

Managed Learning Environments Steering Group Report, March 2002

Contents

1	Executive Summary	2
2	Context	3
	2.1 National Climate	3
	2.2 Technology Context	4
	2.3 College Environment	5
	2.4 Vendors' Environment	6
3	Programme of Activity	7
	3.1 Awareness Raising	7
	3.2 Interoperability Studies	10
4	Conclusions	14
	4.1 Culture	14
	4.2 Standards	14
	4.3 Support	15
5	Recommendations	16
	5.1 Recommendations to Colleges	16
	5.2 Recommendations to LSC	16
	5.3 Recommendations to JISC	17
	5.4 Recommendations to Vendors	19
6	Abbreviations Used In This Report.....	20
7	Sources Of Help.....	22
8	Steering Group Membership	22
9	References	23

1 Executive Summary

This report describes the work of the Managed Learning Environment Steering Group (MLESYG), which was set up to help colleges implement Managed Learning Environments (MLEs). The report offers broad conclusions and makes a number of recommendations to four main stakeholders – colleges, the Learning & Skills Council (LSC), the JISC and vendors – at a time when e-learning¹ is seen as increasingly important.

The MLESYG's activity focused on the needs of the English FE colleges formerly funded by the FE Funding Council (FEFC). The JISC has now established a new Steering Group to pursue MLE interoperability issues specific to Scotland, Wales and Northern Ireland. It is expected that many of the issues and recommendations presented here will have general relevance, but that there will be further recommendations aimed at colleges and funding bodies that reflect local circumstances in these countries.

The MLESYG set up an awareness-raising programme to explain the role of an MLE and to identify the specifications needed to achieve integration of the various systems involved. The awareness-raising work helped to define key terms that are now used throughout the FE community:

- The term Virtual Learning Environment (VLE) refers to the component(s) within an MLE that provides the “online” interactions of various kinds which can take place between learners and tutors, including online learning
- The term Managed Learning Environment (MLE) refers to the whole range of information systems and processes of a college (including its VLE if it has one) that contribute directly, or indirectly, to learning and the management of that learning

An interoperability studies programme was established to investigate the feasibility of using a standards-compliant VLE as a building block in the creation of an MLE. The IMS specifications were adopted as the proxy standard for this work. The detail of the activity in these interoperability studies is available in the separate MLESYG Technical Report².

These activities have served to demonstrate and reinforce the central importance of adopting a standards-driven approach to ILT in pursuit of the interoperability needed for a whole college to become efficient, flexible and effective. Managed Learning Environment thinking is about college processes and standards, not software products. It provides a framework within which choices about software, training and above all support for learners and tutors can be made.

Key conclusions from the work of the MLESYG include:

- Successful implementation of MLEs will require organisational **culture** change and re-engineering of business processes within colleges, with substantial staff training and development required to ensure effective use can be made of MLEs as a way of integrating e-learning into college business
- **Standards** have to be adopted as the basis for interoperability of systems within college MLEs, and between colleges and the LSC. IMS is the best available framework for this interoperability and should be supported centrally
- Colleges will need **support** and information from central bodies to help them plan the development of their MLEs. The JISC and the LSC will have a key role in setting the framework for a coherent interoperability agenda to guide the contributions of agencies, advisory services and vendors

2 Context

The use of Information & Learning Technology (ILT) across the English FE sector, as originally conceptualised by the Further Education Funding Council's (FEFC's) Higginson Committee³, established a view that IT could, and should, be deployed in ways that would enhance all aspects of college services and systems, so as to benefit the extended community of learners who use our colleges.

Managed Learning Environment (MLE) thinking represents a systematic view of how a number of IT components, such as a Virtual Learning Environment (VLE) or a Student Record System (SRS), might interact with college processes to support such a learner-centric college perspective. The work reported here, and in the separate MLESG Technical Report reflects the importance of the MLE programmes at the core of the Joint Information Systems Committee (JISC) Five-year strategy⁴ in developing MLE awareness and implementation across the whole of the UK, in HE and FE.

The MLE concept is about college processes and standards, not software products, and establishes for the Learning & Skills Council (LSC) the critical importance of a standards-driven approach to ILT in pursuit of the interoperability needed for the whole college to become efficient, flexible and effective. It provides a framework within which choices about software, training and above all support for learners and tutors can be made and which the LSC can use as a backdrop to facilitating change in colleges.

The MLE conceptual framework should be used to underpin and inform all aspects of a college's ILT strategic planning, and so contribute to the college's overall planning and management. Current interest in "e-learning" and the use of VLEs within an MLE are then seen within a holistic framework for supporting learners, rather than as stand-alone technology-led changes.

2.1 National Climate

FE colleges operate in a demanding environment, in which reduced real-terms funding, increased competition and heightened quality expectations have put pressure on colleges to change.

The move from the FEFC to the LSC⁵, with its extended mandate now covering work-based learning, School 6th Forms and Adult & Community Learning as well as FE colleges, is putting an increasing emphasis on the need to address social exclusion and widening participation; to make learning even more relevant to the workplace; and to address national priority areas such as Basic Skills. "Just in time" support for learning will become more appropriate for many learners and we will need to cater for a move from course-based teaching to individualised student-centred learning.

The University for Industry (UfI), National Grid for Learning (NGfL), the National Learning Network (NLN) and other initiatives have shown that e-learning is seen by government as a major development area for all learning and skills sectors. This has been reflected in the LSC's creation of the Distributed & Electronic Learning Group (DELG)⁶, which is tasked with establishing, amongst other things, the most effective and efficient ways in which the LSC should support and stimulate the use of distributed and electronic learning for learners and amongst providers.

The funding councils and the JISC had recognized this for some time, and in 1999 the FEFC set up the Further Education Information and Learning Technology Committee (FEILTC) to look at what action was needed at a national level to assist colleges in meeting the challenges. At the same time, all of the FE funding councils entered negotiations to join the JISC as full funding partners. This was achieved in 2000 and has led to all colleges being connected to SuperJANET. This means that, for the first time, we

can be sure all colleges have means to enable their learners to access remotely held materials, so enabling new pedagogies to emerge.

