

EDNER
Formative Evaluation of the
Distributed National Electronic Resource

Final Report

EDNER Deliverable X3

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EDNER: Final Report

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EDNER – the formative evaluation of the UK higher education sector’s Distributed National Electronic Resource (DNER) – was a three year project undertaken by the Centre for Research in Library & Information Management (CERLIM) at the Manchester Metropolitan University and the Centre for Studies in Advanced Learning Technology (CSALT) at Lancaster University. Details of the project’s work and copies of published reports are available at <http://www.cerlim.ac.uk/edner/welcome.html>

Executive Summary

This Report describes the work of the JISC-funded Evaluation of the Distributed National Electronic Resource (EDNER) project, a major formative evaluation which took place between August 2000 and July 2003. The project team, from the Centre for Research in Library & Information Management (CERLIM) at Manchester Metropolitan University and the Centre for Studies in Advanced Learning Technologies (CSALT) at Lancaster University, undertook a complex series of investigations centred on the developments initiated through the JISC's "5/99" Programme ("Developing the DNER for Learning and Teaching") although the scope broadened considerably as the DNER came to be replaced by the concept of a JISC Information Environment (IE).

EDNER was particularly concerned to explore the ways in which the development activities funded by the JISC were producing outcomes which impacted upon learning and teaching in UK higher education. As a formative evaluation project, EDNER was designed to feed lessons back into the JISC and to the Programme participants in an ongoing fashion, and to this end regular meetings with the JISC managers responsible were held and regular reports made to the JISC Committee for the Information Environment. As a result it was possible for intelligence emerging from EDNER's work and from the 5/99 projects to influence strategic and operational thinking. Furthermore EDNER was able to influence the ways in which projects conceived of their work, particularly by providing tools which enabled them to focus clearly on their implicit theories of change and their project logic.

Because EDNER was a formative evaluation, this Report must be treated as a reflection on the learning which has taken place over the last three years; it is not a summative evaluation of the achievements of the Programme.

EDNER's findings are reported in detail in a variety of project reports and other publications. In this document we summarise what we have found in relation to:

- Learners in higher education, including the ways in which they approach the task of information seeking. We found evidence of their overwhelming preference for search engines and of their confusion over what is meant by "quality assured information resources".
- Tutors in higher education and their awareness of JISC projects and services, the ways in which they present electronic information resources to their students and the differences between tutors in different disciplines. We found

very strong evidence that the tutors play a pivotal role in students' choice and use of resources, especially in relation to coursework and other assessments. Undergraduates in their first and second years, in particular, rely heavily on tutor guidance and direction.

- Higher education librarians, including their excellent organisation of electronic subscription services, but a contrasting patchy approach to free Web-based resources, and the generally weak relationships between librarians and tutors.
- Directors of library and information services, who have generally felt inadequately engaged by 5/99 as a Programme and by the concept of the JISC Information Environment despite their high levels of support for the JISC and its services.

We have reflected on the Information Architecture which underpins the Information Environment and made a number of observations about its underlying assumptions. We have recommended that the IA should be thought of more in terms of the user tasks which it supports than the traditional systems approach. Implicit in our comments is the question as to whether the Information Environment is too much led by technology.

A small but important part of the EDNER project involved the analysis of the major digital information initiatives in the UK (such as the National Learning Network (NLN), the National Grid for Learning (NGfL) and the People's Network) to try to determine where commonality of purpose could be identified. This suggests, as indeed has been recognised by the formation of the "Common Information Environment" grouping, that there are considerable similarities between many of these initiatives.

We have reflected at some length in this Report on the methodologies which we used to undertake EDNER. Although we formed an experienced project team, bringing together staff from two internationally recognised research centres, EDNER was probably the most complex project any of us had ever undertaken. We recognised early in our work that part of the challenge was to develop a methodological approach which was robust enough to be applied to the elucidation of processes and performance across any major national-level digital initiative and which would support such programmes in maximising the outcomes and impacts of their work. We would not claim that we have been able to give a comprehensive answer to this challenge, but the Report does demonstrate that we have made very considerable progress towards it.

Among our conclusions are the following:

- That there is a need for more visibility of the IE and its development approaches in the strategic priorities of higher and further education.
- That funded projects should always make explicit their theories of change in relation to the end-user communities they are seeking to influence. In particular, projects concerned with contributing to learning and teaching should make explicit their pedagogical assumptions and the mechanisms they will use to secure take-up by the target communities. Promoting “access” by itself seems to have had limited success.
- That greater consideration should be given to the selection of a coherent set of projects within Programmes even if highly regarded individual proposals then fail to be funded.
- That the underlying assumptions of the Information Architecture should be revisited and that the Information Environment itself should be conceived of as infrastructure and services which enable tasks to be performed efficiently, rather than in terms of content itself or even services.
- That the concept of “quality assurance” in relation to the Information Environment should be examined carefully and explicit user-facing definitions established and promoted.

In the final section of the Report we reflect on the overall conclusions of our work. We believe that we have uncovered evidence of the very real value of JISC development work and that we have made a significant contribution to this success. That there is much still to be done should come as no surprise.

In summer 2003 the EDNER team was invited to continue its work, with a broader remit to examine the development of the Information Environment. This work will be reported separately.

Acknowledgements

The EDNER Project could not have been carried out without the willing and active cooperation of a very large number of people engaged in higher education in the UK. We would like to acknowledge publicly the help given to us by project teams throughout the 5/99 Programme and indeed beyond it, who participated in a variety of EDNER activities and willingly shared their emerging findings and learning with us. Our colleagues at both Manchester Metropolitan University and Lancaster University must also be thanked for their help and support.

Most of all we would wish to acknowledge the contribution of JISC staff to the success of the work. This was truly a collaborative venture and relied entirely for its success on the development of a close working relationship between the EDNER team and those responsible for funding and managing JISC's development work and setting its strategic directions. It is to the credit of all concerned that despite a succession of staff changes on both sides this relationship was developed and maintained, and enabled issues to be discussed openly and freely.

Finally, we would wish to acknowledge the contribution of Professor David Squires of King's College London to the conception of EDNER. David sadly died in early 2001 while the project was still in its initial stages, but his insight influenced the project from start to finish and without him it would have been much the poorer.

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March 2004

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1 Introduction

This document forms the final report of the EDNER Project which undertook the formative evaluation of the Joint Information Systems Committee's "5/99" Programme. This Programme was designed to develop the then Distributed National Electronic Resource (DNER) for learning and teaching by undertaking a series of experimental and service developments which would both demonstrate the ways in which the DNER could have significant impacts on learning and teaching in UK higher education and develop the underlying infrastructure. As far as possible these developments should become embedded in the practice of learning and teaching, thus acting as exemplars which would encourage and leverage greater benefits than the funded Programme itself could produce.

5/99 was described as "Developing the DNER for Learning and Teaching"¹ and the Call document issued in November 1999 described the Programme structure as falling into three areas:

- A: Implementation and development of the DNER,
- B: JISC enhancements for learning and teaching,
 - Enhancing JISC Services for learning and teaching
 - Content issues for learning and teaching
 - Digital Libraries in learning and teaching
- C: Evaluation studies relating to both A and B above.

EDNER itself was formed by bringing together three proposals made in response to this call – one from the Centre for Research in Library & Information Management (CERLIM) at Manchester Metropolitan University which related to the evaluation of Area A, one from King's College London relating to the evaluation of Area B and a proposal from UKOLN for evaluation of the proposed subject portals which it had been intended would be subcontracted to CERLIM. The then JISC Committee for Electronic Information (JCEI) decided that it would be more useful to combine these into a single formative evaluation covering the Programme as a whole and CERLIM was invited to lead this pooled initiative. With the untimely death of Professor David

¹ JOINT INFORMATION SYSTEMS COMMITTEE (1999) Developing the DNER for Learning and Teaching. http://www.jisc.ac.uk/index.cfm?name=circular_5_99

Squires of KCL in early 2001, Lancaster University's Centre for Studies in Advanced Learning Technologies (CSALT) took over responsibility for the work related to Area B – although it should be noted that in practice there were considerable synergies between projects in the two areas and the EDNER project sought to integrate its work across the whole Programme as far as possible.

The 5/99 Programme followed on from the highly successful Electronic Libraries Programme (eLib) but was far broader in intent. Where eLib had delivered new insights and nascent services which enabled academic libraries in the UK to develop towards truly hybrid (traditional + electronic) services, 5/99 took as its starting point the concept of the Distributed National Electronic Resource (DNER). In other words it sought to develop a systematic and coherent national resource of electronic information which would be useful to and used by the academic community as a whole. Bearing in mind previous investment in large bibliographic and other datasets which are used primarily by researchers, 5/99 sought to create a balanced approach by devoting resources to learning and teaching applications while at the same time developing the DNER itself and its underlying infrastructure.

The DNER was at that stage defined in the following terms, although the Call document noted that “the DNER is not something that can be easily designed from formal principles, nor is it something that can be tested out on users in advance”²:

*The Distributed National Electronic Resource (DNER) is a managed environment for accessing quality assured information resources on the Internet which are available from many sources. These resources include scholarly journals, monographs, textbooks, abstracts, manuscripts, maps, music scores, still images, geospatial images and other kinds of vector and numeric data, as well as moving picture and sound collections.*³

It is interesting to note in this definition that the core concept is that of “a managed environment”. In other words the DNER was seen as a container for selected content and a means of delivering that content to end users. The later change from “DNER” to “JISC Information Environment” (IE) can be seen with hindsight as a natural progression towards a concept which was fully integrated into the research, learning

² *ibid.*

³ JOINT INFORMATION SYSTEMS COMMITTEE (1999) Adding Value to the UK's Learning, Teaching and Research Resources: the Distributed National Electronic Resource (DNER). http://www.jisc.ac.uk/index.cfm?name=dner_adding_value

and teaching activities of the higher education community, although it must be noted that there is still a considerable distance to travel before that vision is realised in full.

The underlying Information Architecture which provided the design for the technical infrastructure was derived from the eLib programme and specifically from the MODELS supporting studies and workshops co-ordinated by UKOLN⁴. These studies in turn drew on earlier work⁵ and on the principle, established at the end of the 1980s, that JISC information products should be “free at the point of use”. This principle, coinciding with the widespread availability of workstations to individual end-users, rapidly led to the focus of delivery being on the individual user and to that individual’s desk-top. Given the large number of heterogeneous datasets being made available, the concepts of broker services and of cross-searching came to have considerable prominence in the overall design. Over time this design has developed markedly (see section 7 below and EDNER’s Information Architectures report for a fuller commentary) although these features remain prominent.

EDNER itself was an innovative development, since it was the first time that JISC had commissioned a major formative evaluation to run alongside a large funded programme. The idea was that, in addition to project level evaluation, there should be significant effort expended at Programme level to elucidate emerging lessons and share these both with projects and with JISC – and indeed with the wider community. EDNER was structured in four Strands of work, which evolved as the DNER/IE and the Programme itself developed:

- Strand A, originally termed “Evaluation of DNER development projects” and subsequently “Evaluation of the IE as enabling environment”
- Strand B, originally called “In-depth evaluation of Subject Portals” and subsequently “Evaluation of JISC subject portals”
- Strand C, originally “Impact of the DNER ‘learning & teaching’ projects” and in phase 2 “Impact of the IE on learning and teaching”
- Strand X which dealt with cross-project activity including project management and dissemination.

⁴ <http://www.ukoln.ac.uk/dlis/models/>

⁵ For example the pioneering study by OWEN, J.S.M. and WIERCX, A. (1996) *Knowledge Models for Networked Library Services: Final Report* (Report PROLIB/KMS 16905) Luxembourg: Office of Official Publications of the European Communities.

While others must judge EDNER's success it is noticeable that during the three years of its work the concept of the DNER/IE has advanced significantly and 5/99 projects have developed their thinking about outcomes and impact appreciably. As noted above, JISC's strategic rethinking of the concept led to the idea of the "Information Environment" and EDNER was itself able to contribute to this process in a variety of ways.

As a result of this change, the acronym 'EDNER' became somewhat out-of-date, although it was felt best to retain it to avoid confusion among stakeholders that the project was consulting. In reality the scope of EDNER broadened to include a considerable proportion of the development work being funded under the IE umbrella.

During the academic year 2002-03 the EDNER team won a competitive tender to provide formative evaluation of the DiVLE (07/02) Programme – the Link^{ER} project – and was subsequently asked by JISC to provide evaluation support to the FAIR and X4L programmes – the EFX project. Some of the findings of these projects have been incorporated into this Final Report where they proved relevant, although the Final Reports on those two projects should be consulted for further information (see Appendix 1).

This Report is structured in the following way:

- Section 2 summarises the processes used in the EDNER project.
- Sections 3 to 6 distil key findings in relation to the main stakeholder groups – learners, tutors, librarians and institutions.
- Section 7 summarises issues arising from examination of the Information Architecture.
- Section 8 is concerned with the analysis of the foci of other national digital initiatives.
- Section 9 summarises the methodologies used in EDNER and discusses methodological issues.
- Section 10 provides a summary of and reflection on the key issues from both project and Programme perspectives.

Appendices summarise EDNER's key publications and presentations and list the staff who have been involved during the three years of the project's duration. The availability of EDNER's various interim reports is noted in Appendix 1.

2 EDNER's Processes: developing the IE for learning and teaching

Although the switch of partnership from King's College London to Lancaster University created significant delay, EDNER was able to utilise a two-phase structure which enabled an initial concentration on elucidating what the DNER was, on how current services were perceived and used and on project intentions, followed by a phase of intensive investigation of how the Programme itself and the DNER/IE were developing and impacting on the community. The titles of phase 1 EDNER reports provide an overview of the work carried out in the first phase of the Project:

- Analysis of constituent roles and services of the DNER
- DNER service evaluation
- Local implementation of the DNER
- Portal development within the DNER
- Pedagogical frameworks for the DNER

In essence the Strand A work consisted of increasing understanding of what the DNER was and how different stakeholders might perceive it, of how students interacted with DNER services and how they rated them alongside alternatives, and of how these services and resources were surfacing within institutions. The Strand B portal work was largely preparatory and focussed on elucidating the concept of the portal and what it might mean in the JISC/UK higher education context. The Strand C work involved the development and deployment of a number of tools which could be and were used by projects to sharpen their focus on outcomes and impacts and thus to encourage early consideration of sustainable take-up.

In phase 2 the emphasis changed in the light of the initial findings and with the broadening of the DNER concept into the IE. EDNER was concerned in this phase with exploring institutional impact in more detail, reviewing evidence of information needs, stakeholder perspectives and the Information Architecture. In Strand C the work engaged with the 5/99 learning and teaching projects in a different way as they moved towards producing outputs and towards their use in learning and teaching. Strand B was refocused as the initial idea of subject portals evolved into the development of 'portlets' which could be 'plugged in' to a variety of subject, institutional and other portal family products. The user-focused evaluation of SPP portals has been deferred until these have been rolled out.

A vital part of EDNER's work lay in the development of ongoing relationships with the DNER/IE Development team, with JCEI/JCIE and with other evaluative and support projects such as JUSTEIS/JUBILEE and the QA Focus. It was particularly useful to be able to engage directly with JCIE to explore fundamental understandings of the DNER/IE and the strategic thinking behind it.

Because EDNER's primary audience was the JISC itself, most reports were not originally published more widely. However a set of eight "issues papers" was produced and were well received by the community. As noted above EDNER's publications and presentations are listed in Appendix I: most of the project's reports are now in the public domain, although confidential information has been edited to preserve the privacy and anonymity of individual stakeholders.

2.1 Programme-related processes

EDNER engaged with the Programme, and more widely with the IE development, firstly in order to increase understanding of where value was being, or could potentially be, realised and secondly to assist in the development of thinking about the design of development activities and of the DNER/IE as a whole. Within this part of the work there was a considerable emphasis on discovering how and where JISC resources and services were surfacing within institutions and how individual users were engaging with these resources.

It was decided early in the project that it would be fruitful to approach the DNER both by examining theoretical models and by looking at it from the perspective of the end user. For this reason the project undertook theoretical analysis of a variety of models, ranging from libraries to dot.com enterprises, and coupled this with intensive studies of how students approach tasks which require the use of electronic information resources. In addition, the team examined the surfacing of resources within institutions, from library Websites through to pages maintained by individual lecturers. It was noted at this early stage that semi-closed environments, such as Virtual Learning Environments (VLEs), pose particular difficulties for studying how resources emerge within multiple contexts. Within phase 2, the team concentrated on further examination of the emergence of resources in course materials, including VLEs, reading lists and libraries; interviews with teaching staff, librarians, students and learning technology experts to determine facilitators and barriers to use of JISC resources, and to determine the extent and types of use; interviews with other

stakeholders; and detailed examination of the Information Architecture at the strategic level.

These approaches are described further in section 9 below and in the appropriate project reports (see Appendix I).

2.2 *Project-related processes*

The evaluation focus of the EDNER team had a particular concern with how the people designing and producing the project outcomes conceived of their integration with learning activity. This section explains the process aspects of the engagement with projects in the form of case studies that is more fully reported in the Reports C3 and C4 (see Appendix 1).

Within the UK there have been four major initiatives aimed at creating such primary resources – NDPCAL (the National Development Programme for Computer Assisted Learning, in the 1970s), CTI (the Computers in Teaching Initiative, in the 1980s), TLTP (the Teaching and Learning Technology Programme, in the 1990s) and the DNER (the Distributed National Electronic Resource). The TLTP products and their impact upon UK Higher Education were the focus of substantial evaluation studies. A significant conclusion from these studies was that, in general, insufficient attention was paid to pedagogy, design and the integration of courseware into the mainstream curriculum. The implicit pedagogical beliefs of the courseware production teams became embedded in the courseware and this, among other things, restricted take-up of the courseware by teachers whose pedagogical beliefs and practices were not compatible with those of the courseware producers.

The 5/99 Programme took a different approach to TLTP. Although it was intent on producing and/or improving access to primary resources it did so with what appeared to be a much more open sense of possible pedagogical usage. One aim of the formative evaluation of DNER was to try to surface the implicit theories of learning and change that informed, and were embedded in, the work of the DNER project teams. Both the process and the outcome of our work cast further light on important issues concerning students' use of primary courseware, especially in relation to presentational (teachers' view) and conceptualisation (learners' view) activities.

