applied infoKit

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Creating an MLE

Technology options

- Outsource, buy, build or integrate
- MLE Architectures
- Standards & Specifications
- System Selection
- Risks
- What projects have done
- Landscape project

5. Technology Options

Who should read this:

The first part is written for senior management, governors or council members as it concerns strategic decisions for the institution. The remainder is intended for staff from IT services, purchasing departments and potential developers.

Outcomes:

On completion you should have an understanding of the technology choices that need to be made, and the issues which need to be considered in making them.

Approach:

The aim of this section is to enable you to make the right choices for selecting and implementing the technologies needed for creating an MLE at your institution. It looks at the key issues which need to be addressed in selecting architectures and components of the MLE to ensure that they will fit into the growing MLE and continue to meet the institution's needs in an environment where the MLE is changing, the technology is changing and the institution's needs are changing.

Overview

So far you have been looking at whether or not to implement an MLE and if so what the requirements are.

Once you have gathered the requirements and resolved conflicts and prioritised them you start to think about their feasibility and cost, and then how they can be implemented.

One aspect of this is the technology choices that have to be made. These fall into three categories:

- Whether to develop in−house or use a third party including outsourcing the entire operation
- The overarching architectures to be used.
- Selecting the individual components.

Each of these is discussed below.

This section looks at the technology options available for implementing an MLE. The choices made here will have a long term impact on the MLE as no technology or system will support everything that you might wish to do at an affordable cost.

It is assumed that by this stage you have already identified the requirements for the MLE, and you are now looking at the technologies and processes that are needed to support this. It is likely that not all your requirements will be fully met whatever technology is chosen so that you may have to re−visit the requirements or re−consider priorities.

Issues that need to be considered include:

- How the technologies will integrate with existing systems at your institution
- How the technologies will integrate with systems at partner institutions
- How the systems will adapt as your requirements change
- How well the systems meet the requirements
- Total cost of ownership including: purchase, adaption, support and training
- Long term viability of the systems

It is often easy to look at the purchase price, and to balk at some commercial prices. It is however essential to look at the total cost of ownership, which may be high if a large number of skills (and therefore people) are needed to support the system in−house.

In this section we first look at who needs to be involved in making these decisions, then at who needs to be involved in the various decision making processes, and the outcomes that will be achieved from the technology choices. Finally there is a brief discussion of the approach taken.

The rest of this section looks at two fundamental questions that need to be addressed at the start of the technology choice process before looking at appropriate methods for selecting the right technologies and systems.

A precursor to the MLE infoKit was a set of JISC MLE briefing papers. You may find it useful to read the technical paper from this set.

Types of approach

There are four basic ways in which the technology can be selected for building an MLE and a decision between these needs to be taken early on and at a strategic level.

The four are:

- Outsource: this involves handing over all responsibility for IT (hardware, software and support) to a specialist company who run it on your behalf for a fee. Common in industry and government and used in colleges and universities in the US it is not widely used in FE or HE in the UK. The key advantages are that specialist organisations operate the systems and it is their core business, while IT is not your institution's core function.
- Turnkey: Responsibility for the development of the systems, including hardware, is given to a single company which then has responsibility for ensuring that systems work before handing them over to you to run. The main benefit is if something doesn't work then there is a single place to turn to rather than the vendor of each subsystem (hardware, operating system, and individual systems) blaming the others for the problem. Turnkey approaches may cost more and have reduced flexibility.
- Integrate − This involves buying the best individual systems that meet your needs, and then developing (either yourself or through a systems integrator) the functionality needed to link the systems together. The key advantage is you can select the systems that best meet your needs, the main disadvantage is the complexity involved in linking together disparate systems which work in different ways.
- Build − Using open source software, or starting from scratch, it is possible to build all the systems you want to meet your precise needs. The advantage is that it can do exactly what you want it to, but at the price of having to bear the full development and support costs and not having a community to share problems with. Few institutions will want to entirely build their systems and will in reality purchase and integrate some of the systems they use.

Who should be involved and why

We now look at who needs to be involved in determining which of these approaches is most appropriate in the context of your college or university.

An initial strategic decision as to how the development should be carried out − between outsource, turnkey and integrate/build needs to be made at the most senior level. This is a decision which has implications for you and your institution for many years as both an outsourcing agreement and systems that are developed are likely to last for several to many years. As such it needs to be made by senior management, in conjunction with the Board of Governors or Council.

It is however rare for the full range of options to even be considered as individual systems are purchased as one−off decisions. It is equally rare for the IT director to be keen on outsourcing their empire. The result is that the decision is made by default to build / integrate in house.

If it is decided to go for outsourcing or a turnkey solution then a small team of senior managers will have to make the selection, supported by staff from IT services and purchasing and advised by the same people who will be more actively involved if an integrate / build approach is taken.

We now look at who needs to be involved if the decision is to build or integrate systems in house.

Two types of decision need to be made here:

- System architecture − primarily whether to go for open standards or a proprietary architecture.
- Individual systems − the components that make up the MLE.

As with so many aspects of the creation of MLEs involving the right people will be critical to ensuring their buy−in to the project, and thus its continuing success. Most people are resistant to change, but when they have been involved in the decisions they are much more likely to accept the system and work with it, making the implementation and embedding considerably easier.

Unless you are going for a turnkey solution, where all the systems and their integration are handled by a single supplier (who may use their own products or integrate other people's) there will be a series of decisions to be made covering the architecture and the individual systems that will be included within it.

There are therefore three types of technology / vendor selection that can be made:

- Turnkey solution
- Architecture selection
- System selection

This is a massive, strategic decision, which will cost millions of pounds to implement in a university and hundreds of thousands to millions in a college. As such decisions will have to be made at the highest level, involving principals or vice−chancellors (or their deputies) and boards of governors or their equivalents. Because an MLE cuts across nearly all departments in an institution, and must meet all departments needs (and some of their wants) it will be important to involve the key decision makers in all areas including:

Turnkey solution

- learning and teaching − MLEs have a significant impact on learning and teaching and the head of learning and teaching will need to be actively involved to ensure that the system actively addresses the institutions learning and teaching strategy. An MLE provides opportunities for improving student support, assisting with progression and addressing e−learning.
- registry − many of the systems that will be integrated within an MLE are owned by the registry, and there will be a big impact on how they work as the development of the MLE changes the nature of the way systems operate and who has access to and may enter and amend information.
- student services − Creation of an MLE will have a fundamental effect on student services. More and better information from disparate sources will be available as needed, and delivery can be integrated with other functions.
- estates − if automated timetabling and space allocation is included within the MLE then estates should be involved.

- council / board of governors / senate − a decision of this magnitude which will have a significant effect on the institutions's medium term development, and council or the governors should have a significant say in such an important decision.
- IT services − should have an advisory role. This is not primarily a technology decision, and it would be a mistake for IT services to allow itself to lead the project here. While the technology is important and IT services need to have an input the development of an institutional MLE is about driving the institutional strategy and thus the project needs to be led by strategic decision makers and not from the technology.
- Users − Users should be involved in all stages of the project. If the system does not meet their needs then they will resist, and in some cases may be able to put the project at risk through non−cooperation. As in all areas care needs to be taken to include more than just a few keen people and to draw in staff from a variety of departments and levels of interest in the work.
- Representative from partner institutions − closer integration of systems in regional consortia is growing, it will therefore be useful to involve someone from one or more of the partners to ensure that the systems can interoperate successfully. If you have a "round table" then it would be advisable to use that too. Follow this link to read more about Roundtables.

  While the selection of the architecture is primarily a technical issue it will have a major impact down the line as it limits the systems which can then be integrated. One area where many institutions are trying to rationalise is on the operating systems used for central services, with some trying to move to a Unix, and others moving towards Microsoft. Either of these systems will limit the systems which can then be used to those that can be implemented on that architecture. Even the selection of standards will impose a limit on the possible selection systems. Thus, architecture selection is not neutral and everyone needs to understand the effect that these early choices will have on the MLE down the line.

Architecture selection

The selection of the architecture will have to be led by IT services staff who have the competences to understand the technologies involved and their implication for the development of the MLE. However, members of other departments need to be involved to ensure that they are happy with the results and their implications. A couple of examples will illustrate this. The security architecture needs to meet the needs of all departments, and some − such as registry − will need to be comfortable with the decisions made if they are going to make their information available to users elsewhere.

