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A CRITICAL EXAMINATION OF THE EFFECTS OF LEARNING MANAGEMENT SYSTEMS ON UNIVERSITY TEACHING AND LEARNING

ABSTRACT. The rapid uptake of campus-wide Learning Management Systems (LMS) is changing the character of the on-campus learning experience. The trend towards LMS as an adjunct to traditional learning modes has been the subject of little research beyond technical analyses of alternative software systems. Drawing on Australian experience, this paper presents a broad, critical examination of the potential impact of these online systems on teaching and learning in universities. It discusses in particular the possible effects of LMS on teaching practices, on student engagement, on the nature of academic work and on the control over academic knowledge.

INTRODUCTION

There is a significant change taking place in higher education that has received surprisingly little analysis. In the last few years, integrated computer systems known as Learning Management Systems (LMS) have rapidly emerged and are having, and will increasingly have, profound effects on university teaching and learning. LMS are enterprise-wide and internet-based systems, such as WebCT and Blackboard, that integrate a wide range of pedagogical and course administration tools. These systems have the capacity to create virtual learning environments for campus-based students, and are even being used to develop fully online virtual universities. They are becoming ubiquitous at universities around the world, adding a virtual dimension to even the most traditional campus-based institutions.

Unlike other financial or human resources management systems recently introduced into universities, online LMS have the potential to affect the core business of teaching and learning in unanticipated ways. Despite this, research into the ramifications of LMS, in particular the pedagogical issues, is still in its infancy. In spite of widespread levels of adoption, and although the systems are essentially devices for teaching, attention has been most often focussed on their

technical, financial and administrative aspects. In this paper, therefore, we explore implications arising from the incorporation of LMS into university teaching and learning programmes. After critically examining the significance of these online learning systems in contemporary higher education, we will discuss four specific academic issues associated with their implementation.

THE RAPID EVOLUTION OF LEARNING MANAGEMENT SYSTEMS

An overview of online Learning Management Systems

While it is not our intention to present a technical analysis of LMS, it is helpful to give some background for those who are less familiar with the systems. LMS grew from a range of multimedia and internet developments in the 1990s. In the last four years, the systems have matured and been adopted by many universities across the world. Also referred to as "learning platforms", "distributed learning systems", "course management systems", "content management systems", "portals", and "instructional management systems", they combine a range of course or subject management and pedagogical tools to provide a means of designing, building and delivering online learning environments. LMS are scalable systems which can be used to support an entire university's teaching and learning programmes. With appropriate elaboration, they can also be used to drive virtual universities.

International standards for LMS are only starting to be developed (ADL SCORM 2003; IMS 2003; OKI 2003), and the various vendor products currently available vary in terms of their conformity with these. While the precise specifications vary from system to system, they typically provide tools for course administration and pedagogical functions of differing sophistication and potential:

- asynchronous and synchronous communication (announcement areas, e-mail, chat, list servers, instant messaging and discussion forums);
- content development and delivery (learning resources, development of learning object repositories and links to internet resources);
- formative and summative assessment (submission, multiple choice testing, collaborative work and feedback); and

- class and user management (registering, enrolling, displaying timetables, managing student activities and electronic office hours).

Within limits, the structures, processes and online appearance of the systems can be customised. The systems can be linked with others within an institution. Different types and levels of support and training are offered with particular systems, and in commercial systems these typically constitute significant parts of a package.

While many of the commercial and technological aspects of online LMS are in the relatively early stages of development, a number of systems have assumed prominence in international markets. Examples of commercial systems include: Topclass/Firstclass (WBT Systems 2003), NextEd (NextEd 2003), WebCT Vista (WebCT 2003), Blackboard (Blackboard 2003) and LearningSpace from Lotus (IBM Lotus 2003). Most LMS were commercialised after originally being university development projects, rather than as direct results of business development activities. In recent years, several major USA universities have chosen to release their LMS under open source rather than commercial licenses. The most prominent open source systems have been gathered together in the Sakai Project (Sakai Project, 2004), and include CHEF (University of Michigan 2003), Stellar (MIT 2003) and Coursework (Stanford University 2003). These have grown in collaboration with a standards development programme called the Open Knowledge Initiative (OKI) (OKI 2003). The Open Knowledge Initiative has drawn much interest due to its potential to forge genuine industry-wide standards for the first time.

