



Keynote 3:

Challenges of Change – Information and Communication Technology and Lifelong Learning

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Abstract

- Educational Technology has generally failed to deliver what its enthusiasts believed it has promised. However Information and Computer Technologies (ICT) present an unprecedented set of threats and opportunities to educationalists and their institutions. This analysis begins at an institutional level and takes a perspective founded on further education experiences to provide a fundamental review of the issues that face managers, educationalists and learners.

The particular challenges provided by the all encompassing nature of information which is not only required to manage organisations and individuals activities, but which also provides the “raw material” of learning, provide a starting point. The MIT90s Transformation model is applied to the need for organisational change, in the context of the turbulence that technological change induces in the external environment.

Revan’s learning equations (*learning needs to greater than or equal to the rate of change and learning consists of a combination of programmed information and questioning to share insight and experiences with others*) are used to propose a unification of management, quality and learning processes. It is argued that the harmonisation of this “trinity” requires the harmonisation of system principles and cultural issues. The concept of how these processes need to be applied in order to create a learning organisation and promote a “learning culture” is explored.

The need to consistently scan and assess technological development combined with the careful harmonisation of infrastructure and applications development is addressed. Management information systems are needed to address the tracking of student achievement, as well as the organisation and delivery of learning content in the form of materials, which are increasingly but not exclusively electronic.

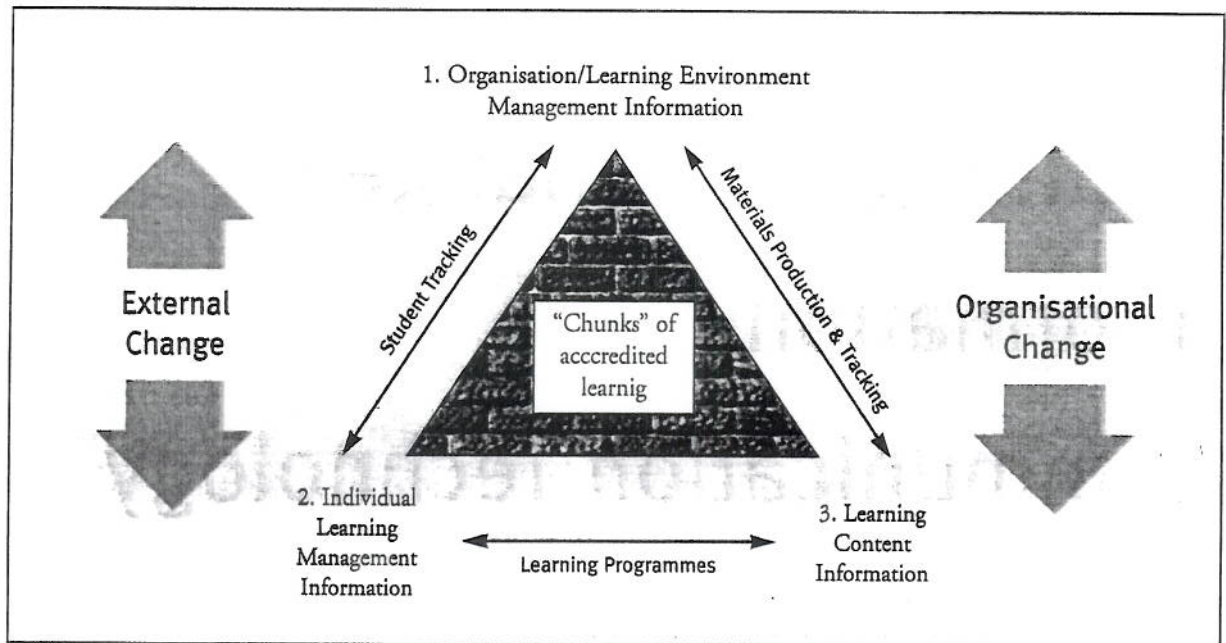


Figure 1

The potential for the application of both Internet and Intranet for supporting computer mediated learning and materials development and delivery is assessed, in the context of FEDA's QUILT (Quality in Information and Learning Technology) staff development programme. The University for Industry and allied developments are contextualised.

of computing, communications and other ancillary equipment associated with information technology.

(Cowham, 1982)

1. The Development of ICT

- The history of IT is both dramatic and short. The digital computer, which is at the heart of the technology, is only 50 years old and has changed dramatically during that time. It is significant that the emphasis in computer applications has changed from computation to communication. It was only in the 1980s that microcomputers began to infiltrate further education colleges widely. In a review of "IT in the College" in 1982, I pointed out that it is:

imperative for institutions to develop coherent attitudes and policies to the acquisition, application and organisation

This was part of a plea for colleges to attempt to adopt holistic approaches to "future proofing". It had become clear that the major costs in the application of IT, were neither hardware nor software, but the staff time and skills employed in both learning and, in developing and servicing applications. Already the promise offered by educational technology, allied to behaviourism, had failed to deliver with innovations such as the short-lived "teaching machines". However the rapid developments in microcomputers offered tempting prospects for computer assisted and computer managed learning (CAL and CML) mirroring developments in computer assisted engineering and manufacture (CAE and CAM).

The widespread infiltration of home computing along with media and communications developments such as satellite and cable communication, in harmony with organisational change, continues to raise society's awareness of the rate and level of technological development. In recent years public attention to these developments has been further

stimulated by the “hype” of the “information superhighway”, which is based on the concept delivering information, using broadband communication channels. It is clear that the development of the ‘superhighway’ presents both opportunities and threats to the future of colleges and universities in their application of ICT.

