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Markland, Margaret and Brophy, Peter (2003) Deliverable D5. UNSPECIFIED. CERLIM (Centre for Research in Library and Information Management).

Publisher: CERLIM (Centre for Research in Library and Information Management)

Version: Published Version

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Link^{ER}

**Linking Digital Libraries and Virtual
Learning Environments:
Evaluation and Review**

**Final report: Formative Evaluation of the
DiVLE Programme**

Link^{ER} Deliverable D5

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Final report on DiVLE Programme

Version control

<i>Version</i>	<i>Date of release</i>	<i>Status/Notes</i>
Draft 1	11.7.03	Suggested report format
Draft 2	2.07.03	Agreed report format
Draft 3	17.7.03	Incorporates MM and PB additions
Draft 4	25.7.03	Incorporates CSALT additions
Draft 5	28.7.03	PB amendments
Final version	30.7.03	CSALT minor amendments

This document should be cited as:

Brophy, P. Markland, M. and Jones, C. (2003) Link^{ER}: *Linking Digital Libraries and Virtual Learning Environments: Evaluation and Review Final Report: Formative Evaluation of the DiVLE Programme*. Deliverable D5, Link^{ER} Project. CERLIM Centre for Research in Library & Information Management

Link^{ER} – *Linking Digital Libraries and Virtual Learning Environments: Evaluation and Review* – is a ten-month project being 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/projects/linker.htm>

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1. Executive Summary

The Link^{ER} project provided formative evaluation of the JISC 07/02 DiVLE Programme, which aimed to explore the technical, pedagogical and organizational issues of linking digital library systems and VLEs. DiVLE was a short programme of ten-month duration and therefore gave scope for the exploration of key areas of interest rather than the development of products and services for the community. We believe that the Programme has produced several promising products for the community and has contributed significantly to a better understanding of teaching and learning within the VLE context, and of the technical challenges posed by linking digital library resources with VLEs.

The Link^{ER} methodology was based upon a longitudinal series of interviews with identified individuals representing each of the projects selected for funding. Link^{ER} staff have also presented interim findings at Programme Meetings, published interim reports, attended project dissemination events, contributed to Steering Group Meetings and held regular progress meetings with the JISC. Important emerging issues have been synthesised and disseminated to the community.

Key technological findings are

- There is a lack of consensus as yet across UK FE/HE on the preferred approach to mapping of 'library' metadata standards, with particular problems of semantic interoperability arising when there is a need to cross-walk between library and learning metadata schemas.
- OpenURL has been shown to work for 'traditional' library resources such as e-journals, but further testing needs to be done to prove its robustness with other resource types, such as exam papers, lecture notes, learning objects and multimedia resources
- The customisation of and interoperability between VLE platforms and digital resources is questionable. It is also unclear how sustainable a customised commercial product would be as new versions are rolled out.
- Familiar problems with cross searching remain, such as differential response times, results ranking, removal of duplicates, and lack of vocabulary control.

- Access management remains problematic, particularly when the integration of personalisation functions is required.
- Learning object repository technologies and standards are not yet mature, leading to problems of access and a lack of suitable targets.

Key teaching and learning findings are

- Many of the tools being developed by DiVLE projects imply considerable changes to the workloads and job roles of academics, and it cannot be assumed that they are willing to take on these tasks or acquire new skills. They are unlikely to have a positive approach to change unless they can see how it will benefit themselves and their students.
- Current academic practice in the choice and use of resources, and the compilation, dissemination and management of reading lists is still insufficiently understood and needs further investigation. Conformance to user needs and current practices will be key in the deployment of DiVLE-type initiatives.
- Assumptions cannot be made about the willingness of students to engage with VLEs and the digital resources embedded within them. There is evidence that place-based students are less likely than distance learners to want to do this. It has also emerged that a minority of students have difficulty adapting to the VLE environment, or may be resistant to certain features. Project outputs may need to be adaptable to a variety of teaching contexts, therefore, and not just to embedding within a VLE.

Key organisational findings are

- It is critical for projects of short duration and with a short lead in time to have key staff in place at the start of the project. Filling vacancies with the right person for the job can be time-wasting.
- Project staff may need to be adaptable, flexible and willing to adjust their expectations, as unforeseen circumstances will change what is and is not achievable. This, of course, may be difficult when they have multiple job roles.

- Contingency planning before the start of the project should help alleviate the unforeseen risks which are bound to occur!
- When planning their project, staff must consider the alignment of the project timescale with the academic year, especially when user testing with students or tutors is a key requirement or where a product needs to be embedded in learning for the start of the next academic year.

2. Background

This final report summarises the findings of the Link^{ER} project carried out jointly by the Centre for Research in Library and Information Management (CERLIM) at Manchester Metropolitan University and the Centre for Studies in Advanced Learning Technologies (CSALT) at Lancaster University from November 2002 to July 2003. Link^{ER} was designed to provide formative evaluation at Programme level, with the fundamental aim of distilling significant, generic issues from the experience of the projects. It was not itself designed to undertake evaluation at the project level.

The DiVLE Programme (linking Digital Libraries and VLEs) was funded under the Joint Information Systems Committee (JISC) call 07/02 as a response to the findings of earlier studies which had called for the linking of digital libraries and virtual learning environments so that meaningful connections could be made between learning activities and learning resources. This was a short Programme over only ten months and it was recognised from the start that it could only have limited impact on what is a significant and complex problem. Nevertheless it was designed to explore the problem space and to indicate promising lines of development. The resulting vision of a fully integrated online learning environment may still be some way off, but the DiVLE Programme aimed to take a step toward realising this vision through the creation of joined-up systems.

2.1 Aims and objectives of the DiVLE programme

The programme aimed to explore the technical, pedagogical and organisational issues of linking digital library systems and VLEs.

