to the human (including user, staff, and organisational levels). On the development front, it means ensuring that solutions work for the environment as a whole and all of its facets, not just for the particular facet in which the development takes place. The assumption behind the holistic approach is that the distributed information environment must grow as a single entity, and staff, user, and organisational cultures must grow with the distributed environment if the end result is to be an integrated, user-responsive whole (Nicholson & Macgregor, 2003).

In recognition of the organisational element of this strategy, SPEIR was steered by the Task Group of the inter-organisational and inter-domain Confederation of Scottish Mini-Cooperatives (CoSMiC), with specific project deliverables pursued within the context of the CoSMiC Joint Research and Development Plan. The Plan is an initiative designed by SPEIR to coordinate collaborative work on the creation and ongoing development of SCIE under six headings *Coordination and Management*, which encompasses both CoSMiC itself and the R&D Plan; *Local User Environments*, which covers both portals and physical environments like libraries; *Shared Central Services*, which includes the CAIRNS distributed catalogue, the SCONE collections database, the embryonic SCAMP staff portal and the terminologies pilot; *Interoperability Forum*, which covers standards and their implementation; *Collaborative Activities*, which encompasses things like collaborative cataloguing and collecting; and *Professional Support*, which covers training, current awareness and staff representation mechanisms.

#### *Practical Pilots Backed by Desk and Field Research*

Within this overarching strategy, the focus was primarily on practical pilots backed up by desk and field research, some major examples being:

#### Organisational Infrastructure and Professional Support Pilot

The project used the CoSMiC Task Group and the CoSMiC R&D Plan and its processes as pilot mechanisms for the organisational structures required to support an interoperable and coherent SCIE. In addition, related CoSMiC 'outreach' initiatives such as descriptive leaflets (on CoSMiC itself, the R&D Plan, and shared services), the WIDWISAWN electronic quarterly, the Scotslink e-mail list for archivists, librarians, and museum professionals, the pilot Scottish projects database, and the annual Electric Connections conferences, were used as professional support mechanisms for the initiative.

#### Pilot Portal Facilities and Associated Requirements

SLIC and SPEIR staff built a pilot 'Scotland's Culture' portal, together with a range of specific local functions (such as a pilot cultural facets landscaper), and facilities for interfacing the portal with shared central services ('canned' searches of CAIRNS and SCONE). The creation of the pilot and plans for its future development were informed by an investigation of the literature on user requirements as regards portal features on the one hand (Nicholson et al, 2004, Appendix 4), and a survey of web-services literature on the other (Nicholson et al, 2004, Appendix 5). The impact on interface themes of e-GIF standards (Cabinet Office, Office of the e-Envoy, 2004) and the Disabilities Discrimination Act (HMSO, 2001) was also investigated.

#### Public Libraries Collections and Z-Servers

The extension of CAIRNS and SCONE to encompass Public Library requirements entailed practical work on incorporating Public Library Z-servers in CAIRNS and Public Library collections in SCONE and was backed up by field research into the configuration of local Z-servers and firewall conditions and desk research into issues such as collection development in Public Libraries relating to electronic resources and the applicability or otherwise of the Conspectus-based methods of measuring collection strength used in the CAIRNS collections strengths landscaper to Public Library circumstances (Nicholson et al, 2004, Section 2.3).

#### Scottish Distributed Digital Library Pilot

A pilot Scottish Distributed Digital Library (SDDL) was created, based initially on three databases. This was underpinned by associated desk and field research on metadata requirements, functionality issues, and cooperative cataloguing using SLIC's OCLC Connexion subscription.