You also need to think about future requirements e.g. does the architecture allow for users to update as well as read data from central databases? You may start out by having centralised data input but there is likely to come a time when the automated input of student marks from VLEs or directly by teaching staff is required. The architecture must enable this even if the functionality is not initially used.

The closer integration of institutions in regional consortia is growing and this involves closer integration of supporting systems including those that make up the MLE. If you have regional pertners it will be useful to involve your partners to ensure that your systems can interoperate successfully.

System selection

Systems selection is covered in a seperate infoKit. The issues are little different when the systems are part of an MLE. There is, however one difference to be borne in mind. The integration of systems is fundamental to the MLE and the numbers of departments and users involved goes much wider than in choosing standalone systems. Follow this link to view the System Selection infoKit.

5.1. Outsource, buy, build or integrate

This section describes different approaches to acquiring an MLE and the benefits of each. It is a descision which has far reaching consequences and should be taken at the highest level within your organisation.

When looking at the technology options it is important to take a strategic view, and this means looking at the entire IT infrastructure and how this is best managed. As mentioned in the overview there are four basic approaches:

- Outsource
- Turnkey
- Integrate
- Build

5.1.1. Introduction

Total cost of ownership

One place to start evaluating the different options is to look at the total cost of ownership (TCO) of the system. This covers more than just the purchase and implementation costs, it includes the running and maintenance costs, staff development (for those running and those using the systems), management costs etc.

In education it is rare to properly cost things as staff time is often left out of the equation. There are innumerable occasions on which I have heard discussions which go something like:

- ***Lecturer*** 'Open source software is always cheaper as you don't have to pay for it';
- ***IT Director*** 'but the time required to adapt and support it may be much higher';
- ***Lecturer*** 'but we have the people anyway so that's not an additional cost';

Of course, it is. The staff already have other work that they should be doing and this is either a distraction or an additional burden. Calculating the total cost of ownership of one option is hard enough, calculating the TCO of a variety of options is even more fraught and inevitably will be full of guesses and estimates. This does not mean that it is not worth attempting. Indeed the results can be quite surprising and provide re−assurance for the selection of technologies and implementation that the right path has been chosen.

Fit to requirements

No solution will give you everything that you need (let alone want), and at each stage compromises have to be reached. Previously in looking at the user requirements, you will have balanced competing requirements to achieve what the institution as a whole needs. Decisions cannot be driven by any set of individuals however important they and their work may be.

Once you come to select the technologies to implement further compromises will be inevitable. Cost and technical feasibility is likely to preclude some options (at least for now), and you will almost certainly have to re−visit the user requirements several times while selecting technologies and systems.

It is also worth noting that each of the options we will be discussing in this section will impact differently on the user requirements. If you acquire a system that already contains a number of integrated components e.g. SAP, PeopleSoft or FD then there will be less flexibility in making the system do what you want and you will have to adjust some of your processes in order to be able to use the system.

Similarly, if you buy a number of different third party (or open source) systems they are unlikely, even after adaption, to do precisely what you want and compromises will need to be made. However as you have made 'best of breed' decisions that are as close as possible to your requirements the adaption required may be less.

It is often assumed that if you build a system it can perfectly match your requirements. Unfortunately this is rarely true. In part this is because of the changing nature of the requirements, so that by the time the system is built the requirements and the understanding of the requirements will have changed. Further, the system will have to be built in such a way that it can be adapted of extended as requirements change. Indeed it could be argued that building the system too tightly to existing requirements will hamper flexibility (probably a requirement in itself).

In short then, you will never get exactly what you want and you need to think about which compromises are acceptable and will give the flexibility that you need to carry the system into the future.

Available skills

Each of the possible methods will put different burdens on the organisation and require different skill sets. It is essential that as part of the process of determining the most appropriate route forward you ensure that you have, or can acquire, the skills needed to complete the process. For instance, if you require a large number of programmers for a short time do you already have the skills in house? Can you divert them from what they are doing at the moment? Can you recruit any additional staff that you may need?

Generally speaking the more of the work that is done in house the greater the technical skills that you will need to have available to you. You may already have the skills or be able to acquire them (by training or recruitment), but will you be able to retain the people, and what happens to them at the end of the project? A big danger historically is that projects like this have run in fits and starts on short term funding with the result that staff are appointed on short term (fixed term) contracts. Six months, or more, before the end of the contract they are already looking for their next job, and they may leave early which can cause major problems.

However, outsourcing or going for a contract with a systems integrator will require significant amounts of senior management time working with bidders and developing the details of the contract. Perhaps the biggest mistake that can be made is to under−estimate the amount of time and effort that senior managers will have to devote to ensuring that any outsourcing contract actually meets your needs. According to Gartner 50% of enterprises do it wrong and end up regretting having outsourced. Remember also that many of these contracts are for simpler, or relatively self−contained operations such as cleaning and catering. Outsourcing should not be attempted unless you believe that you have access to the necessary skills either in house or through the use of expert consultants in the field. Even then, it is recommended that you do not attempt outsourcing IT operations unless you have already tried it in a simpler area and so understad some of the pitfalls.

Future needs

MLEs are for life, not just for Christmas, as the saying goes, and as with puppies they grow up and change. The education environment is changing rapidly, as is the technology. It would be a bad mistake to buy for the present. Changing major components of your MLE could cost a fortune, so it is essential to purchase for the future. This means looking closely at any options and looking not just at whether they meet the current requirements, but whether they will be adaptable to changes in technology or the educational context. It is often assumed that open standards will resolve this problem. But, while they can be a great help, they cannot alone solve the problem. Follow this link to the section on standards.

What should you be looking for to reduce the risks of being stuck with a system which will not grow to meet your needs? Some of the things that you can do include:

- Ask vendors what their development plans are, including timescales and investment levels
- Look at who their partners are. Few vendors claim to offer all the systems that you need, and often form partnerships with other suppliers. What is the nature of these relationships? Are they with other suppliers that you are dealing with?
- See how well they understand the education market (and this includes consideration of how important the education market is to them, as they will inevitably concentrate their efforts wherever it will show the greatest return on investment)
- Look at their commitment to open standards (this matters less if all or virtually all your systems are coming from a single supplier using their own proprietary systems but it does matter if you are looking at several suppliers). Of course, some suppliers look to Microsoft rather than open standards and it is not clear which will be the better bet in the long run; Microsoft has won some and lost others.

Legal

One of the drivers behind integrating systems into MLEs is the need to provide better support for students, and this in turn is driven in part by legislation such as the Special Education Needs and Disability Act and the Data Protection Act, and it will be important to ensure that developments support this. However there are a number of other considerations which need to be borne in mind when selecting the technologies, and especially when considering the ways in which information will be delivered to users (students and staff).

Below are some of the issues that you should consider:

1. ***Purchasing:*** Major components of the MLE such as the student record system or VLE will cost more than the legal minimum for EU procurement rules to kick in, and therefore unless you are developing the system in house you are likely to have to follow those rules. Follow this link to the infoKit on contract negotiation for more about procurement.
2. ***Accessibility*** − The Special Education Needs and Disability Act (SENDA) requires all systems to be accessible. If this is planned in from the start then it need not be onerous, and makes the system more usable for everyone. Follow this link to the TechDis site which offers information and advice on accessibility issues.
3. ***Data Protection and Freedom of Information*** − At first glance these can be thought of as contradictory, one aiming to protect the privacy of the individual, the other requiring you to publish increasing amounts of information. Follow this link to the infoKit on Records Management for more about these issues.

5.1.2. Outsourcing

There is little experience of outsourcing in further and higher education at the moment, though it is more common in schools. Educause (through ECAR) has only recently published anything major on outsourcing, while the Chronicle of Higher Education has published very few articles. This contrasts strongly with the commercial world where IT outsourcing (and facilities management) are very common and have a history of over 20 years attracting some of the biggest IT service companies including EDS and Capita. Educause Quarterly has a good introductory article. It should be noted that according to Gartner research, more than 50% of enterprises get their outsourcing arrangements wrong and end up unhappy with their deals.

A very good discussion of the issues can be found in a white paper from Compass Consulting which says among other things 'There is a general perception in higher education that many educational institutions are outsourcing management of their technology operations. We feel that this misconception arises from the fact that many institutions are outsourcing some technology services − especially student telephone services. .... Compass only knows of one institution where telecommunications is totally outsourced and few institutions where information technology (IT) is totally outsourced. Most of our clients believe that technology is too vital and too strategic to relinquish control to a third party. However, many of our clients do outsource some technology services.'