The first intervention of the evaluation team was to collect data from the project teams and to provide an initial analysis of the 'implicit theories of learning and change' that were embedded in the day-to-day work of the projects. We took an implicit theory of learning to be an unarticulated set of assumptions about how

learning occurs (and, by extension, about how learning resources can best support learning). Such assumptions can be a powerful influence on the nature of the learning resources created by a project team. Similarly, an implicit theory of change is an unarticulated set of assumptions about how the creation of new learning resources is expected to change educational practice. Among these assumptions, we can find expectations about the ways in which teachers in higher education will seek to connect electronic information resources with the rest of the networked learning environment, and beliefs about how discrete information resources can be turned into re-usable learning objects through appropriate tagging with meta-data, for example.

We have reported the outcomes from an analysis of brief project descriptions produced by key members of the project teams in Deliverables DC1 *Pedagogical Frameworks for DNER* and C3 *Project Logics*. The project descriptions were elicited as part of a 'history of the future' exercise, in which projects were asked to focus on their intended core achievements. After this, we presented some further evidence to triangulate with our initial set of findings – this time drawn from the projects' published descriptions of themselves. At a second programme meeting in January 2002 a brief presentation under the heading of 'planning for take up' (of project outcomes) drew a distinction between project *outcomes* and project *benefits*. Following this introduction the programme meeting broke up into groups, with an evaluator facilitating each group. For the first ten minutes of the group meetings, each project representative was asked to complete a short questionnaire, which asked them about the intended *benefits* of their project, what they assumed other people would have to do to turn their project outcomes into benefits, who these people were, why they would be motivated to help, and what the project was doing to involve such people in a timely and sustainable fashion. The material from this intervention is more fully reported in *The take up and use of JISC 5/99 Teaching and Learning project outputs* (Report C4).

We then engaged with a selection of eleven projects and presented them with our project logic descriptions and discussed with them the ways in which our descriptions matched the self perceptions of the project teams and the ways in which project teams might use these descriptions to identify and address any perceived weaknesses in the project's process. The interventions by the evaluation team at two programme meetings to collect data and then to engage with selected projects was an attempt to find ways of systematically working with projects in a manner that was supportive and non-managerial. The clear intention was to help project teams bring into focus issues that were central to the DNER programme's potential for success.

The programme evaluation team maintained contact with projects following the intervention at the January 2002 project meeting.

A central point of our approach has been to help create a shared understanding of what project teams thought would change in educational practice and how their actions would lead towards those changes. The programme evaluation has tried to play a formative role in the development of the programme at all levels. The intervention at the level of the projects has assisted the programme evaluation in grounding our own work but we believe the most powerful impact of this work has been in affecting the process of development of projects by drawing particular attention to issues that the evaluation team had identified as critical issues for the overall programme.

In understanding a complex learning environment such as the IE through the development of logic descriptions and diagrams we focused on the processes through which learning resources are designed and the ways in which they are being made available to users. The outcome of our work throws light on important issues for the design of networked information environments that inform access to information resources, construction of aligned learning activities and pedagogy design. With an emphasis on learning, in designing networked environments we suggest that attention is paid to:

- a) projects going 'beyond access' by describing ways in which learners can use their resources rather than merely talking about making new resources accessible to students,
- b) project outcomes being integrated into meaningful learning activities in which learners can become engaged as they progress toward their goals,
- c) project teams providing a pedagogical rationale by sharing a clear vision on how the use of their outputs/ products will lead to definite educational outcomes and possibly change in education, how they can maximise access to the learning possibilities offered within the information environment and how to provide the conditions for authentic learning.

2.3 Conclusion

A carefully managed mix of approaches was used in EDNER to elucidate intelligence about the DNER/IE itself within the context of use and about the ways in which the

projects and Programme was impacting on learning and teaching.. Further detail on methodologies will be found in Section 9 below.

3 The Information Environment and learners

This section summarises key observations concerning the relationship of learners to the IE.

3.1 *Learners' preference is for search engines*

The majority of students participating in an intensive user study undertaken by EDNER used a search engine in the first instance when locating information. A subject gateway was used in only one search (via the Pinakes site based at Heriot Watt). These findings are in accordance with those of JUSTEIS/JUBILEE.

Search engines are liked for their familiarity and because they have provided results which were perceived to be successful on previous occasions. Individual search engines become "my personal favourite" and phrases such as "tried and tested", "my usual search engine" and "trusted" frequently appear. The most popular starting point when locating information was Google (45% of respondents), followed by the University OPAC (10%). Also favoured were Yahoo (9%), Lycos (6%), Alta Vista, Ask Jeeves and BUBL all (4%). Other starting points were listed but were used by only one or two participants.

Users have confidence in Google for many reasons. For some it is always their first choice of search tool: "Automatically choose Google", "Couldn't think how else to start a search", "Google is always my first choice". It is perceived as a comprehensive and wide-ranging search engine: Google "has a huge archive" and "the largest search engine on the net", or "is a very deep site with a good reach" being typical comments. Several users claim that it is "reliable": "it usually works", "a reliable source", "I used Google because of the site's reliability". Some like its ease of use: "I think it is the easiest search to use", "easy to use, quick to retrieve and in most cases is successful" or "easiest way to find information". In summary, Google is perceived as fast, accurate, clear, and providing relevant information. A number of users commented on the "helpfulness" of Google's advanced search. There were particularly interesting comments on the usefulness of Google for locating journals or journal articles, especially when the known information is ambiguous or incomplete. One participant, looking for a journal title claimed, "Its better to look on Google than on the library journal search for this one as I wasn't sure of the exact name of the

journal". Another said "I find Google is useful when you are not sure of the subject category". Two commented that using Google to search for an article could be easier and quicker than using library resources, saying "Google seems to be quite good at finding articles. If I wanted to look in a journal I'd have to look at a few different databases e.g. Emerald, BUBL etc." and "I thought Ingenta was more specialised articles so I tried this, but Google was faster and more accurate". And another user who first tried the Library catalogue said "Once that fails, I use a reliable search engine (Google) with which I've had success in the past".

The use by students of search engines for locating resources is not surprising as in the pre-1992 university case study we found that academic and some library staff routinely use search engines in the same way. The most common route that academic staff used personally to find resources was through a search engine. Google was named as the search engine of choice in most cases, though Alta-Vista and Yahoo were named as a route by some other interviewees (see 4.4 below).

One reason for some of the problems which students experience when using electronic resources may be that the hierarchical arrangement of current IE gateways is confusing to them. Hierarchies are notoriously difficult to navigate horizontally, so that once down a particular branch students may be unable to navigate successfully to an 'unrelated' branch. They are effectively lost. Secondly, without a firm grasp of the overall 'shape' of the subject, they may find it difficult to identify the correct branches to follow. It would be remarkable if students in the early years of higher education did have a clear conceptual map of their discipline – this is one of the things they are learning. Thirdly, there may be subject-specific factors at work: for example the structure of chemistry as a discipline may be easier to follow than that of, say, social sciences.

Further detail can be found in report DA2 *DNER service evaluation* and C1 *Pre-1992 University Institutional Case Study*.

3.2 Learners define 'quality' in various, very different ways

One of the main aims of the IE is to provide a managed quality resource for staff and students in higher and further education. During discussions with various stakeholders involved with the development of the IE it became clear that common definitions of what is meant by 'quality' electronic resources could not be assumed. Therefore during testing with students from Manchester Metropolitan University (using a Quality Attributes approach to evaluation, including Perceived Quality,

reported in DA2 DNER Service Evaluation and Griffiths, 2003⁶) participants were asked to indicate what quality meant to them in terms of information available via electronic services (they were not asked to relate their responses to any one particular service). Four criteria were presented to them that they could either agree or disagree with. They were also asked to add any additional criteria that were not listed but were important to them. Table 5.1 below presents their responses.

Criteria	Reliable	Current	Accurate	Refereed
Yes	52%	81%	89%	26%
No	48%	19%	11%	74%

Table 3.1: Student responses to definitions of quality

Additional criteria listed by students included: 1) links to related areas; 2) understanding language used; 3) resources relevant; 4) speed of response; 5) resources useful; 6) resources valuable; 7) clear information; 8) source; 9) accessible; 10) timeliness; 11) presentation and, 12) references.

These results indicate that participants are confused as to the meaning of quality when it comes to assessing academic resources. Viewed in the light of the findings of Cmor and Lippold (2001)⁷, who stated that students will give the same academic weight to discussion list comments as peer reviewed journal articles, it would seem that students are poor evaluators of the quality of academic online resources. The original premise of the Perceived Quality attribute used in our investigations is that users make their judgments about a service on incomplete information and that they will come to this judgment based on its reputation among their colleagues and acquaintances and their preconceptions and instant reactions to it. If the notion of quality conveys so many different meanings to students it poses something of a challenge to the academic community in encouraging students to understand and

⁶ GRIFFITHS, J.R. (2003). Evaluation of the JISC Information Environment: student perceptions of services, *Information Research*, 8(4), paper no. 160 <http://informationr.net/ir/8-4/paper160.html>

⁷ CMOR, D. and LIPPOLD, K. (2001). *Surfing vs. searching: the Web as a research tool*. Presented at the 21st Annual Conference of the Society for Teaching and Learning in Higher Education. <http://staff.library.mun.ca/~DCmor/stlhe/>

use “quality assured” electronic resources. It is also apparent that, from a methodological perspective, further work is needed to explore the meaning of Perceived Quality and the interpretation of user responses to this area of enquiry. Fundamentally different understandings of information quality could otherwise lead to questionable conclusions being drawn by researchers and service providers.

3.3 Satisficing is the norm

Unlike the academic researcher who usually has a requirement to locate the key paper in his or her field in order to ensure that an approach or finding has not been overlooked, learners are often satisfied with “any” resource which comes close to meeting their expressed need – and there are often many alternatives available.

Indeed, this may be said to be the age of information satisficing – when something is good enough for the purpose rather than the optimal result⁸. Recent studies into use of electronic resources found that when seeking for information almost all users will only look at the first page of results (for example, Craven and Griffiths 2002⁹, Sullivan 1998¹⁰, Sullivan 2000¹¹). Most users are satisfied that these initial ten or so results are good enough to answer their information need. Users are rarely interested in a comprehensive, high recall search, but rather are satisfied with the retrieval of a few relevant hits. This is an important distinction which needs to inform IE development.

Further information on these issues can be obtained from the Report A3a *Stakeholder consultation and analysis - User information needs*.

3.4 Learners’ awareness of JISC services and projects is low

During user testing undertaken for DA2 *DNER service evaluation* students were asked to indicate their awareness of specific JISC services and projects. The following table summaries student responses.

⁸ See SIMON, H. (1957). *Models of man*. New York, NY: John Wiley and Sons

⁹ CRAVEN, J. and GRIFFITHS, J.R. (2002). 30,000 different users...30,000 different needs? Design and delivery of distributed resources to your user community. In: Brophy, P., Fisher, S. and Clarke, Z. (eds.) *Proceedings of Libraries Without Walls 4: The delivery of library services to distant user*. London: Facet.

¹⁰ SULLIVAN, D. (1998) Counting clicks and looking at links. *Search Engine Report*. www.searchenginewatch.com/sereport/9808-clicks.html

¹¹ SULLIVAN, D. (2000). Survey reveals search habits. *Search Engine Report*. www.searchenginewatch.com/sereport/00.06-realnames.html

Service/project	Information and Library Management (ILM) students % response		Non ILM students % response		Global responses % response	
	Aware	Not aware	Aware	Not aware	Aware	Not aware
DNER	89	11	17	83	41	59
Digital Egypt	22	78	22	78	22	78
BizEd	44	56	28	72	37	63
RDN	38	62	17	83	23	77
History Online	22	78	78	22	59	41
Zetoc	13	87	0	100	4	96
Bristol Biomed	63	37	33	67	42	58
BIDS	89	11	28	72	48	52
ADS	14	86	28	72	24	76
COPAC	100	0	17	83	44	56
SOSIG	100	0	11	89	41	59
Cochrane Library	33	67	33	67	33	67

Table 3.2 Student awareness of selected JISC services and projects (n=27)

It comes as little surprise that students from the Department of Information and Library Management (ILM) showed a greater awareness of JISC services and projects than students from other departments, but it is perhaps the latter group who are of greater interest. The fact that 83% of the non-ILM students were unaware of the (then) DNER is not, perhaps, a matter of concern since it is the services within the DNER with which they might be expected to engage. However, the findings that, 83% had not heard of the RDN, 72% were unaware of BIDS, 83% were unfamiliar with COPAC and 89% knew nothing of SOSIG are perhaps of greater concern. It would be wrong to read too much into awareness of development projects. Indeed, it was quite surprising to find how well-known a new project, such as *Digital Egypt*, proved to be.

Students either have little awareness of alternative ways of finding information to the search engine route or have tried other methods and still prefer to use Google. And, further to this, with a third of the students finding it difficult to locate information (even when using Google) user awareness and training would appear to leave room for improvement. If the IE is truly to be embedded and integrated into teaching and learning, further work needs to be done to equip students with the awareness and skills to use a wider range of electronic resources.

Further detail can be found in the Report DA2 *DNER service evaluation*.

3.5 Use is linked to progression

Academic staff and librarians, interviewed as part of the institutional case studies, expressed clear views about student progression that might have a significant impact upon the use of digital resources. These views were reflected in our survey of students. The survey data showed that at undergraduate level there was a very minor increase in use of JISC generic services from the first year in the final years of study but this was a tiny increase from a base level of complete non-use. The survey data on use of specific services showed no clear pattern by year of study. This is not surprising as the specific services used would be quite different in different subject and discipline areas and this may affect use in particular year groups. Only 8% of our sample were postgraduate students. Comparing undergraduate and postgraduate students, there was a slightly higher use of JISC generic services, such as BIDS or COPAC, amongst postgraduates (4%) compared to undergraduates (1%). Use of JISC specific services, such as BizEd or *History Online*, was higher amongst UG students (14%) than PG students (4%), although sample sizes were small.

All academic staff interviewed reported that there was some degree of progression in the use of networked digital resources. Even when students were introduced to digital resources in their first year it was students in their final years of study who made the most significant use of digital resources. In interviews at a post-1992 university first year students were provided with an introduction to digital resources as part of 'taster sessions' but later contact was by request only. The academic staff and librarians that were interviewed in a pre-1992 university all reported some student use of digital resources from the first year. When students were undertaking projects and coursework at both institutions they were encouraged to make use of digital resources, in particular e-journals and digital searching for additional materials.

The involvement of staff in first year teaching varied but teaching staff with more responsibility for first year students were more likely to mention skills training as an issue, whereas staff concentrating on final year students were less concerned with skills but had an awareness of the students' need for highly specific resources. Academic staff clearly differentiated between an introduction to digital resources, that was often described in terms of basic information skills and sometimes left to librarians, and higher order research-like skills that were developed in the final undergraduate years or at postgraduate level. These were considered to be an academic concern although the involvement of library staff was still considered

appropriate. Departments certainly direct postgraduate students to the library for support in access to and the use of digital resources.

There is a progression in the way subject librarians described the use of digital resources by students. Departments introduced their students to the library in the first year and gradually the students received more support as they became more frequent and competent users. The most significant change took place in the final undergraduate years in relation to project rather than course work.

In the pre-1992 University the view of progression provided by academic staff may have been influenced by the structure of university programmes. These were organised into a distinct first year Part 1 and a Part 2, which covered the further years of the undergraduate programme. The interviews show that the most notable change in the use of electronic resources was often when students were undertaking projects. It was therefore at this point in undergraduate programmes that they were encouraged to make use of digital resources in particular e-journals and digital searching for additional materials.

As noted above, one of the implications of this finding is that greater efforts may be needed to flag the level of resources delivered within the IE. This may be particularly important as the scope widens to include further education and lifelong learning and within the context of a Common Information Environment. It cannot be assumed that an information object which is fit for one student's purposes in a particular discipline would be fit for another's in the same subject area when the range of study is from special needs through to postdoctoral work.

4 The Information Environment and tutors

4.1 *Tutors' awareness of JISC services/projects appears to have increased*

With no benchmark data available, we cannot make any robust claims about increases in levels of awareness. The original plan for the evaluation included two survey sweeps although this was reduced to a single sweep in May 2002, in part in response to interview and institutional indications that awareness was on a low level, low enough to make a survey approach unlikely to succeed. In two universities searches were conducted across the university sites, focusing specifically on department Websites. The searches varied in character as they relied upon the local methods of searching and responded to the two different systems of VLE and the access conditions that applied to them. In both cases a comprehensive list of JISC-DNER resources was searched for. Where links were in publicly available pages the links were inspected and their context recorded. Both searches showed a considerable general interest in the use of digital resources. A subset of these clearly made use of digital resources in teaching and learning. At the post-1992 University, JISC resources were evident in all but one of the faculties, with the largest number in humanities. Few JISC resources were found in science or engineering. At the pre-1992 University the majority of departmental pages showed no JISC resources. The department Websites at the pre-1992 university all had links to digital resources and these were most commonly to other universities, government organisations and news media organisations. These searches indicated that the take-up of DNER/IE resources had been slow and uneven but that this was not the result of a lack of interest in the use of digital resources as other resources were present and appeared to have some degree of integration into teaching and learning. The levels of awareness found later (2003) in the survey results are, in relation to these prior expectations, surprisingly high. (The full data relating to tutors' current levels of awareness is found in Tables 4.1 and 4.2 below).

There is fairly good awareness of the JISC generic services, with 48% of the staff sample having some awareness of at least one JISC generic service. Looking at awareness by discipline (albeit low samples included for each discipline area), awareness is highest amongst humanities (64%) and sciences (57%) and lowest among medicine and allied subjects (33%), social sciences (43%) and mathematics & engineering (44%).

Amongst the staff sample, awareness of JISC specific services is also fairly good (62%), although there is great variation by discipline. The sample is small, but of those who responded, the highest level of awareness is found amongst arts (100%), social sciences (71%) and humanities (64%), with lowest awareness of discipline specific resources by mathematics and engineering (44%).