The FEILTC developed a programme of activity that led to FEFC Circular 99/45⁷, which detailed the FE support for JISC and the plans for using £74 million to support developments under the umbrella of the NLN. Paragraph 15 of this circular reads:

“The committee recommends early detailed research into managed learning environments with the aim that a specification and open standards for these environments be developed for the sector. In order to facilitate authentication and the tracking of individual learning, the committee recommends that research be undertaken concerning student tracking and unique identifiers for students. The Council has approved funding for these activities and has asked the FEILTC to give them early priority in the implementation plan.”

The JISC, recognising that the implementation of an MLE is a difficult area, established the MLE Steering Group (MLESG) to start this work. The Steering Group recognised early in its work that the immaturity of both the products and the thinking about their use was causing confusion in the sector, as was the vocabulary being used. In the JISC Circular⁸ that set out the work programme of the group it was noted that:

“Coming to terms with the MLE concept is made more difficult by the ambiguity of the term’s existing usage. Existing products described as MLEs, while sharing some superficial uniformity, vary considerably in their functions. Moreover, a variety of terms (Managed Learning Environment, Virtual Learning Environment, Learning Management System and On-line Learning amongst others) appear to be used without clear differentiation from each other. There is no particular reason why any one of these terms should be used in preference to another – the main concern is that they should be used consistently across the sector.”

The MLESG decided to develop a programme that would help colleges build MLEs - whether or not these included VLEs – of a type that takes into account that much learning will continue in "traditional" environments such as the classroom and workplace for an extended period, but that there will be a transition to a mixed mode of teaching by integrating the use of VLEs. Whilst the MLESG has been at work, the use of the term “e-learning” has become widespread.

2.2 Technology Context

Current interest in e-learning reflects our wish to understand how technology might be used to change the way in which we learn. Developments in computing power and the invention of new devices have enabled us move from the computer-based learning programs of the 1960s, which offered little more than drill and test, to a much richer environment in which large volumes of information are easily available and in which exciting forms of interaction - between learner and computer, learner and learner, and learner and tutor - can be supported.

This technological progress continues. The dynamic of tutor-learner interactions is about to change again as the widespread availability of wireless networking and the use of “instant-on” or “always-on” handheld devices and tablet PCs causes us to ask new questions about where and how learning might take place. It will take some time yet to understand how this latest technology wave will influence our learning environment options.

With the spread of the World Wide Web, we have already seen a shift in focus from managing the information available on the college’s local area network to one in which

content may be accessed from anywhere and in which content evaluation skills, as well as content finding skills, become Key Skills. The Internet, of which the Web is just a part, has opened up a variety of new methods of communicating, and this puts a new emphasis on the possibilities for peer interactions as well as interactions between learners and tutors.

2.3 College Environment

Colleges have been talking about the implications of moving from a "teaching-centred" curriculum to a "learning-centred" one for years. In 1992, the then Further Education Unit published an important document called "Flexible Colleges"⁹. The central themes in that document foresaw transitions that, using current vocabulary, might be characterised as:

- *From* a "course-structured" teaching-centred curriculum *To* learner-centred curriculum made up of "chunks" of learning, each associated with its own learning resources, assessment and accreditation - Reusable Learning Objects, bundled and repurposed according to need - with the tutor as the key professional managing this individualisation, not the technical specialist
- *From* access to learning being restricted by time and space *To* Anytime, Anywhere Learning ... with company-based training rooms; community learning centres and folks' front rooms as the 'early win' locations in which wireless networking technology developments will begin to offer ubiquitous access to networked information and learning support services
- *From* unattractive learning spaces *To* ones in which priority emphasis has been put on providing a comfortable physical environment; in some colleges the '7 days a week' Learning Centre is already at the centre of the learner experience, rather than the conventional classroom
- *From* an IT-poor environment in which ICT infrastructure will be put there 'if we can afford it' *To* an extended IT-rich one in which the ILT infrastructure represents a central core of the strategic planning of the organisation
- *From* a pedagogic reality based around technophobic 'lecturing' *To* one of 'just when needed' support for learning by 'technology focused' tutors who know when technology does and does not offer an advantage

As part of targeted ILT funding provided to colleges from the NLN programme, colleges have been allocated a sum of money (varying in size according to student numbers) for MLEs.

There is a growing body of content available from the NLN's materials development programme, and all colleges now have substantial "main site" connectivity through JANET. All colleges are expected to operate a robust SRS and Financial System to support management and audit.

Many colleges have bought, or are planning to buy with their MLE allocation, a VLE. There is more to a successful VLE implementation than just the purchase and installation of software. Colleges need to address how they support learning, staff development, equipment (including network and student access to PCs), the provision of content and the integration of the VLE with other MLE components.

The integration of the VLE with other systems is crucial to its adoption as part of a combined solution to supporting learning. Without it, students would have to be separately enrolled into the VLE, instead of having the information passed from the college's SRS, and data captured by the VLE (attendance, assessments, results, and so on) would have to be manually re-entered, adding unnecessary costs to the use of VLEs. A potential solution to this problem is to buy all parts of an MLE from a single vendor in the expectation that they will interoperate. Currently, however, no vendors can provide

all the components of a MLE. As vendors tend to specialise in some components of the MLE, it is unlikely that one vendor's products will meet all of any college's needs equally well.

An alternative solution is to enable the various subsystems to communicate with each other and share data in standard ways that are likely to keep choices open for colleges into the future. The MLESG has started the process of building a wide commitment from funding and planning bodies, colleges and vendors to such a standards-based approach.

2.4 Vendors' Environment

All vendors wish to maximise their market, and that means selling as many systems to colleges as possible. No supplier, however, no matter how large, can supply all the systems needed equally well. All suppliers therefore have to face the issue of integrating their systems with those of other suppliers. There are three approaches to this.

The first approach is where a vendor has such a dominant market share that it can develop systems anyway it wants and other suppliers who want to work with it have to follow their lead. This is called the setting of de facto standards. Industry leaders like IBM and Microsoft have, based on their commercial dominance in the marketplace, often created such standards. However, currently, none of the VLE vendors or MLE component vendors is big enough to impose such a solution on the market.