Global and Australian trends in Learning Management System adoption

The adoption of LMS across the world has been swift. A briefing in the *Observatory on Borderless Higher Education* (OBHE 2002) provides an overview of the spread of the WebCT and Blackboard LMS. In around five years, these two products have grown from inhouse developments in North American universities to dominate international markets. In Australia, the United Kingdom and Canada, over 70% of institutions hold licenses for at least one of these products. In South Africa, Finland, the Netherlands and the USA, between 55% and 62% of institutions use WebCT or Blackboard. The figures in the briefing demonstrate the seriousness with which universities around the world are treating the need to deploy LMS. Indeed, in a recent

discussion of distance education, Oblinger and Kidwell (2000) comment on the almost herd-like mentality underpinning the attraction of universities to online teaching.

There has been a remarkable level of adoption of LMS at Australian universities. A survey of adoption trends was conducted in 2002 (Smissen & Sims 2002). Despite the new and relatively unstable nature of the market, the WebCT and Blackboard brands have a clear market dominance, and are being used at three quarters of Australia's 39 universities. Results from the same evaluation indicate no obvious patterns of brand selection in terms of university characteristics such as size, type, history or discipline focus. While such trends may reflect the developing global LMS market and the relatively small size of the Australian market, they are somewhat surprising in a sector which claims to strive for diversity and innovation.

Being relatively new technologies, there have been no large scale studies of the actual uses and pedagogical effects of LMS. In a recent study of online education, however, Bell, Bush, Nicholson, O'Brien and Tran (2002) found widespread incorporation of online technologies into programmes at Australian universities. Although penetration is greatest in the areas of commerce, education and health, where there is often strong demand for mixed-mode or off-campus delivery, the study found that around 60% of Australian postgraduate subjects and around 25% of undergraduate subjects are using some form of online technology. Overall it was found that around 54% of subjects contain an online component. The report concluded that "even though the percentage of fully online courses and units is low, the percentage of web supplemented and web dependent units seems to be a clear statement that many institutions are using online technology to add value to teaching and learning" (Bell et al. 2002: 27).

It seems likely that the use of LMS will increase. These systems are simplifying the development of basic online materials and making possible the creation of virtual content by an increasing number of academic staff. Within limits imposed by particular systems, staff are able to develop interactive web pages, upload and integrate digital resources, and develop assessment tasks and spaces for online discussion. Templates are often provided to guide and standardise such activities, and to help reduce workload demands placed on individual staff. Universities are encouraging or requiring each subject to have some kind of web presence, and some have policies and incentives to stimulate content development activities. Enterprise-wide LMS are

providing a context and impetus for the development of highly structured "single-entry-point" online teaching and learning.

THE DRIVERS BEHIND LEARNING MANAGEMENT SYSTEM ADOPTION

Universities have been quick to adopt LMS, despite the costs, complexities, and risks involved. From a university planning point of view, the initial selection of an enterprise-wide LMS is a high stakes and high risk decision which involves a great deal of technological and institutional forecasting. It can involve dealing with intertwined educational, administrative and technological issues, the interests of a large and diverse range of stakeholders, and considering new dimensions of established institutional policies and procedures. The management and use of LMS can require developing new forms and lines of accountability and control, and considering dimensions of the interface between the academic and the administrative.

Clearly, there is something so seductive about LMS that, despite their complexities and risks, almost every university seems compelled to have one. Access, cost and quality are three commonly given reasons for the contemporary importance of information technology to higher education and the paradigm shift in delivery modes that is underway (Daniel 2003). It is possible to isolate far more specific drivers, however, which have enhanced the attractiveness of the systems to universities and driven their rapid uptake.