Is IT a core function?

There is an argument, common in much management theory at the moment, that organisations should concentrate on their core functions and should outsource as much of the rest as possible to companies for whom it is their core business.

Thus we have seen many companies that have outsourced catering, cleaning and other service functions. Others have taken this much further and have outsourced a large number of functions including IT.

There are two primary reasons given for this. First, each of these activities take a considerable amount of senior management time, which is better devoted to the organisations core functions of teaching, research and knowledge management. The other reason sometimes cited, which applies most strongly to small organisations, is that it is difficult to retain staff with a sufficient breadth of skills as many of them will be only rarely needed.

We cannot afford all the skills

One of the major issues for your institution, especially if you are a smaller institution, is how to afford the wide variety of skills needed to support all the applications and systems that exist, not just in the MLE but throughout the institution. Many of the skills may be needed only infrequently or part of the time. This means having staff with a wide variety of skills (potentially therefore jacks of all trades and masters of none).

Two obvious solutions to this are to outsource or to form collaborative consortia with other institutions (in your area). Outsourcing provides the opportunity to buy into an organisation which has all the skills needed, because they are working with a variety of organisations, and to an agreed level of service through a service level agreement. The converse of this is that it can be less flexible.

Outsourcing of IT services has not been popular in higher or further education to date. There are a few examples, and these have not all been a resounding success. In the UK only the University of Durham in HE has outsourced its IT operation, and even then the arrangement covers only part of its IT service.

Major issues that have to be considered include:

- rapid changes in IT in terms of hardware, networking and applications make defining contracts problematic
- the integration of IT into the institution; many of the services that are outsourced are essentially free−standing, such as catering and cleaning and more recently student accommodation, with few implications for other areas. The way in which IT is implemented has significant implications for virtually all functions of the institution and therefore the way in which it is implemented will impact throughout the institution
- lack of flexibility − there is a need to specify everything in the contract, when changes from this are needed (and they will be given the rate of change of technology) it can be very difficult and expensive to negotiate, and what might seem a relatively trivial change can end up being very expensive).

Two community colleges which have outsourced in the US are Salt Lake Community College and Cabrini College. As reported in the Chronicle of Higher Education, Salt Lake Community College outsourced its operation because they could not provide all the necessary expertise in house.

Cabrini College had some firm ideas about the kind of outsourcing organisation they wanted to manage their campus computing operations: one that understood their educational mission, their academic values, and their culture. The small Roman Catholic college, in suburban Philadelphia, didn't have to look far, geographically or otherwise. It selected an academic cousin, the larger and more urban Drexel University, just 22 miles away. See http://chronicle.com/free/2001/03/2001032901t.htm

5.1.3. Buying from a single supplier

By buy we mean buying a solution from a single vendor. It is unlikely that one vendor can themselves provide all the elements that are needed, but there are three possibilities here:

- buy a solution from a supplier that can provide (nearly) all the components that are needed to make up an MLE including student records
- buy a majority of the components from a single supplier with a turnkey contract from them to integrate the other components from other suppliers
- commission a system integrator to buy or build systems and integrate them as a turnkey solution

The primary point is that the development is being done by a third party who assumes responsibility for the delivery of the system. As with outsourcing and private finance initiative (PFI) projects it is essential to ensure that the contract meets the institution's needs and contains sufficient flexibility at a realistic cost. There is a real danger that the loss of flexibility that comes from being in the hands of an external supplier will prevent the MLE from meeting the institution's needs at a manageable cost.

However, that said, it is a relatively common solution in US for universities to buy an integrated product covering the core applications from a single supplier such as SAP or PeopleSoft, but it is very uncommon here, with the University of Newcastle being the best known example.

It is worth noting that the equivalent in industry is Enterprise Resource Planning (ERP) systems and more recently Customer Relationship Management (CRM) systems that have been widely adopted. However it also needs to be noted that many of the attempted implementations have either failed or failed to deliver much of their promise and that this is typically not the result of a failure of the technology so much as a failure to adequately address the 'soft issues' around changing the human systems and staff development.

Take up of these systems is much lower in UK education. Causes include:

- the high capital cost
- systems are not seen as strategic, so each system is owned and chosen by different departments
- many institutions do not see themselves as businesses
- many institutions believe that they are unique, and so different from all others that they cannot believe that a standard solution will work

Follow this link to read more about ERP in education.

There are few suppliers that can even claim to be able to supply all the components that are needed to develop an MLE and then they are unlikely to be able to provide all the systems that are needed. The companies involved mostly come from an Enterprise Resource Planning background and have developed systems that were intended for large commercial organisations. Obvious examples of these are Oracle, Peoplesoft and SAP. FD Learning also claims to offer all the components needed for an MLE.

However, because a supplier is able to supply all the systems does not mean that they can be used 'as is' and significant and (generally) expensive modifications are almost certain to be needed, and typically these are not all identified at the outset so that the scale and cost of this can grow during the project.

5.1.4. Integrate

Most institutions will, in the end, decide to develop an MLE by integrating a variety of systems themselves, as all the 'Building MLEs in Higher Education' JISC funded projects have done.

Indeed, the Building MLEs in Higher Education proposals were set up explicitly to look at the issues of integrating existing and new systems to create an MLE. All institutions (except perhaps UfI and UK eUniversities Worldwide) have existing systems which cannot be replaced all at once, so an evolutionary approach is usually required. This approach also allows you to buy 'best of breed' for each system that you need. That is, the system which most closely meets your needs. However, this cannot be done in isolation as products do not cover identical territory and there is considerable overlap and potential gaps if the wrong products are chosen. As John Heap writes in UCISA Update 'It's a mild rant ... about the feature creep of software packages which insist on straying into the territory previously occupied by others'. While that is a problem it is integrating the systems that is the real issue in building an MLE to ensure that the various systems and components can work together.

There are two approaches to this. It can be done in a piecemeal fashion, tackling each set of systems that need to be integrated. This is like painting the Forth Bridge, a never ending task as new systems are replaced and each time the work has to be re−done. The alternative is to develop an architecture and use a systematic approach to data exchange. Thus De Montfort University used an XML based approach building on the work of IMS, while the GIMIS project at Writtle College is using a variety of tools and techniques to achieve integration.

5.1.5. Build

Again, few institutions will be in a position to build the entire systems for themselves. Where there are good commercial or open source systems available then these are likely to be included in any system. Few institutions are going to want to maintain finance or payroll systems when there are many commercial systems available. There may be some that want to build their own systems to support their core business, including student record systems and VLEs this tends to occur mostly in higher education.

Thus, some institutions are likely to build elements of their MLE which will then have to be integrated with other systems. The issues here are the same as for integrating third party systems except that one has more freedom of action as one is not constrained by what vendors choose to provide in terms of an application program interface (API).

Anyone who is considering building their own systems should consider using open source (or similar) products as the starting point. Follow this link to find to find out more from OSS Watch the JISC Open Source Advisory Service.

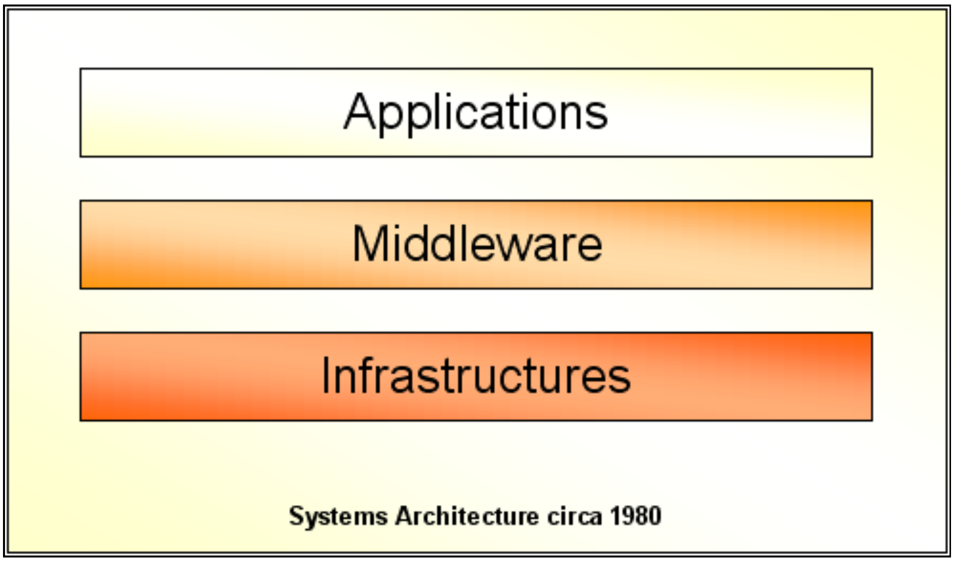
Follow this link for key resources for this section (these open in a new window)