Specific objectives were to:

- explore the issues of linking VLEs with local institutional digital library resources and services
- implement curriculum focussed pilots, based upon units of learning, linking VLEs to digital library systems
- provide models and guidelines for other institutions about the cultural and organisational issues related to joining up these systems in an institution

These objectives have also underpinned the aims, objectives and activities of the Link^{ER} project.

In practical terms, the Programme divided projects into two major Themes. Theme A projects were focussed on technical issues but within institutional contexts, and with a focus on the fit with the national JISC-led Information Architecture. Theme B projects concentrated on pedagogical, social and cultural issues but interpreted these in a practical and action-oriented way, such that they could be seen to interact closely with technical and design decisions. In practice the anticipated division between Theme A and Theme B concerns was by no means clear-cut and projects from both Themes contributed to the development of both technical and pedagogical understanding.

2.2 Aims and objectives of Link^{ER}

The formal aim of the Link^{ER} Project was to provide formative evaluation of the JISC 07/02 Programme.

The Link^{ER} Project's specific objectives were to:

- produce a review report summarising recent developments, achievements and trends relevant to the area of digital library and VLE linkage (updating and broadening the INSPIRAL final report)
- provide formative evaluation across the full set of Theme A and Theme B projects
- identify important emerging issues, innovative solutions and exemplary case studies
- develop and validate guidelines for other institutions, focussing particularly on cultural, organisational, technical and pedagogical issues
- produce interim and final reports capturing key elements of lessons learned and synthesising conclusions for key audiences/stakeholders
- disseminate its reports widely within the community.

3. Link^{ER} methodology

The over-riding concern in designing the Link^{ER} Project was to select methodologies capable of providing rapid feedback from a Programme with a duration of only ten months.

The key to achieving a successful evaluation and review lay in close interaction between the Link^{ER} team and key players in the Theme A and B projects, in the JISC and in the broader community. The focus therefore has been on interpersonal interaction between evaluators and key players.

The core methodology has consisted of a planned, longitudinal series of interviews with identified individuals representing each of the projects selected for funding. From the outset, each member of the Link^{ER} team agreed to take responsibility for particular projects so that continuity of dialogue and understanding could be maintained. Initial contact was made through a visit to the project's institution, and a common interview format was agreed upon for these initial interviews. This ensured a good common baseline of cross-project information. Subsequent discussions were more flexible and reflected the concerns indicated for themes A and B of the call, and the contingencies of the various projects. These discussions have been conducted either face-to-face or by telephone, and have taken place at approximately monthly intervals. Matters discussed have been recorded and shared. This individual attention has proved a very successful strategy. A good relationship has been built up between the evaluators and the project teams who have all been very welcoming and eager to show the outcomes of their work.

In addition to the interviews, Link^{ER} staff have presented interim findings at Programme Meetings, published interim reports, attended project dissemination events, contributed to Steering Group Meetings and held regular progress meetings with the JISC. The team has worked closely with the EDNER project team¹, to ensure that findings from each project can be fed into the other.

The first deliverable, a review of developments, achievements and trends in the DiVLE area, contained a significant element of documentary analysis, using books and journals in the library and education literature and reports etc. from the internet to identify practice and experience in the UK and elsewhere from a variety of

¹ EDNER was the formative evaluation of the 3-year 5/99 Programme, which was designed to develop the JISC Distributed National Electronic Resource (DNER) – now known as the

stakeholder perspectives. A survey of Higher Education Institutions in the UK was also carried out to elicit information about on-going work similar to that of the DiVLE projects and to put any such institutional teams in touch with projects where appropriate.

The second deliverable, an interim report on DiVLE emerging issues, analysed project management, environmental, stakeholder, teaching and learning and technical issues which had been identified by the Link^{ER} team. These were based upon discussions between Link^{ER} staff and the Projects, information gleaned from the project formative reports, discussion at dissemination events, and materials presented by the projects on their websites. The report was presented to JISC, but was project-facing, so that it might inform future progress.

The third deliverable was a website linking to a variety of appropriate resources and based broadly upon the issues emerging from deliverable 2. This website was designed within the lifetime of the project, and a selection of content will be provided and maintained beyond the project end.

4. Findings

4.1 Project Management Issues

4.1.1 Staffing

The short time lapse between the awarding of funding and the commencement of work meant that some projects did not have the staff they needed in place at the project start date, despite this being an explicit selection criterion. Several projects reported delays in recruitment, often hampered by institutional HR processes which could not be circumvented. The secondment process in particular seems not to have worked as expected, and it may be that projects' proposers need to be clearer about what will and will not be permitted by their institutions. Institutions, which must of course sign off proposals to the JISC, need to be quite clear as to what they are undertaking in responding to short-term Programme calls.

Despite these delays at the outset, no project initially reported that their work had been significantly adversely affected by lack of staff. It was expected that any problems would be overcome by the redistribution of work among existing staff, and also in some cases by the use of placement students, though the efficacy of the latter strategy is uncertain and perhaps not what the funding body would have expected. As the projects have matured it has emerged that while these coping strategies have worked well for some, others have found the lack of staff with appropriate skills has caused delay. Getting good people was seen as key to good results. One project seeking staff with particular research / evaluation skills said *'Our other major difficulty was the recruitment of staff to carry out the project. In order to take up grants at short notice, staff need to be in place in existing positions.'* Another attributed the difficulty of attracting suitable staff to the very short contract length which was on offer – experienced and skilled staff are unlikely to be attracted by such contract terms.

Projects have asked whether JISC might be able to intervene with institutions to persuade them to make a 'special case' to speed up the recruitment process in any future programmes, though better liaison with HR departments at the proposal stage may prove a more effective initial tactic.