#### Illustrative Pilot Scottish Terminologies Server

An illustrative pilot Scottish terminologies server was created, based on an extension of work done previously on a pilot terminologies server for the JISC Information Environment (Nicholson, 2003c). In common with most other countries in the world, Scotland has interoperability problems in the distributed environment caused by the use of a plethora of different subject schemes by the various services in the SCIE. SPEIR was asked by SLIC to begin the process of identifying a means of resolving the issue, partly with a view to improving subject cross-searching services to users in medium term, partly in recognition of the probable long-term need to be in a position (for example, in the Scottish Distributed Digital Library) to begin in time to exploit the possibilities of the semantic web (Berners-Lee et al, 2001). HILT tackles the problem of cross-searching by subject in a multi-scheme environment by mapping schemes together, a widely used approach to providing interoperability in these circumstances (see, for example, CARMEN (2000), MACS (2004), LIMBER (2001), and RENARDUS (2002)). As with some other projects (Heery, 2001; Koch et al, 2001; Saeed and Chaudhury, 2002), DDC is used as the basis for the mapping, in HILT's case acting as a spine that links the schemes. In SPEIR, this approach was adapted to provide an illustrative mapping of Scottish terms like 'aliment', 'bairn', and 'provost' to DDC, and via it, to other schemes such as LCSH. An automatic link to the CAIRNS distributed catalogue provided a practical illustration of value in terms of retrieval.

#### Collaborative Working Environments Pilot

A simple co-operative activities pilot was created based on the limited use of the open source TikiWiki software (TikiWiki, 2004) to provide password controlled access to electronic forums or e-fora, closed web-pages, and tailored menus. An associated field test of the use of an electronic forum to upload and co-operatively discuss and amend shared document was conducted.

Of necessity, the above represents only a very brief account of the detailed methodologies employed within the various parts of the project. Full details are published online in the SPEIR Final Report (Nicholson et al, 2004). Further information on some of these details will be reported on in later papers.

### **Outcomes (1): Progress in Key Areas**

The project made solid progress in all of the various areas of the CoSMiC Joint R&D Plan, as follows:

- Successful determination of requirements and working mechanisms for the seamless integration of the Cultural Portal Pilot into CAIRNS and related initiatives such as the SCONE collections facility, the collection strengths landscaper, and the SCAMP updates facility; investigations to ensure applicability in other areas as in public, FE, and other library systems (*Local User Environments; Shared Central Services*).
- Inclusion of Public Libraries and SCRAN in the CAIRNS distributed catalogue (*Shared Central Services*).
- Specification and instantiation of an illustrative pilot terminologies server for Scotland, including implementation of illustrative facilities (*Shared Central Services; Interoperability Forum*).
- Creation of a pilot Scottish Distributed Digital Library (SDDL), based initially on three databases, and cooperative cataloguing (currently only SLIC and CDLR) through the OCLC CORC subscription (*Shared Central Services; Collaborative Activities; Interoperability Forum*).
- Research and development work to permit embryonic services such as CAIRNS, SCONE, SCAMP, and the SDDL to serve as central facilities and data sources for the Cultural Portal Pilot and other Scottish portals (*Shared Central Services*).
- Identification of digital and non-digital collections relevant to the Cultural Portal for SCONE (*Shared Central Services*).

- Development of a pilot cultural facets (from heritage to ballet to football to street theatre) landscaping facility (*Local User Environments; Interoperability Forum*).
- The integration of CAIRNS, SCONE, RCO and SLIR into a single service (*Shared Central Services*).
- Expansion of SCONE collections database in areas such as cultural and public library collections (*Shared Central Services*).
- Implementation of an illustrative closed access cooperative environment for possible use in collaborative collection management and other joint activities (*Shared Central Services; Collaborative Activities*).
- Embryonic mechanisms to support ongoing community management of research and development in the SCIE through the CoSMiC Joint R&D Plan process (*Coordination and Management*).
- Widespread dissemination of project developments and outcomes through the SPEIR website, SPEIR staff publications, SPEIR roadshows, presentations, leaflets and meetings, and a variety of mechanisms external to SPEIR - Scotslink email list, WIDWISAWN, the CoSMiC website and two 'Electric Connections' conferences (*Professional Support*).

Additional outcomes of note arose from work with other projects.