Follow this link for more resources for this section (these open in a new window)

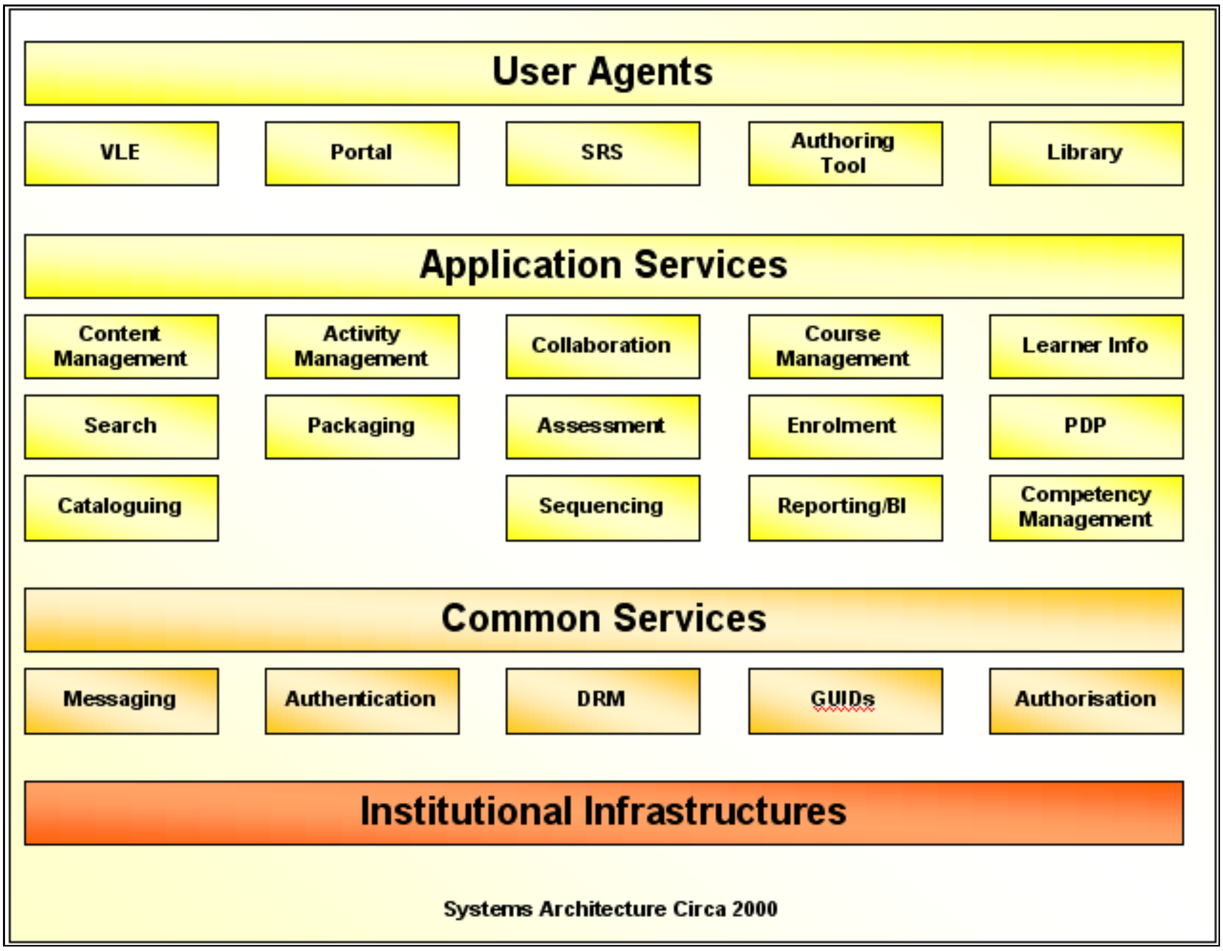
5.2. MLE Architectures

Creating an MLE requires the development of an integrated technology system. This means that early decisions may have a profound impact on later developments. The hardware platform, operating systems, database technologies and middleware will all impact on later systems. Here we look at the way in which architectures are developing, why it is important for you to develop an overarching architecture for the MLE, and why it is necessary to look not just at the applications that are currently being purchased, but at the technology requirement of the whole MLE.

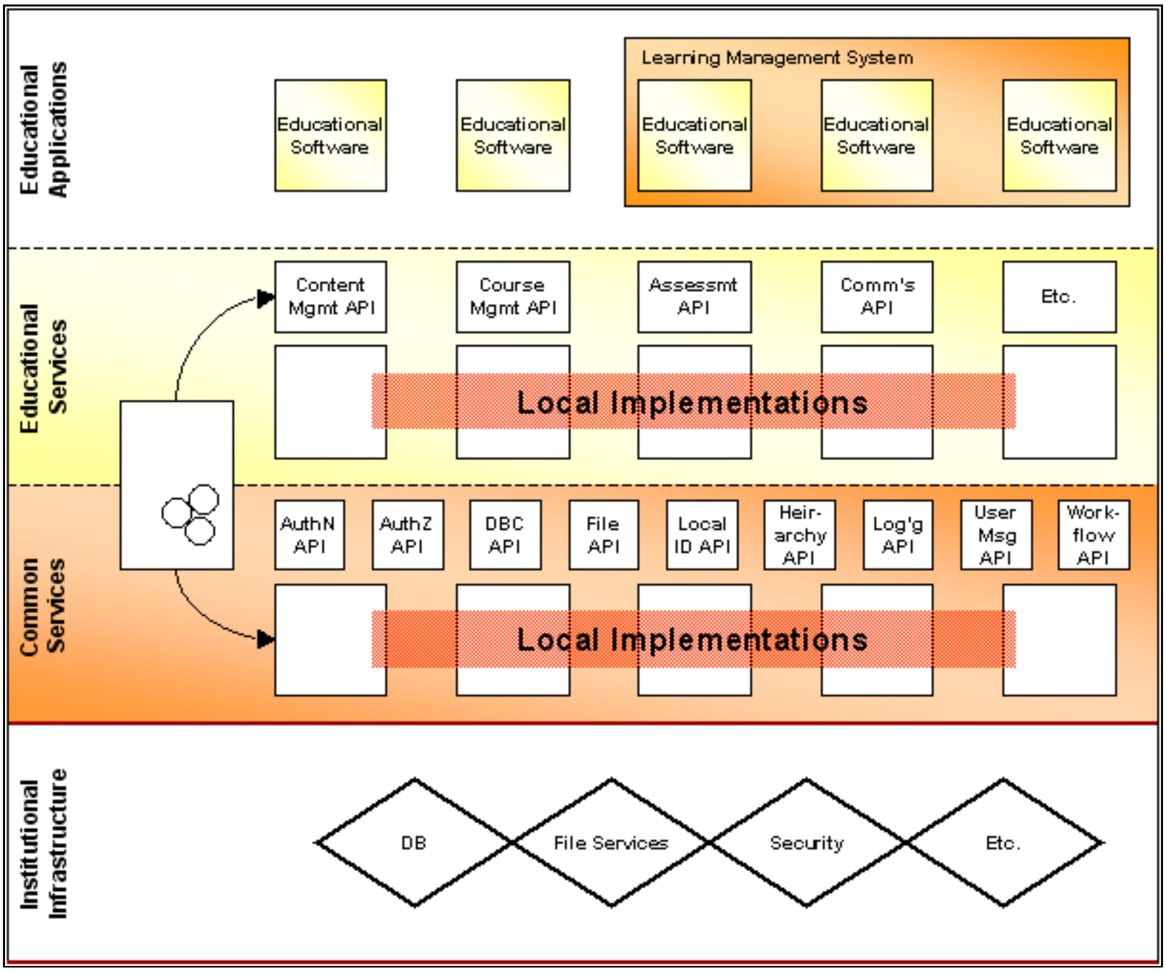
Architectures for major systems have changed enormously over the years. Originally systems were built as single large entities with each system doing everything. By the 1980s we saw a separation into layers with some of the functionality being handled by the operating system, some by generic 'middleware' and others by applications.