Other staffing problems have been caused by unforeseen events such as sickness, bereavement and staff leaving for other jobs. Where this has happened projects

have coped well, largely because of the willingness of individuals to take on extra work or to work in a more flexible manner, both of which are to be commended.

4.1.2 Planning and process issues

- **The need for flexibility** - Despite careful initial planning and scoping, what is 'theoretically true' has not always turned out to be so in practice and it is noted that in some instances projects have had to adjust their expectations in the light of experience when they came to 'do the work'. Indeed several have emphasised the need to be flexible and adaptable. Sometimes, original plans may have been over-ambitious and there has been a need to refocus upon what is possible within the timescale, while prioritising other activities for the future in the light of what has been learned. Some projects worked within a broad and active institutional context where it is relatively easy to refocus their 'groundbreaking work' so that there will be positive outcomes. Others were more narrowly defined and their progress therefore more exposed. The Link^{ER} project has emphasised in discussions with projects that the JISC values the surfacing and documenting of all types of experience, not just of success.
- **The need for good risk assessment and contingency plans** – some projects were threatened by changes over which they had no control. The failure of a supplier to deliver on time was a problem for at least two projects. One was relying upon a key piece of middleware, and had no alternative identified when it was needed. The other was reliant upon a commercial product whose release date was delayed by five months. In another instance a project was threatened by an institutional decision to move to a consolidated server. This impacted upon their access permissions, and they had to devise a workaround to enable them to continue. Although in the event all projects were able to avert failure, these unforeseen circumstances caused considerable pressure upon project staff. It is impossible of course to foresee every contingency but taking the time to have a 'plan B' in place has been shown to help relieve stress and anxiety.
- **The timing of project activities** - A difficulty of aligning project tasks, the academic year and the start and end dates imposed by the funding provider was highlighted by several projects. The particular context in which this is problematic is when projects require input from students during the summer period, when of course, they are not available. *'We would like to do it (focus*

groups) but if we can't we will get what we can using people who are available.' It is difficult to know how this perennial problem can be overcome, and it may have to be accepted that user testing activities may not be as comprehensive or rigorous as desired. The timing of the Programme itself, ending in July, also militates against the embedding of products in learning activities intended for the start of the next academic year unless academic staff have been fully engaged in the development process.

In summary, though we note that although many projects encountered hitches to their original plan, they again proved able and willing to adapt to changed circumstances, and to compensate for them.

4.1.3 Project Evaluation

All projects appear to have engaged in some evaluation of their work - evidence of evaluation activities includes the use of familiar tools such as questionnaires, interviews, focus groups, user group meetings, scenario building and testing, and the development of demonstrators. There are many examples of the involvement of end-users in commenting on projects' work, although it is noted that where the project is primarily concerned with the production of middleware an end-user perspective is problematic. Indeed it could be argued in such cases that were end users to be able to identify the project's work it would effectively have failed!

Despite the evidence of activity, it was not always apparent that an evaluation plan as such was in place, or that evaluation of the progress of the project was being carried out as a routine activity. There was also some evidence of confusion between 'product user testing' and 'project evaluation' and projects in future programmes may welcome guidance on this.

The key issue concerns the differences between:

- The testing of products, which in essence is designed to check the conformance of a product (or a service) to its specification. For example, the project may have developed a functional specification in the early stages of its work; later both project staff and users recruited for the purpose will be engaged in checking that the product does indeed meet the specification. This is an essential step, and is closely related to quality assurance procedures (though the latter will be broader).
- The determination of the effectiveness of the project and, most critically, of its outcomes and impact. CSALT, as part of the Link^{ER} team, has presented a

methodology to enable projects to focus on outcomes from the earliest stages of their work. The emphasis here is on the effects which the project is having or has had on target and other audiences.

For further exploration of the range of different approaches to evaluation, projects were encouraged to visit the EFX Project Evaluation Toolkit which has been set up for the FAIR and X4L projects (at <http://www.cerlim.ac.uk/projects/efx/index.html>). (Notes on the above 'outcomes' methodology will also be found in the EFX Toolkit.)

Some projects commissioned external evaluators to assist them or use their Steering Group to guide and advise. When this is the case, they report great value from their activities, and that an 'outside' viewpoint helps them to focus their thinking, especially upon their project outcomes. Generally, we would commend an element of independence of view in project evaluation.

5. Outcomes and deliverables

The range of outcomes and deliverables from such a short programme was impressive. They have included (briefly!):-

- User needs analyses, as detailed in the previous report²
- New information skills modules, both generic and subject specific
- A range of cross searching tools to enable the discovery of locally held resources of potential use by students and lecturers
- Tools to help with the creation of coursepacks, including obtaining copyright clearance for digital resources
- Tools to help with the creation of learning objects and of learning object metadata
- Tools to help with the creation of dynamic reading lists
- Evaluation of products such as NetSnippets
- Evaluation of Resource List Management Systems
- Learning which will inform the development of OpenURL
- Learning which will inform the development of existing and new metadata standards, especially for learning objects and resource lists
- Practical exploration of the problems of how metadata can be shared between the library and learning communities
- Direct liaison with vendors and input and access to vendor product developers
- Insight into how learners regard the VLE as a teaching tool, and questions over whether it supports or impedes their learning.

A tension common to projects has been between providing something of use to the institution, while at the same time trying to fulfill JISC's broader needs and expectations. Insights into how to manage this balance would be of value. An interesting observation in this context was that a 'local fix' may be desirable to ensure success, but might not be scalable to the wider community. Projects have thus been encouraged to record the local fixes they have found necessary and to provide

reflective commentary on the issues these raise for implementing their findings generically.