First, LMS suggest a means of increasing the efficiency of teaching. They offer institutions a means for delivering large-scale resource based learning programmes. They help to facilitate flexible course delivery, the identification and use of resources, communication and conferencing, activities and assessments, collaborative work, and student management and support (Ryan, Scott, Freeman & Patel 2000). More general claims are often made that LMS will bring new efficiencies to teaching. Despite the large upfront capital investments required, universities are attracted by opportunities to reduce course management overheads, reduce physical space demands, enhance knowledge management, unify fragmented information technology initiatives within institutions, expedite information access, set auditable standards for course design and delivery and improve quality assurance procedures (Bates 1995; Brown 2001; Dutton & Loader

2002; Johnstone 1995; Katz 2003; King 2001; McCann Christmass, Nicholson & Stuparich 1998; Turoff 1997; van Dusen 1997). It is also often argued that LMS will offer universities new economies of scale, although it is still too early to confirm such claims.

Second, the attractiveness of LMS is associated with the promise of enriched student learning. These systems, and online learning in general, are seen to reinforce and enhance a diverse suite of constructivist pedagogics (Gillani 2000; Jonassen 1995; Jonassen & Land 2000; Relan & Gillani 1996). Constructivist theorists contend, for instance, that online modes can enrich learning by allowing students to access a greater range of resources and materials. It is further argued that internet technologies can be used to make course contents more cognitively accessible to individual learners by allowing them to interact with diverse, dynamic, associative and ready-to-hand knowledge networks. LMS may also enrich learning by providing automated and adaptive formative assessment which can be individually initiated and administered.

Third, universities are also driven by new student expectations. It is possible that student expectations for advanced technologies are increasing almost as quickly as the technologies are developing. Green and Gilbert (1995: 12) write that "growing numbers of college-bound students come to campus with computer skills and technology expectations". Frand (2000) further argues that contemporary students have an "information-age mindset", and that these skills and expectations are tacit and profound. In the increasingly competitive higher education marketplace in which students are increasingly perceived as some type of client (Gilbert, 2001), these expectations need to be matched or exceeded. It is increasingly expected that institutions embrace leading-edge technologies. Green and Gilbert (1995: 12) write that "The old competitive reference points describing information resources that used to distinguish between institutions – the numbers of science labs and library books – are being replaced by a new one: information resources and tools available to students".

This brings us to the fourth point. Put simply, competitive pressure between institutions has been a driver behind the adoption of LMS, at least in Australia. Predictably, traditionally distance-learning orientated institutions have embraced new generation technologies and opportunities to reconfigure and expand their programmes (Garrison & Anderson 2003). But more traditionally campus-based teaching institutions have also seen the adoption of new technologies as

necessary for developing the campus environment. The University of Melbourne Strategic Plan, for instance, asserts that "despite the magic of the campus... for the campus-based university to survive, the campus experience will have to capture all the pedagogical richness of the new teaching and learning technologies and modalities" (University of Melbourne 2001). Almost regardless of their history or strategic direction, institutions have seen LMS as a means of leveraging the internet to offer some kind of competitive advantage. Universities are being forced to offer the best of both worlds, real and virtual.

Fifth, LMS are sometimes proposed as a key means of responding to massive and increasing demands for greater access to higher education, though we are doubtful about the extent to which this is a serious influence at the institutional level. The development of virtual places for learning has been regularly heralded as a key means of overcoming access limitations caused by the lack of physical infrastructure. Perhaps more significantly, however, LMS have also been identified as a means of qualitatively reforming higher education so that it can most effectively confront new types of demand. Analysts contend that without substantial change, traditionally structured universities will be unable to deal with a new era in which they no longer monopolise the provision and certification of tertiary education (Daniel 1998; Dearing 1997; Gilbert 2001; Hanna 1998; Johnstone 1995; Moe 2002). Contemporary learning technologies, and LMS in particular, are placed at the heart of these calls for renewal.