By 2000 we have seen the application layer divided into two parts, the user agent and the application services. This has lead to a greater use of re−usable components such as content management and search services.



The Open Knowledge Initiative (OKI) uses a model very similar to this:



and this is being taken even further now, with the move to web services which makes the components even smaller.

Web services definitions

Web services
Web services are a standardised way of integrating Web−based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone. XML is used to tag the data, SOAP is used to transfer the data, WSDL is used for describing the services available and UDDI is used for listing what services are available. Used primarily as a means for businesses to communicate with each other and with clients, Web services allow organisations to communicate data without intimate knowledge of each other's IT systems.

SOAP
Simple Object Access Protocol − A messaging protocol, based on XML, used to send low level messages between computer systems.

UDDI
Short for Universal Description, Discovery and Integration. A Web−based distributed directory that enables businesses to list themselves on the Internet and to discover each other.

WSDL
Web Services Description Language, an XML−formatted language used to describe a Web service's capabilities as collections of communication endpoints capable of exchanging messages. WSDL is an integral part of UDDI.

XML
eXtensible Markup Language is a cut−down version of Standard Generalised Markup Language (SGML), designed especially for Web documents. It allows designers to create

their own customized tags, enabling the definition, transmission, validation, and interpretation of data between applications and between organizations.

5.2.1. MLE Architecture specifics

Most architectures will start by defining some form of directory, probably using the Lightweight Directory Access Protocol (LDAP) so that all the systems are sharing core information about the individuals (staff and students) and some information about them. All systems use this type of information and therefore there is considerable benefit to be had from using it as a core part of the architecture.

Compatibility with existing systems

Perhaps the next critical decision is the standards to be used. Open standards are discussed separately in the MLE Design section.

Proprietary solutions have some advantages, notably that they do usually work as the developers only have to meet their own needs, not the generic needs of all which allows them to optimise the system and fully test it. However it does mean that it will only work with other systems that have implemented the same solution.

This can also affect the order in which systems are implemented. Thus, although there is likely to be a logical order for changing the systems from a functional point of view, perhaps because some systems no longer offer all the functionality that is currently required.

However, when building an MLE it is also important to look at which systems are to be integrated and the nature of that integration. Some systems are much more open to integration and the development of a web interface than others. It is thus possible that some systems may have to be replaced earlier for technical reasons than might otherwise be the case.

Data integrity

Using multiple systems leads to the danger of multiple copies of data and of these getting out of line, this is one of the reasons for building an architecture around a directory system. There is then a single authoritative instance of any information, and when it is changed the updated version is available to all systems. Indeed to some people this is one of the key advantages of moving to MLEs − data need only be collected once and it is correct (or wrong of course) everywhere.

Creating the architecture needs to take into account the nature of the processes (automatic) and procedures (manual) that will be used to support data integrity. This is in part an architectural question but goes much wider and needs to be considered in during implementation and embedding of the systems. However, the architecture does need to be able to support whatever methods are going to be used.

Follow this link for key resources for this section (these open in a new window)

5.3. Standards and Specifications

Much work has been done on defining standards and specifications for MLEs (see below for the difference between standards and specifications). Here we look at why they are an important component in developing an MLE, and the limits of standards. It is argued that they are probably the best way to work but that they are not sufficient to achieve interoperability and other work is also needed.

Standards and specifications

Many people use standards and specifications interchangably, however they do have precise meanings and it is important to understand the differences. Essentially standards are authoritative having been produced by a national or international organisation with the legal power to define standards. Specifications on the other hand have no legal status and may be defined by anyone.

Some specifications (including some from IMS) go on to become standards, but that may take many years. For instance, the standard for HTML is 2.0, while the world is using HTML 4.01 with all the additional features that it offers.

IMS

The IMS Global Learning Consortium develops and promotes the adoption of open technical specifications for interoperable learning technology. Several IMS specifications have become worldwide de facto standards for delivering learning products and services. IMS specifications and related publications are available from http://www.imsglobal.org.

CETIS

There is not scope here for a discussion of all the standards and their place in developing an MLE, and we recommend that you visit the CETIS: 'Centre for Educational Technology Interoperability Standards' web site. CETIS is a JISC funded service which:

- helps to define the standards, ensuring that they meet the needs of the UK FE and HE communities
- promotes their use within the community (including to vendors)
- runs special interest groups covering each of the major areas that IMS addresses.

Considerable help is available from both CETIS and its special interest groups (SIGs), and anyone developing systems is urged to at least join their JISCmail lists.

5.3.1. Why use standards?

There are two approaches to developing systems that can communicate with each other. Either you can use an interface designed specially to meet your needs or you can use some standardised approach. Each has its advantages. Using standards (or open standards as they are sometimes called) confers a range of benefits in developing systems, and it is worth stating them briefly and then looking at the benefits of using a proprietary approach.

They key benefits are:

- You are not tied into a single supplier as the system will work with anyone who is using the same standard. Some standards that work like this are so obvious that they are almost invisible. A good example is the electric socket. You can plug anything you want into a socket without worrying as toasters do not use different plugs to say televisions. The only time that this becomes visible is when you travel abroad and find a different standard in use, which can be overcome using a travel adapter.
- Migration is easier related to the last point, you will be able to change component of your system more easily if they are using the same standard, and are unlikely to have to expend as much effort compared to incorporating a new component within a proprietary environment.
- Development costs are shared. Instead of having to fund the development costs for your particular solution the costs are shared between everyone using the system.

- Future proofing. Standards are developed to be as widely applicable as possible, and are continually under review and revision to meet changing needs. This means that the standard is likely to meet your needs and that many people have been thinking about it to solve the problem. You are therefore likely to find it easier to change as your needs develop.

In short then, open standards give greater flexibility and reduced long term development and support costs, and prevent you getting 'locked into' a single supplier.

The alternative approach is to use specially designed systems (often referred to as proprietary). These can be more efficient as they is designed to do exactly what you want and it may as a result also be easier to implement in the short term. The major disadvantages are:

- Only a limited number of systems will be able to make use of it which may mean that you either have a large implementation task when you buy additional parts of the MLE or that you are unable to use a large proportion of the systems on the market.
- All the adaptation and improvement has to be done for these systems, you are not able to take advantage of developments that are being undertaken at a national or international level. The advantage of standards is that any system that is using them will (in theory) work with any other system that is using the same standards. Of course it is not that simple (see the limits of standards below).

Where vendors are working towards the same standards then it should be much simpler to implement the connectivity you need to make an MLE work. There is also the advantage that the standards are continuously being reviewed and updated in the light of changing needs across the community and that you are likely to find many of the things that you want to do are enabled as the standards are updated.

5.3.2. Which standards

Standards have an important role to play in developing an MLE as they allow the developer to work with systems from other developers that make use of the same standards, without which considerable effort will be needed to move data around the various systems which make up the MLE. As an example, if there is not a standard way of handling dates it is not clear whether 03/06/2003 is 3 June or 6 March. With the complexity of the systems involved in MLEs it is very expensive to link together systems which are not using standards as a separate development has to be undertaken for each pair.

If College 1 has student record system SRS1 and financial system SF1 and VLE VLE1, while college 2 has student record system SRS2 and financial system SF2 and VLE VLE2 and college 3 has student record system SRS2 and financial system SF1 and VLE VLE1. Without standards 6 pairs of interfaces would be needed:

- SRS1 SF1,
- SRS1 VLE1,
- SRS2 SF2,
- SRS2 VLE2,
- SRS2 SF1
- SRS2 VLE1

Standards fall into a number of areas:

- data interchange formats
- data exchange
- data transport
- security

It is worth looking at the first two of these, and at the limits of standards. It is beyond the scope of this work to look at transport and security, and you are advised to refer to the JISC's Authentication, Authorisation and Accounting (AAA) Programme for security.

Data interchange formats

CETIS, the Centre for Educational Technology Interoperability Standards, has been doing considerable work in defining and promoting the use of IMS in the UK, ensuring that IMS meets UK FE and HE needs and explaining how to make effective use of IMS. You are referred to the CETIS web site for details of all these standards.

