Blue-sky scenarios and vapourware solutions: Suggesting a process model for mass distance education and technology

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ABSTRACT

The implementation of technologies is frequently unsuccessful due to an inappropriate approach (pushed by the technology) or a lack of understanding of both the process and the function of technology in the distance education context. This discussion proposes a process model for the understanding and implementation of technologies and media in a mass distance education delivery context like the University of South Africa (Unisa). The authors are of the opinion that such an approach will multiply the successful instances of technology application across the production and delivery landscape.

Keywords: technology, media, distance education, ICT.

INTRODUCTION

The advent of the Internet and World Wide Web (WWW) in the 1990s saw an integration of technologies and media on one platform, and this achievement has sparked a frantic drive to implement technologies at all cost. Ideologies such as the global village, the knowledge society, the information society and knowledge management supported this drive. An unwarranted optimism swept the world and in this regard Murphy et al., Walker and Webb (2001, 1) talk about blue-sky scenarios and vapour-

ware solutions offered by those who promote information communication technologies (ICTs). Predicted scenarios and solutions were often never realised. The commercial world and institutions of education have been under constant pressure to implement technologies to make business practices more efficient or to communicate with students more effectively. In some instances institutions of education found themselves pulled by technology without taking a second look at pedagogy or the nature of delivery. In such cases some grave mistakes were made and in other cases technology was integrated successfully to support a teaching and learning model justified in the context.

Responding to the hype . . .

MacLeod and Ford (*Guardian* 2005, 29 February 2005) mention the e-University in the United Kingdom (UK) that lost US$114 million as early as 2000 and they describe it as the 'most embarrassing British cock-up'. In the same vein MacLeod reports (*Guardian*, 20 March 2006) that an e-learning venture by Oxford University, with Yale and Stanford in the United States (US), folded after failing to attract sufficient students. He describes this failure as an 'embarrassing blow to their prestige' and news of which they slipped out quietly. In this regard he also cites similar events in the US with New York Online, Virtual Temple and the University of Maryland University College Online not making the targets and closing down (investments of up to US$100 million US are mentioned).

Such blunders are certainly warning signs for institutions to proceed cautiously both in terms of understanding core business and how technology can assist, as well as how the market is supposed to respond. Announcing that 'We are online now!' and to expect tens of thousands of students to flock to the keyboard has not happened in most cases. But, in contrast Graves, Henshaw, Oberlin and Parker (1997, 448) are of the opinion that 'institutions that continue to resist change will not realize significant benefits from the new technologies'. Technology promises to make, and apparently has made, a substantial difference in the way people learn – especially via a distance. Institutions of higher learning, especially those who provide the opportunity over a distance, are facing serious challenges to employ rapidly emerging technologies. An essential part of understanding the pressure to use technologies is whether technology has come to shape education (technological determinism) or whether education has changed because it has used technology (a form of social determinism).

It may therefore not always be a case of technology serving the needs of pedagogy, but of technology being in the service of itself in order to further the commercial ideals of the originators. In the case of the former it will be serving the needs of learning and in the case of the latter ICTs will remain a blue-sky of wonderful bells and whistles. There has to be a strategy and a way to deal with technology – especially in the challenging contexts of mass distance education institutions where every part of the delivery engine is challenged and resources are stretched to the limit.

Old cultures and new pressures

Bates (1995, 23) and Guglielmo (1998, 36) identify three generations of distance education and technology. First and second-generation distance learning systems, which

were about correspondence (texts) and multimedia (e.g. computer-assisted learning (CAL)) respectively, centred largely around the production of learning material and its delivery to the learning community. Third generation technology would be known for its interactive and communicative approach with the help of ICTs. Guglielmo (1998, 36) classifies online learning as a third generation of distance education when it complies with the above and employs Internet/computer-mediated communication (CMC) technologies. But this generation of delivery has not swept over the distance education landscape the way it was expected.