		<i>Number of services aware of</i>		Total
		None	1 or more	
Humanities	Count	5	9	14
	% within Discipline	36%	64%	100%
Social science	Count	8	6	14
	% within Discipline	57%	43%	100%
Arts	Count	1	1	2
	% within Discipline	50%	50%	100%
Mathematics and Engineering	Count	5	4	9
	% within Discipline	56%	44%	100%
Medicine and allied subjects	Count	8	4	12
	% within Discipline	67%	33%	100%
Science	Count	3	4	7
	% within Discipline	43%	57%	100%
Totals	Count	30	28	58
	%	52%	48%	100%

Table 4.1: Awareness of JISC generic information services and gateways

		Number of services aware of		Total
		None	1 or more	
Humanities	Count	5	9	14
	% within Discipline	36%	64%	100%
Social science	Count	4	10	14
	% within Discipline	29%	71%	100%
Arts	Count	0	2	2
	% within Discipline		100%	100%
Mathematics and Engineering	Count	5	4	9
	% within Discipline	56%	44%	100%
Medicine and allied subjects	Count	5	7	12
	% within Discipline	42%	58%	100%
Science	Count	3	4	7
	% within Discipline	43%	57%	100%
Totals	Count	22	36	58
	%	38%	62%	100%

Table 4.2: Awareness of JISC specific information services and gateways

4.2 Tutors’ awareness has not been transmitted to their students

This assertion is supported by data from Tables 4.3 and 4.4, where we compared level of awareness between staff and students.

Awareness of both JISC generic and JISC subject specific services is significantly greater amongst staff than amongst the student population. A significant proportion of staff (48%) have awareness of JISC generic services, compared to only 4% awareness amongst students. For awareness levels of the JISC specific services, 62% of staff in this sample have some awareness, compared to only 24% awareness amongst students.

		Number of services aware of		Total
		None	1 or more	
Students	Count	283	13	296
	% within Discipline	96%	4%	100%
Staff	Count	30	28	58
	% within Discipline	52%	48%	100%
Total		313	41	354
		88%	12%	

Chi-square value = 96.2, $p < 0.000$, $d.f. = 1$

Table 4.3: Comparison of awareness of JISC generic services between staff and students

		Number of services aware of		Total
		None	1 or more	
Students	Count	226	70	296
	% within Discipline	76%	24%	100%
Staff	Count	22	36	58
	% within Discipline	38%	62%	100%
Total		248	106	354
		70%	30%	100%

Chi-square value = 34.12, $p < 0.000$, $d.f. = 1$

Table 4.4: Comparison of awareness of JISC specific services between staff and students

4.3 Presentation of resources is highly inconsistent

Academics engaged in the delivery of courses are promoting resources to their students in a variety of ways. Contextualising the promotion of resources within the learning environment is clearly beneficial, but we are concerned that many of the sites which we examined lacked any coherent structure to provide that context. Some academics are seen to provide lists of links with little or no grouping into

meaningful subject areas, and little annotation or explanation of the intended learning benefit.

In addition, some of the descriptions of resources provided by academics are clearly wrong. The description of BIDS as a 'WWW search tool' and a 'Useful admin site' are just two examples. We recommend that consideration be given by JISC and by institutions to the provision of standard descriptions to academics who wish to promote resources on the Web. JISC services might also be encouraged to regularly explore the back-links to their services and provide friendly advice to UK academics whose descriptions leave something to be desired.

There is evidence that lecturers do not understand the process of creating links to different resource types, especially those which carry authentication mechanisms. This surfaces as attempts to embed hyperlinks to full text journal articles in PDF format which have been retrieved through an authenticated search. For the student, this simply results in an error message reporting a timed out session. It is clear that home institutions need to provide guidance to staff who wish to support their students in this way. Work on the provision of persistent links using resolver services is clearly highly relevant but academic staff will need to understand and use these mechanisms.

There is some evidence that academics are 'borrowing' lists of links to resources from other Websites to mount on their own. One view is that this tactic avoids unnecessary duplication of effort, but the proliferation of out-of-date, or error-laden lists should clearly be discouraged.

The inconsistency of presentation of resources creates problems for users. Previous research (Griffiths, 1996) has shown that users struggle with the plethora of interfaces to resources and need a core, common set of basic features across resources in order to optimise use. This, coupled with the lack of awareness of JISC services demonstrated by students (4.2 above), and with their preference (because it is "familiar") for search engines as a means of resource/information discovery (3.1 above) indicates that there is a need for consistency in presentation of resources.

Further detailed analysis of these issues can be found in the Strand A phase 1 deliverable DA4 *Local Implementation of the DNER*, and in *Issues Paper 4 Providing links to online resources*.

4.4 Tutors make heavy use of search engines for finding L&T resources

Academic staff report making considerable use of search engines to locate materials for learning and teaching. The most common route that academic staff used to find materials for use in their teaching-related work was through a search engine. The subject area and discipline had a significant effect on the balance of methods used as science subject areas made less use of materials found in this way for undergraduate students and some areas of study such as history and law made significant use of large databases (see 4.6 below) The type of material used in learning and teaching was often that easily found by using a search engine. It is something of a “chicken and egg” argument when trying to unravel the reasons for this pattern of use as to whether the type of resources being used influenced the search and discovery method or vice versa.

Google was named as the search engine of choice in most cases, although some other interviewees named Alta Vista and Yahoo. Some staff were aware of the restrictions of this type of searching but found it quick and easy. Most academic staff reported using different search routes especially when they mentioned their research work but these were mentioned less often in relation to teaching and learning materials. The level of the materials used in learning and teaching was mentioned in several cases. Web based materials were described as being pitched at a good level for material that was not central to the course but being used as additional and supporting material. This was a common use of digital resources. For example a music lecturer made use of a digital resource to support the explanation of the workings of the human ear. Another reason for using search engines was that students could easily access the materials found in this way. There was a clear notion of Web based material being more or less universally available. The variable quality of resources found in this way was seen as an asset by some academic staff and this feature was explicitly used for teaching students how to treat variable sources in academic work.

4.5 There are significant differences detected by discipline

The use of digital resources was significantly related to subject and discipline area. The Institutional mapping showed a wide variation in the overall number of links from Departmental pages and more detailed analysis showed that this unevenness was retained when links to internal university pages were removed. The academic staff

who were interviewed showed a variation in their use of digital resources that was linked to broad subject and disciplinary issues. This differentiation by discipline and subject area was also reflected in the interviews with library staff. From the survey data we were not able to assess the extent to which there were differences in the transmission of information (measured by level of awareness) between staff and students by discipline (due to the small staff sample size). However we were able to establish that within the staff and student samples there were differences in levels of awareness by discipline area (see 3.4 and 4.1. above). For example, staff awareness of JISC generic services and specific services when examined by discipline was high in the humanities and low in mathematics and engineering in both cases..

The use of digital resources, which of course is a different issue from awareness, could be broadly divided into two main types. In physics, engineering and mathematics the use of digital resources was closely related to the use of specialist software, in particular MatLab. In all cases the staff in these subjects expressed an interest in the use of images, including moving and 3D images and simulations, and this was particularly so in the case of biological sciences. In more social subject areas such as politics, languages and applied social sciences, the interest was mainly in the use of particular types of Web-based materials. These subjects needed access to the most current information and to news media such as local language newspapers. A third kind of use was found in areas that had access to large amounts of non-copyright materials such as history and law. In these cases large databases were used for searching for materials in both digital and non-digital forms.

The level of use of digital resources by academic staff was also reported by subject librarians to vary markedly within subjects and disciplines. The use of resources was reported to be influenced by the history of each department and by the external demand that exists within the subject area and relevant professions.

- a) Subjects reported to have low use of digital resources: languages, politics, arts, philosophy and religious studies.
- b) Subjects with moderate use of digital resources: linguistics, american studies, psychology, educational research, geography, biology and environmental science.
- c) Subjects with a notably high use of digital resources: management, law

Some differences in information usage have also been noted in *A3a Stakeholder consultation and analysis – information usage in higher education*, but were not as

distinct as the majority of participants were recruited from humanities and social science.

The review work undertaken in Report A3 *Stakeholder consultation and analysis – user information needs* does identify differences in information need and use according to subject discipline. Scientists use two main sources of information, formal (including printed information such as books, journals, reports etc. which may be said to be usually written for dissemination to a wide audience) and informal (including conversations with colleagues and attendance at conferences or meetings which are oral in medium and usually designed to be disseminated to a smaller group or individual). Social scientists rely more heavily on formal sources of information and their use of these sources is very similar to that of scientists. Some value is given to informal sources but it is not given as high a priority as for scientists. Humanities also depend more on formal sources of information and see the library as a valuable source of information.

4.6 Where tutors use VLEs, links to library resources are generally weak

There is evidence that tutors include some links from their VLEs to the institutional library, and to library resources. However, these are often simple links to the library home page or to subject databases, even in instances where a good working relationship exists between tutor and librarian. A surprising number of tutors do not link from their VLEs to library resources at all, some stating that student induction sessions are sufficient to inform students of what the library has to offer, or because they have not found the library Webpage relevant, or indeed simply because they had not realised that they could do so.

One study showed that there have been meetings of librarians with learning technologists responsible for the VLE, in which they discussed how they could include library resources in the VLE. Currently most librarians in that university do not believe they are in a position to say how digital materials might fit into the VLE. There is only one course, and that is at MA level, that has library links in the VLE and it is currently the only group in the university known to use this environment in this way.

The evidence of academic use of library resources in VLEs suggests that a major difficulty and restraint on their use is the technical environment allowing such links to be made simply. This may point to a need for the types of tools and services which were developed by the DiVLE programme. For example, the innovative work carried

out on OpenURLs may enable the embedding of direct links from the VLE to the full text of electronic journal articles and other materials managed by the library, and to appropriate external resources. Certainly, the development of dynamic, annotated reading lists with hyperlinks directly to the resource will ease the task of resource acquisition. The inclusion of learning objects in the library catalogue will be a new resource for the creation of VLE materials. It will be imperative though, that tutors know about these tools and services and have the skills to use them to embed library resources into their VLEs.

An overview of the technical, pedagogical and cultural issues raised in the DiVLE Programme can be found in Link^{ER} deliverable D5 *Final Report: Formative evaluation of the DiVLE programme*. An account of the efforts being made to address the integration of digital library resources into VLEs by the wider community, often instigated by the library sector, can be found in Link^{ER} deliverable D1 *A review of recent developments achievements and trends in the DiVLE area*.

4.7 To tutors 'information' is much more than published information

The academic staff who were interviewed used digital resources in a variety of ways. A clear aspect of their use of digital information sources was that for them "information" was much more than "published information". One of the significant uses of digital materials was the use of networked digital resources to "bring the world into the classroom". The tutors using digital resources in this way were clearly interested in access to primary materials but not only from government sites and reputable organisations that provided primary resources. It was clear that some of these staff were also interested in the unregulated aspects of the digital environment as a way of bringing the world into the classroom. This use of information resources was also a way of introducing students to powerful and potentially dangerous sources in a way that would help to develop the students' skills in how to read and handle such information.

When tutors are asked how they find out about information resources, it emerged that they do not only use published information such as professional journals, conference papers, newspapers, government and other agency reports. They also rely heavily upon less formal information sources. One significant aspect of this was the use of a digital version of the invisible college. Academics often use colleagues' personal Webpages to keep up to date with developments in a particular field. Other sources of information were the Webpages of prominent academic units and

research centres and email discussion lists. Academic staff also still rely upon many informal non-digital communication systems such as seeking the opinions and recommendations of colleagues within their department and elsewhere, and picking up information from informal conversations in meetings, seminars and conferences. Many also rely upon Web searching as an information gathering strategy (see 4.4 above).

It was clear that academic staff do not view information in a simple way and the uses they make of information are often highly personalised. Within the array of sources of information available to tutors, published information is only one source and informal resources in both face-to-face and digital environments have a very significant role.

This reflects the findings of Project INISS as far back as 1980, where it was reported that, at least for social scientists:

there is heavy reliance upon oral forms of communication in face-to-face encounters and over the telephone, both within the department and without. For example, oral forms of communication accounted for 60% of all information events and combinations of oral and written forms (e.g., making notes during a conversation or reading out parts of a document during a telephone conversation) accounted for a further 10%.¹²

¹² WILSON, T.D. and STREATFIELD, D.R. "You can observe a lot..." A study of information use in local authority social services departments Conducted by Project INISS <http://informationr.net/tdw/publ/INISS/index.html>

5 The Information Environment and librarians

5.1 Libraries offer the best systematic presentation of resources in most institutions

In most universities, the library Webpage typically has a series of top-level links, which include a link to databases and e-journals and another to Internet resources. Databases and e-journals provide a single access point for subject areas to the available resources. E-journals can also be accessed directly from the library catalogue. There may be an Internet links section which can be viewed by subject, faculty or under a heading such as "Databases and Gateways".

Departmental pages tend to be extremely uneven in the number and types of links presented. Only a minority of departmental sites have a systematic organisation of well-maintained resources. Some instances have been found of extensive 'resource finders' with links to several hundred online resources, often arranged in categories. Few have any annotation or explanation of content beyond the title or group heading. These resources are typically not well maintained, and may have many dead links, or pointers which now lead to a completely different Website. Some departments give a contact email address, though this may not necessarily be current. Some indicate when the page was last updated, and this can be months or even years ago. Most departments are linked to the library either directly or via a link to the University home page. Few have no links at all on their Webpages. It is common for departments to have Internet links to other related resources but not necessarily to databases coming through the library. Subject librarians write the library's Internet links pages largely independently of any systematic academic staff input.

Further detail can be found in DA4 *Local Implementation of the DNER* and C1 *Pre-1992 University Institutional Case Study*.

5.2 Librarians do not regard organisation of 'free' resources as a priority

There is a marked contrast in the attitudes of librarians at a post-1992 university towards subscribed and free resources. Subscribed resources undergo a structured process of trials and evaluation by librarians before being purchased. They are then managed and monitored by the library using the management information tools that are usually supplied with the resource. Subject librarians will promote under-utilised resources, which either leads to increased use or to the decision to discontinue the subscription.

'Free resources' fall into various categories and are given different degrees of priority compared to subscribed resources. The RDN is valued because it does the 'organisation' for the librarian, though some hubs were thought to be better than others.

Where there is a particular need to seek out free resources, as for example when the library offers an alerting service, then this is done systematically. If feedback shows that these resources are particularly useful, then they may be included on the library Website where link checking software will ensure that they remain currently active.

Sometimes academic staff identify Websites to support their courses and ask for these to be included on the library Website. Sometimes free resources are recommended by colleagues or students, and these are evaluated by librarians and may also be included. Librarians are very wary, however, of their Website becoming large and unwieldy. Because of this they do not spend time 'surfing' the Web to find useful things for inclusion in their library resource base.

The librarians in the pre-1992 university case study also do not regard organisation of 'free' resources as a priority and made a clear distinction between the set of subscription digital resources that were managed by the library and the digital resources available on the Web and the Internet. Resources available freely on the Internet and Web were outside the library's control and the librarians felt little or no need to engage with them. The resources that were funded through the library were considered to be the responsibility of library staff and were evaluated. They were therefore considered to be of a different standard and likely to be relevant, timely and reliable. Librarians did not have the same degree of interest in freely available resources accessed directly using the Internet and Web.

Further detail can be found in the September 2002 *EDNER Project Report to JCIE* and in *C1 Pre-1992 University Institutional Case Study*.

5.3 Librarians' relationships with tutors are generally weak

Although the post-1992 University used in the case study has a system of designated subject librarians, they report that dissemination of information about library resources and services to tutors can be difficult. There are formal routes that can work well; librarians have input into course committee meetings and are invited to contribute to learning and teaching days or to research supervisor training. Indeed there are examples of close liaison between individual librarians and tutors, and where these are in place tutors find them extremely beneficial. However there seem

to be many tutors who rarely call upon the services of subject librarians except for the provision of passwords, and indeed librarians even suggest that some tutors rarely venture into the library. They also report that when they offer 'updating sessions' to tutors, these tend to be poorly attended.

In the pre-1992 university each subject area also had a designated subject librarian and all nine subject librarians were interviewed for the case study. The librarians' relationships with academics varied across the different departments. In general, there was a gap between library and academic staff. Each department had a member of staff responsible for library liaison but communication with the department, other than for subscription services, often relied upon the development of personal relationships rather than a formal link. Evidence of the lack of communication was given by librarians in terms of past problems, such as when departments had directed students to resources to which the library either did not subscribe or to which the subscription had not been activated.

Further information about the relationship between librarians and tutors can be found in Report A3a *Stakeholder consultation and analysis – information usage in higher education* and in Link^{ER} deliverable D1 *Review of recent developments achievements and trends in the DiVLE area*.

5.4 Librarians have little involvement in VLE development in most institutions

Unless the institution has a corporate e-learning agenda and a culture of cross-discipline collaboration between its teaching, computer and information support and library staff, librarians will find it difficult to become involved in VLE development. This lack of collaboration clearly hinders VLE developers in being able to take advantage of the particular areas of expertise which librarians have to offer, for example their skill in selecting and providing access to resources of academic quality and their understanding of how to manage subscription services and deal with copyright issues.

Why they are 'left out of the loop' is not always clear, but this may be because librarians are not generally involved in the VLE selection and purchasing process. Academic staff too are often distanced from the purchasing of a VLE and there was little evidence of a demand from academic staff for help with skills development or a full realisation of the potentials for a VLE-library link. The library staff interviewed in the pre-1992 university were deeply involved in rolling out a new library system but it

was not clear that any real thought had been given to integrating this system with the VLE. Indeed the new system was seen as an opportunity for the library to gain some greater independence from computing and information services, which ran the previous system.

In one university the organisational structure had been integrated, with the computing and information support service being sited within the library and staff in the two separate organisations maintaining close links. This had recently changed with the computing and information support services moving out from the library in an organisational restructuring. It was clear from this example that organisational barriers can have significant impact on cross communication between library, academic and information support staff.

Work done for the Link^{ER} Deliverable D1 *Review of recent developments, achievements and trends in the DiVLE area* uncovered a variety of imaginative ways in which librarians are showing teaching staff what they can do; by building basic VLE 'shells' for different subject areas containing generic links to relevant supporting information resources in the hope that lecturers will buy into these; by demonstrating how information skills training can be built into online teaching at the point of need; by providing new tools, such as extensive image databases with annotation facilities; and by building pilot demonstration systems so that the concepts and possibilities of integrated digital resources can be presented to the lecturer in a very immediate way.