- Progress towards integrating the HaIRST open access repositories metadata harvester pilot with CAIRNS and (as a result) the SDDL. HaIRST is a JISC-funded project and is not scheduled to end for another 12 months (HaIRST, 2004).
- Inclusion of a pilot service offering online access to electronic journals or digitised journals produced by small Scottish publishers in the common information environment, based primarily on the SAPIENS project (SAPIENS, 2004).

## **Outcomes (2): Issues, Barriers, Proposed Actions**

Inevitably in a project of this complexity, forward movement was sometimes achieved with difficulty and often led to the identification of problems as well as to achievements representing real progress. In SPEIR, difficulties of this type were identified under all six headings of the CoSMiC R&D Plan, as follows:

### *Coordination and Management*

Early work on the CoSMiC R&D Plan and on consideration of the updates process suggested that it might take several years for the process to become embedded in institutional and organisational cultures. Once working to the satisfaction of all parties, the Plan can provide SLIC and its members with a mechanism for (a) managing the development of the SCIE on an ongoing basis (b) influencing the agendas of the funding agencies who can help fund its development. However, the project recognised that it might be some time before this level of usefulness was achieved and made recommendations to SLIC and CoSMiC that they take steps to bring the plan to the attention of funding agencies and also attempt to improve institutional 'buy-in' to the process. For this and other reasons, the project also recommended that an attempt be made to improve communication generally within the CoSMiC sphere of operations. A key proposal was the suggestion that the embryonic electronic forums facility set up by SPEIR using TikiWiki software be used as a means of improving communication in the distributed community.

### *Local User Environments*

Key issues under this heading were a possible requirement for a second portal and the lack of knowledge about the needs of users. On the portals front, it was suggested that the work done on the Cultural Portal project and the related support infrastructure (CAIRNS, SCONE, SCAMP and other shared services) would benefit from being 'proved' in a second subject area, one possibility here being a suggestion from the community at large that Scotland

should consider developing a Science Portal. On the user needs front, it was recommended that consideration be given to funding in-depth research into the user interface needs of key Scottish user groups (School and HE and FE students, socially excluded groups, lifelong learners, the business community, tourists and potential tourists, and so on).

### *Shared Central Services*

Issues identified in this area included terminology issues, the further development of the SDDL, and the exploitation of shared services through the greater deployment of 'canned searches'. On the terminologies front, it was noted that a number of developments were occurring in Scotland in respect of developing local terminologies which, if not co-ordinated within a national scheme, would result in a further degradation of subject-based cross-search and cross-browse services in Scotland. The development of an 'operational terminologies and semantic interoperability support service' was recommended, as was the creation of an electronic discussion group on terminologies to co-ordinate the work. In the case of the SDDL, the problem had been slower than hoped-for development. Here, the recommendation was to take the initiative forward by the best means possible, preferably through identifying additional funding. With canned searches the issue was simply that they were new. Steps would have to be taken to encourage wider deployment within local portals.

### *Interoperability Forum*

Two issues were identified under the interoperability heading. The first was the unwillingness of some IT departments to allow the CAIRNS client to communicate with Public Library Z39.50-compatible OPACs through local authority firewalls. This was identified as a barrier to the continued development of CAIRNS and as an issue to be tackled at the highest level. The second was ongoing issues with the interoperability of metadata in the distributed environment – as big a problem in Scotland as it is elsewhere. Here, the recommendation was to continue attempts to both, raise awareness and, identify funds to tackle existing interoperability or metadata quality issues on an ongoing basis.

### *Collaborative Activities*

The major issue identified under this heading was slow progress in the area of formal collaborative collecting work. In this respect, it was noted that a basic infrastructure for development of this was in place, but that there was a need for organisational leadership from key players such as SLIC, CoSMiC, NLS, SCURL and others if progress was to be made on real collaboration. It was proposed that CoSMiC aim to stimulate discussion of the topic through the creation of an online forum where issues relating to collaborative management of the distributed Scottish collection could be aired.

### *Professional Support*

A good deal of progress was made on the professional support front within SPEIR. It was noted, however, that many professionals remained unaware, either of the work itself, or of key details relating to their own specialisms – that further work was required, particularly in the sphere of electronic communication.