2. Information and education

- Information plays a key role in the context of education, training and learning. Information is required to:

1. manage:
 - i educational organisations
 - ii the learning environments and learning opportunities provided by educational organisations;
2. manage individuals’ learning programmes and processes, such as in action planning and the recording of achievement;
3. form the content of an individual’s learning programme. (See Fig: 1)

It is this central role that information holds in learning that has led to the current state of convergence in ICT and information and learning technology (ILT). Figure 1 provides a model of the aspects of information and learning that colleges and universities need to address in their application of ICT. The concept of “chunking” learning, into units of assessment and modules for delivery, is introduced into the model as a key element, to be used in the construction of learning programmes. It is well known that FEDA has been actively engaged in promoting a credit-based framework for all post 16 qualifications for a number of years. The aspects of information listed above that are involved in the management and delivery learning inter-relate. They need to be linked, for example through systems for student tracking, learning materials production and tracking, and for design-

ing and delivering students’ learning programmes. Managing organisational change is an essential response to dynamic external change.

1. Learning and the Management of Change
2. Organisational Management of ILT
3. Learning Environments
4. Individual Learning
5. Learning Content

The new government is promoting a number of initiatives in the context of lifelong learning, particularly the University for Industry (Ufi) and Individual Learning Accounts (ILLAs) which can be readily mapped against this model.

3. Organisational Transformation

- Probably the most influential piece of work that has been undertaken on the organisational impact of ICT was the MIT 90s project. This was a major 5-year multidisciplinary research program undertaken at the Massachusetts Institute of Technology, among whose sponsors was the British firm, ICL. Ten major findings were reported, the first three of which were that:

1. Turbulence in organisations’ environment will continue
2. Improvements in IT capability will continue
3. It is necessary to rethink the core of the organisation.

The research suggested that IT can provide new methods of working that can extend the reach or scope of an organisation and must be addressed as a strategic resource. The transformation model has five levels and three stages: Evolutionary, Transitional and Revolutionary. The model is particularly significant to colleges both in informing their own organisational needs, as well as in the

responses that are made to the organisations that they service, in terms of training and development needs. The model is outlined in Figure 2 below. NCET(1995) have taken it and applied it to the education context in "Managing IT". This NCET publication has been used by FEDA in launching the Quality in ILT (QUILT) staff development programme.

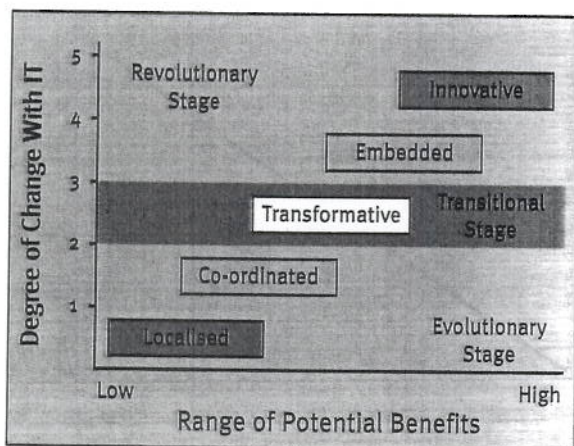


Fig 2

Enabling conditions that MIT identified as being required for transformation to take place are:

1. a shared vision for organisational development;
2. flexible human resource practices;
3. investment in education and training;
4. the existence of a readily available infrastructure.

The transformation model is also featured in the Learning Environment Architecture project described by Ford et al (1996) in "Managing Change in Higher Education". This book contains a wealth of material relevant to the management of educational change. Of particular interest is the attention given to a "Learning Chunk", which is defined as:

a bounded learning activity with a specified set of learning objectives and a set of assessment procedures capable of testing to what extent these outcomes are met by students.

(page 57)

Again development of the organisations infrastructure is identified as a key stage in managing change.

4. Learning Organisations

- Implicit in the transformation model and earlier historical analysis is the need to develop an organisational culture of change, which requires a focus on learning often identified as the need to become a "learning organisation". In his book, "The Learning Organisation", Garratt acknowledges the work of Professor Reg Revans, who is recognised as the founder of action learning, an approach which remains highly influential in the field of management development. Revans' equation, expressing the relationship between learning and change

$$L > C$$

is used. It states that for an organisation to survive, its rate of learning (L) must be greater than or equal to the rate of change in its external environment (C). The rapid development of ICT and continuing, if not accelerating, turbulence in the external environment demonstrates the need for a high rate of learning for those working in colleges and universities. The challenge for colleges and universities is the need to truly become "Learning Organisations", practising in their management, organisation and operation what they "preach" to their students and customers.

Revans also proposes a learning equation which is:

$$L = P + Q$$

where an organisation's learning (L) can be expressed as the sum of programmed instruction (P) and questioning insight (Q). The learning equation is equally applicable to individual learn-

ing. Revans argues that the tendency to focus on P, at the expense of Q bedevils the English education system. The same criticism can be levelled at Educational Technology and most attempts at CML. An overemphasis on P can in fact provide a major block to learning. In learning to learn, it is essential for the learner to focus on learning to ask discriminating questions. This provides an important challenge, in the application of ICT, where there is an inherent danger of focusing on content ie P. The Internet already also provides some interesting paradigms for ICT development, such as the compiling and banking of lists of "Frequently Asked Questions" (FAQs) and answers. It is interesting to ask how much and how effectively can electronic conferencing and group working facilities be used to promote questioning?