The second approach, and one that has been used with varying degrees of success up to now, is the bespoke development approach to integrating systems. This means buying consultancy and programming from the vendors, which is a mixed blessing for vendors. It may bring in additional income from the systems integration work, but it can make fixing and supporting existing systems and bringing out new versions of systems considerably more expensive. It also means that the licence revenue may have to be lower in order to remain competitive if the costs of integration are high. Further, with many systems from many vendors, the integration costs incurred in providing a bespoke integration for each pair of systems is very high, a cost that ultimately has to be carried by the sector.

The third approach, supported by all the vendors involved in the pilots, and by others as well, is to use standards to achieve interoperability. This means that all the vendors agree to implement a common method of exchanging data between systems and only has to be implemented once by each vendor. With this approach, it needs to be kept in mind that specifications do not provide 'plug-and-play' interoperability, and, given the differences between colleges, may never be able to provide this. Nevertheless, such standards significantly reduce the task, and hence the cost, of achieving multi-way interoperability. At the very start of this work, a meeting was held at the FEFC with representatives of the JISC, the FEFC and many of the VLE vendors in FE who agreed on a standards-based approach to ensure interoperability between products, to make sure that colleges would not be 'locked in' to any particular supplier. It was agreed that the best approach was to use 'IMS with English FE extensions' to achieve interoperability.

Similar discussions were held with the VLE and SRS vendors in the autumn of 2000 and their agreement to the 'IMS with English FE extensions' approach was confirmed.

Content publishers were another group of vendors involved in the project. They want their content to work in as many VLEs as possible to maximise the market for their materials, and VLE vendors want a wide range of content to be available to run on their systems. Many of these vendors were already looking towards IMS as part of their product development.

3 Programme of Activity

In 1999, FEFC Circular 99/45 prompted colleges to consider the use of MLEs. Later, a budget allocation was made available to all FEFC colleges for expenditure related to MLEs. In the early stages of the involvement of the JISC as a funding partner in the FE sector, it was recognised that the use of MLEs was a significant area of work on which the JISC could usefully focus. The MLESG was established by the JISC Committee for Integrated Environments for Learners (JCIEL) to explore this area of FEFC interest. The two years of the MLESG activity have focused on understanding what creating a MLE might mean for a FE college. It was recognised early that this would involve cultural and technical issues and the activity was built on a view that information technology can, and should, be deployed in ways that enhance ALL parts of college services and systems so as to benefit that extended community of learners who use our colleges.

As part of joining the JISC, the FEFC asked the JISC to advise colleges and help them to implement MLEs. Although many colleges hoped to receive advice on which particular VLE to buy, this was not practicable. Colleges vary enormously, and how colleges want to use VLEs varies even more. Going out to tender for a single VLE for the whole sector was not a solution. Worse, it would also have damaged the VLE market for the sector, seriously limiting options for the future.

A programme was therefore set up to explain to colleges the role of an MLE, and of a VLE as part of that, and to develop standards needed to achieve integration of the various systems, most notably the exchange of data between systems and the (re)-use of learning materials in different VLEs.

The group met on a monthly basis and set tight timescales for its work, which focused on two key areas: awareness raising and feasibility testing through the interoperability pilot projects.

3.1 Awareness Raising

To assist colleges in understanding the issues involved in implementing MLEs, the group undertook a major programme of awareness raising. This involved members of the group speaking at many events attended by colleges, producing a series of leaflets (the MLE Information Pack¹⁰ and working with other groups such as BECTa, Ufi and NILTA. The JISC also issued a circular, accompanied by a letter from the FEFC, to all college Principals explaining the issues and the approach being taken⁸.

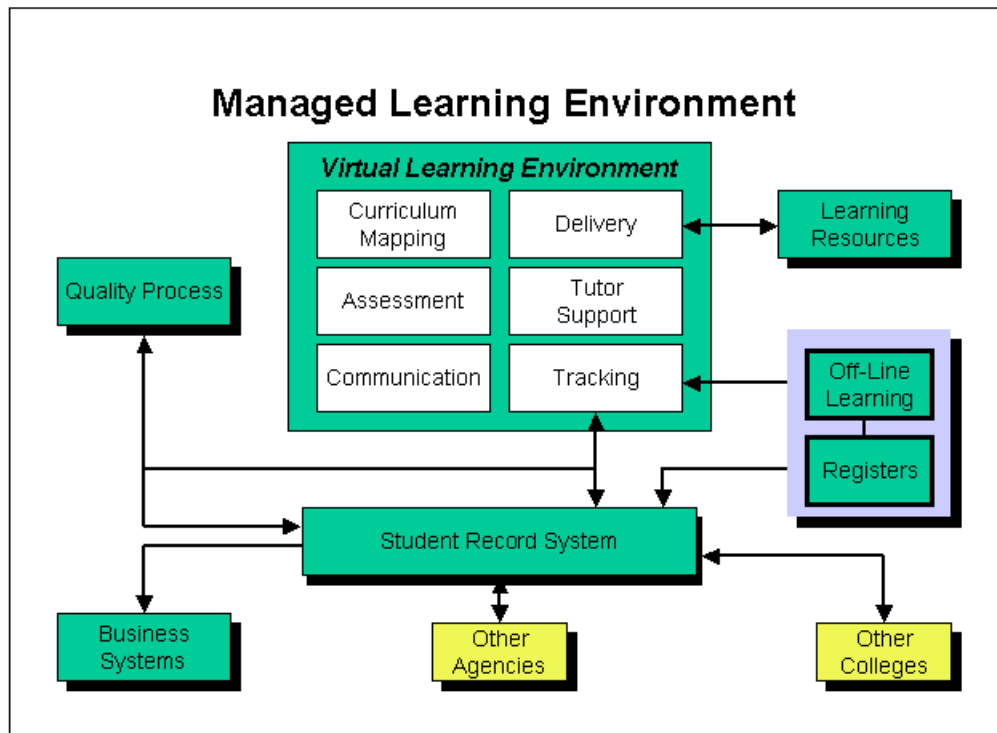
The MLE Information Pack contained 22 briefing papers. The packs were sent to representatives in FE colleges across the whole UK, including the Principal, Vice Principal, Director of Curriculum, IT Services Manager, Librarian/Learning Resources Manager, Director of Staff Development, Director of Human Resources, Director of Finance, ILT Champion (England and Wales only) and Directors of Management Information Systems.