Bates (1991, 12), writing from the first stages of the new Internet-based ICT revolution, is of the opinion that it would be easier to create new institutions of higher education based on online technologies than to convert old industrial model institutions doing mostly conservative correspondence teaching. Daniel (1996, 25) concurs with this and goes on to say that when new knowledge media are targeted, new institutional types have to be established as part of a comprehensive re-engineering of the provision of learning. For Moyo (2003, 497–498) the concept of virtual education remains largely rhetorical. This is supported by Kirkup and Kirkwood (2005, 185) when they state that ICT has not produced the radical change in learning and teaching that was promised, despite its widespread adoption. The pressure to implement technologies is high but institutions are slow to develop policies regarding proper support for delivery via new ICTs (Schnorr 1999, 115).

The production and delivery cultures of mega universities are unique and they may experience problems when they implement new technologies to improve teaching and learning. According to Kirkup and Kirkwood (2005, 186), these adoption patterns (which vary significantly from institution to institution) are better understood if higher education is seen as being made up of many institutional activity systems. ICT is only one of the tools forming part of the whole and teaching is only one of many activities. The adoption and implementation of ICT may therefore even vary within a single institution – no uniform assessment can be justified in all cases. A gradual and focused approach, based on the needs and gaps as identified in the production and delivery processes, will assist with the implementation of technology in education.

The challenge

The above background has revealed a number of issues that have to be addressed in approaching technologies for mass distance education delivery. Technology can never be implemented for its own sake. It will be in the service of educational philosophy and models. One condition, therefore, demands an understanding of the nature of teaching and learning in a particular delivery context. Another requires that because the production and delivery culture of mega institutions are very particular in that they do not adapt rapidly to new practices and tools, any approach adopted will have to investigate the nature of the production and delivery process, and suggest a strategy that will see the adoption of technology from different stages in the production process.

The challenge in this discussion will be to map the production and delivery process and to list technology options that can be considered in terms of a number of contextual

factors. Process modelling, a step-by-step model of development and delivery with technology will be used? as a macro approach, to describe the production and delivery process in the context of Unisa. It is expected that such a mapping will enhance understanding of both the process and the technologies in order to aid the establishment of a more efficient approach to the implementation of technologies.

TECHNOLOGY AND LEARNING

There can be no fail-safe approach to technology in distance delivery (with the challenge to be affordable and accountable) without a thorough understanding of what exactly it will aim to achieve in the teaching and learning process. If it is accepted that it will serve pedagogical objectives then there must be agreement on what those objectives are. Before those needs and possibilities are elaborated upon the nature of learning needs to be explored.

Learning as a complex process

According to Nunes and Fowell (1996), learning is 'a complex process involving a large range of activities, some active, some passive, some creative, some reactive, some directed, some exploratory'. From a more specific point of view academic learning, which is the business of higher distance education, is a process of construction of knowledge and the development of reflexive awareness, where the individual is an active processor of information. According to Nunes and Fowell (1996), this type of learning occurs through interaction with rich learning environments, and results from engaging in authentic activities, and by social interaction and negotiation. ICTs can be used to develop and mediate such learning experiences via a distance. It will therefore be important to define technology in order to understand how it can address the needs of the learning.

A needs-based definition of technology

Bilton (n.d.) provides a holistic definition of *technology*. It can be defined in terms of objects, knowledge, activities, a process and as a socio-technical system. This implies that technology consists of the physical devices (e.g. machines and tools, etc), the expertise behind technology inventions and what people do (e.g. methods and procedures). People and technology objects are working in combination. But most important of all is the fact that technology begins with a need and ends with a solution (Bilton n.d.). This means that it completes a specific function.

Should first generation distance education be compared with third generation distance education, we see a need for interaction and social construction of knowledge in the learning process. Technologies such as the Internet and WWW have addressed this communication dimension. The roles and actions of distance education teachers changed as a result. Production and delivery processes also had to be adapted in order to bring the learning experience to the learner. It would therefore be hard to convince ourselves that education as such was determined by technology in the past decade – it is

more a case of technology assisting with specific needs. This definition brings us to the adoption of technology according to the needs contained in the production and delivery of learning.

Technology and learning provision

Haddad (2003, 5–6) lists a number of these benefits that technology brings and which all educators and developers of training should be familiar with:

- Materials can be presented in multiple media for multi-channel learning. This assists with different paths of learning for different students.
- Video, sound and multimedia can assist with engagement and enjoyment of the learning experience.
- Students from African culture and traditions often have to cope with foreign concepts before they are adapted for local relevance. Multimedia can bring abstract concepts to life.
- Enquiry and exploration can be enhanced as the classroom is opened up to a wealth of resources elsewhere on communication networks.
- Communication technologies enable groupwork across borders and other boundaries.