Data exchange

Currently there is no single standard for transferring the data from one system to another, and a variety of approaches have been adopted from manually exporting / importing through the use of ftp to fully automated processes.

It would appear that SOAP (Simple Object Application Protocol) is likely to be the eventual solution as this is the way that web services are moving.

5.3.3. Compliance with standards

The relevant standards (notably IMS) are still very immature which means that they are still changing as they get further refined and developed. New versions of the standards may be significantly different from older ones, so that systems which are at first glance using the same standards will not work together.

Even where they are using the same version the immaturity means that different interpretations are possible in some parts of the standard leading to incompatibility. Should both of these problems have been overcome many vendors only implement part of the standards and unless both include all the parts that you need they still will not work together.

To address this CETIS has organised a number of 'plugfests' where a variety of suppliers come together and actually exchange data between their systems and identify any issues that need to be addressed.

In the long run it is likely that compliance testing will be developed at which point you should look for products which have been certified. Unfortunately this is still some way off and in the interim there is little alternative to actually testing whether interoperability works prior to purchase.

5.3.4. The limits of standards

While open standards are the best approach for developing MLEs there are a number of problems with them, and they will only take one so far in the implementation of MLEs. You need some understanding of these issues if you are to achieve a successful implementation.

Most of the points addressed here were highly visible in the FE MLE programme run by the JISC which primarily looked at using IMS to link together VLEs and student record systems, but the issues will be found in many other areas too.

- Many of the standards are not standards at all − most of the standards in the area of learning technologies are not official standards, they are specifications produced by bodies with no legal standing. This includes IMS which is funded by a number of universities and suppliers and the JISC. Although many of the 'standards' are really specifications they will be referred to as standards for the sake of simplicity.

- Many of the standards are poorly developed. Standards are typically arrived at through a consensual process, which attempts to draw in as many of the participants as possible. This is very slow, with the result that we are often having to develop systems based on drafts of specifications which are likely to change. Until people start implementing the standards in their systems it is not really possible to know where their weaknesses lie, and so what changes may be needed.
- Many standards contain ambiguities − this is related to the previous point. However ambiguities cause a particular set of problems as they allow different vendors to implement the standards in different ways which are incompatible with each other. Thus, although two systems both claim to be compliant with a particular standard (and may indeed be so) they will not actually interoperate with each other.
- Version control − standards are moving very quickly, with new versions of many of them coming out twice a year. They are not always completely backward compatible so that different versions of the same standard may well not work together. This causes problems during purchase and when it is necessary to upgrade systems.
- Lack of compliance certification − many systems claim compliance with the relevant standards, but it is not clear what this means unless they are certified. For instance, Wi−Fi Alliance certifies equipment as being compliant with 802.11 wireless standard and that they do interoperate. There is no similar body covering educational technology standards.
- Competing standards − many bodies have an interest in developing standards, and in the area of educational technology these include the Institute of Electrical and Electronic Engineers (IEEE), IMS, ADL (who produce SCORM). Even when they are attempting to work together it still takes a long time for their various standards to converge.
- Incompleteness − the standards may not cover everything that needs to be addressed so that some of the work has to be done outside the standards, or the standards have to be stretched to cover the issue.
- Multiple standards − there is a need to use different standards to cover different aspects of the problem (IMS for data formatting, SOAP for transport etc). It may be difficult to tie these together.

Despite this long list of problems there is rapid progress being made on many of these issues, and it is worthwhile taking an open standards approach.

The MLEs in FE Case Studies found that although institutions are aware of IMS standards there is little evidence, from these case studies, of widespread adoption of standards based approaches. This may be connected with vendor lock−in.

Follow this link for key resources for this section (these open in a new window)

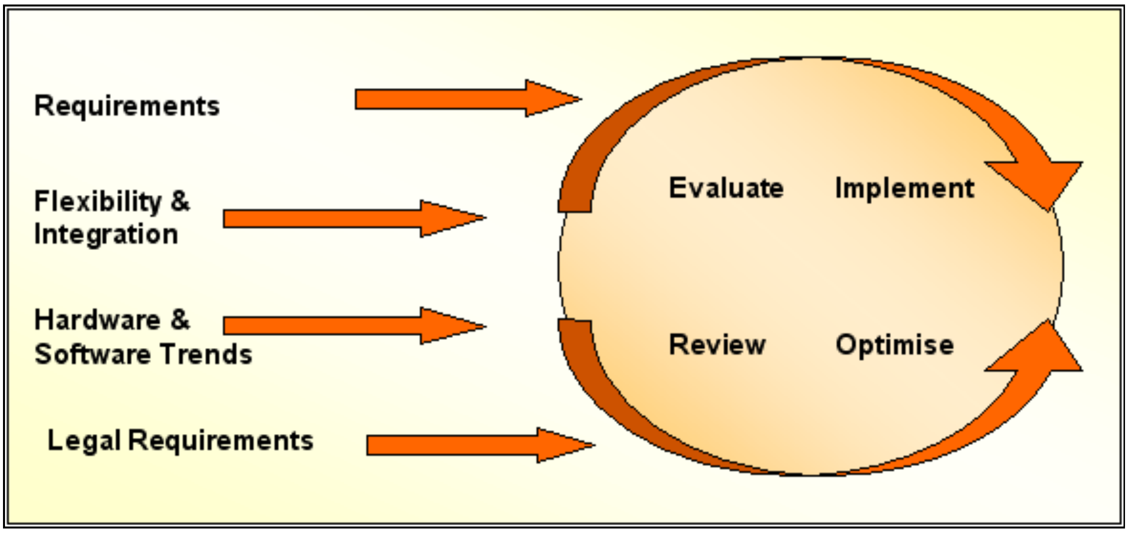
Follow this link for more resources for this section (these open in a new window)

5.4. System Selection

5.4.1. Introduction

Selecting the systems and technologies to be used is one of the critical stages in MLE development. It is little different from the selection of systems and applications that you have already been doing. The difference is the importance of the systems working with other systems within and beyond the institution with the additional requirements that this brings and the wider set of stakeholders involved. Follow this link to the System Selection infoKit.

Selecting requirements is not a one time operation, and is best thought of as an iterative process as shown in the diagram.



You will need to consider the user requirements, the flexibility of the system, trends in hardware and software (including standards) and the legal requirements. Using these to evaluate the systems and select what you want. The systems will then need to be implemented (and this includes modifying the software to your needs and almost certainly modifying some of your processes as well). having implemented the system you will then over time want to optimise it in various ways to meet your needs better. There should then be a review process and the cycle starts again.

5.4.2. Functional requirements

Clearly, the most important (but not the sole) selection criterion must be the functional requirements for the applications. Unfortunately, it is most unlikely that any system will meet your requirements precisely and that you will have to either adapt your requirements to the available systems or modify the systems to meet your needs. Typically there will be a bit of both adapting the systems and adapting requirements to the systems as the cost of making the adaption to the software may not be cost justifiable.

5.4.3. Long−term support and development

It is important to ensure the long term viability of any systems selected, whether built in−house, developed from open source systems or bought from a vendor.

In house
: You must ensure that you not only have the requisite skills to build the system but that you will be able to retain them to continue developing and supporting the system.

Open source
: Care is needed if you select open source systems. The vast majority of such systems do not develop a large user base and ultimately stop being supported and developed. In looking at open source systems it is therefore important that you look at the size of the installed user base and the amount of activity in support of the systems. Almost all open source systems have discussion boards etc. associated with them. A good idea of the level of support can be obtained by looking at these. look for the level of activity but also the speed of response to queries, problems and bugs. With the most popular systems the response time is usually much better than from commercial software. Thought also needs to be given to the development of the system. Of course, development and adaption can be done in−house (and as with in−house development you will need the requisite technical skills), but good open source software has a large community of developers who are continually improving and upgrading the software. However, this may mean that you have little control over the direction that the software takes.

Bought from a vendor

Besides all the usual things that one has to consider (such as the viability of the company, provision of support etc.), it is essential to look at their development plans for the system. Many of the systems you are looking at will be designed for other markets as well as education. If education (and in particular your sector) are not a major part of their market then are things that are a priority for you going to be a priority for them. For instance, when the funding bodies change the reporting rules will they be in a position to amend their system accordingly?

5.4.4 Integration with other systems

Creating an MLE is more about linking systems together than anything else so the ability to integrate a system with other systems that make up the MLE must be one of the key criteria.