Finally, and not least, LMS are part of an important culture shift taking place in teaching and learning in higher education. LMS offer universities a hitherto undreamt-of capacity to control and regulate teaching. From a managerial perspective, the disorder associated with academic independence and autonomy in the teaching and learning process can appear chaotic and anarchic. The management and leadership of academic communities requires, correspondingly, a high tolerance of uncertainty, but such tolerance is in increasingly short supply in an era of attention to quality assurance and control. LMS may appear to offer a means of regulating and packaging pedagogical activities by offering templates that assure order and neatness, and facilitate the control of quality. The perceived order created in teaching and learning by LMS is, we suspect, one of the more persuasive reasons for their rapid uptake.

THE EDUCATIONAL ISSUES

There is limited educational research into the pedagogical impact of LMS. In efforts to identify salient topics for research, there has been an explosion of small-scale, localised and descriptive case studies looking at the effects of information and communication technologies in teaching and learning (Kezar 2000; Merisotis & Phipps 1999). These studies typically focus on the use of specific technologies in particular classes or subjects (Flowers Pascarella & Pierson 2000; Kuh & Hu 2001; Kuh & Vesper 2001). With technological and economic factors often the primary drivers behind the adoption of the technologies, researchers have frequently produced *post hoc* observations and explanations of their pedagogical qualities. Despite considerable practical impact and much exploratory attention in the research literature, therefore, researchers are only just beginning to identify the underpinning practical and theoretical issues. With this context in mind, we will examine four general issues related to Learning Management Systems.

The influence of Learning Management Systems on teaching and learning

Analyses of LMS in undergraduate programmes often devote attention to economic and technical issues. Such research tends to reduce the analysis of LMS to an examination of the deficits they eliminate in current pedagogical practices, or to the institutional efficiencies they claim to offer. LMS are primarily tools for teaching and learning, however, and it is essential that discussions about LMS are informed by pedagogical considerations.

On paper, LMS are described as supporting an extensive range of teaching and learning activities. It appears that features which enable access to learning resources, communication between staff and students, conferencing, interactive multimedia, personal bookmarking and note taking can well support the discursive interactions underpinning individual students' learning (Britain & Liber 1999; Laurillard 2002). A recurrent message arising from the study of educational technologies, however, is that it is not the provision of features but their uptake and use that really determines their educational value.

It seems that, to this point, LMS have been largely based on training-type models, even though many have emerged from universities. Used in their most utilitarian form, it could be argued that

LMS are based on an overly simplistic understanding of the relationship between teachers, knowledge and student learning. In-built functions may not encourage awareness of or experimentation with sophisticated pedagogical practices. Indeed, the textual nature of the internet may reinforce conceptions of teaching as the transmission of decontextualised and discrete pieces of information. It has been argued that the flexibility and nuance essential to effective teaching can be compromised once pedagogy is coded and compiled into software (Lessig 1999). At the extreme, under the label of self-paced learning, LMS might even be encouraging a movement towards preprogrammed forms of teaching.

One of the most obvious limitations of LMS is their reliance on forms of assessment which can be automatically "corrected", such as multiple choice and short response tests. While there is obviously a place for multiple choice tests, and they can be designed to test reasonably complex understandings, it would be a matter of grave concern if this form of testing and feedback became dominant in higher education. It reinforces positivist epistemological assumptions about the convergent nature of knowledge (Kolb 1984) which run counter to the approaches to knowledge adopted in many academic disciplines. The danger is that, if this is the most prominent aspect of the assessment function in LMS, it will drive pedagogy towards a simplistic, mechanical form of the vitally important assessment and feedback loop.

LMS are not pedagogically neutral technologies, but rather, through their very design, they influence and guide teaching. As the systems become more incorporated into everyday academic practices, they will work to shape and even define teachers' imaginations, expectations and behaviours. This may be particularly the case for academics with only a few years experience. The age of such teachers may mean that they are more likely to have an "information-age mindset" (Frand 2000) and consider online learning as a normal and necessary rather than optional part of teaching. Regardless of their personal characteristics, however, the incorporation of LMS into universities makes it likely that such academics will gain most of their experience in teaching contexts saturated by such systems. These are important considerations given the possibility that, increasingly, LMS will play a major role in how academics learn to teach.