There is no doubt that most of the projects have produced valuable outcomes which are expected to make an impact upon their own Universities, as they have stated that their work has already been embedded into the institution, or will be so in the near future. Some have a high profile in their institution. *'Our toolkit will be incorporated into the University MLE. We have contributed regularly to discussion on the MLE infrastructure and the strategic direction of its development.'* A few have proved already that their work is transferable. It is encouraging though that most are looking beyond their 'local' environment and beyond the project end date, to continuing the development of their products and services. *'In the last Steering Group Meeting ... the members discussed the idea of incorporating other library catalogues from different universities in the region in the future. This would be useful in supporting specific cross-institutional courses.'*

Although projects may not have delivered exactly what they planned to, all have produced valuable outcomes, whether technical deliverables, research findings, or learning by valuable experience. Some have achieved more than they set out to do; *'The project partners have far exceeded the project's aim'*. Others are confident that their learning will be of value to a wide community; *'Our work will be relevant to Learning Object repository builders and communities interested in creating metadata. It will also be very relevant to libraries that want to provide electronic access to different services'*.

² LinkER Deliverable D2 'Interim report on DiVLE emerging issues' section 1.4

6. Project dissemination and contact with the wider community

Dissemination activities have been impressive. They have included:-

- Project websites which have (mostly!) been frequently updated. These offer to the wider community project deliverables and other outputs, conference and seminar presentations, technical papers, background information and much more.
- 'In-house' outreach consisting of presentations to staff, discussion groups, briefings sessions, formal staff meetings, and interviews for publication in in-house newsletters. A number of projects have recognised the value of fostering support and interest at an early stage within their institution.
- Workshops for the local and wider community
- A webcast, which was a new experience for both the project and some of the participants
- Presentations to user groups and vendors
- Conference presentations both within the UK and internationally
- Publication of journal articles in Ariadne, Assignment, The New Review of Libraries and Lifelong Learning and elsewhere.

It is evident that these active dissemination programmes have sparked much interest in the academic community. Projects have been approached and asked to collaborate in large-scale programmes and to feed into developmental work at other universities. Some are being used as exemplars by vendors and project partners.

It is pleasing to note that as well as providing detailed technical outputs, projects intend to write for a non-technical audience. This is important if the broader community is to be persuaded of the importance of systematic integration of library and other information resources into VLEs.

It is unclear from the list of dissemination activities how many of these capture the FE sector, and few are specifically targeted there. Many of the projects are library led, but their work crosses into other communities, most notably the teaching and learning community, and product and service vendors. It may be that projects are simply relying upon familiar HE / library community outlets for their dissemination

activities, or perhaps are less aware of appropriate fora through which to disseminate their work to Further Education. It can be difficult to make inroads into the public arenas of these communities unless, say, a close working partnership with a vendor is in place, but it is surely important that this work is disseminated to these communities too. As the JISC has a 'bigger picture' of the HE and FE communities than most individual projects, it would be most useful if the JISC could provide a steer on ways to reach the widest possible audience.

7. Inter-project communication

Inter-project communication emerged early on as an important issue for some projects. The DiVLE programme had a discussion list from the outset, but this did not prove a popular forum (though it is noted that some technical staff found the CETIS list useful). A possible lesson here is that it is better for programmes to latch on to suitable existing lists rather than setting up their own (although a closed list may be needed to discuss management issues). This has the further advantage of opening up discussion to a wider audience.

It was clear as early as the October Programme Meeting that there was overlap of interest, particularly between some of the technical projects, and they were encouraged to look for these links and to set up dialogue at this early stage. At the March 2003 Programme Meeting the Programme Manager offered support to projects wanting to organise inter-project meetings or workshops, and included in this extra financial support if needed. For whatever reason, this offer was not taken up, and the issue was raised again at the July Programme Meeting, with the complaint that synergies between projects had only been discovered 'by chance'.

It seems that projects wanted this kind of focused feedback activity, but did not wish to organize it themselves. Even when Link^{ER} provided projects with contact details, they did not seem to follow them up. It was our impression from conversations during Link^{ER} visits to the projects that this was always on 'the list of things to do', but the problem was lack of time rather than lack of will.

At the final Programme Meeting in July, it was noted that technical developers were very eager to share what they had learned and keen that this should be captured and recorded in some way. We are pleased that the Programme Manager intends to bring together the various project technical teams to reflect upon their learning and to pull together their findings, particularly on the handling of metadata, OpenURL etc. into one DiVLE Programme Technical Report, and we would urge the JISC to give this venture every support.

8. Stakeholder issues

8.1 Project partners

The relationship between project partners has proved interesting. Some partners are only nominally involved in projects, others have a close working relationship with project team members. In two instances projects report that concentrated input from an expert partner for a period of only one or two days has been instrumental in clarifying difficult issues and moving the project forward.

- **Vendors** - As some vendor products are also in the development stage, there is a definite feeling of 'learning together' in some partnerships and mutually beneficial arrangements are developing which may prove fruitful for the wider community. The involvement of vendors on Steering Groups, for example, can provide a fast route to information about the product and good advice. However, more than one project has found their vendor to be *'inflexible and reluctant to allow us to customize their product'*. One project was hampered by misunderstandings about what the product could deliver, and reports learning that *'promises made by vendors are not always to be trusted'*; this too is a valuable outcome to share.
- **Inter-university** – Partnerships with other universities are both long-standing and new, and some have revealed cultural differences which have required an 'adjustment in approach'. For example, in some institutions computing services are fully committed to experimental developments such as those proceeding in the 07/02 projects; in others they operate as services with a primary role of delivery to internal customers: the latter approach can create difficulties, for example with firewalls designed to prevent external access to learning systems or other development activities. More subtly, different institutions operate in markedly different ways – some, for example, being much more 'managerial' than others – and this creates tensions for joint development teams which may have to reconcile very different decision making processes (a problem exacerbated when relationships between universities/colleges and commercial firms are considered). A further issue is related to reporting lines and accountability: this is noticeable in 07/02 where many projects are building products which are designed for internal use: there is thus an 'experimental/developmental' reporting line to JISC (or at least to the Project Director) and a separate 'development of university services'

reporting line to a Head of Service or Pro-Vice Chancellor. There have been issues too when assumptions have been made that pedagogic practices are common across different universities. When what is being tested is the transferability of project outputs across different universities and different VLE platforms it is essential that robust methodologies to facilitate transfer are explored and agreed at an early stage. A final example occurs where the outcome of the project will be a new system or service which impacts on staff workloads and responsibilities – it is one thing for staff to work flexibly to enable a concept to be proved, quite another to accept permanent changes to their jobs.