Packs were also sent to all UK universities and distributed at numerous conferences and other events. The packs have also been used in other countries, including the USA and Eire. Over 18,000 packs have been distributed in hard-copy format and further copies have been downloaded from the JISC Web site.

3.1.1 What is a Managed Learning Environment?

In the MLESG Circular we proposed the term VLE be used to refer to the component(s) within an MLE that provides the “online” interactions of various kinds which can take place between learners and tutors, including online learning.

It was suggested that the term MLE should be used to include the whole range of information systems and processes of a college (including its VLE if it has one) that contribute directly, or indirectly, to learning and the management of that learning.



Reproduced by kind permission of BECTa

3.1.2 What Does a VLE Do?

As outlined in MLESG Briefing Paper 1¹¹, the principle functions that the complete VLE needs to deliver are:

- Controlled access to curriculum that has been mapped to elements (or “chunks”) that can be separately assessed and recorded
- Tracking of student activity and achievement against these elements using simple processes for course administration and student tracking that make it possible for tutors to define and set up a course with accompanying materials and activities to direct, guide and monitor learner progress
- Support of online learning, including access to learning resources, assessment and guidance. The learning resources may be self-developed, or professionally authored and purchased materials that can be imported and made available for use by learners
- Communication between the learner, the tutor and other learning support specialists to provide direct support and feedback for learners, as well as peer-group communications that build a sense of group identity and community of interest
- Links to other administrative systems, both in-house and externally

The best VLEs allow the delivery of individual learner needs through adaptation of the experience to the learner level, but also support the work of groups of learners working together towards common or related goals. The rest of the MLE helps the college and the tutor to support the learner. At the simplest level, an MLE allows the automation of processes such as registering students onto courses, modules and units. In the future,

when more fully developed, it will also help the learner by handling the students' desired learning outcomes, their learning styles and supporting progression. To achieve this, a number of the college systems, including the VLE, SRS, progression system, learning resource centre systems and assessment systems, will all need to share data cooperatively. This is what current technology, using IMS specifications, is beginning to offer.

It should be noted that, because of the nature of VLE products and their functionality, no individual VLE would meet the needs of all colleges in the whole sector. In addition, a variety of systems need to be connected to form an MLE. An approach that allows colleges to choose the systems that they need is therefore essential so as not to throw away the considerable investment made by colleges in their current SRS and other systems.

Many colleges have requested advice and guidance on which VLE they should buy. It would be impossible, however, to advise on any one particular product because a product that is appropriate for, say, a large multisite college might not be appropriate for a small single-site college. This underlines the importance of a strategic approach to implementation by each college, and the need at a national level for all SRSs and VLEs to interoperate, if they are to be successfully used in different combinations in different colleges.

Finally, it should be noted that the IMS specifications are being developed in a rapidly changing world, and the specifications themselves are evolving. Two systems that conform to different versions of IMS specifications may, therefore, not be fully compatible with each other. When considering systems that need to exchange information, it is important to check that they both implement the same version of the appropriate IMS specification.

3.1.3 Results and Lessons Learned

On the basis of the two evaluations of the MLE Steering Group¹² that were commissioned by JISC, this part of the programme appears to have been extremely successful in raising awareness at all levels in colleges. It also helped define and establish key terms that are now used across the community. This increased understanding and shared vocabulary also helps colleges in their discussions with vendors, leading to implementations that are more appropriate to their needs.

The MLE conceptual diagram has clearly been very successful in establishing the concept of the MLE and understanding the difference between VLE and MLE.

As part of the evaluation of the MLESG, LearnDirect Training sent out a survey on the ILT Champions and VLE email lists. One of the questions asked was "Has the work of the MLESG helped you understand the difference between Managed Learning Environments and Virtual Learning Environments?" In reply, 75% of Champion/VLE list respondents and 83% of Principals answered yes.

Another of the questions asked whether participants had seen Circular 7-00. From the Champion/VLE respondents, 62% had seen it prior to the survey, of which total 90% said it had been helpful (or very/extremely helpful) in their "understanding of VLEs and MLEs". In addition, 96% of Principals had seen the Circular 7-00, and all found it helpful or better.

The MLESG Briefing Packs prove to be useful in awareness raising and information sharing. As part of the evaluation of the MLESG, LearnDirect Training used the VLE email list to ask which of the participants had seen some or all of the leaflets from the Briefing Pack; 63% of respondents had seen all the papers and 26% had seen some. Respondents were also asked if the papers had been useful: 74 % responded with

‘extremely useful’ or ‘very useful’; 22% responded with ‘useful’; only 4% responded with ‘not very useful’.

3.2 Interoperability Studies

The second part of the programme was the interoperability studies programme that explored the use of IMS educational specifications to allow for data interchange. In May 2000, the JISC sought, and achieved, agreement from VLE vendors to an approach to systems integration based on ‘IMS educational specifications with FE extensions’. IMS produces specifications for use in both education and commercial training for exchanging data between a range of systems. The IMS Global Consortium is an international body that aims to provide specifications which can be used anywhere in the world. One benefit of this is that vendors who work in many countries can adopt them, knowing that work done in one country will be useful in another. It also means, however, that the specifications are generic and may need customising to meet national, sectoral and local needs. This is recognised in the specifications, which provide ‘hooks’ for extensions to be added and these were used when providing the FE extensions. In the autumn 2000 meeting, vendors of SRS confirmed that they were happy with this approach, and it was agreed to run a series of pilots to prove the concept and to determine the nature of the FE extensions needed.