ICTs allow access to information sources, and allow for collaboration and discussion towards knowledge construction.

'A mixed package'

The ideal distance education learning experience ('complete package') would therefore contain a mix of media and technologies, and sufficient human interaction as support to students. The product would be the result of a combination of media (e.g. text, sound or video) to convey the content. The content, in turn, would be packaged on the most suitable storage technologies (e.g. guides, tutorial letters, CDs, audio cassettes or video cassettes) to be delivered on a system appropriate for the context (e.g. postal system, WWW, television or radio). This delivery has to be supported by sufficient 'human services' as part of an integrated strategy. But such a 'product' would present any institution with a tremendous challenge regarding the development and production of integrated learning experiences with different technologies and media.

TOWARDS A PROCESS MODEL

Technology is often allowed to infiltrate large organisations 'on its own terms' in the absence of a definitive strategy or process. Under such conditions individuals are allowed, and are often provided with resources, to operate on their own when experimenting with technologies to enhance learning. While such experiments are often done with great success, they are person-specific and tend never to influence learning provision as part of the institutional production process. Production and delivery processes at mass distance education institutions may be resistant to change by their very nature,

which compounds the problem even further. A proper view on the production and delivery process will expose the opportunities for technology integration which, if appreciated, can assist with the infusion of technology in order to assist with teaching and learning objectives. Through a process, perspective technology will directly serve pedagogical needs, while the mere acquisition of the latest electronic gadgetry is avoided.

The need to be dynamic

Mega universities (providing distance education *en masse*) were designed and built around production processes, and have very strong and large industrial production systems. By their very nature they restrict technological innovation and challenging such systems is difficult (Heydenrych 2004a, 5–6). In 1996 the annual purchase of printing paper at the Indira Gandhi Open University (IGNOU) in India was 1 100 tons (Daniel 1996, 40), a significant indication of its print-based correspondence tradition. While there is a desire to use other media as modes of delivery, there are constraints limiting available options. Daniel (1996, 174) reports that the striking feature of IGNOU's planning documents is 'their focus on making the current system work better rather than looking for solutions in new technology'.

Production processes can also be equated with distance delivery, which makes change extremely difficult (Heydenrych 2004a). According to van Aswegen et al. (1995, 10), course design and development at the University of South Africa (Unisa), for example, was traditionally (prior to 1994) the exclusive domain of the academic departments, with the assistance of an editor on completion of the writing process. Materials were fed into a correspondence system, divorcing human input from delivery. To a large extent, learning development and production remain compartmentalised and take place in a linear manner, while sharing of information and co-operation did not stimulate critical thinking towards quality distance education delivery and the innovative use of technology (Heydenrych 2004a). Campion (1995, 193–194) and Raggat (1993, 22) agree that such restrictive Fordist production systems have low levels of product innovation, a rigid development process and low labour responsibility. What is needed to enable innovation with technology and new attitudes with agents is an integrated and involved process where there is high product innovation, a flexible and inclusive development process, and high labour responsibility. The production and delivery process should be open to, and encourage, the integration of appropriate and affordable technology and relevant support practices as needed by the learning experience.

If there is no integrated process (including people and systems at every level of the production and delivery process), and a shared understanding of both the nature of distance education and the value of specific technologies, there cannot be innovation of the kind that serves the best interests of the institution and the learner. In order to affect change in strong production and compartmentalised production environments it is required that at every stage of production and delivery of a course-appropriate technology options must be considered and implemented in an involved fashion. Any process that aims at innovation with technology should involve technologies, people, resources,

users and systems as a strategic commitment. By using such an inclusive and involved process the 'multiplier effect' could be achieved (Dempster nd). Understanding, expertise and participation are grown through small projects (course developments) having the maximum effect and eventually affecting the institutional culture.