5.5 Librarians have a key role in information skills training for students – but such training must be embedded

We have established evidence which suggests strongly that the majority of students in higher education, whether or not they are sophisticated Internet users, use Internet search engines as their preferred access path and are reluctant to use other approaches (section 3.1 above). While the preference for very simple search engine approaches is prevalent, we need to note that this does not mean that students are necessarily best served by this approach. It may be that they would get better results using specialist subject gateways but for whatever reason students do not take this approach. In addition, the lack of awareness of JISC services and projects demonstrated by students (section 3.4 above) also creates barriers to resource use. Both of these issues may be partly resolved with more user training, but this needs to be embedded within students' learning experiences.

The traditional training given to students by librarians at the library induction session is highly regarded by tutors. Institutions often have well established library induction sessions for new students. Librarians report that whereas tutors might be keen for their students to attend these induction sessions, it is not common for they themselves to join in. Furthermore, tutors tend not to agree with the librarian beforehand what the objectives of the session should be, leaving the content up to the librarian. This is a matter of concern when conversations with some tutors suggest that they consider these induction sessions to provide all the information that the student needs about the library and its services. Librarians on the other hand, see induction as an 'introductory' or 'taster' function with a definite need for follow up, preferably focussed upon a particular pedagogical need. Furthermore, given that many tutors themselves are struggling with appropriate presentation of resources (section 4.3 above) it is clear that librarians have a key role to play in developing the information skills of students and tutors.

Further information can be obtained from reports DA2 *DNER service evaluation* and DA4 *Local Implementation of the DNER* and from Markland, 2003¹³.

¹³ MARKLAND, M. (2003). Embedding online information resources in Virtual Learning Environments: some implications for lecturers and librarians of the move towards delivering teaching in the online environment, *Information Research*, 8(4), paper no. 158
<http://informationr.net/ir/8-4/paper158.html>

6 The Information Environment and institutions

Many of the issues concerning the IE and institutions have been reported in the preceding sections. However, an important stakeholder group, the Directors of Library and IT services, were not primary subjects for investigation as they were not end users nor directly concerned with the delivery of learning. Yet they are clearly an important and influential group and their decisions impact directly on the take up of JISC services and the fit between IE and institutional information environments. For this reason, EDNER sub-contracted a survey of Directors to Professor Alan MacDougall, who reported in May 2003. The report is available separately but key findings are summarised here.

6.1 *Library and IT service directors feel disengaged from JISC's strategy*

There appeared to be a perceived lack of understanding of JISC strategic thinking and a gulf between the Directors and the JISC. Overall, the Directors felt that JISC was a “faceless” organisation. Apart from those Directors who were directly involved with JISC activity, most Directors knew, or knew of, only one or two people in the JISC. Several knew no-one in JISC. Some confessed they had no route of access into the JISC. A few Directors had heard of certain names but had no idea of their job title or responsibility. It was a widely held feeling that Directors would welcome a more meaningful and closer link with the JISC at the strategic, senior officer level.

6.2 *Library and IT service directors have little awareness of 5/99*

Overall there was little current knowledge of the 5/99 Programme. Most interviewees struggled to recall the theme. For example:

“I can't think of anything about 5/99 and its impact - I haven't remembered”.

Once prompted, however, most had some residual memory of the call. Generally, however, Directors felt that they did not need to concern themselves with an understanding of the detail since another member of staff would be designated to deal with the matter.

Overall comments were somewhat critical of the call although there was the occasional positive comment. For example:

“Hit all the right notes of issue. .. can see the teaching and learning (elements of the call) but other (parts of the call) were difficult to justify”.

“Rather a disparate but interesting programme”.

“There are pockets of success, for example moving image”.

A range of reasons was given for not responding to the call with a bid from their institution. Because the focus was on learning and teaching applications, some may have felt that the library or IT service was not the right focus. Some said it was a waste of time bidding for any programme because they knew it would not be successful (i.e. based on an assessment of their track record). Others would not bid because it was not core business : it was...“not the current mission or fit”.

Others said they were too busy with other matters, or did not have staff to deal with bidding. They were “stretched by local pressure”.

Many of those who had bid said they did so because the bid theme was in fact core business. Others did so to expand staff horizons, whilst another said contract staff employed on projects brought new skills and thus supplemented core staffing as well as enabling new development work.

Some concern was expressed that the manner of award meant automatically that a bid was considered only on its own merit rather than assessing whether a strategic balance had been reached across all the bids. This was meant as a criticism of process and criteria rather than of an assessor’s judgement.

Criticism of the failure to disseminate information about the progress of 5/99 was apparent. Almost all felt the JISC has failed to update the community: “Dissemination is a big issue. It is a fundamental problem in funding programmes.”

It was suggested that: “it would be really great to see succinct summaries of 5/99 (even ongoing)”. These summaries “should cut to the quick - how this could help me in the future together with content detail”. The JISC “must identify the crucial issues, try to identify them in little clusters, distil and disseminate the key messages”.

“Town” meetings have been appreciated as a good innovation. There was a groundswell of opinion that the JISC should concentrate on calls that were more focused and perhaps on only two or three major priorities, and that resource should have been more focused in those areas.

Overall Directors were keen to draw a parallel with a previous programme, namely the *electronic Libraries Programme* (eLib). Directors felt that eLib was well organised, properly structured and themed, well packaged and excellently disseminated (although there was some debate about whether the “Let a 1000

flowers bloom” approach was the best way to proceed). In contrast it was perceived that the 5/99 programme was almost the exact opposite, although it would be fair to question how far this comment results from 5/99 focusing away from the Directors’ main focus of responsibility. Among the strands that emerged from these interviews was a lack of understanding about the process by which the JISC came to the conclusion that the 5/99 programme should be devised and launched:

Directors were critical of the fact that the 5/99 programme appeared to come from nowhere i.e there had been insufficient flagging in the preceding years as part of a strategic plan. There was also a feeling from some that the 5/99 call did not sufficiently engage the academic community. However, “teaching and learning is a key element in thinking” according to one Director, especially where one country in the UK is committed to driving forward life-long learning across the education sectors.

For all of the above reasons it was not possible for Directors to state that overall 5/99 programme has yet had any major impact on their library/IT strategy or operation.

6.3 *Library and IT service directors believe the DNER is still extant and do not understand the IE concept*

Some Directors said they had only just come to terms with the name “DNER”. More than half of the Directors were unaware that DNER was not now the preferred JISC term. Allied to terminology, most Directors were unaware of the new JISC structure or how it worked. A few Directors who were aware of the structure (not committee members) expressed some concern about it and whether committee function/bureaucracy might obstruct progress. Few appreciated where the development programme fitted into the structure. It was also perceived that there was an artificial divide between development of infrastructure and development of content. It was stressed that both were inextricably linked

Content was mentioned again and again. The following comment was typical:

“Bearing in mind that 5/99 was outwardly about learning and teaching, the content has been a by product and not a fundamental underpinning of the programme. There is still a great deal of work to be done in relation to JISC defined programme for content delivery...should there be a blurring between content and information environment?”

6.4 *Library and IT service directors support the development of a coordinated information policy for the sector*

Some Directors suggested that JISC should be doing more to explore regional liaison and cooperation, for example, as a pump priming and leveraging role with Regional Development Agencies. It was recognised that this was a matter of concern particularly to England. There was also a call for improved cooperation with other bodies in the field such as SCONUL, CURL, RSLG, UCISA etc. This would be undertaken as part of the thinking for a coordinated information policy.

Closely related to the above point is a call for a coordinated information policy for higher education and beyond. The proposal for the creation of RLN gives an impetus for this coordination to be introduced.

7 The Information Architecture

We have followed the development of the Information Architecture (IA) closely during the Programme's three years and believe that it has provided a sound basis for progress during this period of development. At the operational level, EDNER focused on one of the IA's guiding principles, that the Architecture supports the development of single points of access to multiple sources of information. At the strategic level EDNER attempted to assess the fit between the broad institutional and national higher education landscape and the IA. Both of these foci informed a concentration in EDNER on the *purposes* of the IE and on the use (and more particularly the task and activity assumptions) which it is intended to support. A diagram of the IA, developed by UKOLN, is shown below (Fig. 7,1).

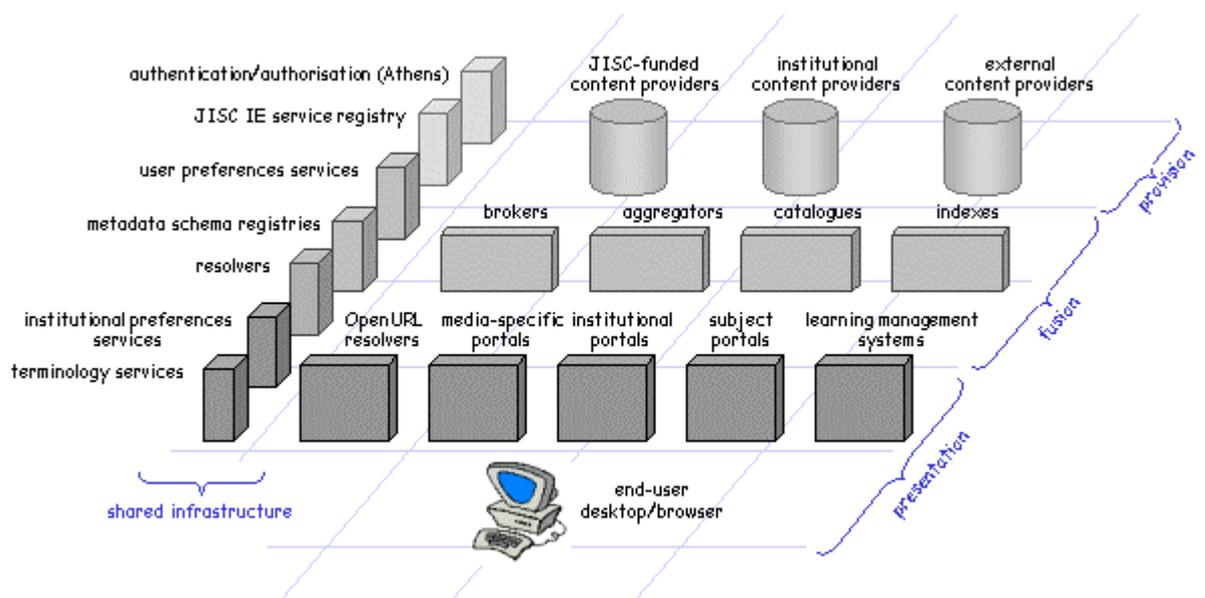


Fig. 7.1 JISC Information Architecture¹⁴

Strand B was concerned with the development of the subject portals, although it has not yet been possible to subject the emerging services to user testing.

The following sub-sections summarise key issues arising from this work.

¹⁴ From UKOLN. *JISC Information Environment Architecture*. <http://www.ukoln.ac.uk/distributed-systems/jisc-ie/arch/>

7.1 Information and other architectures

One of the effects of focussing on learning and teaching has been to raise again and again the question of where the boundaries of an information environment – and hence of an information architecture – should be drawn. In addition, changes in the research environment, particularly the development of the Grid to create and exploit huge and complex datasets, raise similar questions from that perspective. The relationships between architectures is therefore a critical issue.

7.2 Presentation and use

Each of the models of the IA focuses on the individual end-user and culminates in ‘presentation’ to that user. Even if we could identify a discrete ‘information environment’ this begs the question as to how the user processes the information resources – what happens between presentation and use? More fundamentally, what does “use” entail – and should the IA be informed by a greater understanding of how end-users actually make use of these resources? As the context shifts towards integrated environments for broader purposes (for learning, for research, and so on) this issue will become more prominent.

7.3 Unidirectional delivery

The IA diagrams suggest that traffic is almost all *to* the user rather than considering the user’s role as a producer of information (whether or not this is formally published, a distinction which is becoming difficult to make as more and more ‘informal’ information is stored or at least exposed on Websites). For example, if users are to deposit materials which can be found within the IA architectural design, they will be expected to provide consistent and coherent metadata. How are they to do this? What tools might they require?

7.4 What kind of information?

The IA model does not fully take into account the fact that the user is receiving many different types of information from many different sources, and has to integrate the JISC offer with all the rest. A very large part of the information component of learning, teaching and research is culled from open Websites, from discussion lists, from unpublished conference or workshop presentations and so on (see section 4.7 above). The IA does not support processes to organise and exploit these resources.

7.5 Cross-searching

A key IA capability is often stated as the ability to select and cross-search large numbers of heterogeneous sources and to present unified results to the user. Indeed this – the ability to discover relevant resources in a wide range of provider services, combine them and present them to the user – is the basis of the various IA functional diagrams. There is no doubt that these are important functions and it is easy to see why in a world of ever-proliferating sources, the need to bring order to impending chaos is given high priority.

However, we have some comments about this concentration of focus.

- It is not clear that users themselves see this capability as being of crucial importance. For many purposes users appear to prefer to access their 'favourite' sites and to select these for themselves. An alternative IA would support the selection of sites/services and the use of native interfaces (thereby providing deep searching), coupled with strong pressure on centrally-funded services to conform to common 'look and feel' principles.
- It is arguable that the whole idea that academic users need services which enable them to find the 'needle in the field of haystacks', i.e. THE key paper which tells of a new research finding in their field, is in fact only part of the picture, and reveals that the IE is actually built primarily on the needs of researchers. For many tutors the evidence (see section 4.4 above and elsewhere in the EDNER reports) seems to be that they use a generic search engine to find ANY object which meets a teaching need: so they are content with an object which 'does the job' even if it is not necessarily the 'best' possible.

These observations do not in any way invalidate the provision and exploitation of high quality metadata and the use of cross-searching to discover resources hidden in a range of heterogeneous services, but they do suggest that other approaches also need attention. For example, keyword searching of full-text, among other approaches, is important to users and may, as the IE develops a broader audience, become more critical. It must again be noted, in favour of such approaches, that the overhead of creating and managing complex metadata will be unattractive to many of these communities and their suppliers.

A final issue under this heading is that cross-searching is not a good mechanism to support browsing and that more attention needs to be paid to such serendipitous activity.

7.6 Quality

The issue of “quality” of content has been referred to in section 3.2 above. From an architectural point of view it could be argued that the IE is neutral since it can deliver information objects whether they have been quality assured or not. However, it could equally be argued that there is a need for more middleware services to enable content quality to be defined in user terms at provision and request stages. In this context an indicator of level would also be an indicator of quality – “fitness for purpose”.

7.7 eprint repositories

Although eprint repositories are strictly outside the scope of 5/99 we have followed developments with interest since they have the potential to change the nature of the IE in significant ways. We note, however, that the IA does not yet demonstrate how these services will be integrated into the total offer – they are, of course, providers of content but more importantly they need to be integrated from a publishing perspective. For example, centrally-provided shared vocabularies might be needed as a shared service. This would not necessarily imply the development of a single, high-level vocabulary but might be operationalised by encouraging each subject community to identify and/or develop an agreed vocabulary of its own. As far as possible this should involve international collaboration to ensure that metadata harvested from repositories worldwide could be processed successfully by eprint discover services, but even UK-level agreement would considerably enhance the probability of successful roll-out of sustainable services. Of course, such a strategy would leave several issues to be resolved, including the handling of boundary issues between disciplines and the handling of multi-disciplinary and inter-disciplinary enquiries. There would also be value in exploring the scope for common ontological frameworks to enhance interoperability.

7.8 Middleware and shared services

A recent comment (at the JISC Development Forum) that middleware has become dominant in the IA model needs to be taken seriously. There are good reasons for this and a strong argument that thin presentation and provision layers are appropriate (i.e. that the complex processing of requests should be done in the ‘invisible’ middle

layer). Indeed the semantic web¹⁵ and Grid developments suggest that this is the future for the majority of networked services. What is needed, perhaps, is a clear articulation between the different middleware components and between competing components of the same kind. An example of the latter issue would be user preference services which show every sign of proliferating.

7.9 Standards

The IA has been a successful vehicle for the promotion of open standards and a recent paper from UKOLN has provided a helpful summary of the current position¹⁶. It is also notable that the IA has proved flexible enough to accommodate new and emerging standards (OpenURLs would be a case in point) where that has proved necessary.

There is a need for continuing debate between the academic/IA community and the developers of broader services in networked environments. The adoption of web services approaches by IA developers and the increasing use of, for example, SOAP interfaces for searching content services etc. demonstrate that there is good awareness in our community of how development paths are changing and an ability to accommodate such changes. However, there is continuing criticism from some providers in the commercial sector that the academic community tends to develop its own, over-complex approaches which never gain more widespread acceptance – Z39.50 tends to be the focus for such comments. The difficulty, of course, is that widely-accepted and implemented alternatives are often not available at the time that they are needed. However, the IA community does need to remain alert to the possibility that some of its standards commitments may, over time, prove to be transitory.

7.10 Conclusion

As we move forward it is essential that the focus is placed firmly on an architectural design which is driven by the tasks and activities which users perform or wish to perform. This requirement is similar to, but perhaps goes a stage further than, that articulated recently by Neil McLean and Clifford Lynch who argue for: "...a

¹⁵ See Berners-Lee, T. et al. *The Semantic Web*.
<http://www.scientificamerican.com/article.cfm?articleID=00048144-10D2-1C70-84A9809EC588EF21&catID=2> and www.w3.org/2001/sw

¹⁶ JISC Information Environment Architecture: Standards Framework
(<http://www.ukoln.ac.uk/distributed-systems/jisc-ie/arch/standards/>)

conceptual shift away from a traditional systems architecture viewpoint to one where applications become defined by the services provided and the services that can be accessed.”¹⁷ As will be apparent, our view would be that focusing on services is not itself enough. Until we have a much clearer understanding of the tasks that the end-users are performing and of the ways they link these tasks together it will be difficult to develop a truly comprehensive architecture.

¹⁷ MCLEAN, N and LYNCH, C Interoperability between Information and Learning Environments – Bridging the Gaps. *A Joint White Paper on behalf of the IMS Global Learning Consortium and the Coalition for Networked Information* DRAFT – Version of June 28, 2003 http://www.imsglobal.org/DLims_white_paper_publicdraft_1.pdf

8 Related Initiatives

As part of the evaluation, a wider perspective was taken by the EDNER team in order to provide intelligence for the developing JISC IE on its relation to other national digital initiatives. To this end, a content analysis of stated objectives and content for a number of national digital initiatives was undertaken.