5.4.5. Integration with partners

The area of working with partners both within sector (FE−FE and HE−HE) on a regional basis and between sectors (FE−HE) is an issue of growing importance, this will increasingly mean that the systems of these institutions will need to work together. We are already seeing courses jointly provided between FECs and HEIs and where this involves the use of VLEs (as it increasingly will) there is a need for the systems at all the partners to communicate with the chosen VLE (or more likely VLEs). Further, to support progression and cross charging there will be a need for a variety of systems to work together.

It will be very difficult to add this in later, if it is not considered when choosing the technology, and strongly suggests the need to use open standards, unless all the partners agree on some other approach.

The standards will be needed at a variety of different levels:

- Transport mechanisms for exchanging data (such as SOAP)
- Data formats (such as XML specifications from IMS)
- Semantic (what data will be transferred)

An approach which might be considered is the use of web services which are specifically designed as a standards based approach to creating shared applications.

Students and staff will also increasingly be working for several members of the consortium there are therefore considerable advantages in using common systems / components.

Systems may also need to work with those of local industry, funding councils, HESA etc.

5.4.6. Fit to strategic requirements

We have already seen the importance of establishing strategic and user requirements. However when selecting the technologies there are likely to be a number of compromises which have to be made because of the nature of existing systems and the availability of suitable technologies. For instance, it may be technically necessary to do some of the low priority (from an institutional viewpoint) developments first in order to derive the greatest benefits elsewhere.

The most obvious example here is the necessity of developing the directory systems which underlie so many of the other systems and is an essential part of building an MLE. It is worth noting that in the Building MLEs in HE programme every project is using an authentication service based on, or compliant with, LDAP. More generally there is a need to recognise that progress towards an MLE is evolutionary and that the may be a need to switch out some systems earlier or later because of their technologies and how they can therefore be integrated into the MLE.

5.5. Risks

In an area developing as rapidly as this the selection of technology has a a range of risks associated with it. It is important to consider these risks and what can be done to mitigate them when selecting technolgies.

Risks fall into three categories:

- Technology
- Supplier
- Environmental.

These are discussed in turn.

5.5.1. Technology

Speed of change of technologies

Technology is changing with enormous speed. In the last few years we have seen the explosion in the use of XML, the development of specifications in learning technology standards, the dramatic growth in the use of wireless networking and the continued dramatic improvement in price / performance of computers.

There is therefore the danger that any system selected will be rapidly overtaken by some new technology which renders the choice a dead end and result in the need to acquire a new system in the relatively near future.

The risks come from a number of areas:

- Hardware − although this is changing and improving rapidly everyone is in the same position and therefore suppliers have to make their systems backward compatible or very few in the market will be able to use it. The major risk is that existing systems become unsupported and have to be replaced. This is not peculiar to MLEs and should be part of any standard risk analysis.
- Operating systems − much the same as with hardware, except that it is at the operating system level that some systems will be interacting and there may be issues when large numbers of different operating systems (or versions of operating systems) are in place. It may be a particular issue in areas like disaster recovery where having a number of versions of the operating system can significantly affect the costs. Again, this is not peculiar to MLEs and should be part of standard risk analysis.

    - Languages − Many of the languages being used for developing systems are themselves evolving. If you are acquiring systems (and the supplier or other third party is maintaining them) then this is not a major issue. However, where you are developing or adapting existing systems then there are two major risks:
    - The lack of skills − There is an enormous shortage of skilled programmers and education is not a noted good payer. Recruiting and retaining the right skills can be difficult and this matters for a system which is mission critical
- Adapting code to changing languages − As languages change some features may be withdrawn, or worse behave differently. However, it may not be possible to stick with old versions of the language. As systems grow this can become a major problem.

Poorly defined standards

This is covered in greater detail in the section on standards, but it is worth reiterating here. One of the fastest areas of change at the moment is the interoperability specifications, in large part because they are not yet fully defined. This has two serious consequences.

- Things that claim to be following the same specifications may not actually work together. Currently it is essential that actual interopability is validated between any systems that are being considered. Even if they can demonstrate that they are following the standard (which is doubtful given the nature of the validation tools) this does not mean that the various suppliers are interpreting them in the same way.
- The change in the standards. Most of the relevant standards are rapidly evolving as requirements are being better defined and further refined. This means that systems acquired at different times will almost certainly be using different (incompatible) versions of the standards and it is therefore likely that you will have to keep upgrading systems in order to make them work with new systems that you are installing.

Gaps and overlaps between systems.

When systems come from different vendors there can be gaps between what they offer, and there will almost certainly be overlaps.

As John Heap wrote in UCISA Update (June 2003) 'the number of overlapping feature sets becomes confusing and daunting − especially for the hapless end users. Let me give you a couple of examples. Within our particular version of a Management Learning Environment, we have adopted WebCT as our Virtual Learning Environment and SCT Luminus as our portal technology. Both of these have messaging facilities. This means that together with our email system, it becomes possible to send messages to students via a number of routes. The poor staff who happen to communicate with students thus end up wondering which of these routes is most appropriate for a particular type of message to a particular group of students. We have recently had to offer guidance on the appropriate use of these various messaging tools. Similarly, within our MLE, we have adopted CMIS as our timetabling system. We recently had a demonstration of CMIS v2 and, lo and behold, they have added a range of features which would normally exist within a student record system. This means that we have to be careful either to disable such facilities or to ensure that our end users do not start to populate these with duplicate student data.'

5.5.2. Supplier

Supplier viability

Supplier viability is a major consideration in any software or hardware purchase and there is nothing special about MLE components in this respect. However, many people are using open source systems as part of their MLE and as such they need to take the same care in looking at the long term viability of the systems. There is a long and unfortunate history of software being developed, released to the community and dying. A small number of systems will continue to be supported. The problem is to identify them.

A few pointers are worth mentioning here.

- The size of the user community − the larger the community the more likely that people will continue to develop the system.
- The importance of the system − even if the community is relatively small if the system is essential to some members then it is more likely that they will continue to support it (though not necessarily in a way which meets your needs)

- Lack of alternatives − if there are good alternatives then other users will be more likely to switch and see less need to continue with the system.

Lack of cooperation between vendors of different systems

In the field of MLEs suppliers clearly need to work together at the moment as they are unable to provide all the parts of the solution that users need. This forces them to cooperate. However, you need to be clear as to the nature of this cooperation. Few systems vendors will have the resources to work with all the vendors producing complimentary systems. Although the systems may be made to work together now what guarantees are being offered that this will continue to be the case?

If one of the suppliers is extending the range of systems that they offer they may even have a reason to want to end interoperability with what will become competing systems. This is less likely if there is some formal relationship between them. Unfortunately that is unlikely to be the case between all the systems that you want to make work together as each of the relationships have to be built pair−wise while you want many systems to work together.

5.6. What projects have done?

5.6.1 Introduction

This section briefly identifies what each of the projects in the MLEs in Higher Education programme did. There is an overall description of each project followed by a description of the systems that they integrated. Further details are then supplied in the key resources and more resources section.

This section draws heavily on the work of Paul Browning and his report 'Technical review of the JISC MLE in HE programme'.

5.6.2 Brief description of the projects

De Montfort University

The aims of the project were to assess the technical and organisational feasibility of integrating multiple technologies into a single managed learning environment at DMU, to develop a model of integration capable of generalisation to other institutional contexts, and to disseminate this to the UK educational community.

The available technologies were assessed. Information was gathered on data flows, user needs, interface requirements using a variety of methods. A prototype system was developed using Java and XML. Users are able to connect to an MLE server via an ordinary Web browser. The MLE server authenticates them and provides them with secure, personalised view of various data−sets and applications, including the University's student information system (course, module and personal information), timetable data, assessment results, news/messages, and key University documents.

User evaluation studies were carried out, and independent experts provided usability and accessibility assessments. Various revisions were made to the system in the light of these.

Assessments were made of the organisational requirements for successful implementation, the ethical and legal implications of extending student access to information, the resulting technical security requirements, and costs and benefits.

When Version 2 of uPortal (an open source portal development toolkit) became available, DMU's in−house system was ported to this. Both systems use similar technologies and architecture, while uPortal offers a more robust, sustainable platform.

The findings of the project were publicised via a Workshop, and through participation in JISC conferences and events. Detailed reports and executive summaries have been produced for each aspect of the work. These are available via the project Web site.