Revans identified "four corrigible handicaps" that can block organisational learning as the:

1. idealisation of past experience;
2. charismatic influence of (other) successful managers (or learners);
3. impulsion to instant activity;
4. belittlement of subordinates.

An essential part of learning is the promotion of teamwork, which requires:

1. being prepared to give in order to take, and to listen in order to talk;
2. commitment to a common purpose;
3. practising openness, honesty and consistency;
4. providing support and help;
5. sharing of ignorance and insecurity as well as information, knowledge and experience;

across the whole organisation.

Nowhere is the challenge to learn greater than in the use and effective application of ICT. The frequently applied strengths, weaknesses, threats and

opportunities (SWOT) analysis can be adapted and applied to profiling staff working with and in ICT. These staff can be profiled on a scale of "experienced or inexperienced in the use of IT" and on a scale of "threatened or stimulated by change". This framework, albeit vastly simplified is presented below in Figure 3.

Simplified IT Staff Profiling Model

IT Experienced	<ul style="list-style-type: none"> - Tend to block progress - Preserve "Mystique" & Expert Status - Hold Onto Suppress Information 	<ul style="list-style-type: none"> - Give Time & Support to Others - Admit own Inadequacies - Recognise Potential - Consider the Options & Pitfalls
	TE	SE
IT Inexperienced	<ul style="list-style-type: none"> - Avoid Using & Learning - Look for Problems - Unreal Expectations 	<ul style="list-style-type: none"> - Enthusiastic - Pursue Learning - May want to "Re-invent Wheel" or enter cul-de-sacs
	TI	SI
	Stimulated by Change	Threatened by Change

Figure 3

The management task lies in removing or challenging threats and insecurities, and in providing the maximum opportunity to obtain effective experience. Implicit in the danger posed by experienced staff who are threatened or insecure (Threatened and Experienced ie TE), and who often occupy the position of "gatekeepers" to IT, is in the reverence of the status attributed to the "expert". In a field as dynamic as IT development, the static concept of the expert is both invalid and inappropriate as it acts as a barrier to, rather than enabling and stimulating potential and development. Experience and expertise in IT applications, along with retaining the capacity to be stimulated by change (Stimulated and Experienced ie SE), is in contrast dynamic and provides a combination to be highly valued, if the experience is applied effectively. It can be argued that a high degree of polarisation exists between the TE and SE categories, which represent people who have been highly exposed to technical change and the need for constant learning and "unlearning" that is demanded.

The need to unlearn in the context of learning, albeit paradoxical, must not be under-estimated. Each wave of development makes a high proportion of the knowledge and techniques required for working in the previous wave both irrelevant and redundant. Indeed this material needs to be unlearned as it can provide a barrier and block to

acquiring the knowledge and techniques necessary for effectively riding the new wave. However a core of experience continues to be valid and useful. It is developing the ability to know what to discard and what to retain that is critical, which can be likened to identifying what experience constitutes a "dead branch" and what remains on the main stem of the evolutionary tree of development. It is probable that SE people have become successful in "learning to learn". Can there be any place for TE people in a learning organisation? The skills and experience of SE people should be harnessed to develop and support both categories of inexperienced user (Threatened and Inexperienced ie TI and Stimulated and Inexperienced ie SI). There is always a danger with SI staff that they are or become "obsessed with change" and technology, a phenomenon which often manifests itself by a focus on gadgetry rather than investment in effective solutions. In the case of a college, university or indeed school, staff development should mirror the learning experiences and approaches used with students. The challenge is that staffs' learning (L) needs to be greater than or at least equal to the change in knowledge and experience of students (C) in relation to ICT.

5. Quality and Planning

- It can be argued that the central purpose of education should be to improve the quality of life through learning. Planning is a key activity in the learning process, as is the review and evaluation of how effective a learner's action plan has been. Similarly planning has a critical role in the context of institutional quality improvement and of coping with change. The dangers of preparing plans which are not integrated or harmonised with the reality of the institutional context and culture; and where an "implementation gap" may exist, have been identified. This situation, described by Hoyle (1986) as "organisational pathos", and the ideal where the plan is well integrated with organisational reality, through effective management are both represented in Figures 4a and 4b below.

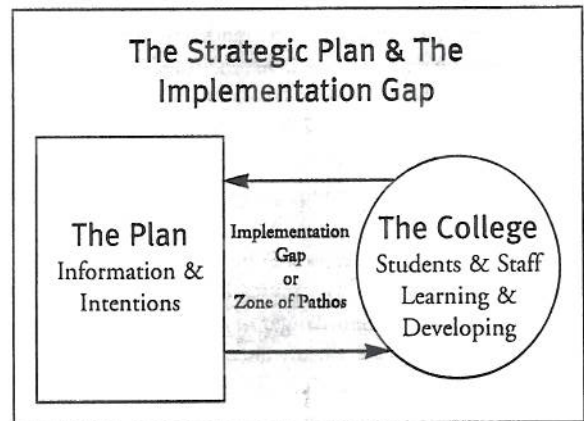


Fig 4a

In the model use of the square and circle symbols is generalised, so that squares with their hard edges are used to represent products, systems, plans and processes for control. Soft edged circles are used to represent the cultures and processes required for development and the effective implementation of plans. In reality complex organisations will consist of a web of overlapping circles or sub-cultures. In a learning organisation there will be a free and open exchange of information and knowledge between teams which can be represented by the overlapping circles. The guiding principle is that there needs to be integration and harmonisation of future plans and present reality, systems and processes, and procedures and cultures. Harmonisation and integration is represented by the zone where the square and circle overlap which can be described variously as the zone, where effective management, learning and quality can be achieved.