The pilots were concerned with the integration of systems from different suppliers using the IMS specifications. It was therefore decided that the projects should be led by colleges (rather than vendors) and, as vendors would gain market advantage by implementing the specifications, it was decided that they should fund their own development work. A call for proposals (JISC Circular 11/00¹³ ‘Pilots to prove the concepts of interoperability within Managed Learning Environments in the Further Education Sector’) was therefore issued, asking for bids from interested consortia - led by a college - involving at least two vendors to test either the exchange of data between SRSs and VLEs by means of IMS or the use content (learning objects) that conforms to IMS within the college VLE. In all, 23 bids were submitted and 12 of these were funded. The first stage of the pilot determined which part of the IMS specifications to use, and how these related to the FEFC's Individual Student Record / LSC's Individual Learning Record (ISR/ILR) used for student funding. This involved discussion with all pilot projects led by Bill Olivier from the JISC-funded Centre for Educational Technology Interoperability Standards (CETIS) with input from IMS Europe, IMS headquarters in the USA and a specialist consultant. There was, and continues to be, healthy debate on the best way to map the data to meet the needs of colleges while keeping the implementation burden manageable for vendors.

Once an approach had been agreed, vendors began implementation, working closely with colleges to ensure that the data exchange met the colleges’ needs.

This work raised many issues and it was only by vendors agreeing to collaborate that the issues could be addressed and the lessons learned could be made available to the community, as discussed below.

The pilots have not addressed all the areas where information needs to be exchanged, so vendors must continue development work in order to meet colleges’ needs. Furthermore, the technology, college needs and IMS specifications are evolving, so more work will be needed to achieve fuller systems integration.

3.2.1 Areas Addressed

The JISC Circular set out a number of areas of interoperability that could be explored through the pilot programmes. Areas suggested for inclusion were:

- Interoperability between an SRS and a VLE
- Interconnection between a VLE and learning resources (content)
- Interoperability between content and test authoring tools and a VLE
- Interoperability between course creation tools and an SRS or VLE
- Interoperability between a profile server (or service) and an SRS or VLE

However, no successful bids were funded for interoperability between a profile server and an SRS or VLE.

The pilots were mostly successful in demonstrating that ‘IMS with English FE extensions’ is a sensible route to achieving systems integration. Not all projects had finished development work by the end of the funded period, but all vendors involved are committed to the use of IMS to achieve data exchange between systems.

3.2.2 Results and Lessons Learned

The issues addressed in the VLEs and content interoperability are significantly different from those in the VLE and SRS exchanges and are thus discussed separately.

3.2.2.1 VLEs and Content

The pilots that centred on the use of content within VLEs have confirmed that the use of IMS Metadata for describing and searching for content works well and that the use of the IMS Content Packaging specifications to describe the structure of content allows content to be exchanged and, to a limited extent, used in a variety of VLEs.

IMS Content Packaging provides only a simple structure, similar to that of a Table of Contents in a book, which can be used with any content. IMS Content Packaging does not place any limits on the type or format of the content, but it is recommended that it should work in common Web browsers.

If tracking of a learner’s use of content is required, then both the content and the runtime system need to support the Advanced Distributed Learning (ADL) Network Shareable Content Object Reference Model (SCORM) in addition to the IMS Content Packaging specification, as it is ADL SCORM which specifies how content can receive and return information between the content and the VLE. SCORM version 1.2 is currently recommended because it integrates both IMS Metadata and IMS Content Packaging, so can be treated as an enhancement of these.

Many content publishers attempting to transfer their existing content to SCORM have found that, like IMS Content Packaging, it only supports linear sequencing. SCORM does not support publishers’ more sophisticated content. To this end, IMS is currently developing a Sequencing specification to be optionally added to Content Packaging, which will enable more sophisticated content to be used. This is likely to be adopted into a future version of SCORM. It is clear that publishers will be making use of some of these more sophisticated developments as they become available, and colleges should expect to upgrade their content in line with this.

3.2.2.2 VLEs and Student Record Systems

The pilots looking at the exchange of data between the VLE and an SRS made significant progress and also raised number of issues. Data exchange between VLE and SRS takes place in two directions: there is a need to get registration information from the student record to the VLE, and to get progression and attendance and results information back from the VLE to the SRS.

This raises a number of questions including what data should be passed from the student record to VLE and vice versa, which of the IMS specifications should be used and what means should be used to move the data from one system to the other.

The issue of what data should be passed between systems in part reflects the ways in which different colleges work. There was a core of common data (such as student name, unit or module identify, date) which all colleges used; equally there were other kinds of data that only some colleges needed. CETIS is now reviewing the data that were exchanged in each of the pilots, in order to agree a minimal set of data that all vendors should implement.

By the end of the pilot projects, although vendors had implemented the IMS Enterprise specification enabling enrolments and results to be transferred between systems, no vendors had got as far as implementing the additional FE extensions. These constitute a relatively small set of seven fields that hold the data necessary for the ISR/ILR returns, but are likely to be generated in the VLE. They hence need to be passed to the SRS that generates the ISR/ILR returns. These fields were mapped into the IMS Learner Information Profile (LIP) specification and made available as an extension to the IMS Enterprise specification. Work is still continuing by vendors to finish implementing this part of the IMS specifications and further meetings will then need to be held with the pilot groups and vendors to finalise which fields will form the core set to be used for the sector.

Even with the review of the standards, vendors that have not been involved in the pilots should implement the existing specifications as these will form the basis for the new specification and migration will be much easier than starting from scratch. Vendors that do not engage in implementing IMS specifications now will have considerable delays in developing compliant systems in future.

A further issue raised concerns about how data are physically transferred from one system to another. Producing data for exchange in an agreed common format is a significant step, but the need for a secure, reliable and cross-platform means of transporting data is wider than the education and training spheres, extending into both government and the commercial sectors. There are a number of developments taking place in this area and the IMS Consortium has decided to await their outcomes before recommending any transport mechanism.