Figure 8.1 illustrates occurrences of most popular keywords (or truncations of keywords) in the objectives, content or both. This refers to whether a keyword was mentioned by a national activity or not, rather than total frequencies.

Learning is mentioned in the objectives of two of the activities (Culture Online and National Learning Network), in the content of four of the activities (BECTA, eLib, UK e-Universities and FERL) and is mentioned in both the objectives and content by eight of the activities (Learndirect, LTSN, Learning and Skills Council, NGfL, NOF-Digitise, People's Network, Ufl and the JISC IE).

Access is mentioned in the objectives of eight activities (Culture Online, LTSN, Learning and Skills Council, NLN, People's Network, RSLG and UK-online and JISC IE) and in the content of five (Archives Hub, eLib, NeLH, NOF-Digitise, Ufl). One of the activities (UK e-Universities) mentioned access in both the objectives and content.

Support is mentioned in the objectives of six of the activities (Culture Online, FERL, LTSN, NeLH, RSLP, JISC IE) and in the content by four of the activities (Learning and Skills Council, NHS Direct, NOF-digitise and UK-Online). Four of the activities mention support in both the objectives and content (BECTA, eLib, NLN and People's Network).

Education is mentioned in the objectives of two of the activities (UK e-Universities and JISC IE) and in the content of four (Archives Hub, FERL, Learndirect and Ufl). Three of the activities mention education in both the objectives and content (BECTA, Learning and Skills Council and NGfL).

Delivery is mentioned in the objectives of five of the activities (LTSN, NLN, RSLG, Ufl and JISC IE), in the contents of two (BECTA and eLib) and in both the objectives and content of one (Learning and Skills Council).

Training is mentioned in the objectives of one of the activities (NGfL), in the content of two (BECTA and eLib) and in both the objectives and content of two (Learning and Skills Council and People's Network).

Quality is mentioned in the objectives of one activity (JISC IE), in the content of three (NeLH, NLN and Ufl) and in the objectives and content of four (eLib, UK e-Universities, LTSN and the Learning and Skills Council).

Teaching is mentioned in the objectives of four activities (NGfL, NLN, People's Network and the JISC IE), in the content of three (BECTA, eLib and FERL) and in the objectives and content of one (LTSN).

Advice is mentioned in the objectives of two activities (LTSN and NLN), in the content of six (Learndirect, NeLH, NGfL, NHS Direct, UK-Online and Ufl) and in both the objectives and content of BECTA.

KEY to codes:

Keywords in Objectives

Keywords in Content

Keywords in Objectives and Content

	Learning	Access	Support	Education	Delivery	Training	Quality	Teaching	Advice
Archives Hub		Dark Blue		Dark Blue					
BECTA	Dark Blue		Grey Hatched	Grey Hatched	Dark Blue	Dark Blue		Dark Blue	Grey Hatched
Culture Online	Orange	Orange	Orange						
eLib	Dark Blue	Dark Blue	Grey Hatched		Dark Blue	Dark Blue	Grey Hatched	Dark Blue	
UK e-Univ	Dark Blue	Grey Hatched		Orange			Grey Hatched		
FERL	Dark Blue		Orange	Dark Blue				Dark Blue	
Learndirect	Grey Hatched			Dark Blue					Dark Blue
LTSN	Grey Hatched	Orange	Orange		Orange		Grey Hatched	Grey Hatched	Orange
L&SC	Grey Hatched	Orange	Dark Blue	Grey Hatched	Grey Hatched	Grey Hatched	Grey Hatched		
NeLH		Dark Blue	Orange				Dark Blue		Dark Blue
NGfL	Grey Hatched			Grey Hatched	Orange	Orange		Orange	Dark Blue
NLN	Orange	Orange	Grey Hatched				Dark Blue	Orange	Orange
NHS Direct			Dark Blue						Dark Blue
NOF-digi	Grey Hatched	Dark Blue	Dark Blue						
People's Net	Grey Hatched	Orange	Grey Hatched			Grey Hatched		Orange	
RSLG		Orange			Orange				
RSLP			Orange						
UK-Online		Orange	Dark Blue						Dark Blue
Ufi	Grey Hatched	Dark Blue		Dark Blue	Orange		Dark Blue		Dark Blue
JISC IE	Grey Hatched	Orange	Orange	Orange	Orange		Orange	Orange	

Figure 8.1 Keyword occurrences in objectives and content statements of national digital initiatives

A comparison between each of the national activities showed that terms relating to learning, access and support have been mentioned by most of the national initiatives, either in relation to objectives, content or both. This suggests that there are very strong similarities between the initiatives in terms of the purpose and in the content that they aim to deliver (or are already delivering). A number of key public sector bodies have already recognised that parallel investment has taken place in the digital educational assets, infrastructure and services to support enhanced engagement with on-line resources for formal and informal learning and the establishment of the Common Information Environment Working Group¹⁸ is a highly significant development in enabling the vision articulated in the JISC's Information Environment Strategy (2001-2005):

“This strategy recognises that the key to pursuing the development of the Information Environment is in partnership with other agencies who are also looking to find solutions to the challenges of distributed information resources and ways of presenting them to new audiences”.¹⁹

¹⁸ http://www.jisc.ac.uk/index.cfm?name=wg_cie_memo

¹⁹ http://www.jisc.ac.uk/index.cfm?name=strat_ieds0105_draft2

9 Approaches to Evaluation

9.1 Introduction

The main purpose of this section is to summarise and reflect upon the strategies and methods which were deployed in EDNER in conducting the formative evaluation. In explicating the approaches used in EDNER, however, we consider that these should be set in the wider contexts of: (i) issues in conducting a formative evaluation; (ii) issues in evaluating large-scale digital initiatives and (iii) models and approaches to evaluation utilised in related national initiatives. These contexts provide the opportunity for reflection on the lessons learned from EDNER's strategy and the strengths and weaknesses which have emerged.

9.2 Issues in conducting a formative evaluation

A useful framework for the discussion of the process of evaluation within EDNER is provided by Suchman²⁰ in his seminal work in which he outlined six key areas in which issues relating to formative evaluation needed to be acknowledged and resolved where possible. These are:

- *Relation to public demand and co-operation*
- *Definition of evaluation problem and objectives*
- *Evaluative research design and execution*
- *Role relationships and value conflicts*
- *Resources for evaluative research*
- *Utilisation of findings*

(i) *Relation to 'public' demand and co-operation*

The range and variety of stakeholders - funding bodies, development teams, students, lecturers, researchers, librarians etc – who were consulted each had different levels of awareness and perceptions of the developing Information Environment, or the DNER in the early stages. We were dependent on the co-operation of users and stakeholders as subjects in some of our investigations.

²⁰ SUCHMAN, E.A. (1967) *Evaluative research : principles and practice in public service and social action programs*. New York : Russell Sage Foundation.

Although some were specifically targeted, especially the key players such as institutional managers and library directors, others were chosen for convenience and willingness to participate – e.g. local lecturers, students, 5/99 project staff. There were covert agendas which obfuscated the perceptions, such as institutional take-up and the temporariness of contract staff. At the same time, many stakeholders were more interested in the immediate delivery of services than the potential from development projects. We were conducting our evaluation in a dynamic technical and organisational environment, so that the subject of investigation was ever-changing.

(ii) *‘Definition of evaluation problem and objectives’*

The evaluation ‘problem’ (research question) as defined in Strand C of the JISC 5/99 circular was not precisely defined. The two Calls for evaluation proposals were

- *To ‘evaluate the improvements generated in use of JISC Services and Resources for learning and teaching as a result of the programme described in this circular.’*
- *To ‘provide formative evaluation of the DNER....’*

The problems inherent in this broad-brush approach to defining the evaluation requirements was compounded within EDNER when three proposals (and proposers) were integrated into one project (i.e. EDNER). The task was thus to evaluate both the 5/99 programme and the developing DNER/IE. This was a mix of demonstrator projects and services, each requiring differing approaches to evaluation. This was not an insuperable problem and was accommodated within the EDNER partnership, where the tensions were recognised and managed. Stakeholder perceptions of the developing DNER were, however, disparate. Also ill-defined at the outset were the objectives of the primary construct to be evaluated – the DNER (e.g. “to provide the globe’s high quality digital content to staff and students in (UK) higher and further education, at any time, and from anywhere.” Such visionary objectives are impossible to measure, so they needed to be transformed into accessible desired outcomes.

(iii) *Evaluative research design and execution*

The EDNER team could not look to precedents in guiding the evaluation design since there was no precedent in the developing entity (i.e. the DNER/IE) or in approaches to evaluation of such an entity. The re-organisation of the JISC and the DNER/IE

Development Team mid-way through the evaluation called for a redefinition of focus and objectives in the evaluation design. Within this shifting environment, we also encountered overlapping and even duplicate activity being undertaken elsewhere under the auspices of JISC.

(iv) Role relationships and value conflicts

Amongst the EDNER team and the JISC /DNER Development team there existed a wide mix of cultural and discipline experience. Academics, librarians, technical developers, project managers, programme managers, administrators and others came together to discuss issues emerging from the formative evaluation and to provide the EDNER team with intelligence/information on ongoing developments.

(v) Resources for evaluative research

As indicated in 9.3 below, a comprehensive evaluation of the 5/99 programme and all its constituent projects would have required more resources than were available. Shortly after the commencement of EDNER, JISC incorporated further education into its remit, which EDNER did not have the resources to address. The DNER concept was broadened into the JISC Information Environment and new portal projects were funded. The entity which EDNER was evaluating was thus changing and expanding at the same time.

(vi) Utilisation of findings

Due to the formative nature of EDNER, findings and issues were emerging from our work in the early stages of the evaluation. Key issues were flagged with the JISC DNER/IE team, were written up into workpackage reports and presented to JCEI/JCIE. With hindsight, we consider that the timing of this early feedback was appropriate and has had some degree of influence on the subsequent developments in a strategic sense. It was also clear that EDNER intervention had significant effects on 5/99 project teams, not least in repeatedly insisting on a focus on project logic, on outcomes and on theories of change. While we cannot claim that all projects fully utilised these insights, the evidence suggests that they were influential for a significant number.

9.3 Issues in evaluating large-scale digital initiatives

Saracevic and Covi (2000)²¹ have highlighted issues which need to be resolved in the evaluation of digital libraries. Again, these issues provide a useful framework for the examination of the processes within EDNER and within other digital initiatives included in this report. In their view, to be considered as an 'evaluation', any evaluation has to meet certain requirements. It must involve decisions related to:

Construct for evaluation. What to evaluate?

Context - What is "evaluation" in the context of the digital information environment? What level of activity should be evaluated? (Programme, Projects, Individuals..)

Criteria - reflecting performance as related to selected objectives. What parameters of performance to concentrate on? What dimension or characteristic to evaluate?

Measures - What measures to apply to various criteria?

Methods - How to evaluate? What procedures to use?

A clear specification on each of these is a requirement for any evaluation of digital libraries. Unfortunately, it is not as yet entirely clear what is to be specified in each of these five elements. No agreement exists not only on criteria, measures, and methodologies for digital library evaluation, but even on the 'big' picture, the construct and context of evaluation. The evaluation of digital libraries is still in a formative stage. Concepts have to be clarified first. This is the fundamental challenge for digital library evaluation.

In terms of 'Construct', Saracevic and Covi posit a number of discrete digital library 'elements' which could be evaluated. These are shown in Figure 9.1.

²¹ SARACEVIC, T. & COVI, L. (2000) Challenges for digital library evaluation. *Proceedings of the American Society for Information Science*, 37, pp. 341-350.

- **Digital collections, resources**
 - selection, gathering, holdings, media
 - distribution, connections, links
 - organization, structure, storage
 - interpretation, representation, metadata
- **Preservation, persistence**
- **Access**
 - intellectual
 - physical
 - distribution
 - interfaces, interaction
 - search, retrieval
- **Services**
 - availability
 - range of available services e.g. dissemination, delivery assistance, referral
- **Use, users, communities**
- **Security, privacy, policies, legal aspects, licenses**
- **Management, operations, staff,**
- **Costs, economics**
- **Integration, cooperation** with other resources, libraries, or services

Fig. 9.1 Potential elements for evaluation in a digital library context
(Saracevic and Covi)

In other words, an evaluation must specify clearly what elements are evaluated, with a full recognition of the emphasis. Every evaluation will leave something out. With the present state-of-the-knowledge, no evaluation can cover even the majority of elements involved in a digital library, nor can it pretend to do so. Thus, there is no "evaluation of digital libraries" – there is only an evaluation of some of the elements in their construct. (Saracevic and Covi)

We would also note, as we have stressed above, that this kind of approach grossly underplays the importance of evaluating outcomes and impact, and fails to contextualise the "digital library" within the user's task and strategic environment. It thus falls short at the very point where formative evaluation could be most valuable.

Finally, we need to note that, in any case, the DNER/IE is and always was far more than a “digital library”. Part of the motivation for EDNER’s concentration on appropriate models in phase 1 was to try to elucidate the extent to which digital library and other constructs would contribute to evaluation methodologies. This remains a key issue.

9.4 Approaches to evaluation used in EDNER

9.4.1 EDNER approaches used in Phase 1 (August 2000-April 2002)

In Phase 1 of EDNER, there were five distinct foci:

- Analysis of constituent roles and services of the DNER (Report DA1)
- DNER service evaluation (Report DA2)
- Local implementation of the DNER (Report DA4)
- Portal development within the DNER (Report DB1)
- Pedagogical frameworks (Report DC1)

In the ***Analysis of constituent roles and services of the DNER (Report DA1)*** the starting point for identifying the constituent parts of the DNER was the definition of the DNER by the JISC and the DNER team, i.e. ‘*The distributed national electronic resource (DNER) is a managed environment for accessing quality assured information resources on the Internet*’.²² Some deconstruction of this definition was necessary in order to identify appropriate targets for this analysis within manageable boundaries. Although ‘*the Internet*’ was the broad context of the Study, possible routes into identifying the constituent parts of the DNER were via the concepts of the ‘*managed environment*’ and the ‘*quality assured information resources*’. The boundaries of the ‘*managed environment*’ were too blurred to provide adequate focus for the study. Implications (and indeed, previous and current intentions) of the inherently ‘*distributed*’ nature of the DNER are that the ‘*managed environment*’ is also distributed.

²² JOINT INFORMATION SYSTEMS COMMITTEE (1999) Adding Value to the UK’s Learning, Teaching and Research Resources: the Distributed National Electronic Resource (DNER). http://www.jisc.ac.uk/index.cfm?name=dner_adding_value

A graphic representation of the blurred, or overlapping, boundaries had been represented in a DNER Discussion document (Fig. 9.2). The problems arising from identifying constituent parts from this perspective were obvious.

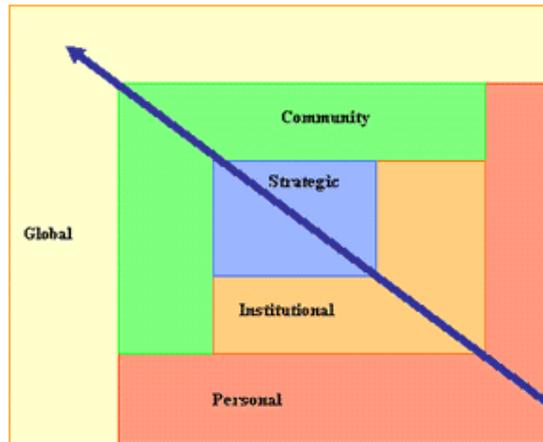


Fig. 9.2 The scope of the DNER environment

<http://www.jisc.ac.uk/dner/background/discussiondoc.html> (April 2001)

The 'landscape' metaphor had also been used to describe the DNER environment for some time, and was a useful one in modelling the DNER for the purposes of articulating a development strategy (Fig. 9.3). Its perspective was necessarily reductionist, however, and its implicit assumptions concerning the substance of the constituent parts of the DNER were not apparent.

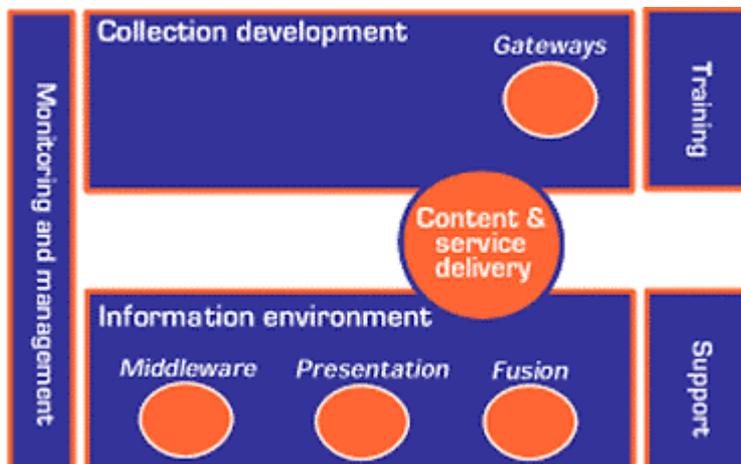


Figure 9.3 A schematic representation of the DNER landscape (June 2001)
<http://www.jisc.ac.uk/dner/services>

A more transparent perspective had been posited by Andy Powell and Liz Lyon (UKOLN), whose graphic representation (Fig. 9.4) of the content of the DNER reflected the approach taken by the Evaluation Team in focussing, in the first instance, on JISC funded activity.