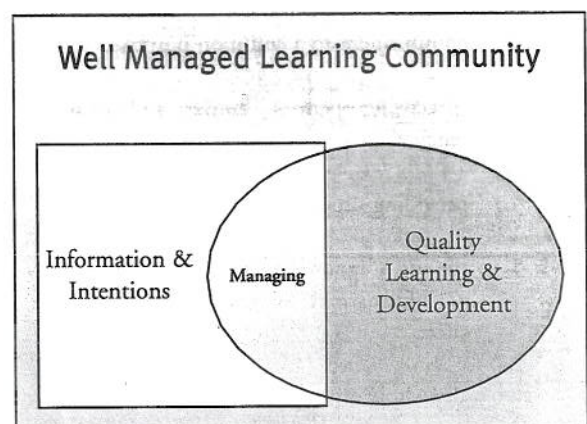


Fig 4b

Applying this model to the application of ICT, means replacing “the plan” in a square with “technology infrastructure” and “effective applications” being placed in the circle. This model can now be used to represent the effective or ineffective institutional implementation of ICT. Ineffective application would mean separation rather than integration of the square and circle.

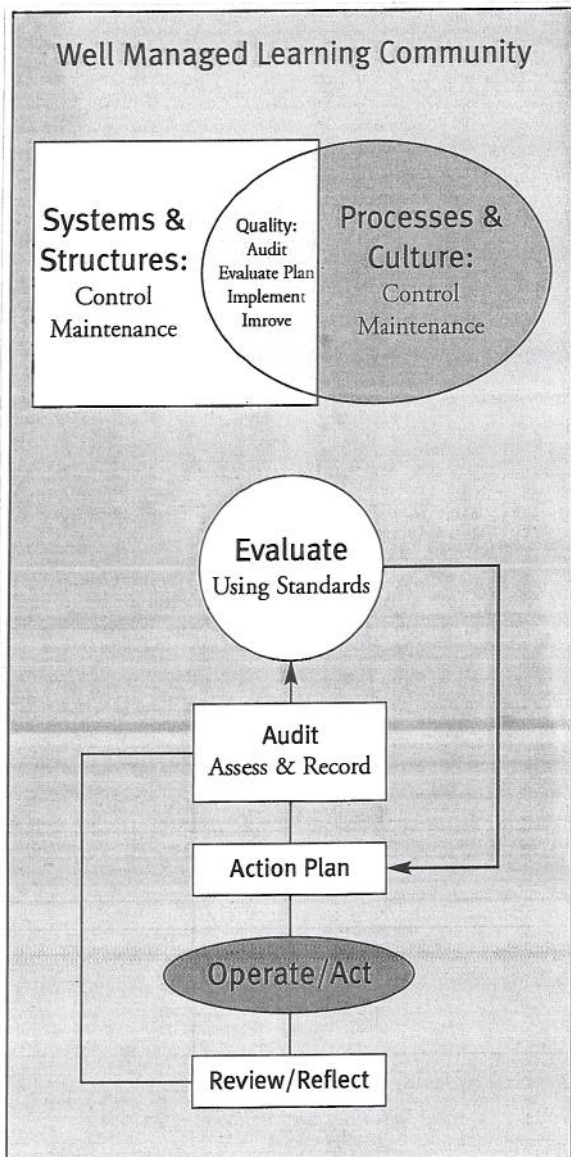


Fig 5

A generic model for quality systems and processes using the same symbolic approach is shown in Figure 5 (Cowham, 1995). In the square the emphasis is on control and maintenance, often stereotyped as the ISO 9000 approach. In the circle

the emphasis is on assurance and development which might be associated with Total Quality Management. The point is that development cannot be embedded without systems for control, while systems can be made over-rigid, misapplied and stifle development. The two approaches must be harmonised to create a ‘quality zone’. A flow-chart of the activities that form a quality cycle is suggested, beginning with an audit of the current situation, requiring evaluation before action planning. After a period of action, both review and reflection are a necessary pre-requisite to evaluation forming a cycle of continuous improvement. The adoption and application of quality standards is a key and critical process in addressing improvement. The development and adoption of standards in the development of ICT has been equally critical and the importance and significance of “open” and “industry” standards have already been referred to. In ‘Lila’, Robert Pirsig propose a metaphysics of quality which begins with the distinction between static quality (square) and dynamic quality (circle):

a dynamic advance is meaningless unless it can find some static pattern with which to protect itself from degeneration back to the conditions that existed before the advance was made. Evolution can't be a continuous forward movement. It must be process of ratchet-like steps in which there is a Dynamic movement forward up some new incline and then, if the result looks successful, a Static latching-on of the gain that has been made: then

(page 176)

It is important to note that each phase of development requires an audit review and improvement of static systems. There is a close match between the quality cycle and the process of learning inherent in portfolio building and portfolio based assessment. Applying the model to the learning equation, Revans’ P implies programming bounded by a square, while Q implies questioning bounded by a circle. Over time the circles should form an ascending spiral with the squares forming a supporting series of steps, represented in Figure 6.