- **JISC** - Of course the partnership with the JISC is key, though some projects seem unsure about how their own and DiVLE activities will feed into future JISC strategy and would welcome clarification on this point. There are also anxieties about how their work might be carried forward after the end of the project.

8.2 Raising awareness of cost

It is interesting to note that at least two projects intend to make the cost of resource provision more apparent to lecturers. One will do this by making *‘institutional spend and item cost more apparent to lecturers’* so that they *‘gain an understanding of the ... implications that this might have on institutional budgets’*, the other by the development of a *‘third party copyright clearance facility’* in conjunction with HERON. Other projects may like to consider whether they too would like to do this as they operationalise services.

8.3 Accessibility for staff and students with disabilities

Several projects have been addressing accessibility issues from the outset, often drawing upon expertise within their institution, and there is mention of awareness of W3C, and WAI, of the use of standard style sheets and of JAWS or similar text reader software. However, three projects claim that accessibility is not relevant at this stage of product development, but will be taken on board during later dissemination activities. It is worth mentioning that while these accessibility issues should form an integral part of user testing of products and services, the issue of accessibility in a wider sense, for example in relation to the needs of off-campus students, should not be forgotten and may require particular attention. It is also worth

adding that projects should be aware of the limitations of accessibility-checking software and of the need to assess aspects of accessibility manually.

It is also noteworthy that projects are already discovering vendor products which do not comply with accessibility standards. We recommend that all such instances should be recorded and that feedback to the JISC and to the vendor on this point be encouraged.

8.4 Cross cultural communication

Finding a common language between technologists, educationalists, librarians, different departments in the same university and even members of a project board can prove difficult, as can understanding different professional standpoints and priorities. Many of the projects are dealing with multiple stakeholders, and have noted how this can have a significant impact on the development of the project. One, for example, describes how a cross institution team had different understandings of the terms 'copyright', 'resource', and 'medium' and how a 'merged perspective' had to be achieved before the project could move forward. This problem is likely to be mirrored and amplified in the different communities when the project has to present its outputs to different audiences, and needs to be given careful consideration.

9. Teaching and learning issues

Some interesting issues have arisen from the projects' work with academics as potential users of the projects' outputs. Projects have identified different understandings in the library and academic communities of the purpose and management of reading / resource lists. While librarians use these lists to ensure that resources are provided for students and academics in a timely fashion, they speak of a 'poor understanding among academic staff as to what the library does with submitted resource lists'. They note that some academics delegate responsibility for liaison with the library to administrative staff who are unclear about how the library makes use of the lists. They also make the point that their need for sufficient notification to give them time to order new materials may not coincide with the 'traditional' view of the beginning of the academic year as library staff need the time to review and create resource lists.

Projects found that it is important to train all staff who encounter the VLE to the same standard. In one case the academic areas of the VLE remained invisible to library staff and they didn't have access to all resources. Consequently library staff did not have a full understanding of what was available.

The comments on teaching and learning in this Report are grouped into five sub-sections that are all informed by the idea that academic staff are key gatekeepers in relation to the activities of students. It is notable that some of the project evaluation data indicates that resources are more likely to be used if they are embedded within taught modules rather than linked to library web sites.³ These sections also deal with issues that are directly relevant to library staff and students but the focus here is primarily on the role of academic staff.

9.1 Academic links to the library

Although we have not gathered direct evidence from academic staff for the Link^{ER} evaluation we know that the work that some projects have done may result in a changed role for academic staff, for example in the maintenance of reading lists once

³ Brook, J (2003) Analysis of Web Logs as an Evaluation Tool available online at: <http://informs.hud.ac.uk/cgi-bin/informs.pl?area=publications>

they have been compiled. It will certainly result in changes to the work patterns of library staff.

It is encouraging that some projects are exploring in more depth how and when academics actually compile and disseminate reading and resource lists to their students, both within and outside of their VLEs. They are fostering the idea that the resource list as managed by the library should be treated as an '*organic list that can alter and be updated throughout the year*', and are providing tools, guidelines and advice to cultivate an on-going process which is simple for academics or administrative staff to use, yet which meets the needs of library staff. Academic practice in the area of reading lists is still not well understood and there is a lack of detailed knowledge of how much work may be involved in the maintenance of reading lists. For example, the amount of change that may take place within reading lists over time is still largely un-quantified. A detailed understanding of actual user behaviour and needs is essential as academics are unlikely to have a positive approach to change unless they can see in what ways their practice and workloads may alter.

It may be recalled that the conclusion of the Link^{ER} Project's review of developments, achievements and trends in the area of digital libraries and VLEs was that:

*" It has been noted that the vast majority of published evidence suggests that initiatives to link libraries and VLEs come from the library perspective: there is little evidence that education practitioners, strategists or theoreticians have identified the issue as being of significance. This has resulted in a major gap and weak pedagogical underpinning of many initiatives that have taken place."*⁴

Teaching and learning issues were also identified as important barriers by the INSPIRAL project.