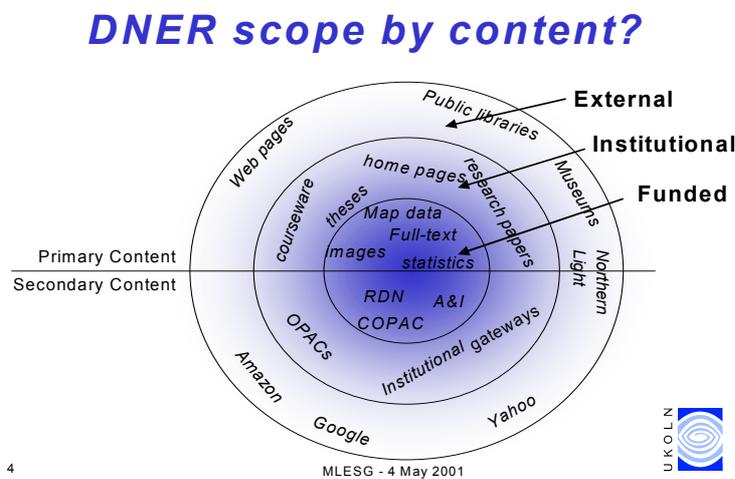


Figure 9.4 Scope of the DNER content (A. Powell, L. Lyon. MLE Steering Group, 4 May 2001, UKOLN, University of Bath)

<http://www.ukoln.ac.uk/distributed-systems/dner/arch/presentations/dner-arch-mlesg/dner-arch-mlesg.PPT> (May 2001)

Fig 9.4 was a useful starting point for debate on the constituent roles of the DNER, even though its focus was limited to content. In this diagram, the core of the DNER scope is ‘funded’ activity and it was this element which provided the focus for this study.

The analysis of the constituent parts of the DNER therefore focussed on ‘funded’ activity and included JISC 5/99 Learning and Teaching and Infrastructure projects. JISC Services, JISC Collections and eLib projects/services.

The services, collections and projects were categorised by type and subject. Two categories of resource type were used in the analysis of constituent parts of the

DNER: 'explicit' and 'implicit'. The implicit types were those categories which emerged from the inductive analysis of the 5/99 project documentation. Labels representing subjects and resource types were those based on the Content Mapping Study undertaken by UKOLN in April 2001. The analysis of the projects funded under JISC Circular 5/99 represented an inductive analysis of the emerging DNER, and utilised documentation emanating from the 5/99 Projects (project plans, where available, or alternative documentation). The rationale underlying this approach was that the DNER was defined by both concepts (vision statements and objectives) and by the way it is 'enacted' in the material and services being made available. The 5/99 project plans and other documentation contained the best available evidence. The analysis was primarily concerned with the question "what is the 'substance' of the DNER?".

In the *DNER service evaluation* (Report DA2) the aim was to evaluate the quality of a sample of DNER 'services' (both those deriving from 5/99 learning and teaching projects and others) according to defined criteria from a user perspective. This was achieved by establishing a set of Quality Attributes – a technique based on an approach first identified by Garvin²³ and applied by Brophy²⁴, with revisions and adaptation for its use in this context. Student volunteers were recruited to undertake defined tasks over a two-day period. The attributes examined were:

- Performance
- Conformance
- Features
- Reliability
- Durability
- Currency
- Serviceability
- Aesthetics
- Perceived quality
- Usability

²³ GARVIN, D.A. (1987). Competing on the eight dimensions of quality. *Harvard Business Review*: pp. 101-9.

²⁴ BROPHY, P. (1998). It may be electronic but is it any good? Measuring the performance of electronic services. In *Robots to Knowbots: the wider automation agenda*. Proceedings of the Victorian Association for Library Automation 9th Biennial Conference, January 28-30 1998, Melbourne: VALA, pp 217-230.

Thirty test queries were developed, one for each of the fifteen tasks on day one and one for each of the tasks on day two. These queries were designed so that they would be of sufficient complexity to challenge the users without being impossible for them to answer. Particular attention was paid to the design of the day one queries in that each was targeted at retrieving information from a known Website (service under evaluation), but information could also be found using alternative sources. Testing was conducted in a controlled environment based within the Department of Information and Communications. Each participant searched for the fifteen test queries and completed questionnaires for each task undertaken. Each participant searched for information which was available on a variety of JISC and non-JISC services.

A matrix was created using SPSS (Statistical package for the Social Sciences), into which coded data was entered. Qualitative comments were analysed using an Access database.

In investigating the ***Local implementation of the DNER (Report DA4)***, the aim was to determine how services and resources were surfacing in the learning and teaching environment. Those selected for evaluation followed the criteria outlined below. *Google* was also included to provide comparative data.

In order to see which higher education institutions were linking to each resource, a consistent set of Internet searches was carried out. The aim was to find up to 50 or 60 appropriate non-library links to each resource, and then to record how many links fell into the Institution or Individual categories. Each link found would be studied to see how the resource was presented to the user, and whether any consistent patterns or issues emerged.

In evaluating *Portal development within the DNER (Report DB1)*, the Team examined a wealth of documentary evidence, considered parallel portal/gateway developments outside UK HE/FE and held discussions with a large number of key players. The Report was concerned only with the strategic framework for UK HE/FE portal development. A variety of relatively minor issues were also discussed with the DNER and portal development teams on an ongoing basis.

In the work on developing *Pedagogical frameworks for the DNER (Report DC1)* the 5/99 L&T projects were categorised according to a small number of basic assumptions made by the projects themselves (Table 9.1).

1. There exists a set of material objects (such as artefacts in a museum or documents in a public records office) which if rendered into a digitised form would be accessed and used by learners, to their educational advantage	ARTWORLD, BuilDNER, CSCCA Digitisation, Textiles, Biota?, Digital Egypt, LEMUR, Virtual Norfolk
2. There exists (or will exist) a set of digitised resources which, if used more frequently or more widely, would be of educational benefit to learners. The main barriers to greater use are:	
- teachers do not know they exist or find it hard to locate them	FAILTE; LIFESIGN
- access to the resources is complicated; seamless or simpler access methods needed	CHCC, TimeWeb, PICTIVA
- access to the resources alone, by students, will not be as beneficial as access which is mediated through carefully crafted educational packages and/or contextualising material or courses	Designing Britain, Biota, PATOIS
- access by students requires special skills	L&T Materials for Beilstein Crossfire; INHALE
- teachers need to be shown or advised about how to incorporate them into their teaching	CHCC, EDINA Digimap e-MapScholar, TimeWeb, Use of Numeric Data in L&T, ARTWORLD, BB-LT, CSCCA, PICTIVA, Textiles, PATOIS
3. In general, students use of DNER-type resources will be constrained by the complexities of access	ANGEL
4. Our basic (scientific?) understanding of	EBONI, RESULTS?, HOTBED,

new media (etc) in HE needs improving if we are to make good design/pedagogical decisions	Click & Go Video?, LIFESIGN
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Table 9.1 Project assumptions

Not surprisingly, those projects which offered a much more detailed and focussed pedagogical rationale were harder to categorise in terms of the table given above. The examples which stood out most clearly to us were:

Virtual Learning Arcade	Students get a deeper understanding of economic theory & processes (etc) through use of models or simulations
VDML	Students of minority languages need good access to the target language, to a broad range of other learning resources and to a critical mass of fellow students

Table 9.2 Pedagogical rationales

9.4.2 EDNER approaches used in Phase 2 (April 2002 – July 2003)

In EDNER’s Phase 2, there were five key foci:

- Institutional impact
- Pedagogical assessment of 5/99 projects
- Information needs
- Information Architecture & Portals
- Related national digital initiatives

9.4.2.1 Institutional impact of the developing Information Environment

Two case studies were undertaken at the Evaluation Team’s host institutions, one being a pre-1992 and the other a post-1992 university. Using the host institution provided a depth of access to individuals and resources which would not have been possible in other HEIs.

In Case Study 1 – a post-1992 university – interviews were held with students, lecturers, and librarians. An analysis of student citations was also undertaken.

In the *Institution-centred IE implementation – Analysis of Student Citations in the e-environment (Report A1)*, the aim was to determine the type of material which students were using, and the extent to which this was available electronically.

Dissertations were chosen for the citation analysis, rather than papers or coursework submitted on the same topic by each student for assessment throughout the year, as dissertations encompassed a wider range of topics within a subject than the coursework. The 16 dissertations selected for this study were those submitted by the end of September 2002 as part of the selected postgraduate courses.

Sylvia²⁵ (1998) suggests that citation analysis is an appropriate method of determining the type of resources most used most frequently, as it is unobtrusive, while citations are easy to obtain, and are not altered by examination. According to Buttlar²⁶ citations are ‘an indirect, uncontaminated source of data’ as their analysis does not require the participation of a respondent. The reference and/or bibliography sections of the dissertations were converted into a separate spreadsheet for each bibliography. The categories chosen for this study were based upon Oppenheim and Smith’s (2001) groupings²⁷, with the addition of categories for ‘UK Government publications’, ‘conference papers’ and ‘theses’. The category ‘Website’ was substituted for ‘Internet’. The initial categorisation indicated whether students had given a reference to an electronic version of a source, as a URL was present. It was then necessary to carry out a search for the remaining references within the categories ‘conference papers’, ‘reports’, ‘journal articles’ and ‘government publications’ to determine whether an electronic version was available. In the case of the ‘journal articles’, this was implemented using the online periodicals directory Ulrichsweb (<http://www.ulrichsweb.com>).

The vignettes reported in *Information usage in higher education (Report A3a)* were developed from a series of interviews at the first case study site. This ability to express the results of qualitative studies as narrative is a very significant advantage

²⁵ SYLVIA, M. F. (1998) Citation Analysis as an Unobtrusive Method for Journal Collection Evaluation Using Psychology Student Research Bibliographies. *Collection Building* 17(1), pp. 20-28.

²⁶ BUTTLAR, L. (1999) Information Sources in Library and Information Science Doctoral Research *Library and Information Science Research* 21(2) pp. 227-245.

²⁷ OPPENHEIM, C. and Smith, R. Student Citation Practices in an Information Science Department *Education for Information* 19 pp. 299-323.

as it “gives a better ‘flow’ than can even the best annotated tables of statistics”.²⁸

Each vignette is based upon more than one interview, so although they would seem to reflect only one person’s experience, they are in fact a reflection of the experiences of all the participants, divided either according to type of academic or discipline. The vignettes have been created by the evaluator (or researcher), to interpret a particular incident and use it to illustrate a more general situation²⁹.

In the first series of interviews with lecturers, the aim was to explore what kinds of resources lecturers were selecting to support their online teaching modules, and how they sought such resources, to query the role played by university librarians in the discovery process, and to ask how lecturers were presenting the resources to their students. The lecturers who participated had all recently expressed an interest in using a Virtual Learning Environment (VLE), namely WebCT, as a teaching tool. All had had some degree of training in how to use the various facilities offered by the VLE. The training had not included in any great depth the embedding of online information resources, beyond indicating that linking to these was a possibility. The emphasis was not upon the skills and practices of the individual lecturers when developing their VLE but was clearly focused upon their attitudes towards online information resources. Face-to-face interview was the preferred method of investigation, but an email questionnaire was offered as an alternative to those lecturers who expressed willingness to help, but were concerned about the time commitment involved. This dual approach led to a response of over 60%, but it quickly became clear that several lecturers had ‘dipped their toe into the water’ and then decided not to deliver their teaching in this way. Fifteen usable responses were received, covering the business, science and engineering, education, law, food clothing and hospitality management, humanities and social sciences communities. Seven offered hour-long face-to-face interviews and the rest preferred to respond by email questionnaire. The email responses were received very quickly, and helped steer the more in-depth interview discussions.

A second series of interviews at the first case study site was undertaken with lecturers, researchers and students across a variety of disciplines and academic status. In all, ten individual interviews were conducted, consisting of four lecturers (from the Economics, English, Politics and Languages departments), five research

²⁸ BAWDEN, R. (1990) Towards Action Researching Systems. In: ZUBER-SKERRIT, O. (ed.), (1990). Action Research for Change and Development. CALT, Griffith University, Brisbane, pp.21-51.

students (from the History, Economics, English, Sociology and Languages departments) and one undergraduate (from the History department). Nine more undergraduates from the English, Languages, Politics and Sociology participated in two group interviews.

The use of the critical incident technique (CIT) during the interview was useful in elucidating participants' typical information needs and the information seeking process that they undertake in order to answer those needs. CIT is a qualitative research method in which participants are asked to provide the researcher with anecdotal information about the last time they were in a particular situation, what led them to be in that situation, and what the results were. Since its development over 50 years ago, CIT has been used in hundreds of published studies related to various fields of research³⁰.

In the second case study site, which was a pre-1992 university, the aim was to link the surfacing of DNER/IE resources and services with a greater understanding of the current use of digital resources by academic staff for teaching purposes (*Pre-1992 University Institutional Case Study (Report C1)*).

An overall view of the University Web servers was initially obtained by conducting simple Google searches from the University homepage. The searches were conducted for DNER/IE, 5/99 projects searched for by project name, the RDN (Resource Discovery Network), the individual subject gateways and other related services e.g. Internet Detective and the RDN Virtual Training Suite. It was assumed that the subject gateways would indicate if there was any greater awareness of these established services and if so whether such awareness had any impact on broader take-up. The Google search was more thorough than expected and the searches included some instances of material held on Lotus Notes databases, the local V/MLE. It should be noted that though Google searched for Lotus Notes pages the searches only identified unprotected pages. Each link from the search was traced and categorised according to who had provided the link, the nature of the link itself and its specific context. An agent was constructed to search the VLE databases, including those areas that were password protected. This was only partially successful as the agent was only able to search indexed databases. Though this was a minority of all databases held on the VLE servers the learning technology unit were

²⁹ STENHOUSE, L. (1981) What counts as research? *British Journal of Educational Studies*, 29(2), pp. 103-114.

confident that this represented most of the active area. Indexed sites were the more recent and most used parts of the databases, while many of the unindexed areas were historic and inactive sites. A piece of freeware, *Xenu*, was used to search Department Websites. These searches gave information about the relative scale of Departments' usage of Web links and the types of links that were offered. This general sweep was accompanied by more qualitative searches of department Websites aimed at judging the way in which Web links were made use of. The full searches were conducted once but shorter searches were repeated to capture any significant changes in the pattern of surfacing of such DNER/IE related resources over the lifetime of the project. No significant changes were recorded.

An exploration was undertaken of key academic staff who had been identified by others within the university as staff that were advanced in their current teaching activity, in particular their use of digital resources. The nineteen academic staff who were interviewed came from sixteen departments covering a range of disciplinary areas. The staff were mainly experienced lecturer grade staff but they included one professor, a manager of continuing education courses who designed the courses and one researcher with limited teaching commitments. The researcher was responsible for the development of the department intranet. The departments were chosen to reflect the range of University departments and included Physics, Mathematics and Statistics, Biological Sciences, Engineering, Applied Social Sciences, Marketing, Politics and International Relations, Geography, Modern Languages and Culture, Music, Law, Education and History. In three cases two individuals from the same department were interviewed to obtain two perspectives on the wider department usage of digital resources.

The interviews were conversational in style and began with a request from the interviewer for the member of staff to describe their personal use of digital resources in their teaching.

The interviews were conducted in the member of staff's own office and a computer was always available. The interviewer focused initially on the member of staff's own use of digital resources but later in the interview the respondent was asked about the relationship of the individual member of staff with the department and the library. A section of the interview towards the close was reserved in order for the interviewer to make use of the networked computer to show a number of relevant sites to the

³⁰ FISHER, S. and OULTON, T. (1999) The Critical Incident Technique in Library and Information Management Research. *Education for Information* 17 (2), pp. 113-125

interviewee including the DNER/IE and RDN. The availability of the computer during the full course of the interview also allowed the member of staff to show relevant departmental, course and personal areas used for teaching purposes.

Within the case study nine subject librarians were also interviewed on the use of digital resources across the University. Data was collected from interviews using a conversational approach; the interviews lasted approximately 30 minutes and took place late in the academic year 2001/2. The interviews took place in the librarians' offices and in all cases there was access to a networked computer.

For the *Stakeholder consultation and analysis: Report on consultation with HE Directors of Library/Information Services (Report A3b)* MacDougall Consulting Ltd was engaged to undertake a study of the awareness of Directors of University Library Services (or equivalent) of the JISC's development programme in general and the 5/99 Programme in particular.

The selection of the sample took into account the need to encompass a wide diversity of institutional types and individual responsibilities. The variables included:

- Institutions: national i.e. Scotland, Wales, England and Northern Ireland; regional/geographical spread; Russell group; New universities; civic universities; research intensive; teaching and learning emphasis; specialised rather than broad based universities
- Individual Directors: differing responsibility, that is, Director of Library Services or University Librarian, Director of converged service etc.; JISC Committee involvement/no involvement or engagement; JISC bidding (successful and unsuccessful); male/female ratio.

All 20 Directors readily agreed to be interviewed. At the time of arranging interviews each Director was sent information about the consultancy, including appropriate URLs referring to the 5/99 call and EDNER project. Interviews lasted on average one and a half hours. A checklist of questions was used as a framework although discussion was allowed to flow to accommodate the ideas and thoughts of each of the interviewees. The Directors were assured that views expressed in the Report would not be attributed to named individuals, but all agreed that quotations could be used in an anonymous way to illustrate or highlight particular themes.

The *Surveys of impact (Report C2)* utilised a combination of methods to investigate levels of awareness and use of the JISC 5/99 projects and some related JISC brands, resources and services amongst several stakeholder groups in UK higher

education. The four components of the study were: (1) a telephone survey of *teaching staff*, (2) a paper questionnaire survey administered to *students*, (3) an online survey of institutional *support staff* and (4) an investigation of service awareness amongst the LTSNs, using a combination of examination of activities and contacts with key figures.

The overall sampling method involved multi-stage sampling. The samples for each of the surveys (i.e. accessing those populations 1-3 detailed above) were generated by a common approach even though each population was investigated by different survey approaches. The initial selection of institutions utilised a sampling frame based on lists from the UK higher education funding bodies, and including all university-level HEIs in the UK. A stratified random sampling approach was employed for selection of institutions. We then chose four departments from each HEI, using random sampling. This gave a total of 80 different departments. Of these, just over half (41/80) agreed to participate.

We approached 5 staff in all 41 departments, and in total we obtained participation from 58 staff in 20 universities. Of these, 56 were employed on a full-time basis. Length of employment at their current institutions ranged from 'less than 1 year' to 35 years (with a mean value of 8.2 years). The greatest level of participation in this study was by Humanities, Medicine and Social Sciences, and participation was particularly low for Arts. Nearly all of the participants lecture as part of their post, and are also involved in supervision of undergraduate student projects. A significant proportion (62%) is involved in postgraduate supervision, while 52% convene/direct courses. The participants were asked about their use of information services and gateways and about their awareness and use of discipline-specific services and resources.