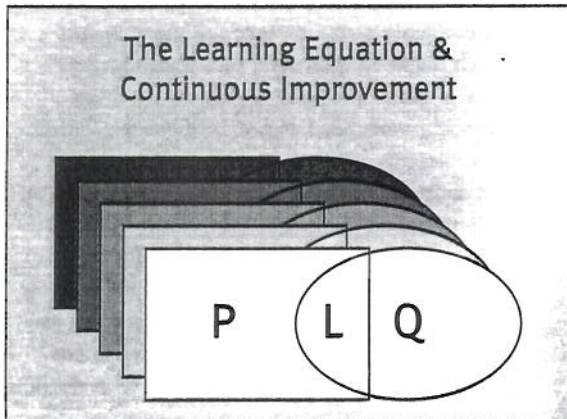


Fig 6

6. ICT Application and Infrastructure

- Implementing an ICT strategy needs the careful harmonisation of development of an efficient infrastructure that can support effective applications. While the infrastructure of hardware, networks and software, with appropriate staff roles, is concerned with the development and operation of systems and standards; application of ICT requires creative processes for exploring its capability, including its impact and effectiveness, and the design of quality learning experiences. A product should be learning materials or "courseware". Courseware should encompass content material, learning activities, assignments and assessments along with the means for tracking, monitoring and recording student progress. With ICT, learning may involve the medium as well as the message. In other words using ICT will enable learning about the capability of ICT and also develop skills in using it. There is the real danger that learning activities focus on **P** to the exclusion of **Q**. Quality courseware should include investigative activities where ICT provides a rich source of information as well as supporting the interaction with peers and tutors.

Effective applications require the investment in an efficient infrastructure, to support the applications. Without an appropriate infrastructure, applications will never be embedded. There is the inherent danger, however, that a great deal of attention and resources are committed to establishing an infrastructure which do not result in effective applica-

tion. Infrastructure is required to support, not to dominate or determine applications and the priority must lie with pedagogy and a concern with effective learning applications.

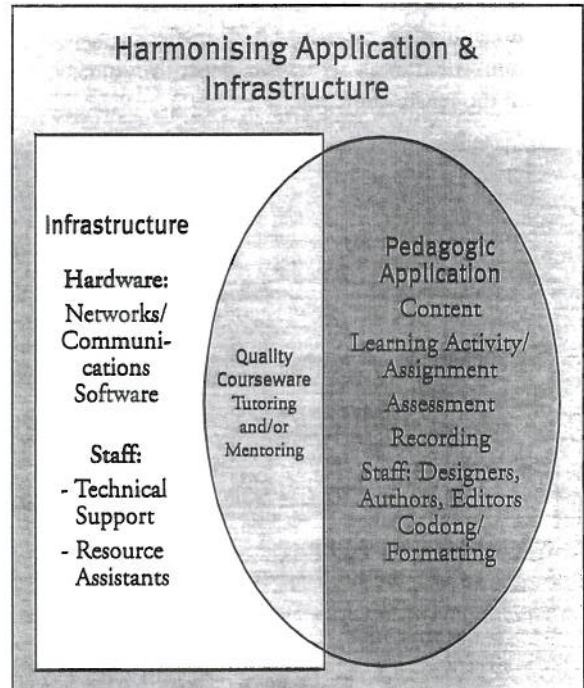


Fig 7

Inevitably new roles and functions are required to support the infrastructure and to develop the application. Indicative information is given in Figure 7 above, which links with the "changing teaching styles" and "redefined staff roles", associated with the embedded and innovative levels of the MIT transformation model, described in Section 3. In fact an implication of ICT development is the "atomising" of the traditional teacher role into a range of specialist functions.

7. 'Future Proofing'

- The term "future proofing" refers to the challenge of anticipating developments to realise an appropriate return on investment ICT infrastructure and development time. Pro-active strategies are required for hardware and software acquisition and development and, more significantly for, staff and applications development. Developing strategic partnerships with complementary organisations and concentrating on quality and flexibility of