There is a need for an interim solution for FE until a more complete solution has been found. The pilots used several different techniques to achieve file transfer between systems, including FTP and HTTP. However, if different vendors make use of different methods to transfer data between systems, then transfer might have to be done manually and, in the worst case, could not be done at all. The JISC needs to continue working with vendors to agree on one or two methods of moving data between systems so that colleges may implement systems from different pairings of vendors.

All involved need to liaise closely on the complex mix of issues that emerge from the LSC's need to develop both funding methodologies¹⁴ and data capture strategies¹⁵ to suit the College, 6th Form, Workbased and Adult & Community sectors. Non-college providers have not had the benefit of the NLN programme and understanding of MLE issues is only just emerging. The needs of these sectors are broadly similar to those of colleges but the context is different. For example, in Adult & Community Learning there are many small locations; many voluntary and community organisations have little technical support or expertise; the scale of provision in any one location is small and the infrastructure relatively poor, or sometimes absent. Much of the provision takes the form of outreach in community locations and connectivity is a major problem.

The interoperability studies demonstrated that there is no easy way to achieve interoperability, but interoperability is easier through the use of IMS than without it. However, colleges must expect additional work with and by their vendors to meet their specific needs. Without IMS, the task would become much greater, and hence more

expensive, and there would be a danger that many colleges would either not be able to afford to achieve the degree of interoperability that they would like or that they would not have the skills to achieve this alone.

4 Conclusions

During the two years of its operation, the MLESG has focused on gaining an understanding of what creating an MLE might mean for an FE college. The Group's programme of activity has been built on a view that IT can, and should, be deployed in ways that enhance all parts of college services and systems so as to benefit the extended community of learners who use our colleges.

As noted early in the life of the Steering Group, and shared with colleges through the JISC 7/00 Circular⁸ it is clear that introducing an MLE involves cultural, technical and relationship issues. Following the publication of this circular the group initiated an awareness-raising phase that led to the production of the very widely circulated JISC Managed Learning Environments Information Pack¹⁰. This pack, alongside the large number of events run during 2000-2001 to disseminate its contents and ideas, alerted stakeholder groups to the issues. The next major phase of the work involved the scoping, commissioning and completion of a number of college-vendor interoperability studies to check the feasibility of using standards-compliant software as building blocks in the creation of a MLE.

These actions have served to demonstrate and reinforce the central MLE concept: the importance of adopting a standards-driven approach to ILT in pursuit of the interoperability needed for a whole college to become efficient, flexible and effective. MLE is about college processes and standards, not software products. It provides a framework within which choices about software, training and above all support for learners and tutors can be made.

Conclusions have been drawn that reflect the need for a culture change in colleges, commitment to standards and systems to support such change, and the building of relationships to support the change process positively. These conclusions are the basis for the recommendations presented later to the key stakeholders – colleges, the LSC, the JISC and vendors.

4.1 Culture

Successful implementation of MLEs will impact on the core business processes of colleges, so some re-engineering of business processes and organisational change will have to be undertaken.

Introducing new technology changes human practices as well as technical processes.

Both have to be co-designed, managed and integrated with equal care to ensure that both humans and the technology are able to do what, respectively, they both do best. Effective development and implementation of MLEs cannot occur without substantial and suitable staff development. This development needs to be included in a college's ILT strategy and supported through funding managed for the LSC by the NLN Programme Board.

MLEs, with VLEs at their heart, need to be the basis for college ILT strategies. Colleges will need support to ensure that their ILT strategy supports their learning objectives. Such support could take the form of sharing best practise, or producing models, as well as the support already on offer from the JISC, BECTa and other agencies and advisory services.

4.2 Standards

The interoperability studies have demonstrated that IMS specifications are presently the best way for colleges to develop MLEs that will meet their needs by integrating their VLE with their student record and management systems. It is clear that more work needs to be done by all parties - vendors, colleges, the JISC and the LSC - to achieve this.

Products involved in the pilots still need further development work to be fully compliant with IMS and will need further work as new versions of IMS are released. The adoption

of future versions of the specifications needs to be carefully managed and carried out with the agreement of all stakeholders.

Data transfer mechanisms between systems are essential for the development of MLEs. The pilots did not agree a common method of transfer in data from one system to another, only common formats. Work is needed to establish the best interim methods for transferring the data from one system to another, and an agreement needs to be reached with all the vendors to implement this so that colleges can easily exchange data between their systems.

IMS has proved to be the best approach to interoperability, although it does not provide a 'complete solution' to exchanging data between systems. It is the best step towards full interoperability available. The JISC needs to continue its work in supporting IMS development to meet the sector's needs and to promote the effective use of IMS in the community. Despite claims to the contrary, much of the content does not work fully in all environments, so further testing is required. To aid use of conformant products in the sector, the JISC and the LSC need to support the development of an IMS conformance testing facility – working with government departments and vendors to reinforce this essential interoperability platform.

4.3 Support

An incidental but significant relationship has been at the centre of the MLESG programme – that between the JISC and the LSC (initially FEFC). Alongside the rollout of JANET to all FE colleges, the MLE agenda has been central to the new engagement between the JISC and the LSC and has been a high priority item for many RSCs as they have started to build up their approach to the needs of their college communities. The JISC intends to build upon these relationships through a forthcoming programme of MLE activity that extends the focus of the English programme to colleges in Scotland, Wales and Northern Ireland. A separate programme will focus on a key area for HE and FE funding councils by exploring the development of MLEs across regional FE/HE partnerships. The JISC will also continue the awareness-raising aspects of the MLESG through events and publications.

One of the most striking outcomes of the MLESG programme has been the good practice it has sought to promote by encouraging vendors to work simultaneously with each other and with their college customers. All involved now take the issues of interoperability seriously and all vendors involved are now working on developing IMS compliance for their systems. This, more than anything else, shows the degree of success of the programme in changing the culture amongst both vendors and colleges towards the issues surrounding the interoperability of systems. It is clear from the level of commitment from vendors that the work started by this programme will be continued, with further input from bodies within the sector such as the JISC, CETIS and the LSC.

Colleges will continue to need support and information to help them to plan for their MLEs, to procure components of the systems, and to keep up-to-date with the most current versions of specifications. Colleges would also benefit from sharing examples of good practice. The JISC should continue to provide support through the effective mechanism of the RSCs.