At present, there have been few if any generalisable studies on the pedagogical effects of LMS. While it is ideal if not essential that LMS encourage effective pedagogical practices beyond the mere

transmission of text, this may indeed be the dominant current use of online learning resources. Our concern is whether it is possible for LMS to stay simple enough to be a component of everyday teaching, while at the same time supporting sophisticated and diverse educational practices. Given the commitment made by the higher education community to LMS, this is an important question.

The uncertain effects of Learning Management Systems on students' engagement

If LMS are having widespread effects on the structure of university teaching, they are obviously affecting student study habits and learning. Investigating this point involves analysing the general dynamics of students' engagement or interaction with their institutions. Student engagement refers to the intellectual, emotional and practical interactions students have with educationally purposeful activities and conditions (Kuh 2001; McInnis 2002). Despite growing recognition of the importance of student engagement, little research has been done into how the adoption of LMS as a vehicle for independent resource-based learning is creating new patterns of engagement.

One dimension of engagement is the broad out-of-class interactions students have with their universities. There is a plethora of unanswered questions: Are LMS affecting how students' understand their higher education community and their self-identification within those communities? By packaging universities into an online environment, do LMS make it easier for students to identify and explore institutional resources and services? How do LMS influence students' feelings of inclusion in broader academic communities? What are their perceptions of LMS-mediated interactions with staff and other students?

A further dimension of engagement concerns students' interactions with the online learning systems themselves. There is not yet a general understanding of students' use of or attitudes towards the systems. Indeed, most of the discussion about LMS seems to occur without consideration of their effects on students. It is likely that students see the systems as a general part of university infrastructure rather than as special tools which add value to their learning. On a practical level, it will be important to develop an understanding of how LMS influence the practical dynamics of students' learning.

As LMS become more established in teaching programmes, it will be essential to examine their effects on students' engagement with

fundamental learning activities. On a cognitive level, there is interest in how LMS affect the way students explore and contextualise learning resources, summarise, synthesise and make judgements about their knowledge, confront complexity and work through confusion, and get summative and formative feedback. LMS may influence students' confidence with and motivation for learning, or their understanding of the significance of what they have learned. Practically, they may mediate the academic conversations students conduct with their peers and with staff, the management of their learning, how they document, distribute and apply their knowledge, or the time they spend really trying to understand a topic.

Undoubtedly, It will be valuable for research to explore the new patterns and processes of engagement of campus-based undergraduate students who are extensive users of online LMS. In addition to the ramifications for academic and administrative staff and pedagogy, it can be anticipated that LMS are having significant effects on student learning. Do students use LMS to negotiate more nuanced forms of involvement with their university study, or are LMS enabling students to develop more virtual forms of presence in and interaction with their university learning communities? Alternatively, do they encourage increasingly independent and perhaps isolated forms of study?

The new dynamics in academic work and the organisation of teaching

University teaching has traditionally been the primary responsibility of academics, often working quite independently. While varying greatly with discipline, student characteristics and institutional contexts, effective teaching and learning is an essentially adaptive process involving ongoing interaction between students and staff. Traditionally, it has been the teacher's role to "make student learning happen" (Ramsden 1992), and untangle and draw together the differentiated understandings students bring to a course (Laurillard 2002). Reducing this discrepancy, which Moore (1993) refers to as "transactional distance", involves teachers developing structure and content for their course, and then seeding and managing the pedagogical conversations and feedback dynamics instrumental for learning.

As may be expected of systems designed as comprehensive university teaching and learning machines, LMS bring new structures and practices to teaching. While many of these structures augment

and integrate conventional pedagogics, others add new dimensions and expectations to teaching. Regardless of personal experience and institutional context, teachers need to become adept at new forms of communication and online dynamics, familiar with new delivery methods, even perhaps assume new virtual identities and develop sensitivity to the rhythms of just-in-time learning. Such changes might require substantial restructuring of established routines and procedures.