## **Conclusion: Future Actions, Stability and Achievable Progress**

By making significant progress in all of the key areas tackled and identifying areas requiring future attention, SPEIR has brought the goal of a stable and coherent *Scottish Common Information Environment* a step closer. As will be clear, the degree of further development required is significant, and completion will take many years of work, but an embryonic infrastructure now exists that can be the basis of gradual development in line with available resources. With this as the backdrop, recommendations for future actions fall into two categories. The minimum requirement is to provide a level of future funding that will permit development and support of existing facilities and joint investigation by SLIC and CDLR of how more stable infrastructural elements such as CAIRNS and SCONE might be embedded



within existing organisations and services. The ideal – assuming more significant levels of funding can be found – is to couple these actions with major research and development work aimed at developing the infrastructure further and tackling the various issues and barriers described above, with the following being perceived priorities:

- Creation of a Scottish Terminologies and Semantic Interoperability support service
- Further development of existing shared services, particularly the Scottish Distributed Digital Library and the staff collaborative collection management portal.
- The creation of at least one additional pilot portal for Scottish citizens (One possibility would be a Science portal tailored for a range of groups – school children, socially excluded groups, researchers, the business community etc. – but the plan would be to consult the community on the preferred focus for this work).
- Intensive research into the user interface needs of key Scottish user groups (School and HE and FE students, socially excluded groups, lifelong learners, the business community, tourists and potential tourists, and so on).
- The creation of a fully operational and stable pilot infrastructure, together with a mirroring facility to support ongoing R&D work without impacting on service levels.
- Improved communication mechanisms, including the pro-active use of e-fora.
- The creation of a programme to tackle existing interoperability or metadata quality issues.

Given reasonable levels of financial support, other issues identified by the project (see previous section) could be tackled in the context of funded work under some or all of these headings in line with the holistic approach being taken in Scotland to research and development in this area.

At time of writing, SLIC are actively seeking funding that would enable the existing services and mechanisms to be sustained and follow-up work to be carried out at some level, with the outcome of the process likely to be known within two to three months. Precise priorities have yet to be determined, but are likely to be drawn from the SPEIR recommendations, with a Scottish terminologies service a probable focus. Progress beyond that will depend on the funding opportunities that present themselves and on community needs. In this regard, the existence of the CoSMiC joint R&D plan mechanism should help ensure wide consultation on R&D priorities. It should also help fund R&D priorities through bids to a wider range of funders, spread workloads through the participation of a larger number of community players in R&D work, and provide a basis for influencing assignment of priorities by funding agencies. All SPEIR recommendations will be fed into the updating process for the Plan.

## **Concluding Remarks**

The focus of the SPEIR project is, of course, Scotland, a small country with a population of around 5 million and devolved responsibilities in terms of library and information services. However, the issues tackled by the project – technical, organisational, and other issues (standards and their application, for example) relating to the creation of a coherent distributed information environment encompassing the Archives, Libraries and Museums domains – are likely to be of interest to others tackling similar issues in their own geographical area. The Scottish model, or variations on it, is likely to be of interest as a model for other small countries (or regions within larger countries) where a coherent approach to the development of an interoperable information environment is an aim. Indeed, there has already been interest in the approach taken, and in the elements of the approach, from a number of quarters, from some of the regions of England, through Scotland's various Celtic neighbours, to countries as far afield as Finland and Croatia. Further information on the approach, and on its various elements, can be obtained by contacting the authors of this paper (CDLR, 2004).