Introducing process modelling

Technological progress and other developments in the market place confront education organisations continuously and system turbulence may be experienced as organisations are trying to cope with pressures to change. There is similar turbulence as institutions try to make sense of new technology developments and the pressure to implement them. Organisations, especially large industrial production systems, are complex and dynamic (Kawalek and Kueng nd). They are complex because they are made up of many interrelated parts. These interrelated parts are arranged in a structure and the intricacies of the interrelationships between any combination of parts cannot be understood except by those taking part in them. The Unisa production and delivery system is also a complex system made up of many phases and agents. Its compartmentalised nature makes a shared understanding very difficult. Organisations can be described as dynamic because they change their functions in order to innovate or respond to market conditions with resultant changes in the culture and practices supported by the organisation itself.

When technology innovation is approached from the view of a 'pull effect', it appears as if there is no progress. There may in fact be change and progress but it cannot be assessed from an integrated perspective. There is therefore a need to tie efforts to frame the assimilation of technological change so that specific nodes of integration in the production and delivery process can be enabled towards a higher level of understanding and implementation.

Defining process modelling

Wilson (in Kawalek and Kueng nd) defines a *model* as an explicit interpretation of one's understanding of a situation. It can be expressed in mathematics, symbols or words, but it is essentially a description of entities, processes or attributes and the relationships between them. For Wilson (in Kawalek and Kueng nd) it may be 'prescriptive or illustrative, but above all it must be useful'. For Beer ea (in Kawalek and Keung nd) all models have one characteristic in common – it is the mapping of elements in the system modelled into the model. In the context of computing 'process modelling' has come to be associated with a number of ideas related to dynamic behaviour in organisations, businesses or and systems (Snowdon nd). Such systems are viewed as operating or behaving as a number of interrelated processes. Process modelling does come with a technical background, but it overlaps with ideas and developments related to business process engineering. Businesses are to be understood in terms of key processes and principles in order to maximise the effectiveness of key processes and business itself. According to Curtis et al. (1992), process models may be valuable in the following five areas:

1. Facilitating human understanding and communication

2. Supporting process improvements
3. Supporting process management
4. Automating process guidance
5. Automating execution support.

The most important advantage of process models is highlighted by Kawalek and Kueng (nd) – for them a process model can serve as a facilitator for organisational learning. When one deals with organisational change, especially the implementation of educational technologies, it is inconceivable that real change can happen without the understanding and change generated with people that populate and support the system. In this discussion the authors propose to model the production and delivery process, and integrate technologies and their appropriate use at all stages. This will enhance deeper understanding of the production and delivery process and the use of technologies which in turn can improve delivery (teaching and learning). A deeper understanding of the use of technologies, at all stages will ensure an increase in technology use across the institution rather than separate instances of innovation by individuals. A descriptive model will map the production and delivery process at Unisa and technology options will be integrated.

The model context

Unisa is a dedicated distance education institution serving approximately 215 000 students (about 14 000 from Africa and other continents). It delivers 5 000 different courses through 70 teaching departments and learners can take examinations at 500 centres worldwide. The institution can be regarded as a mega university in terms of student numbers. Production processes at Unisa have evolved into a very strong industrialised delivery culture (mainly print production and mail delivery). Such cultures complicate innovation and the implementation of technologies. Laurillard (1993, 99) mentions a number of issues in a statement that captures the complexity of the decision of whether and how to employ technologies for learning: 'The development of educational media has an odd mix of engines driving it – technological pull, commercial empire building, financial drag, logistical imperatives, pedagogical pleas – and between them they generate a strange assortment of equipment and systems from which the educational technologist must fashion something academically respectable.' The proposed model will have to be viewed against a background of institutional characteristics. These characteristics are influencing the extent to which technology can be applied and they become strategic factors in this regard. Making decisions about a particular media and technology mix to establish distance education delivery or to develop, produce and deliver a course in a particular production context demands the consideration of these strategic factors relevant to the Unisa context. Four categories of factors have been identified in this regard:

1. Costs
2. Access

3. Technical factors
4. Pedagogy.

Production costing

When the technical production capacity and costing are considered, it can be recommended that certain components be outsourced in cases where there is no technical expertise available in-house. However, commercial production houses often lack learning development expertise and the role of the learning development team at the host institution therefore remains crucial in assuring quality. Where the institution is applying economies of scale that can reduce the overall quality of learning, the presentation of the learning experience as such should be reconsidered. It would be advisable to inform prospective students that they are paying more because they are receiving quality.