9.2 The use of resources by staff.

As noted in 9.1 above there is little detailed knowledge of current academic practice with regard to the use of resources for teaching and learning. User needs analysis conducted as part of the DiVLE programme has identified academic staff as having already well developed ways of finding materials that may be both surprising and resistant to change.

⁴ Link^{ER} Deliverable D1 p 40

" We were concerned by comments that were raised by some of the academic staff in our focus group. A small number of staff commented that the tool would be of limited use to them, as they already know which resources they are going to put on a module resource list as they have a list of 'favourite' sites. We were surprised by this viewpoint, which seems to indicate that module lists are not reviewed and updated on a regular basis to take account of new content."

An academic view of priorities may not begin from a standpoint that emphasises new content. Academic priorities may well lie elsewhere, for example in a concern for setting out the development of a set of ideas over time using classic texts rather than the most up-to-date resources.

The evidence from the DiVLE programme would accord with findings made during the EDNER evaluation of the DNER which found that academic staff were most likely to use Google for desktop searching. Searching for new materials was often managed through informal networks, through colleagues, conferences and printed or electronic circulars that alerted them to new materials. It was noted that searching through the RDN for teaching materials is rare and this finding is also in agreement with earlier findings by EDNER. It will be important for projects trying to link digital libraries with VLEs to have a good awareness of the current practices of academic staff. For there to be successful deployment of new technology the projects will need to ensure that either the new arrangements conform to current practice or that sufficient attention is paid to the changing of current practice in ways that will assist the deployment of project outputs. Practices are highly resistant to change both amongst academics and the student populations they work with. One DiVLE project has monitored student use of the VLE and the pattern of access times is surprisingly conventional, not dissimilar to existing library opening hours. For example, there was very little use late at night or early in the morning.

The user needs analysis conducted by one project recommended that Google should be included as a search target but only as an optional search facility. The focus group they held with academic staff recorded that a majority of participants were doubtful about the inclusion of Google on the grounds that searching through Google can provide a large number of results of low perceived quality. On the other hand the project also recorded that academics use Google as their primary source of information and that although academics seemed to have a high level of awareness of the RDN only 30% made use of it for teaching. Another example of a user needs analysis resulted in a list of institutional recommendations that had the intention of

feeding into a review of procedures to support changes in current practice. It also reported the current student practices of reading on screen to avoid printing costs. This finding led directly to a recommendation to improve the quality of readings for on-screen display.

It is also noted that divergent pedagogic practices can mean a significant refocusing is necessary to ensure the transfer of project outputs from one University to another.

"Differences in the delivery of teaching at the University of X, where courses are not modularised, and direct access to the classroom by anyone other than tutors is not the norm, has meant that some aspects of the transfer of the project methodology to X is requiring a different approach"

The outputs of projects had to be developed with an eye to how they might need to be adapted in other environments if they were to be successfully transferred. We would say more generally that among project partners there is a need to develop methodologies that can be transferable from one institution to another and that these should be agreed early on in the project life.

Further work in the projects has identified how complex the organisational and institutional differences can be when trying to implement a system in more than one university. In some cases this can lead to the development of project outcomes that have a greater capacity for transfer as generic solutions and 'workarounds' have to be sought. We noted in the Interim report that many of the DiVLE projects did not have a clear focus on the academic staff who are likely to use the project outputs. Given the limited timescale of the programme it was encouraging to find that some projects did go beyond their original remit to include academics in the project.

In the Interim report we recommended that all projects reviewed their current understanding of the academic staff who are likely to make use of the project outputs so as to ensure that they had a clear strategy in place for enrolling academic staff thus ensuring that the outputs were taken up. Equally academic staff need to have clear incentives to turn the outputs into sustainable benefits. We pointed to an example of this approach in one project that made use of initial interviews for the user needs analysis to promote bursaries that were designed to support online course development using the project's concepts. We would re-affirm this conclusion.

9.3 Academic staff and metadata

Related to the issue of changed working practices noted in relation to reading list usage we identified a further issue which impacted upon certain projects, namely the

collection and management of metadata, especially where the tools being developed enable or require lecturers to place learning objects into a repository, or to link them to a library catalogue. This begs the question of who will create, provide and check the metadata for these objects, chase up missing data fields, maintain the data and generally 'do the housekeeping'. If responsibility for the process is given to the learning content or learning object creator, how can projects ensure that this will result in high quality metadata? Or should library or information specialists be given this task, and if so, have they sufficient understanding of educational content to enable effective retrieval by the teaching and learning community? The complexity of the metadata creation process for learning objects is not yet well understood, although it is currently being explored by CETIS, who have been able to provide advice and guidance to the DiVLE projects. There are certainly implications here for new institutional processes, even new job roles, and it is not always clear that projects are considering the impact of these outcomes.

9.4 VLEs and Distance Learning

The INSPIRAL Final Report noted that campus based face-to-face teaching would need to apply digital libraries and VLEs in such a way that they would enhance teaching and that distance learning would need to be supported in ways that would not disadvantage the distance students. The linking of digital libraries with VLEs is central to that vision and some projects are finding that the different ways distance and place-based students relate to VLEs affects the way in which resources are provided.

One project has as one of its central aims the integration of distance students into a full provision of library services. As part of that provision the project is developing a set of information skills units for use by place-based as well as distance students. These units were originally to have been authored within the VLE but the project found that only distance learners actively use the VLE. Campus-based students do not necessarily log into the VLE. The different student behaviour of place-based to distance students has meant that it was more useful to locate the material outside the VLE even though distance students can still access it from within the VLE. This minor project revision draws attention to a significant issue that all projects might need to consider. The integration of digital libraries with VLEs will potentially bring together different student bodies with quite different ways of relating to both the VLE and to library services.