Interviewees were asked to distribute ten printed questionnaires to their students. From this we obtained a volunteer sample of 286 students. 32% of the sample were studying humanities subjects, followed by 24% studying 'medical and allied subjects'. In contrast, only 3% of the sample were Arts students, with this being the only discipline that had very poor representation within the sample obtained. In terms of mode of study, nearly all (95%) of the 286 students were studying full-time and most were undergraduates (92%). In terms of year of study, this was fairly evenly spread between years 1 to 3, with fewer students included in years 4 and 5 of study.

9.4.2.2 Pedagogical assessment of 5/99 projects

An important aspect of our approach to the formative pedagogical evaluation of the IE involved surfacing the often implicit theories of change embedded in the work of project teams (*Project Logics (Report C3)*). The approach we used builds on the work of Nash et al.³¹ and McLaughlin and Jordan³², who suggested that understanding process variables helps project teams to improve the internal logic of their projects. Among 5/99 project teams, this approach has helped create a shared understanding of what they believe will change in the real worlds of learning and teaching in UK higher education and how the actions they take will lead towards those changes. Here we outline the key characteristics of the research methodology developed for evaluating a large-scale nationwide initiative such as the IE.

The evaluation activities undertaken were characterised by an underlying complexity due to the ill-defined nature of the research task. We were aware that any data we collected would be dependent on the perspectives of different observers across a widely varied sector who might have a partial view of the impact of the initiatives we were investigating. In reporting our analyses we dealt with the requirements of different audiences including academics, stakeholders, funding agencies and policy makers. Consideration of meeting audiences' needs may have implications during data gathering. A principal data gathering activity was to ask 62 team members from about 35 projects to write down:

- the intended benefits of their projects
- the people who would turn the project outcomes into real benefits and the actions they would take to achieve that
- the ways in which their project might work to involve such people in a timely and sustainable fashion.

Towards that end we aimed to obtain a complementary mix of viewpoints on each one of the projects' processes. All the information collected from the project team members was analysed by creating a logic table showing the linkage between the

³¹ Nash, J., Plugge, L. & Eurelings, A. (2000). Designing and evaluating CSCL projects, Paper presented at the European Conference on Computer Supported Collaborative Learning 2000, Maastricht.

³² McLaughlin J. & Jordan G. (1998). Logic models: a tool for telling your programme's performance story, <http://www.pmn.net/education/Login.htm>, 5 June, 2001.

programme activities, outputs, customers reached and outcomes. Activities include the action steps taken by the projects to produce outputs. Outputs are the products and/or services provided to the projects' direct customers. Outcomes refer to the changes or benefits for learners resulting from activities and outputs. Because outcomes can be sequential we distinguished short-term outcomes, which come first, from intermediate outcomes which result from an application of short-term outcomes and finally long-term outcomes or impacts. The data collected from the projects' team members were categorised and tagged into the columns of the table, while the accuracy of the information contained was checked from other sources, such as project plans, reports and Websites. The examination of the elements of the projects' logic was informed by an earlier analysis. This analysis had suggested that project teams did not provide clear descriptions of educational benefits as only 25% of the respondents talked about enhanced learning whereas the majority talked about more, easier and better use of an information resource or service³³.

Eleven projects were selected for further investigation based on the following criteria: a) accuracy of the information gathered, b) an indication that some impact on L&T has been achieved and c) end dates of the projects. We also tried to achieve representation from all the cluster groups.

A logic diagram or map was created for each one of the selected projects telling the projects' story based on the information contained in the logic table described above. For clarity we used fewer terms in the maps than in the logic table, which proved to be too detailed and complicated while communicating with the project teams. The logic maps showed the inputs (i.e. activities undertaken which lead to intermediate goals) and outputs for particular customers, which derive from the intermediate goals. The work involved in explaining these links 'brings to the surface' the projects' implicit theories of change. This graphic articulation of each one of the selected project's theories of change was elaborated and developed through discussions with project team members. The diagrams were revisited and refined over time bearing in mind the need to answer the question of how the projects can help to promote learning and teaching, developing strategies for transferring the knowledge and skills learnt in regard to the implementation of the information resources on learning and teaching through Websites and workshops offered to the user communities. However, in terms of the development of qualities in learners – such as learner autonomy – projects

³³ Summary of the initial analysis of the Manchester (January 24/25) data presented at the March 4th meeting between DNER programme staff and the EDNER team.

have not made this a priority and only two projects could be identified that had built learner autonomy in as one of their aims.

In understanding a complex learning environment such as the IE the development of logic maps enabled investigation of the processes through which learning resources are designed and the ways in which they are being made available to users. The concept of design is relevant to process issues in the creation of learning tasks enabled within learning communities contributing to the enhancement of learning. Our analysis of the logic maps developed within our case studies focuses on three main areas: 1) access to information resources, 2) learning activity and 3) pedagogy design.

9.4.2.3 *Take up and use*

Two Strand C workpackages (C4 and C5) were derived from the original plan for the pedagogical evaluation of the DNER 5/99 Projects devised when CSALT took over this part of the evaluation from King's College London. The original CSALT plan had envisaged a single Workpackage based on a series of case studies conducted over a two-year period. In the revised second phase plan the activity was only to take place at a later stage of the DNER programme and to run for a reduced period of time from October 2002 (C5) and from March 2003 (C4). The work reported in *The take up and use of JISC 5/99 Teaching and Learning project outputs (Report C4)* could thus be thought of as an extension of the case study approach begun in the *Project logics* workpackage. One way of conceiving the link between the different case study based workpackages and reports that have a connection to the individual projects is to think in terms of C3 as *process*, C5 as *product* and C4 as *prospects* (in the sense of take-up of project outputs).

The activity located in workpackage C5 involved contacting and in some cases visiting projects, collecting project documents, including where appropriate final project reports and lists of contacts who currently use or may make use of project products. Some of this work had already begun with some of the selected projects as they were projects that had been part of the examination of project process for Workpackage C3. Workpackage C3, as noted above, was a formative intervention that took the form of a project centred evaluation, examining process using project logic maps. Workpackage C5 was intended to be broad in scope and focused on the *products* developed by the project. The products of projects included courseware (e.g. *Inhale*), guidelines etc (e.g. *Click and Go*) as well as more recognisable

artefacts. In the case of *Click and Go* this involved following up workshop participants (a relatively large number), but in the case of *Inhale* it involved visiting sites that had adopted *Inhale* outputs and implemented them in another university setting.

Contrary to the order implied in the Project Plan, workpackage C4 followed on from C5 both in timing and in its conception. This aspect of the case studies was intended to be narrow in scope and planned to yield some illuminative vignettes of use. The focus here was on the user group and assessment of impact and potential for take up. It was at this point that we hoped to be able to engage users of projects' products and investigate how sustainable the outcomes were or might be, why users might take up and continue to use project outcomes and what benefits end users found in them.

The case studies were conducted using a mixture of methods. In all cases there was a documentary analysis of the project plans and written products. In each case a project summary was drawn up in a common format reporting a digest of this literature review and some additional items considered to be of interest by the evaluation team. The additional items included consideration of the nature of the project outputs in relation to three dimensions:

- The degree of mediation required
- The degree of independence of other resources
- The degree to which pedagogy was implicit within the outputs.

Projects were also assessed in relation to the challenges that they had faced, for example in recruiting staff or in relation to developments between partner groups. This also included a consideration of the unintended outcomes that resulted from some projects.

In some cases project activities such as workshops and other dissemination events were visited. A mixture of telephone and email was used to maintain contact with project teams and in some cases visits were made to the project teams. Project outputs were examined remotely when this was possible and in some cases users of project outputs were contacted and visited or they provided written comments to the evaluators. Not all attempts to contact users of the projects were successful and this aspect of the work will continue after the formal end of the EDNER project, as some project outputs will not be used in educational settings until the academic year 2003/4.

An output from the evaluation was a set of summary digests that tried to capture the main features of the selected projects. These summaries were then used with the more detailed materials collected from each project to provide the basis for developing some general themes.

A key aspect of the method was to have a continuing formative relationship with those projects that were common to this Workpackage and the Workpackage C3 that focused primarily on project logics. It is our contention that the work we did in this regard helped projects focus on what we identify in this report as a key set of distinctions.

- Project outputs

These were defined as the deliverable items that the project produced and included a variety of artefacts including software, reports and guidelines.

- Project outcomes

These were the intended outputs put to use as defined by the projects themselves. Outcomes were the outputs when recognised, valued and put to use by an intended user group.

- Project benefits

The project team introduced this distinction to try and focus project teams on the sustainability of outcomes by identifying those users who would take the project outcomes forward after the project finished. Benefits were outcomes sustained by user groups for their own reasons independent of the projects continued existence.

9.4.2.4 *Information needs*

The aim of the activity undertaken for the *User information needs (Report A3)*, was to identify and analyse previous research from a discipline perspective. A matrix of requirement was established from literature published in the pre- and post-electronic eras. The work was thus essentially desk-based analysis of published literature.

9.4.2.5 *Information Architecture & Portals*

In the *Portal profiling: an analysis of features in a range of portals (Report B1a)* an extensive sample of the literature on the subject of portals was scrutinised to gain an insight into what was being considered as the functionality that differentiated a portal from a simple Webpage. An initial list of features that might be found in a portal was

then compiled from the features suggested in the literature. Those features consisted mostly of what might be expected in a commercial portal as provided by popular search engines such as AltaVista, Excite and Yahoo!, or Internet Service Providers (ISPs) such as AOL, Freeserve and MicroSoft Network(MSN), plus some from specialist (or vertical) sites such as iVillage, LibraryHQ and Zdnet, and academic sites such as MyLibrary @ NCState (North Carolina State University) and MyUCLA (University of California at Los Angeles). Added to this were portal features contained in a survey conducted on behalf of the JISC-funded Subject Portals Project (SPP). The resultant list of features was edited for duplication of features under different names, i.e. where different terminology had been used to describe the same feature. The features were grouped where possible into similar types. Some groupings were fairly obvious: e.g., the features 'chat', 'chat channels', 'instant messaging', 'computer conferencing', 'newsletter', 'message boards', 'discussion groups', 'ask an expert' and 'collaborative working' all readily fell into the group 'Community Communication'; several varieties of news - 'general', 'local', 'world', 'sport', 'weather', 'stock market', - could all be grouped under 'News'. Based on the literature review, a list of portals for possible analysis was produced. The list included what various authors suggested were portals, whether or not the site owners described them as such. Each of the sites on the list were subjected to a brief initial investigation to confirm their existence and suitability for inclusion in the analysis, as a result of which some sites were excluded.

A matrix was constructed of the features list against the final sites list, and each site systematically investigated to find which of the features it offered. The analysis took place between the first week in June and the first week in October 2002.

9.4.2.6 The Information Architecture

The *Evaluation of the Information Architecture (Report A2)* was based on a combination of environmental scanning, documentary analysis, discussions with experts and scenario testing. The aim was to examine the IA not just in terms of technical coherence and appropriateness but as an expression of the IE itself in strategic terms. The report therefore laid emphasis on the implicit assumptions which the IA encapsulated and the implications for the IE and for the community of the view that it took.

9.4.2.7 *Related national digital initiatives*

The aim of the work on related initiatives was twofold. In the first instance (*Context Analysis (Report X1)*), the aim was to identify links between the JISC IE and other national digital initiatives. For this purpose, a number of related UK national activities were identified. The Websites of each of the identified initiatives were explored in relation to information they provided on objectives and content. The initiatives included: Archives Hub, BECTA, Culture Online, eLib, UK e-University, FERL, Learndirect, LTSN, L&SC, NeLH, NGfL, NLN, NHS Direct, NOF-digi, People's Network, RSLG, RSLP, UK-Online, Ufl and the JISC IE.

Keywords relating to the objectives and content were selected from the text of each initiative to build up a list of keyword frequency codes. Using ATLAS/Ti content analysis software, different combinations of a selected keyword were assigned to a single code, so for example, frequencies of the text relating to learning would include combinations such as *learn*, *learning* or *learned*. Keywords were only assigned a code if they directly related to the objectives or the content. For example, the Learning code was not applied to text that simply said 'Learndirect will provide', but applied to text describing different methods of learning. Where no clear list of aims and objectives was provided, it was necessary to extract relevant information from other areas of the site such as the Executive Summary.

Secondly, approaches to *evaluating* the range of national digital initiatives were identified from published reports and Websites. A summary analysis of approaches to evaluation is provided in 9.5 following. A detailed account of evaluation objectives and methods used in the evaluations is provided in the full report (*Development of Evaluation Methodologies (Report X2)*).

9.5 *Models of evaluation for national digital initiatives*

This section provides a summary analysis of evaluation approaches to national digital initiatives and to other major relevant evaluation activity in a digital information context. This overview is presented according to the *Construct* on which evaluations have focussed (see 9.3 above).

In the main, the constructs have been found to centre around users, but the evaluations have focussed on a wide range of characteristics and criteria relating to users as follows:

<p><i>Awareness (of initiative)</i></p>	<ul style="list-style-type: none"> • Formative Evaluation of the Archives Hub (2002) • Evaluating the Learning and Teaching Support Network [Lancaster University] • JISC IE EDNER
<p><i>Behaviour of</i></p>	<ul style="list-style-type: none"> • Culture Online Cultural Web Site Visitor Survey; Results from Cultural Institutions DCMS McKinsey & Company August 2001 • JISC IE EDNER • Dimensions and Use of the Scholarly Information Environment. Introduction to a Data Set Assembled by the Digital Library Federation and Outsell, Inc. By Amy Friedlander. November 2002
<p><i>Demographics of</i></p>	<ul style="list-style-type: none"> • Culture Online Cultural Web Site Visitor Survey; Results from Cultural Institutions DCMS McKinsey & Company August 2001
<p><i>Expectations of</i></p>	<ul style="list-style-type: none"> • Culture Online DCMS Second Stage Qualitative Study Report (04/01) (SRU Ltd)
<p><i>Experience of</i></p>	<ul style="list-style-type: none"> • NHS Direct online. Hampshire Ambulance Service NHS Trust, NHS Direct Hampshire and Isle of Wight and NHS Direct Online. Clinical Governance Review. Commission for Health Improvement (CHI). FEBRUARY 2003
<p><i>Impact on</i></p>	<ul style="list-style-type: none"> • NeLH Pilot Evaluation Project (NCC, 2001) • FERL: Practitioners programme. Evaluation • New Learners, New Learning: A strategic evaluation of learndirect [Ufl] Dr Penny Tamkin, Jim Hillage, Sara Dewson, Alice Sinclair. Institute for Employment Studies. ISBN 1 84478 8. June 2003 • NGfL Impact2 • The National Learning Network. Final report to the Evaluation Steering Group and the NLN Programme Board by the Learning and Skills Development Agency (LSDA) and Sheffield Hallam University. Oct 2002 • RSLP Preliminary evaluation (1999) • Evaluating the Learning and Teaching Support Network [Lancaster University]

<i>Needs of</i>	<ul style="list-style-type: none"> • Culture Online Cultural Web Site Visitor Survey; Results from Cultural Institutions DCMS McKinsey & Company August 2001 • JISC IE EDNER • RSLG Final Report 2003 • Dimensions and Use of the Scholarly Information Environment. Introduction to a Data Set Assembled by the Digital Library Federation and Outsell, Inc. By Amy Friedlander. November 2002
<i>Skills acquired</i>	<ul style="list-style-type: none"> • Evaluation of UkOnline centres
<i>Value (of initiative to)</i>	<ul style="list-style-type: none"> • Archives Hub Summative evaluation (July 2003 completion) • NeLH Pilot Evaluation Project.

Table 9.6 Evaluation Characteristics

The following constructs have also been used where indicated:

<i>Educational potential</i>	<ul style="list-style-type: none"> • Culture online results of Omnibus survey of people in England. Survey carried out by Taylor Nelson Sofres Phonebus. Interest in arts and culture and Culture Online (June 2001)
<i>Evaluation design</i>	<ul style="list-style-type: none"> • Evaluation of the Electronic Libraries Programme. Report of a brief consultancy for FIGIT/JISC Tavistock Institute, 1995 • Longitude II Toolkit for local evaluation CERLIM / Resource
<i>Information architecture</i>	<ul style="list-style-type: none"> • JISC IE EDNER
<i>Institutional impact</i>	<ul style="list-style-type: none"> • Evaluating the Learning and Teaching Support Network [Lancaster University] • JISC IE EDNER
<i>Interface & functionality</i>	<ul style="list-style-type: none"> • NHS Direct Online: online interactive project evaluation (City: D. Nicholas) Nicholas, D, Williams P, Huntingdon, P, Last M (2001) <i>NHS Direct Online Interactive Enquiry Service Evaluation of the Pilot stage</i> Report submitted to NHS Direct Online Operational team London: City University • JISC IE EDNER • An Evaluation of the HE Archives Hub. September 2000. The Tavistock Institute

<i>Mapping activities against objectives</i>	<ul style="list-style-type: none"> • Policy mapping Study. Tavistock Inst. 1996
<i>Programme processes and outputs</i>	<ul style="list-style-type: none"> • ELib -Synthesis of Annual Reports. Tavistock Institute, 1998 • Summative evaluation of phases 1 and 2 of the eLib initiative: Final report. Esys Limited . Feb 2000
<i>Project logic</i>	<ul style="list-style-type: none"> • JISC IE EDNER
<i>Strategic context</i>	<ul style="list-style-type: none"> • NeLH Pilot Evaluation Project (NCC, 2001)
<i>Relation to similar projects/initiatives</i>	<ul style="list-style-type: none"> • JISC IE EDNER
<i>Take-up</i>	<ul style="list-style-type: none"> • NHS Direct Online: online interactive project evaluation (City: D. Nicholas) Nicholas, D, Williams P, Huntingdon, P, Last M (2001) <i>NHS Direct Online Interactive Enquiry Service Evaluation of the Pilot stage</i> Report submitted to NHS Direct Online Operational team London: City University
<i>Usability</i>	<ul style="list-style-type: none"> • NHS Direct Online: online interactive project evaluation. Nicholas, D, Williams P, Huntingdon, P, Last M (2001) <i>NHS Direct Online Interactive Enquiry Service Evaluation of the Pilot stage</i> Report submitted to NHS Direct Online Operational team London: City University. • NeLH Communities of Practice Evaluation Report. Christine Urquhart, Alison Yeoman, Sue Sharp. Final report 1 July 2002. Prepared for NeLH team, NHS Information Authority. Department of Information Studies, University of Wales Aberystwyth • Formative Evaluation of the Archives Hub (2002) .Christopher Ramsden, John Kelleher, Shirley Russell. The Tavistock Institute

Value	<ul style="list-style-type: none"> • NeLH Pilot Evaluation Project (NCC, 2001) • NHS Direct Online: online interactive project evaluation. Nicholas, D, Williams P, Huntingdon, P, Last M (2001) <i>NHS Direct Online Interactive Enquiry Service Evaluation of the Pilot stage</i> Report submitted to NHS Direct Online Operational team London: City University.
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Table 9.7 Evaluation constructs

In summary, the following methods were used in the evaluations listed above.