Desired targets for costing are

- high economies of scale (scalability)
- low unit production costs
- low initial capital investment

Access

The South African socio-economic reality, for example, is such that many current and prospective distance learners do not have access to the Internet. It would be unjust not to consider this fact when courses are developed. The current scenario at Unisa is that online facilities are used to support paper-based delivery, or to enhance specific learning experiences related to online technologies, or to deliver a whole course online (a dual delivery commitment). This scenario accommodates the reality of low access, as well as the needs of specific courses.

Distance learners want to remain mobile when they study. They need a 'portable' learning experience. In some instances it is necessary to use printed matter, which is portable. If part or the whole of a learning experience is delivered online, the developers have to ensure that learners will be able to access materials and communication environments from anywhere in the world, without having to download client software.

Desired targets for access are

- high student affordability
- low student skills needed
- high access.

Technical

Technical considerations are important as the institution has to plan, implement and sustain a number of acceptable technologies in order to optimise the learning experience for the particular context.

Some technical targets are

- high production capacity
- high sustainability
- high package integration
- high delivery speed
- low Internet bandwidth occupation
- high platform independence
- high 'reach/footprint'
- high synergy (compatibility).

Pedagogy

Anthony Bates (1995, 34) raises two crucial issues that have to be addressed when considering technologies for delivery. First, we must ask ourselves what our system of teaching is. The second suggestion that Bates (1995, 35) makes is that the learning development process and delivery systems should allow the most appropriate use of the media and technologies available to an organisation. A course would therefore be based on a mix (blend) of technologies in order to optimise the learning experience.

Face-to-face or live contact sessions (synchronous communication) may restrict learners' ability to control when and where they want to learn (an important benefit of distance learning). Using asynchronous communication (allowing learners to communicate and respond when it suits them) will allow learners to pace their activities and to study at their convenience, within the limits of the delivery schedule. There would probably have to be a mix between the two modes of communication in order to achieve a successful distance education learning experience based on purposeful communication and support. Two-way communication is essential for a quality learning experience and technologies should be assessed with this requirement in mind. Synchronous (live) communication means that learning stakeholders (learners and teachers) have to be connected at the same time (depending on the communication technology used, there may also be a restriction of location). Asynchronous communication allows both parties to connect, communicate and reply whenever they have the opportunity, but within a reasonable time-frame (e.g. asynchronous discussion forums via the Internet). Synchronous communication technologies can often be expensive to maintain, but this is not often true of asynchronous technologies. Video-conferencing (synchronous communication), for example, is expensive and access is limited, while self-pacing is hardly possible. Deciding on the mode of communication (or a mix of the two modes) is important, because the chosen mode may restrict learner access, be costly, or reduce control and self-pacing opportunities. Such decisions affect the whole distance learning delivery process.

Teaching staff need a certain level of technical skill to support a technology-rich learning experience, from which students benefit in the long run. Some technologies by their very nature allow communication and didactical control up to an acceptable standard, while others are not efficient. It is, however, important to put pedagogical considerations first when selecting technologies.

Some pedagogical targets are

- highly asynchronous and synchronous mix
- high student skills benefit
- high didactical control
- high two-way communication
- high collaboration
- high staff access
- low labour investment
- low staff skills needed.

Clarifying media and technologies

Building delivery around the use of one dominant medium may become problematic for the host institution in the long term as it may lead to the establishment of a restrictive production and delivery system. The dominance of texts in the Unisa distance education package has become highly problematic, because it has affected the quality of the learning experience. Some parts of the basic content of a course may not easily be captured with the help of one medium only. It is essential to consider different media as some parts of the content may be conveyed better in one medium and other parts in another medium (e.g. text and video or text and colour images or graphics).

Storage technologies should not be confused with media – a CD cannot express a message, for example. A CD read-only material (ROM) will contain texts, images, sound and video which express the message and the content required in a digital format. Storage technologies have to be mixed where necessary to capture the learning content successfully – for example, one language course may contain texts (e.g. study guides, workbooks, tutorial letters), a number of audio cassettes and a video cassette, or all of these may be captured on a CD, depending on student access. In the case of Unisa, texts are mostly printed on paper (e.g. prescribed books, study guides and tutorial letters), as this does not require access to any additional playback devices which would increase students' expenses. Storage technologies are chosen to store content in ways that suit the levels of access and mobility of the learning stakeholders, including teachers, support staff and learners.