Other problems have been uncovered for some students in relation to their VLE. In one case the VLE was not highly visible to the students, some of whom did not know it was there, while in another it became apparent that a minority of students have not adapted to using the VLE. In a further instance it became apparent that some student resistance developed to the VLE based on the particular features of the VLE in question. Given these problems, it cannot be taken for granted that students will react positively to the integration of library services and VLEs. This is a concern not only in relation to VLEs in general but also in relation to the particular features of some particular versions of some VLEs.

One student cohort was found to be still having difficulties with the VLE after several months' use, manifesting itself in less than optimum use of the system. Evaluation work was still in progress, but it was suspected that this lower use was because the VLE environment was less flexible than it could be and did not allow effective cross-linking. This meant that students' expectations of easy access to resources were not met, and they had to spend a substantial amount of time going up and down hierarchies to access material. This in turn was the result of their earlier choice of VLE - a more expensive version of the software concerned should support more extensive cross-linking.

The interplay between different student bodies, the choice of VLE and even the particular version of VLE presents a potentially complex problem for projects that wish to ensure that their project outputs have a more general application. We would confirm our interim conclusion that whilst projects in this field cannot consider every eventuality they will need to be sensitive to the way their project outputs may need to be carefully adapted to meet other teaching and learning contexts

9.5 Integration into a whole institution view

The question of different stakeholders is not simply one of language and projects have encountered different interests within host institutions. For example one project noted:

"The University Library has an existing relationship with a commercial software company called Sentient, who are developing an electronic reading list product called 'Reading List Direct'. The Library has been piloting this product since early 2002 for the creation and management of electronic reading lists. The product seems to be developing some functionality, which is along similar lines to the ... project. In particular, Sentient is now offering an 'RDN integration module', although we haven't

seen this in operation at this stage, and we have limited information about what this will provide. It may be that there will be some overlap with the work that we are undertaking."

We note this not to draw attention to the organisational questions this raises but to point towards another question that projects will need to address as they move towards dissemination of project outputs.

The shifting pattern of provision in the entire institution will present itself to academic staff. They will not be concerned with the political, organisational and technological issues that lie behind the situation but they are likely to be hesitant in the way they approach new initiatives if they cannot see a single stable solution to the problems they identify for their teaching and learning. This raises the question as to how projects can present their work as a component of the institutional e-learning strategy – a requirement for a coherent and compelling institutional vision.

10. Technical issues

As might be expected, a considerable number of technical issues, or issues whose importance is being confirmed as projects develop their products and approaches, have emerged.

Developments elsewhere have run in parallel with the DiVLE Programme, and it is notable that DiVLE projects have already contributed and intend to contribute further to the release for trial use of the NISO OpenURL Framework for Context-Sensitive Services, the release by CETIS of the first draft of the UK Common Metadata Framework, and to the IMS Charter for Resource List Interoperability. It is pleasing to see IMS make reference to JISC in their press releases as ‘a leading force’ and to note the ‘excellent work in the UK’. These developments strengthen the case for the compilation and publication of a technical report from the combined DiVLE projects.

Finally it may be noted that the recent ‘White Paper’ issued by IMS and CNI⁵ reflects many of the issues explored by DiVLE projects and highlighted by project and programme evaluation. A continuing dialogue on strategic as well as technical issues needs to be established.

The following headings summarise those issues which have emerged throughout the DiVLE Programme:

10.1 Resource Description

Not unexpectedly there are a range of issues arising from the attempt to integrate ‘library’ and ‘learning’ objects. These may be summarised as:

- The difficulty of creating metadata, which can cater for the conflicting requirements of content management systems, the library catalogue and the published standards
- The need to map ‘library’ standards/schema (MARC, DC etc.) with ‘learning’ approaches (IMS, LOM, SCORM etc.). There is of course a considerable amount of international effort in this field, going well beyond the DiVLE

⁵ McLean, N. and Lynch, 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

programme. As yet there is a lack of consensus across UK FE/HE on the preferred approach.

- Problems of semantic interoperability even where it is possible to map fields between schema. Mapping between vocabularies is thus a significant issue (as it is in other fora).
- Lack of support for some requirements which arise at the learning environment / digital library boundary, of which reading lists are the most obvious example. Thus library management systems support item level descriptions but may not support embedded annotations, course coding etc. which are sharable across the Digital Library / VLE interface. There is also an important issue in this area related to version control, since academic practice may be one of 'continuous updating', thereby creating dynamic rather than static objects.
- The use of multiple metadata schemas to describe objects (and multiple controlled vocabularies) creates problems. It is likely that these will be needed to provide different 'views' on each object dependent on different purposes / audiences.

10.2 OpenURLs

This is becoming a key technology to provide persistent links, and a number of projects are providing useful demonstrators. Generating learning object OpenURLs is shown to be feasible by at least one project but we are unsure yet of the generic solution – a 'LOM-OpenURL' community is however developing. Other projects stated an intention to test out various aspects (including, for example, multimedia, lecture notes and exam papers) in the second half of the programme but information on these is not yet available (or it may be that projects will offer them as recommendations for future work). It is noted that the NISO OpenURL standard (version 1.0) was released for public comment during the programme and is currently in the testing phase. It is interesting to note that one project has questioned the timeliness of further investigations into the use of OpenURL to resolve learning objects, suggesting that there is as yet no clear evidence that large Learning Object Repositories will become as commonplace as is usually claimed.

10.3 Embedding third party services

There are issues around the ways in which 'library' services such as HERON can be embedded in the VLE. (The HERON example is interesting because of copyright clearance issues, but the issue is more generic and relates to a variety of potential services.) For instance, it is still common for some services to be restricted by university IP address rather than, for example, Athens-enabled so that off-campus access is not enabled. Where services are (relatively) standalone this can be made clear to users but it is more difficult to handle this cleanly once they are embedded in the VLE. At the object level, it appears that while some publishers are happy to grant permission for, say, an image to be used in classroom teaching they are not happy to allow it to be delivered in a VLE, regarding this as 're-publishing'. If this cannot be handled seamlessly (from academic staff and student viewpoints) it could undermine the use of VLEs.