Writtle College GIMIS Project

The project aims to improve the output and dissemination of Management Information Systems (MIS) information throughout the College, reinforcing the College's Information Strategy by providing the ability to create intrinsic streams of information flow.

The primary objective is to create an information distribution system to make available information currently held in disparate systems. Also, the creation of Electronic Data Interchanges (EDI) where appropriate between the main College MIS systems which have little or no inter−system communication.

The production of a 'middleware architecture' and web based front portal called 'StaffNet' and 'StudentNet', will allow for a cost effective solution, ease of access and independence from the underlying system components, ensuring that any required changes, developments or upgrades are effected with minimum disruption to the Generic Integrated Management Information System (GIMIS).

To date, any consolidation of data from these systems is done manually or in a partially automated series of macros. The result is an inefficient use of both time and staff resources. Even if such systems work perfectly, there is a time lag between the data extraction and the final results, and there are no easy ways to verify the results or "automatically" refresh the data.

The primary role of the GIMIS project is to link these systems, to facilitate seamless communication and data sharing. Although the primary aim is to simplify the existing data and management information needs of the college staff and students, this development will inevitably lead to new uses for the data that is held. For further information follow this link to the GIMIS project.

St Andrews University INSIDE Project

The Universities of St Andrews and Durham are currently in the process of responding to the growing need for user−centric campus information services. Staff and students are individuals who play particular roles and hold specific responsibilities within their institutions. Yet they are faced with ploughing through multiple unconnected data repositories in order to satisfy simple queries and accomplish routine tasks. Even then there is no guarantee of a successful outcome. Inappropriate access control mechanisms and the lack of client software deters even the most persevering online users. Numerous ad hoc record systems developed at Departmental level replicate work that is being done centrally, but are not co−ordinated with each other or Central Services.

Perhaps the distinguishing feature of INSIDE within the Building MLEs in HE programme is its recognition that information maintained by Departments, and the work involved in doing so, are important components in the overall institutional information base.

INSIDE has three general goals:

- development of a model of University information flows and processes based on analyses and formal modeling techniques
- the generation of user−centric portals for staff based on their institutional roles and responsibilities

- the piloting the of value−added services based on the analyses of existing processes.

For further information follow this link to the INSIDE project.

University of East Anglia MARTINI Project

MARTINI will provide an integrated information delivery service for students. It will deliver what the students need, where and when they need it. As such it will be the focus of student access to institutional information systems.

Students will have direct, seamless and secure access to all personal data held about them on university databases, combined with easily navigable links to related data of interest to them. A student will be able, for example, enquire about marks gained for course units they have completed, check the timetable for courses on which they are currently registered, view the range of course options open to them and sign up for their preferred options.

MARTINI will develop a web based front end and a set of tools, which will allow the integration of a range of institutional information systems. This information will also be presented to users through a web interface and in text form for persons with special needs.

The system will be database driven to include both static data (e.g. course guides) and dynamic data (e.g. course marks, accommodation information etc.).

In addition to having access to the range of institutional databases, links will be provided to University wide information. It will be possible for users to tailor the front end to their personal preferences. The range of preferences will be decided in collaboration with the students as part of the user involvement in the project. For further information follow this link to the MARTINI project.

University of Sunderland SMILE Project

The project takes the University's learning support systems and its administrative systems and links them together to provide, for our users, a single system that will help students in their studies, tutors in their teaching and administrators in their management.

Ravensbourne College TISR Project

TISR's objective, achieved, was to develop 'a meta−system capable of integrating different software applications that could also work across different platforms and offer the capability of integrating any other arbitrary system resulting from new additional data sources.'

The validating example of the TISR project is a model of the student record. The project shows how a student record can be embodied as an LDAP directory entry, and, using the TISR API, how the LDAP directory can be populated with student records whose individual components are derived from different sources.

5.6.3. What are the projects integrating?

De Montfort University

- Student Information System,
- Timetabling System,
- Key documents (eg. Student Handbook, Regulations),
- News/messaging system

Writtle College

The College's four primary databases:

- Finance Resource 32000 (Oracle platform on a DEC Alpha server [True 64 UNIX])
- Library Dynix (running on an AIX server)
- Student Records HEMIS (Oracle platform on a DEC Alpha server [True 64 UNIX])
- Timetabling Facility CMIS (Access platform on a Novell server) In addition to the above, circa twenty five ancillary databases and discrete data sources used throughout the College are also being integrated within the GIMIS core e.g. Locations database, FE Attendance et al.

St Andrews University

School Systems and Centrally Maintained Systems. In particular the exchange and management of data about students and modules. Integrating VLE with IS to form MLE.

University of East Anglia

The system will be database driven to include both static data (e.g. course guides) and dynamic data (e.g. course marks, accommodation information etc.) and will provide access will be provided to the following systems:

- Student records,
- Unit enrolments and marks,
- Course data, down to unit level.

Accommodation records, Debtors and payments data, Library borrower information, IT Service use data, and Timetabling information (when available).

University of Sunderland

- A Virtual Learning Environment (WebCT) and
- student records system (SITS) within a portal.

Ravensbourne College

TISR is a lazy meta directory. Its action is to integrate disparate data sources that make up the student record. We have developed sample data providers to this end including: JDBC, LDAP, EJB and XML. In short TISR will integrate whatever you want.

More detailed information on these projects can be found in the Key Resources folder.

Follow this link for key resources for this section (these open in a new window)

Follow this link for more resources for this section (these open in a new window)

5.7. Case studies from the JISC Landscape survey

The Managed Learning Environment Activity in Further and Higher Education report (Landscape Survey), supported by the JISC and UCISA, includes a number of case studies of MLE development. Summaries of some if these are given below. Integration was mainly done in−house with support from the various vendors.

5.7.1. University of Birmingham

In 2001/02 the University of Birmingham implemented WebCT as its campus wide VLE. This is linked to three different software packages that are used for assessment:

- QuestionMark Perception is used in various parts of the university to create assessments
- Respondus is used for the creation of question sets that are then loaded into WebCT
- TRIADS is used for highly specialised assessment.

In September 2003, it is anticipated that Personal Development Portfolios for students will be piloted and managed via the MLE.

In the future, it is anticipated that the Portal Project, which will encompass MLE development, will offer additional services such as online student transcripts, the exam paper database, events calendar and the library catalogue and its associated facilities.

5.7.2. University of Brighton

The institutional MLE, called Studentcentral, was implemented early 2002/03. Students have a single sign−on and have access to course material, study management pages, student services, email and library facilities. The MLE was designed to be a tight−coupling between the VLE (Blackboard), the digital library, the student records / course module systems and other administrative systems containing information relevant to students.

5.7.3. University of Dundee

In September 2003, the university implemented an MLE comprising of 2 VLEs, the personnel system, student management system and QuestionMark Perception for computer−aided assessment. Blackboard is used by the majority of staff and students with MESIS being used by the medical and nursing schools. The university plans to have a fully integrated MLE in place within two years (2005/06).

5.7.4. Institute of Wales Institute, Cardiff (UWIC)

UWIC implemented a VLE (Blackboard) 3−4 years ago and has now integrated it with its student record system to enable online enrolment in courses and course development.

Repeating the Study

The 2005 Study of Environments to Support e−Learning was undertaken to update the picture of issues of integration of business processes, services and systems in support of learning and teaching within UK Further and Higher Education institutions.

The study was completed by JISC and UCISA from a consortium of research organisations led by the Social Informatics Research Unit at the University of Brighton, and was overseen by a Reference Group with key sector representatives. The key tasks of the Reference Group were to ensure that where questions were made there was a clear progression and justification from the previous survey, and that changes in the sector were appropriately reflected. The most obvious change was the shift in terminology from MLEs to environments which support e−learning. The research methods included a national survey of all FE and HE institutions attracting an overall response rate of 32%, and consultation with key stakeholder groups.

Section Editor

Tom Franklin has been working in learning technologies for over ten years. During this time he has been responsible for a wide variety of projects including the development of three virtual learning environments and much of the early work on managed learning environments. He has worked on computer aided assessment and the use of virtual reality in education as well as the effective use of VLEs. More recently he has been involved in the use of wireless networking in education and the effective use of portals.

While working for JISC he was responsible for the creation of both CETIS and TechDis. He has undertaken a wide variety of evaluations of e−learning.

Current work includes consultant to the portals, wireless computing and ubiquitous computing.