Content and facilitation may have to be provided via different delivery platforms (e.g. radio, instructional television, study guides via the mail system and the WWW). This makes the creation of generic content, to be stored in many formats, a requirement (a central content repository may be needed). Delivering the learning experience involves receiving the total package in a format that the learner can 'browse' and interact with through the most accessible technological means. Delivery does not mean that the learner receives a structured package with information only – the learner also has to be able to communicate with all learning stakeholders as the learning experience unfolds. Delivery technologies often have to be mixed to achieve the best results. Most of the package may, for example, be delivered through the mail system, while the learner may also have the opportunity of attending group sessions in regional centres, to telephone or

e-mail the teacher or take part in group discussions via course support environments on the WWW.

A process model

Looking at delivery as a process with various steps or phases (Heydenrych 2004b), at which technology and competency could be optimised to enhance effectiveness, we can come closer to implementation and evolution of technology in a mass delivery system. The Unisa production and delivery process is mapped as a process consisting of five steps which cover the learning experience from conceptualisation to facilitation:

Step 1: Internal approval and accreditation

During this step the outline for a course, containing a broad curriculum statement, is submitted for approval to internal committees and subsequently to statutory bodies and departments for accreditation.

Step 2: Establishing the teaching and learning approach

At this stage learning developers/instructional designers determine the pedagogical framework and the nature of facilitation to optimise the learning experience. Content, dialogue and interaction are structured accordingly.

Step 3: Determining the media selection

Media specialists and learning developers/instructional designers determine the best mix of media to convey the message to the learner and the enable facilitation from and through the different media. Typical media for the first phase are:

- text
- sound/audio
- video
- animation
- graphics.

Step 4: Selecting storage technologies

Depending on the above institutional factors, content can be provided on different technologies to optimise reach to students and to enable facilitation. The selection is also dependent on the delivery platforms supported in the context (e.g. study guides and CDs cannot be used where the speed and convenience of the WWW is needed, depending on access). Typical storage technologies are

- books/documents (e.g. tutorial letters, study guides, readers, booklets and brochures)
- audio cassettes
- video cassettes
- CDs (video, data and audio)

- DVDs (video, data and audio)
- WWW (Web servers).

Step 5: Selecting delivery mix

The learning experience may be transported by one platform (e.g. mail system as study guides or via the WWW only). There can also be instances of blended learning where the content and resources are provided via different platforms at the same time (e.g. study guides and CDs via the mail and facilitation and support via the WWW). Typical delivery technologies are

- mobile telephony (short message service (SMS)), (MMS) and WWW access)
- radio broadcasting
- instructional television (satellite)
- video conferencing
- telephony (land lines)
- personal contact sessions
- WWW.

Step 6: Producing content

In the final instance, and after proper planning according to institutional factors, production of content and resources can be initiated. Production teams (e.g. authors and/or scriptwriters) and production facilities (e.g. print, video or television production) produce content according to specifications provided as a result of the previous five steps.

Modelling the process in this way will enhance understanding of the distance education production and delivery process. When available technologies are considered at each step, the process becomes alive with options, and people get involved as they consider the strategic factors and select the options. The model aids the understanding of the context, complete process and technologies.

CONCLUSION

There can be no doubt that technology can assist with the delivery of distance education on a grand scale. But cultures of mega institutions are very strong and resistant to change as these institutional types have been created around specific production processes. For Kirkwood and Price (2005, 259) digitisation has indeed been a driver in the transformation of higher education. It has opened up the ‘one-way flow of packaged knowledge’ which was inherent in second-generation distance education. But we have also witnessed many failures which have been swept under the carpet. There appears to be no radical solution or ‘quick fix’ that would enable the blue skies promised by the ICT hype.

A suitable approach will have to follow the production and delivery process, and make use of opportunities to enhance understanding and to integrate technologies at all stages. Process modelling, and mapping the production and delivery process can serve

as a valuable tool towards this objective. Its adoption will open up the process to agents who have otherwise not been able to gather knowledge about the complete process. Understanding distance education production and delivery, and the value of suitable technologies may assist with a gradual but more integrated implementation process. Such an approach will multiply the successful instances of technology application across the delivery landscape.

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