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## Glossary

**ALF.** Ayrshire Libraries Forum is a library cooperative for the Ayrshire region. Website available: <http://library.paisley.ac.uk/alf/alfhome.htm>

**CAIRNS.** Cooperative Information Retrieval Network for Scotland is a distributed union catalogue for Scotland, available: <http://cairns.lib.strath.ac.uk/>

**CDLR.** Centre for Digital Library Research is based at the Department of Computer and Information Sciences, University of Strathclyde. Website available: <http://cdlr.strath.ac.uk/>

**Connexion.** OCLC's Connexion provides a one-stop access to integrated cataloguing tools and the world's largest online catalogue and bibliographic database, WorldCat. Website available: <http://www.oclc.org/connexion/>

**CoSMiC.** Confederation of Scottish Mini-Cooperatives is 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'. Website available: <http://cosmic.cdlr.strath.ac.uk/>

**HaIRST.** Harvesting Institutional Resources in Scotland Testbed is a JISC funded project researching the design, development and implementation of a pilot service to provide stable ongoing UK-wide access to locally created learning and research resources in HE and FE institutions in Scotland. Website available: <http://hairst.cdlr.strath.ac.uk/>

**HILT.** The High Level Thesaurus project, investigating and reporting on the problem of cross-searching and browsing by subject across a range of communities, services, and service or resource types in the UK. Website available: <http://hilt.cdlr.strath.ac.uk/>

**JISC.** The Joint Information Systems Committee (JISC) supports further and higher education by providing strategic guidance, advice and opportunities to use Information and Communications Technology (ICT) to support teaching, learning, research and administration. Website available: <http://www.jisc.ac.uk/>

**NLS.** National Library of Scotland. Website available: <http://www.nls.uk/>

**RCO.** Research Collections Online is searchable analysis of the subject strengths of the larger general libraries in Scotland which support learning, teaching and research. Website available: <http://scone.strath.ac.uk/rco/index.cfm>

**RSLP.** Research Support Libraries Programme was a UK initiative, funded by the four higher education funding bodies, aiming to bring together both traditional and new forms of access to library information, with specific reference to support for research. Website available: <http://www.rslp.ac.uk/>

**SAPIENS.** Scottish Academic Periodicals: Implementing an Effective Networked Service provides online access to a number of Scottish academic and cultural periodicals. Website available: <http://sapiens.strath.ac.uk/>

**SCAMP.** Scottish Collections Access Management Portal is a web portal designed to support collaborative collection management amongst Scotland's information professionals. Website available: <http://scone.strath.ac.uk/scamp/>

**SCIE.** The Scottish Common Information Environment is an initiative aiming to facilitate collaborative and cross-sectoral partnerships capable of building a common on-line information environment for Scotland, within the wider UK CIE.

**SCONE.** The Scottish Collections Network provides descriptions of collections of all kinds held in libraries, museums, and archives in Scotland, as well as collections about Scottish topics held elsewhere. Website available: <http://scone.strath.ac.uk/service/>

**SCI.** The Scottish Cooperative Infrastructure is a set of embryonic offline and online mechanisms to support collaborative work aimed at building and developing 'Virtual Scotland'.

**Scotland's Culture.** A portal providing access to a wide range of printed and electronic resources, including data held by national and local organisations, galleries, museums, libraries and local authorities, through a single search interface. Website available: <http://www.scotlandsculture.org/>

**SFEU.** The Scottish Further Education Unit is the key development agency of Scotland's colleges. Website available: <http://www.sfeu.ac.uk/>

**SCURL.** The Scottish Confederation of University and Research Libraries is the principal association of research libraries in Scotland. Website available: <http://scurl.ac.uk/>

**SDDL.** A Scottish Distributed Digital Library entailing the creation of a coherent digital learning, information and research landscape for all Scots, collaboratively built and maintained via an agreed nation-wide, standards based, globally interoperable, cooperative infrastructure.

**SLIC.** The Scottish Library and Information Council is the advisory body to the Secretary of State and Scottish Ministers, on library and information matters. Website available: <http://www.slainte.org.uk/SLIC/index.htm>

**SLIR.** Scottish Library and Information Resources provides addresses and contact details of libraries and other information services located in Scotland. Online version available: <http://scone.strath.ac.uk/slir/index.cfm>

**SPEIR.** Scottish Portals for Education, Information and Research is a SLIC-funded project that extends and builds on the work of earlier projects such as CAIRNS, SCONE and SEED. Website available: <http://speir.cdrl.strath.ac.uk/>