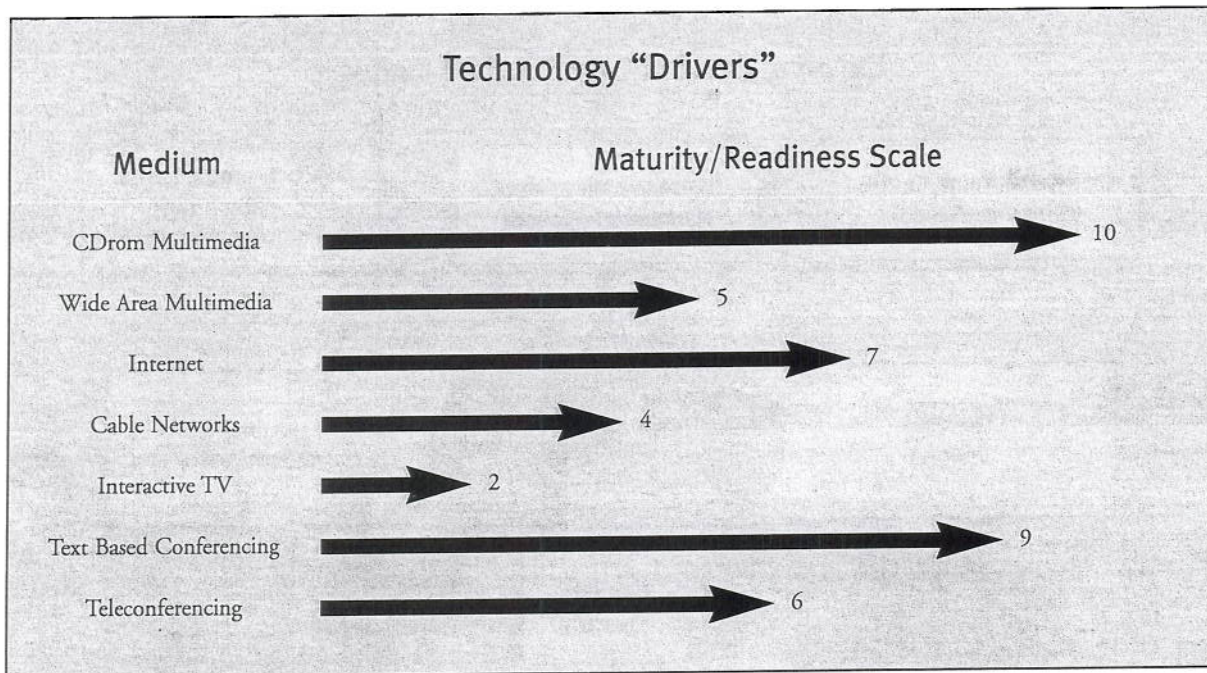


Fig 8

applications are essential survival skills. FEDA's QUILT staff development programme has prioritised partnership activities, such as the South Yorkshire colleges' Learning To Teach On-Line (LETTOL) project.

Continuous scanning and review of influences in the external environment is essential, requiring assessment of the maturity/readiness of emerging technology and evolution of "industry standards." The pursuit of industry standards is important to ensure staying in the mainstream of evolution and development, rather than becoming stranded in an evolutionary cul de sac. Figure 8 below, adapted from Rob Arntsen of IBM, maps a number of emerging technologies, likely to impact directly on the future of further and higher education, against a maturity scale of 0 to 10.

The lower the score on the scale, the less likelihood there is for an industry standard to have evolved and the greater the risk in investing in a particular product or solution, albeit offering a longer lead time for experimentation and learning. A high score for a "driver" will probably mean that a clear industry standard has emerged and that convergence has matured with low cost, high capability computer based solutions. The importance of

latching infrastructure and development onto an industry standard at the earliest opportunity cannot be overstated.

8. Learning Environments and the Ufl

- The production of quality courseware depends upon a clear understanding and analysis of the curriculum, reflecting the potential that ICT offers in enabling individualised learning. Colleges and universities need to develop and organise information systems, which combine satisfying management and external accountability requirements with the facility to track and support individual student's learning requirements. An aspect of the QUILT programme provides support on college information requirements and student tracking.

Arguably college's function can be defined as providing effective learning environments for a range of communities of learners. A learning environment must provide for access to structured content (P) as well as systems for student support, including recording progress and achievement, normally

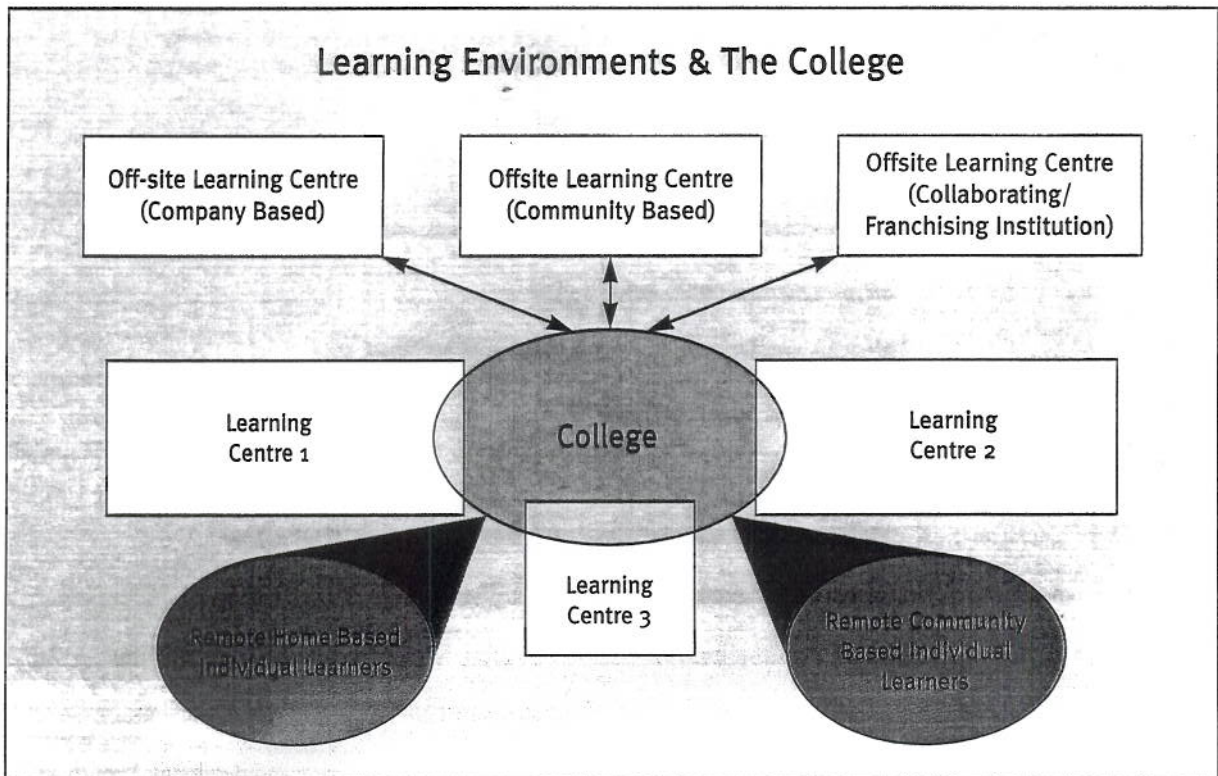


Fig 9

in a learning centre. Learning centres may be college based or located external to the college on the premises of an employer or in the community as shown Figure 9.