10.4 Openness of VLE platforms

Although projects have not reported major difficulties there remain questions as to how open the VLE platforms are and thus the degree of customisation and interoperability that can be achieved or should be attempted. The first question relates to the feasibility of customizing the VLE; the second to the desirability, long-term, of so doing. Certainly, experience suggests that the major VLEs (WebCT, Blackboard) are more 'open' than in the past and there is now a body of experience in developing, for example, open source plug-ins (as, for example, in the Blackboard Building Blocks community). However, it is one thing to develop additional features and to customize a commercial product within an experimental setting. It is quite another to demonstrate the sustainability of this approach. Previous experience, for example with library management systems, suggests that local customization can come unstuck when commercial suppliers roll out major upgrades to their products. Further, institutions need to be very sure that they can support the maintenance load that local customization imposes. This may also raise questions of how scalable across HE/FE solutions developed in projects actually are, particularly if 'local' solutions have to be adopted. Again, to give an example of problems that can arise, customizations are rarely as broadly tested against different product versions as their commercial equivalents. However, it may be noted that these issues will in part be considered through JISC's introduction of a central source of open source expertise. One project has clearly indicated that an advantage of the 'home grown' VLE is that it permits better access to the VLE technical specifications than a commercial product

would allow. Again, however, we would point to questions over long-term maintenance.

10.5 Cross-searching

A number of familiar problems with cross searching are being reiterated. These include:

- The shallow nature of much cross-searching, and the related problem that access to native interfaces may be needed for deep searching of a particular resource.
- Differential response times from different resources. This means that results cannot be presented reliably until the slowest target has completed, especially if the intention is to concatenate and process result sets.
- The ranking of result sets is problematic even when the full set is available since the end-user may not define ranking criteria in the same way as developers or targets.
- Removal of duplicates is non-trivial.
- Problems of semantic interoperability, even where common schema are being used and interpreted in the same way. There is considerable scope for confusion where there is no common agreement or approach to vocabulary control.
- While there is considerable experience of cross-searching, cross-browsing is less well understood.

10.6 Access management

Authentication and authorisation requirements are being explored but the solutions/development paths need further clarification e.g. limitations of Athens, Shibboleth, SSO. There is a need to pay attention to the integration of personalisation functions across VLE/DL, including the wider issue of interoperability between the broader range of administrative systems. Some useful lessons on this are emerging from the 7/99 Programme, although EDNER has collected some evidence that users do not rate personalisation highly as a required feature.

10.7 Non-standard resource types

An issue has been identified in providing resource linking where objects are not in standard (web accessible) formats and some further exploration is needed of this issue. Examples would include some executables or audio files requiring a 'wrapper' or some other files requiring synchronization. Again, this issue has relevance well beyond the immediate aims of the DIVLE Programme and it would be useful for projects to record instances.

10.8 Learning Object Repositories

Projects have identified problems linking to learning objects, most importantly a lack of suitable targets. *'SFX has been very successful. What has been less easy is finding LO 'things to link to'.* Or again *'It has been difficult to find LO repositories that will co-operate with the project.'* Additional problems are that learning object metadata is often stored in secure databases and is not accessible by URL, and also that repositories are not interoperable because they were created pre-standards. Where interrogation has been possible it has often been at a fairly basic level so far, though it is hoped to demonstrate some degree of search complexity in the near future. This problem is echoed in other fora, and will probably not be resolved until learning object repositories are based upon more mature and robust technologies and standards.

11. Conclusion

In the 7/02 Call, the JISC made it clear that the nature of the DiVLE projects was to be short practical explorations, implementations or focussed studies. JISC was seeking generic outputs which would benefit the wider community, and indications of appropriate areas for further studies.

It is our view that these aims have been achieved. The list of outcomes and deliverables is impressive, and is evidence of the sheer volume of work which projects have successfully undertaken.

At this stage several of the technical projects have created tools which will be embedded in their own institution in the very near future, and have fostered interest in these in the wider community. Others have less tangible outcomes, but have carried out creative and innovative technical explorations which will make valuable contributions to the technical body of learning.

The pedagogical explorations have deepened our understanding of the limitations and constraints when working within the VLE environment. There are messages from users that the VLE is not an environment which suits every student, particularly when the VLE software itself is not sufficiently flexible, robust or reliable to meet user needs. There is evidence that library staff need the same standard of VLE training as academics, and that this is not always provided. There are warnings of the impact that the move to an integrated digital library and VLE teaching environment may well have upon the job roles and practices of the teaching community. These outcomes of the DiVLE programme are valuable lessons for institutional e-learning policies which must be taken on board if the VLE with integrated digital library facilities is to become a key teaching and learning environment.

12. Recommendations for future work

In our view, the following issues need to be explored further

- We strongly recommend that the technical work undertaken by the DiVLE projects be collated and synthesized into a combined technical report. Inter-project communication has been problematic, and there is a risk that although the projects seem to want such a collaborative report, it may not happen. If this is the case valuable synergies between projects will be lost. This would be unfortunate, especially as it is evident that some technical learning is already feeding into international standards, thereby raising the profile of individual institutions and the JISC.
- We also strongly recommend further exploration of the issue of academic practice in this area. In particular the creation, management and maintenance of online reading lists is not well understood, and the impact of the new tools being created by the DiVLE projects upon the activities of teaching staff and indeed librarians too needs to be explored. A detailed understanding of user behaviour is needed, if resistance to changes in working practices is to be avoided.
- The behaviour of distance and place-based students in VLEs seems to be unclear, and we recommend that this is also an area where further study could be enlightening.