5 Recommendations

The recommendations presented below are grouped according to the main stakeholder being addressed: colleges, the LSC, the JISC and vendors. The recommendations do, of course, have some relevance to each sector stakeholder, even though only one stakeholder may be specifically mentioned.

The recommendations include culture change, standards and systems, and supportive relationship issues introduced in the report's Conclusions section.

5.1 Recommendations to Colleges

1. Colleges should use the MLE conceptual framework as a guide to planning IT infrastructure to support a whole organisational approach to development planning that takes into account pedagogic, business and technical factors
2. Colleges should consider how this report (and the forthcoming report from the LSC's DELG⁶) might influence their approach to their central task of widening participation and raising standards of learning
3. Colleges should consider how successful implementation of an MLE could impact upon their business processes and plan for organisational change where appropriate
4. Colleges should seek current advice from advisory bodies about VLE procurement and vendors' commitment to conformance with IMS specifications for the systems that they offer
5. Colleges should test content they intend to use in their VLE to ensure that it can *at least* import and deliver IMS Content packaging and that it meets college needs in terms of student tracking
6. Colleges should invest significant resources in staff development and technical support to ensure the success of any MLE implementation
7. Colleges should consider the most appropriate role for the key organisational departments, including IT support departments and curriculum departments in the development of MLEs
8. In developing MLEs, colleges need to plan properly for appropriate version control for both new student intake and new content files.
9. MLE systems will need to grow and adapt with the college. It is essential that colleges ensure vendors can supply ongoing support for their products and developments that will meet their needs. The value of support is likely to be proportionate to the cost.
10. Colleges should be aware of any pedagogic limitations of current content specifications and should consider their use of content and systems that rely exclusively on those specifications accordingly.

5.2 Recommendations to the LSC

1. The LSC should, through the NLN Programme Board, develop policies and strategies for the wider implementation of MLEs across the whole post-16 sector
2. The LSC should consider how the new LSC funding and information models could help or hinder the development and adoption of e-learning, taking into account the associated implications of offering individualised curriculum supported by online content and tracked through VLEs.
3. The LSC should consider, and then advise colleges, as to how its data capture procedures will integrate with college MLE systems and inform colleges of its support for IMS as a means of achieving interoperability. This should include harmonisation of the IMS Learner Information Package and its own data requirements.

4. The LSC should provide funds, to be managed through the NLN Programme Board, for staff development in the use of VLEs
5. The LSC should ask the NLN Programme Board to ensure that NLN materials conform to IMS and SCORM specifications, and this conformance should extend to learning materials supplied to the NLN by vendors
6. The LSC should encourage the Department for Education and Skills (DfES) to set up a conformance-testing centre so that MLE software components can be tested for conformance to IMS/SCORM specifications and standards
7. The LSC should provide advice and support to colleges through additional resources for TechDis in the development of systems that comply with accessibility legislation
8. The LSC should take steps to ensure that the Further Education National Training Organisation (FENTO), and its successor, updates its standards to take account of MLE thinking and implementation
9. The LSC should take steps to ensure that inspectors are equipped to evaluate the use in colleges of ILT and, in particular, of VLEs
10. The LSC should encourage the Qualifications Curriculum Authority and qualifications validating bodies to consider the need for appropriate arrangements for on-demand online assessment
11. The LSC should consider how to extend the NLN programme and RSC infrastructure to its non-college post-16 sectors

5.3 Recommendations to the JISC

1. The JISC should ensure that content and content repositories for learning objects, which it supports or provides, are IMS and SCORM compliant.
2. JISC should continue to support and encourage the development in IMS of further specifications to overcome any limitations of SCORM, integrate Computer Aided Assessment (CAA via IMS QTI), the integration of IMS Simple Sequencing, and in particular support for the forthcoming Learning Design specification.
3. JISC should co-ordinate with the LSC, vendors and the sector, the timing of coherent transitions from one version of each specification to another as they evolve over time.
4. The JISC should continue its work in supporting IMS development to meet the sector's needs and to promote the effective use of IMS in the community. As part of this, it is recommended that the JISC should support the development, by others, of a conformance testing facility
5. The JISC should work with the LSC and other Funding Councils to define how the information needs of the funding bodies and the outputs from MLE and other college processes can best be matched
6. The JISC should work with the e-envoy and vendors to agree a common mechanism for data transport (both within and beyond the MLE) needed to improve interoperability
7. The JISC should support colleges through the development of secure authentication systems for the educational community in order to support widespread use of VLEs for online assessment
8. The JISC should provide advice and support to colleges towards the development of systems that comply with accessibility legislation
9. The JISC should continue to support colleges in implementing MLEs through the RSCs, helping colleges adopt the most appropriate versions of the specifications and to share best practice

10. The JISC should build upon the successful collaboration of vendors, colleges and other agencies in the development and implementation of MLEs through the development of acceptable frameworks for engagement with vendors.

5.4 Recommendations to Vendors

1. Vendors should actively engage in the development of standards for all components of a MLE. In particular, Student Record Systems (SRS) or Management Information Systems (MIS) and Virtual Learning Environments (VLEs) that conform to current versions of the IMS Enterprise and IMS Learner Information Package specifications (+ agreed FE extensions)
2. Vendors should participate in a national conformance-testing centre as part of a long-term commitment to standards
3. Vendors need to adopt a common data transport mechanism to support the flow of information in an MLE
4. Vendors should implement appropriate SCORM content and content delivery specifications in their products
5. Vendors should adopt pricing structures, support mechanisms and consultancy that encourage a wider range of post-16 institutions to implement MLEs
6. Vendors should be aware of the four post-16 sectors of the LSC and their different needs
7. Vendors should develop content production, content packaging and content management tools in addition to content delivery tools.