Increasingly, learners will require remote individual access to learning resources and systems. The challenge is to model learning environments using ICT. Employing the current vogue to attach a 'virtual' prefix to identify an ICT based approach virtual colleges and universities will be based on virtual learning environments, providing flexible access to learning materials, and requiring the development of 'virtual' tutor systems. Figure 10 illustrates a model proposed by David Wardell of MANCAT, which has 3 main components:

- Learning material, packaged in modules
- Tutorial & assessment support, based on portfolio assessment
- 'Support system' providing workshop and conference support.

The more remote the learner is, then the greater the need for a fully comprehensive, completely specified and above all robust system to support learning and provide a rich learning environment. Using Figure 9, there will be a greater tolerance for errors and "missing" elements of a learning system in the college based learning centre which can be remedied by the availability of on-hand tutors who can readily adapt to unforeseen needs and problems. Off-site learning centres will retain some of this tolerance and flexibility in terms of systems, but will generally require systems and standards to be more rigorous, than on-site centres, where-as the remote individual learner can be seen as offering the ultimate challenge.

Figure 11 is based on using the Internet for supporting on-line learning for remote learners. Prototyping Internet based solutions using an intranet to test out materials and solutions in the context of on-site learning centres is a current QUILT priority. Intranets provide a "safe" environment for learning with and testing Web based systems and techniques. Figure 11 suggests one scheme for Internet and Intranet development within a college, reflecting a need to separate infor-