Analysis of project reports	Analysis of search terms
Analytical exercises	Cartoon tests
Case studies	Citation analysis
Computer logs	Document analysis
Expert commentary	Expert review
Focus groups	Group discussions
History of the Future exercise	Interviews
Literature review	Manager surveys
Pilot-testing	Project logic maps
Questionnaires	Regional workshops for validation of findings
Self-reporting	Sentence and story completion
Surveys	Usability assessments
User survey	User testing
Vignettes	Website appraisal
Web surveys	Workbook exercises

Table 9.8 Methods used

In conclusion it can be seen that a wide variety of characteristics, criteria and methods have been identified both for use within EDNER and being used in other

evaluations. This illustrates the problem outlined at the start of this section, namely that developing a robust evaluation methodology for large scale digital initiatives is extremely complex, especially if the issues of outcomes and impact are to be taken seriously.

10 Conclusions and reflections

10.1 *The 5/99 Programme and the DNER/IE: strategic issues*

The 5/99 Programme was an ambitious initiative which sought to bring the benefits of the “managed environment” of the DNER/IE into the classroom. It sought to do this both by developing the DNER/IE itself and by funding a number of exemplars or proto-services which could demonstrate real benefits to the learning and teaching process. Over the three years of the formative evaluation a considerable number of strategic issues emerged, and these are summarised in this section.

10.1.1 The DNER and strategic priorities in higher education

One of the lessons to emerge from our analysis of documentary evidence and from interaction with both the JISC Committee for the Information Environment and the Development Team was that the DNER/IE might have been engaged more fully with the key strategic priorities identified by the funding councils. An example that we identified was the question of how the DNER/IE supported the aim of widening participation. It was difficult to see from the evidence that this had been considered explicitly either in the design of the DNER/IE or in the development of the 5/99 Programme and the selection of projects for funding.

10.1.2 The role of the DNER/IE development projects

It was clearly the intention that the 5/99 projects should engage with real-life learning and teaching in higher education and should help to bring about significant change in the purposeful use of electronic resources. EDNER’s early work identified an issue in that many projects had not thought through how this engagement would occur – all too commonly the projects spoke of “improving access to resources” and appeared to assume that this would of itself improve learning and teaching. Because this disjointedness was identified early on, EDNER was able to offer significant help to projects in examining their project logics and repurposing (see Section 2.2 above). This does, however, remain a fundamental issue for future programmes.

10.1.3 The 5/99 Programme

The mechanisms used to put the Programme in place may not have obtained the optimum mix of projects. There is a tendency in all Programmes to assess and fund

those projects showing individual merit, rather than to select a set of projects which together will best meet the overall requirement. A particular issue may be that the scope of some projects seems to have been too narrow if the aim was to have a broad impact on learning and teaching in UK higher education.

In fact the projects, partly because of the clustering mechanism, were able to identify both synergies and gaps and there was a noticeable degree of collaboration within most of the clusters, which is to be commended. The Programme Managers worked hard to foster relationships and achieve cross-Programme learning, and the Programme meetings were very useful for this purpose. At these, EDNER was able to play a significant role through workshops, group exercises, etc.

Despite these efforts we discovered (see section 6 above) that there was a view among senior institutional managers that 5/99 was fragmented and little understood.

10.1.4 The Information Architecture and its underlying assumptions

We have been convinced throughout the EDNER project that the Information Architecture (IA) is a robust and useful underpinning for technical development of the DNER/IE. However, there are a number of fundamental assumptions which underpin it which do not necessarily map well to learning and teaching. For example,

- We have not found compelling evidence that cross-searching of heterogeneous datasets is a critical application in learning and teaching, yet it is fundamental to the design of the IA. It is debatable whether the requirement for this functionality will become more prominent in the future.
- The IA is conceived in terms of **delivery** to the end-user rather than seeing the end-user as a part of an “information loop” which involves selecting **and** receiving **and** modifying **and** repurposing **and** sharing **and** creating **and** publishing (not necessarily formally) information.
- The IA does not describe an architecture for the discovery etc. of non-formal information sources such as personal Websites and email discussion lists yet these form a significant element of the information useful to and used in higher education.
- The underlying design of the IA (which goes back to the MODELS work) is that information objects will always be described by well-constructed

metadata. This is in fact likely to be true only of a proportion of the information objects useful for learning and teaching.

- The relationship between the IA and the architectures of virtual and managed learning environments is unclear, although it is currently being explored in a number of fora.
- The IA does not provide as useful approaches to browsing as it does to specific item searching, and this needs to be addressed.

10.1.5 Quality

It has always been emphasised that the DNER/IA is concerned with the delivery of “quality assured” information. However, we have noted that there is no common understanding of what this means. We investigated it with students and discovered that for many of them it had little to do with peer review or other accepted mechanisms in higher education. Furthermore, the “entry cost” to the DNER/IE is not defined in this way either. Subscription datasets are evaluated in terms of overall quality but often include objects with variable quality assurance. The subject hubs use different criteria in deciding which free Internet resources to select and highlight to users. Despite the fact that students at different stages of their courses need objects at different levels, there is no attempt to indicate level when exposing resources (nor has any mechanism been identified to do so). A further issue which we discovered was that for teaching purposes tutors require access to what might be termed ‘bad examples’ and to materials which are highly dynamic.

These issues suggest that there is a need to explore quality from the users’ perspectives and to ensure that systems capable of responding to those needs are in place.

10.1.6 Communication

While eLib addressed a tightly-defined audience, 5/99 has had a much more broadly defined and disparate community in mind. Perhaps for this reason, it has been difficult to communicate a coherent view of the Programme to stakeholders. The change from DNER to IE appears to have compounded the difficulty from the point of view of communicating a consistent and coherent message.

10.2 The 5/99 Programme: project outcomes

The engagement of JISC with teaching and learning through the 5/99 projects has raised some issues that JISC may wish to consider in relation to any further work in this area. Although project teams had some views about the ways in which teachers in higher education can seek to connect information resources with the rest of their wider learning environment, insufficient attention was paid to the relationship between learning activity and information resource. The project teams often relied on the mediation of external bodies to shape the nature of learning activities and their outcomes even though these bodies were not directly involved in the design of the resources. There was an assumption generally among some projects that the use of networked technologies would lead to definite educational outcomes and possibly change practice in higher education simply by making resources available to students. To maximise benefits other actions were needed to make the jump from project outcomes to benefits for the user community. In designing further information environment initiatives it might be worth encouraging better communication between projects and their potential partners and richer forms of interaction between learners and materials.

The original DNER proposal formulated by JISC for additional government funding captured some of the core intention:

‘Although this data has been primarily used for research purposes, it is beginning to find a use in learning and teaching. However, this work has been slow and some additional funding would enable the JISC services to be used in totally different ways than originally envisaged. There is a strong requirement to improve the interaction between the people who are involved in the development of new learning environments and the national information systems and services being developed by the JISC. It is therefore proposed that an initiative be funded to integrate learning environments with the wider information landscape *aimed at increasing the use of on-line electronic information and research datasets in the learning and teaching process.*’ (DNER 1999³⁴, para 8 our italics).

³⁴ Quoted in: JISC Circular 5/99: *Developing the DNER for Learning and Teaching* http://www.jisc.ac.uk/index.cfm?name=circular_5_99

Project outcomes were, as might be expected, impacted on by a variety of changes in circumstances and challenges to the project teams. This had an overall impact on the timing of many projects such that project outputs were not available at suitable times for academic use. A consideration for teaching and learning projects might be to ensure that projects aim to produce deliverable outputs well before they are intended to be incorporated into teaching and learning. In particular this means aiming to have products available well before the start of the academic calendar so that delays can be accommodated. The degree of impact this had on the projects we engaged with has varied according to the type of product and the timed date of the deliverables but it is absolutely certain that, in virtually all institutions, products produced after May are unlikely to be made use of in teaching and learning in the following academic year. It is also worth project managers making sure that user testing is built in earlier into project life spans so that project teams can identify as near to the beginning of the project as possible areas that hinder learners from gaining maximum benefit from using the resources. There was some evidence that projects produce their key outputs late in the project and have little systematic contact with potential users during earlier stages of development. Practical involvement of users in the development of a digital resource which some projects managed to include was clearly very useful in: a) helping to identify user needs, b) enabling greater student interaction with the resource and c) developing better integration in learning and teaching. This approach would be facilitated if projects had in place a clear evaluation framework from the start – user needs assessment could be built into this framework and treated as an ongoing project benchmark.

Overall the projects need to develop specific and targeted relationships with some well defined segments of their target user group. A crude but informative division of projects could be made between those that had a narrow or highly specific focus and those that had broad or generic aims. Those with a narrow or specific focus should be prompted to develop a number of definite contacts outside of the project area with the aim of transferring and generalising project outputs. This is not always a simple task as some products have a definite relationship with either a place or a physical resource that may not be available at another location. The danger is that without such explicit prompting the resource becomes isolated and of significantly reduced use to the wider academic or JISC community. There are some elements of individual projects that are transferable from that project to other areas of work. This is often not clear to the project themselves and JISC may need to work with projects

to make these transferable elements more clearly visible and available to other interested parties.

Those projects with broad or generic aims should be encouraged to work with smaller and well specified target groups during development rather than relying on immediate connection to a wider community. There were examples of projects describing their target audiences as teachers and learners. The projects that did not have a clear focus on particular target groups risked failing to engage with potential users. In one case the failure of a project to achieve its aim could be accounted for by a failure to appreciate the complex nature and dynamics of its target group. Whilst there is no way to ensure that this will not occur in future projects JISC may wish to consider prompting projects to specify more closely how they will relate to their target groups to ensure a continuing dialogue. This is particularly important when project *outcomes* rely heavily on potential user groups *making use* of the project in a reflexive way. If a project relies for its success on the target audience populating the resource and making regular use of it then this issue is doubly important.

There was some evidence from projects that assumptions were being made about the willingness of students to adopt digital resources. We feel strongly that account must be taken of those students who still consider the use of digital resources and computers to be incompatible with their subject areas. It should not be taken for granted that students will be enthusiastic about new initiatives without being given a particular impetus. The same but to a lesser degree could be said about academic staff who may also have a resistance to adopting the new practices required to integrate digital resources in their teaching. Another indication of the lack of spontaneous interest in project outcomes is that for some projects it has been very difficult to get users involved in the testing of their materials and outputs. As a consequence in some cases the evaluation could only ascertain the views of a handful of students.

The programme evaluators would claim that our involvement with the projects clearly helped the project teams to think pedagogically and to make better connections between outputs and outcomes (see section 2 above). Such a claim is difficult to evidence but we would argue one outcome of our work has been to identify the need for ongoing formative evaluation at a programme level that can engage with individual projects. In terms of the overall objectives of the programme we would also identify the cluster meetings as having been useful to projects individually and in

terms of helping the programme to operate as a whole. We would suggest that even greater collaboration among teams should be encouraged.

10.3 Envoi

Undertaking the formative evaluation of the 5/99 Programme proved to be a challenging experience for all concerned. For all the reasons enumerated earlier in this Report, evaluating a highly heterogeneous service and project environment, within a shifting technological and strategic framework and with a desire to focus on outcomes and impacts requires a complex, flexible, managed mix of methodologies and needs to be undertaken by a team with a diverse set of experiences and skills. EDNER was fortunate to be able to construct such a team and to engage in a cooperative manner with a committed and enthusiastic community of funders, developers and stakeholders. It is our hope that the lessons learned from this work have been and will be useful in enabling maximum value to be obtained both from 5/99 and from future programmes.

Appendix I: EDNER Deliverable Reports, Publications and Presentations

Note: All public reports are available for download from
<http://www.cerlim.ac.uk/edner/dissemin/dissemin.html>

EDNER dissemination activities	
PHASE 1 REPORTS	
Strand A	DA1 <i>Analysis of constituent roles and services of the DNER</i> Version 4.3 (January 2002)
	DA2 <i>DNER service evaluation</i> (May 2002)
	DA4 <i>Local Implementation of the DNER</i> Version 6 (January 2002)
Strand B	DB1 <i>Portal development within the DNER</i> Version 4.1 (31st December 2001)
Strand C	DC1 <i>Pedagogical frameworks for DNER</i> Version 1.3 (4th July 2001)
	DC3 <i>Plan for the pedagogical evaluation of the DNER</i> Version 1.1 (5th July 2001)
PHASE 2 REPORTS	
Strand A	A1 <i>Institution-centred IE implementation - Analysis of student citations in the e-environment</i>
	A2 <i>Evaluation of the Information Architecture</i>
	A3 <i>Stakeholder consultation and analysis - User information needs</i>
	A3a <i>Stakeholder consultation and analysis - Information usage</i>

	<i>in higher education</i>
	A3b Stakeholder consultation and analysis - Report on consultation with HE Directors of Library/Information services [Confidential]
Strand B	B1a Portal Profiling - An analysis of features in a range of portals
Strand C	C1 Pre-1992 University Institutional Case Study
	C2 Surveys of impact
	C3 Project Logics
	C4 The take up and use of JISC 5/99 Teaching and Learning project outputs
Strand X	X1 Comparisons relating to objectives and content of related national activity
	X2 Evaluation methodologies: an analysis of evaluation methodologies for national digital initiatives
	X3 Final Report
LinkER related report	D1 Review of recent developments, achievements and trends in the DiVLE area D5 Final Report: Formative Evaluation of the DiVLE Programme
EFX related report	D3 Final Report
ISSUE PAPERS	1) How students learn
	2) How students learn: propositions
	3) Changing conceptions of teaching
	4) Providing links to online resources
	5) Portals
	6) Web accessibility issues
	7) Articulating implicit theories of change

	8) How students search
PUBLICATIONS	Brophy, P. (2002). Evaluating the Distributed National Electronic Resource: the EDNER Project. <i>VINE</i> , 126 , p. 7-11.
	Butters, G. (2003). What features in a portal? <i>Ariadne</i> , 35 . [Online] http://www.ariadne.ac.uk/issue35/butters/
	Goodyear, P. and Jones, C. (2002). Implicit theories of learning and change: their role in the development of e-Learning environments for higher education. In: S. Naidu. (Ed.), <i>Learning and Teaching with Technology: Principles and Practices</i> , (p.29-41). Kogan Page: London and Sterling, VA.
	Griffiths, J.R. (2003). Evaluation of the JISC Information Environment: student perceptions of services, <i>Information Research</i> , 8(4) , paper no. 160 [Online] http://informationr.net/ir/8-4/paper160.html
	Griffiths, J.R. and Brophy, P. (2002). Student searching behaviour in the JISC Information Environment. <i>Ariadne</i> , 33 . [Online] http://www.ariadne.ac.uk/issue33/
	Jones, C. and Brophy, P. (2002). Digital Resources in Higher Education - Some issues arising from the formative evaluation of a national initiative in the United Kingdom. <i>European Journal of Engineering for Information Society Applications (EJEISA)</i> , 4 (3). [Online] http://www.ejeisa.com
	Markland M. (2003). Online information resources in virtual learning environments, <i>Assignment</i> , 20 (2), p. 28-31.
	Markland, M. (2002). The integration of digital libraries and online information resources into the online learning environment: an annotated bibliography and discussion. <i>New Review of Libraries and Lifelong Learning</i> , 3 , p. 3-15.
	Markland, M. (2003). Embedding online information resources in Virtual Learning Environments: some implications for lecturers and librarians of the move towards delivering teaching in the online environment, <i>Information Research</i> , 8(4) , paper

	no. 158 [Online] http://informationr.net/ir/8-4/paper158.html
PRESENTATIONS	Brophy, P. and Fisher, S. (2001). Evaluating the distributed national electronic resource. In: <i>International Conference on Digital Libraries: proceedings of the first ACM/IEEE-CS joint conference on Digital libraries</i> , Roanoke, Virginia, United States.
	Fisher, S. (2002) Evaluating the UK's Distributed National Electronic Resource. In: Brophy, P., Fisher, S. and Clarke, Z. (eds.) <i>Proceedings of Libraries Without Walls 4: The delivery of library services to distant user</i> . London: Facet.
	Goodyear, P., Jones, C., Zenios, M. (2003). Scrutinising the logic of innovations: A case of mistaking publishing for teaching? <i>10th Conference of the European Association for Research on Learning and Instruction (EARLI)</i> , Padua, Italy (August).
	Griffiths, J.R. and Fisher, S. (2002). A quality management approach to the evaluation of digital library services. In: <i>The fourth DELOS workshop on Evaluation of Digital Libraries: Testbeds, Measurements, and Metrics</i> . In press. Presentation available at [Online] http://wwwold.sztaki.hu/conferences/deval/presentations/griffiths.ppt
	Jones, C.R., Zenios, M. and Markland, M. (2003). Digital resources in higher education: pedagogy and approaches to the uses of digital resources in teaching and learning. <i>CAL '03 Conference</i> , Queen's University Belfast, Northern Ireland, 8th-10th April 2003
	Markland, M (2003) Online learning environments – a new challenge for lecturers and librarians. In: <i>Proceedings of Internet Librarian International 2003</i> . Medford, New Jersey: Information Today.
	Zenios, M., Goodyear, P. and Jones, C. (2003). Researching the impact of the networked information environment on

	learning and teaching, <i>CAL '03 Conference</i> , Queen's University Belfast, Northern Ireland, 8th-10th April 2003.
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Appendix II: The EDNER Team

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