6 Abbreviations Used In This Report

ADL	Advanced Distributed Learning
BECTa	British Educational Communications and Technology Agency
CETIS	Centre for Educational Technology Interoperability Standards
CIS	Corporate Information Systems
DfES	Department for Education and Skills
DNER	Distributed National Electronic Resource
FE	Further Education
FEFC	Further Education Funding Council
FEILTC	Further Education Information Learning Technology Committee
FENTO	Further Education National Training Organisation
FERL	Further Education Resource for Learning
HE	Higher Education
ILT	Information Learning Technology
IT	Information Technology
JCIEL	JISC Committee for Integrated Environments for Learning
JISC	Joint Information Systems Committee
LIP	Learner Information Profile
LSC	Learning and Skills Council
MLE	Managed Learning Environment
MLESG	Managed Learning Environment Steering Group
NGfL	National Grid for Learning
NILTA	National Information Learning Technology Association
NLN	National Learning Network
RSC	Regional Support Centre
SCORM	Shareable Courseware Object Reference Model
SRS	Student Record System [often but rarely accurately referred to as 'the Management Information System' (SRS)]
Ufi	University for Industry
VLE	Virtual Learning Environment

7 Sources of Help

At the time of compilation of this report, the sources listed below provided useful additional help on MLEs, VLEs and interoperability. The shelf-life of such lists is notoriously short because they are new areas, developing rapidly as the e-learning world moves on. The JISC keeps an up-to-date list of sources available on their MLE Web site at:

<http://www.jisc.ac.uk/mle/>

<p>Ferl Web site http://ferl.becta.org.uk/</p>	<p>This includes a comparison of many of the VLEs widely in use in the sector</p>
<p>CHEST VLE Comparison Grid http://www.chest.ac.uk/datasets/vle/</p>	<p>CHEST has constructed a Grid to help purchasers compare five popular VLE products for which they have negotiated license deals. The table covers product descriptions, licence conditions, support services and pricing.</p>
<p>VLE mailing list VLE@JISCMAIL.AC.UK</p>	<p>This list is managed by the Ferl/BECTa team and is provided by the JISC through its JISCMail service. Contributors are predominantly from the FE sector but by its nature it covers issues of interest to HE as well.</p>
<p>CETIS Web site http://www.cetis.ac.uk/</p>	<p>CETIS is funded by the JISC to represent the community on learning technology specifications and standards bodies (mainly IMS) and to disseminate information back to the community and support adoption.</p>
<p>FE Focus Group and Special Interest Groups http://www.cetis.ac.uk/fe The five CETIS Special Interest Groups (SIGs) are: Metadata, Content, Profiles and Enterprise, Assessment and Accessibility.</p>	<p>CETIS runs an FE Focus Group run by Steve Jeyes and Clive Church, based at Newark and Sherwood College, to serve the needs of the FE sector. It links with the five CETIS SIGs, and collaborates with other bodies serving the FE sector.</p>

8 Steering Group Membership

John Gray (Chair)	Newark and Sherwood College
Mary Barker	NILTA
Malcolm Batchelor	Assistant Information Strategies Coordinator
Sonja Bisset	JISC Secretariat
Susan Eales	Collections Manager, FE Learning Materials
Richard Everett	JISC MLE Coordinator
Tom Franklin	LTSN Senior Technology Advisor
Helen Gray	Learning and Skills Council
Lesley Hawkins	JISC Secretariat
Alun Hughes	University of Highlands and Islands
Ann Hughes	Information Strategies and CIS Focus Co-ordinator
Terry Keefe	University for Industry
Elaine Kelly	JISC Secretariat
Bill Olivier	CETIS
Daxa Patel	JISC Technology Development Programmes Coordinator
Sarah Porter	JCIEL Programme Manager
Bob Powell	BECTa
Paul Ricketts	City College, Manchester
Malcolm Read	JISC Secretary
Sue Rigby	Learning and Skills Council
Norman Wiseman	JISC Head of Programmes

9 References

- ¹ Announcement from the Department for Education and Skills Post 16 e-Learning Task Group <http://www.dfes.gov.uk/elearningstrategy/news.cfm?aID=86>
- ² *The Managed Learning Environments Steering Group Technical Report: A report on the Interoperability Pilot programme*, JISC: 2002
- ³ *Report of the Learning and Technology Committee*. Further Education Funding Council: 1996. [Chairman: Sir Gordon Higginson]. Coventry, Further Education Funding Council.
- ⁴ *JISC Five Year Strategy 2001-2005*. JISC: 2001. http://www.jisc.ac.uk/pub01/strat_01_05/
- ⁵ *Learning and Skills Council Strategic Plan 2001* LSC: 2001. <http://www.lsc.gov.uk/>
- ⁶ Learning and Skills Council Distributed Electronic Learning Group. LSC: 2001. http://www.lsc.gov.uk/news_detail.cfm?ID=20
- ⁷ *ILT Implementation Plan* Further Education Funding Council Circular 99/45 http://www.fefc.ac.uk/documents/circulars/fevc_pubs/9945.pdf
- ⁸ *Managed Learning Environments (MLEs) in Further Education: progress report*. JISC Circular 7/00 http://www.jisc.ac.uk/pub00/c07_00.html
- ⁹ *Flexible colleges. Access to learning and qualifications in further education*. Part 1. Priorities for action. Further Education Unit: 1991.
- ¹⁰ *JISC Managed Learning Environments Information Pack*, JISC: 2001. <http://www.jisc.ac.uk/mle/rep/infopack.html>
- ¹¹ *MLEs and VLEs Explained* MLE Briefing Paper 1 in *JISC MLE Information Pack*, <http://www.jisc.ac.uk/mle/rep/briefings/bp1.html>
- ¹² Evaluation Reports of the MLE Steering Group. ESYS and DirectLearn: 2002 [unpublished]
- ¹³ *Pilots to Prove the Concepts of Interoperability within Managed Learning Environments in the Further Education Sector*. JISC JISC Circular 11/00 http://www.jisc.ac.uk/pub00/c11_00.html
- ¹⁴ Learning and Skills Council Funding Methodology Circular <http://www.lsc.gov.uk/>
- ¹⁵ Learning and Skills Council Data Collection Circular <http://www.lsc.gov.uk/>