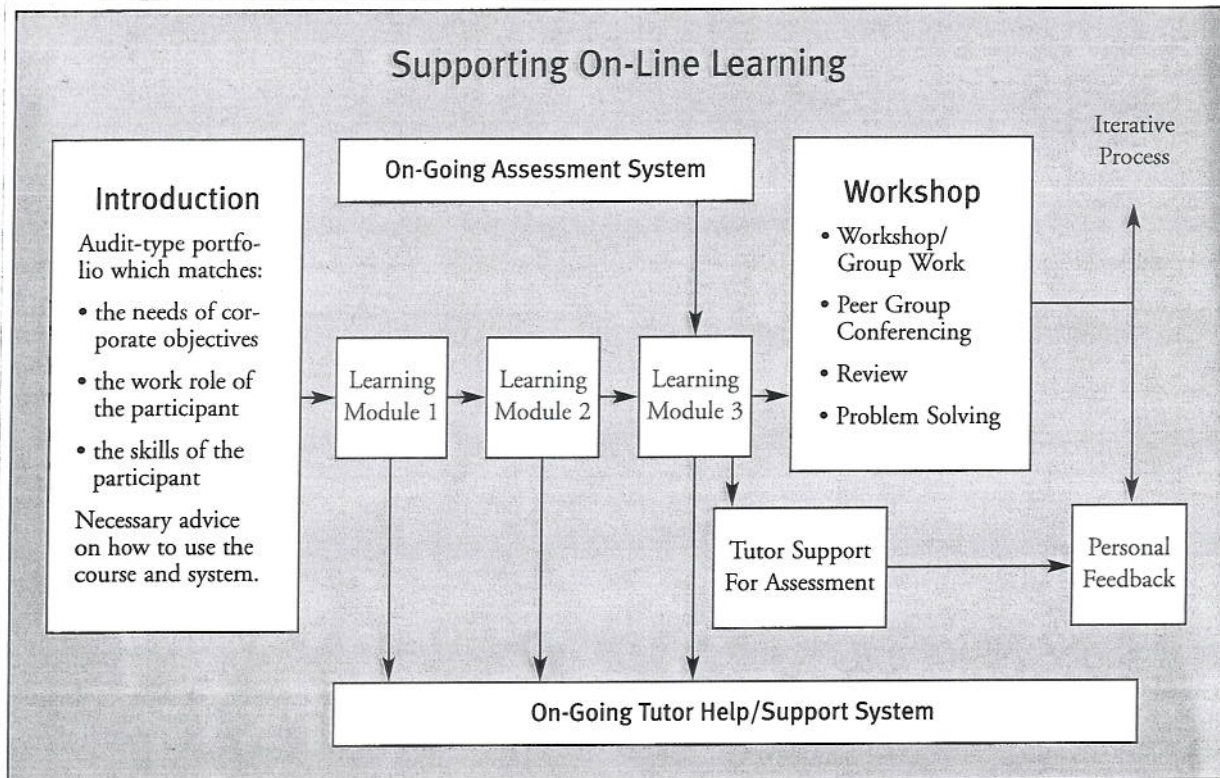


Fig 10

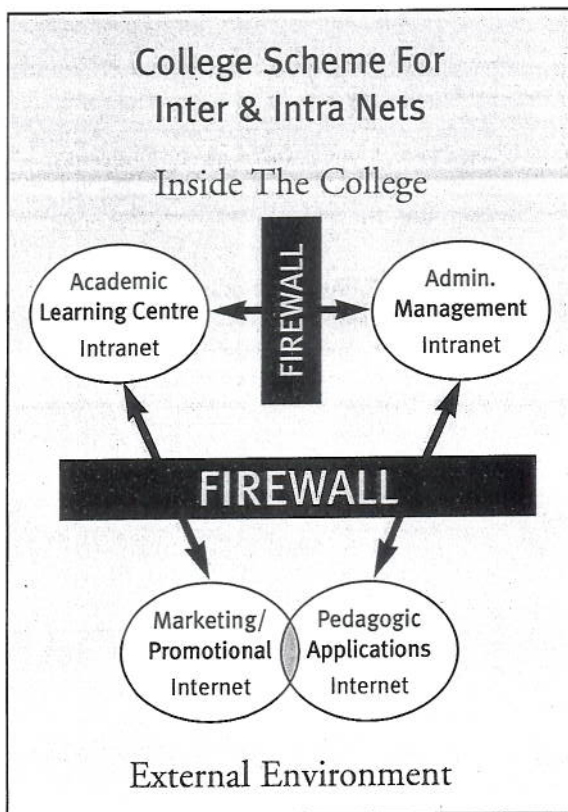


Fig 11

mation used for management purposes which will increasingly be made available for web based access, from learning content and support material. Giving students direct access to the former could present serious security hazards for management and confidential information, requiring a "firewall". Similarly there is a need for the two-way exchange of information between the Intranets and the Internet, but the security risk is even greater again requiring "firewalling".

The much-vaunted Ufi has generated a great deal of expectation and presents both significant opportunities and threats to colleges and universities. A fuller analysis than can be provided here is given in my FEDA Viewpoint paper (Cowham, 1998). In his recent paper, "University for Industry - a flagship for demand-led training, or another doomed supply-side intervention?", David Robertson (1998) points to the dangers of government supply side focused training initiatives which pay insufficient attention to demand in the market. In addition "the Ufi may be burdened with expectations it cannot meet... in descending order of magnitude and responsibility: a multi-billion pound business, a national planning body, a national qualifications

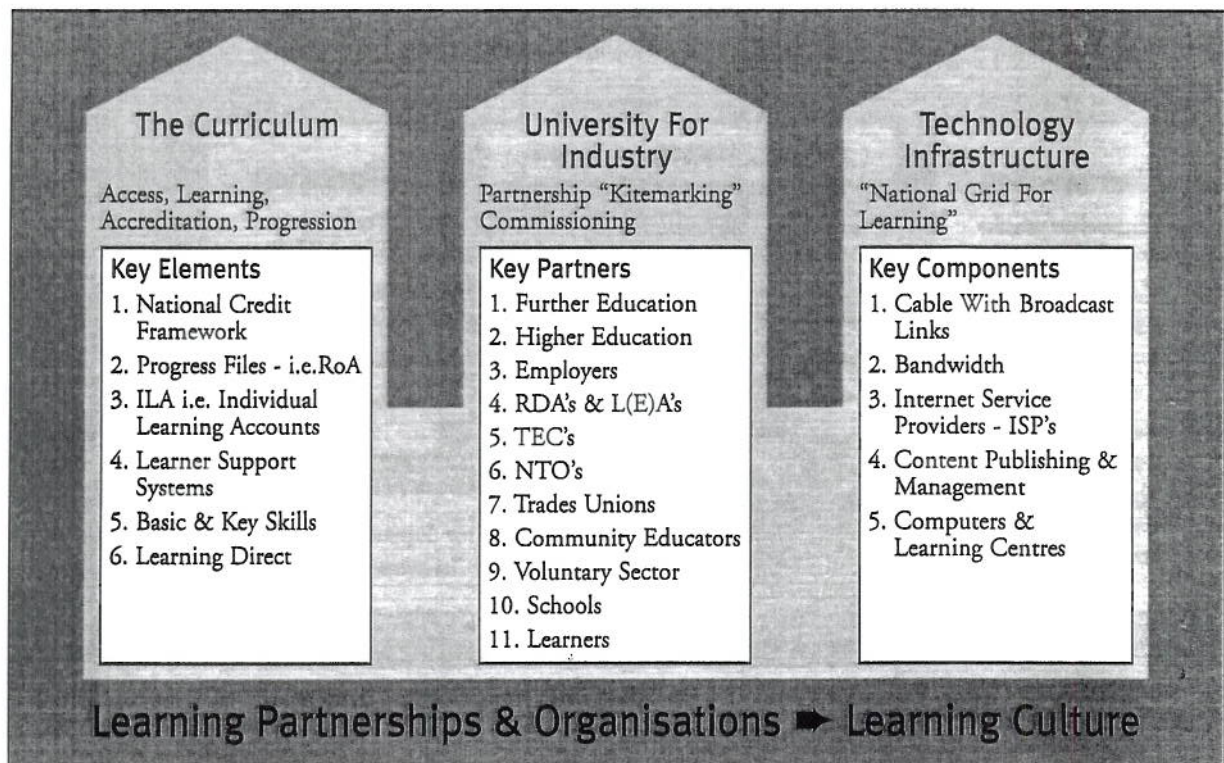


Fig 12

framework, an accreditation and quality control authority, a programme commissioning agency, a national advice and guidance service, and a Website. The only thing it would not provide, directly, is learning". The last point provides a real concern in that little attention is given to issues concerned with learning. Figure 12 is taken from my paper and attempts position the Ufi in the context of another initiatives and needs classified under the key elements of: curriculum, infrastructure and partnership.

To realise the Ufi's potential, surely the major responsibility lies with the colleges and universities able to meet the challenge of effectively managing change, providing high quality learning environments and experiences, and "practising what they preach" in a context of networked lifelong learning.

Author's note

- Figures 1 to 11 and a major part of the analysis provided in this paper have been adapted from my handbook:

Cowham, T. (1997) 'Information and Learning Technology: a development handbook', FE Matters FEDA paper, Volume 1 Number 15, March 1997

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