The introduction of new technologies into the university teaching programmes has a tendency to create new relationships between academic and administrative staff. One important change is a convergence of the academic and administrative responsibilities for teaching. The incorporation of LMS into university teaching programmes leads to new kinds of organisation in the development of learning resources and the management of learning. As well as playing a support role, technical and administrative staff are often much more directly involved in the development of teaching and learning activities. While "academic-free" teaching may seem only a very distant prospect, major online delivery ventures already have business plans based on the employment of limited numbers of academic staff who create content with the support of larger numbers of less expensive student support staff.

LMS are creating new and complex divisions of labour between administrators and teachers which are in need of exploration. The preparation of sophisticated online learning materials frequently involves collaborations between academic and instructional staff. Where once academics worked independently to develop lecture notes, course materials and assessment tasks, producing artefacts for online learning can involve ongoing work in teams of multimedia and software developers.

Organisational changes linked with LMS resonate with a managerial desire for total quality teaching. Along with the synergies that new forms of collaboration might bring to the preparation and conduct of teaching, come new forms of control and accountability. The more engineered materials produced by such collaborative teams reflect increased technological and administrative input over teaching content and practices. Further, unlike less formalised traditional materials, the sophisticated results of such collaborations are also more open to various forms of monitoring, inspection and control.

Institutional research needs to explore these emerging forms of administration. What are the pedagogical effects, for instance, of the

more explicit and less nuanced forms of relationship between students and staff? To what extent are academic staff being constrained in the teaching process? What are the implications of ''academic-free'' teaching on campus-based universities? What are the consequences of students increasingly seeking learning assistance from technology support staff rather than from teachers?

The possible corporatisation of academic knowledge

LMS impose particular structures on the development of online resources, opening up certain possibilities while constraining others. As the systems develop, staff are offered an increasing range of features they can use to build and deliver their courses. It is important to question, however, whether such offerings are an encouragement or limitation to the diversity and distinctiveness of discipline focuses and teaching approaches found across an institution. In incorporating online learning systems into university teaching programmes, it is important to consider whether commercially available systems are adaptable to the needs of diverse academic cultures and communities. It would be a retrograde rather than progressive step if the adoption of an online learning system resulted in the overly systematised compression of different disciplines and styles of learning.

Restrictions on the migration of content appear to be a major issue with LMS. Technical and financial factors can make it difficult for institutions to migrate between different systems. Although vendor products are starting to incorporate tools which allow standards-based distribution of content between systems, the standards themselves are only being defined, and effective and transparent tools are still some time away. However, the key questions in this area are not about delays in the development of software, but about the overall control institutions have over content. Without ultimate control over the source code that runs the programme, pedagogical content may no longer be in the hands of individual teachers, or universities, but transnational corporations.

The commercialisation of content appears to be a goal of LMS vendors. By establishing web-based delivery mechanisms, such companies have developed the foundations for selling online content. Many systems are owned by large publishing houses which are understandably interested in the development and distribution of copyrighted material. Gaining access to large libraries of online learning objects can be a major reason for selecting a particular

system. With the development of portable learning objects still some distance in the future, however, commitment to one system can mean exclusion from others. Whether it is at all possible, let alone desirable, to standardise content across institutions, nations or cultures is a matter which institutions will need to consider carefully.

Balancing such trends towards the possible commercialisation of academic knowledge is the development of a number of open source LMS. Unlike commercial systems, open source programmes are distributed with the source code used to run a programme, making it possible for users to adapt and develop the software. Open source software is produced in collaborative international developer networks which operate in parallel and are open to peer validation and review. By adopting open source LMS, institutions can join together to form their own developer communities. Rather than giving control of pedagogical content over to third party commercial organisations, therefore, universities retain the ability to shape the contents and operations of their online learning systems.

Through making the internet a more seductive and accessible tool for teaching, LMS may also be homogenising the creation, style and ownership of pedagogical knowledge. Educational research might investigate how the parsimonies offered by LMS balance with a possible standardisation and "shrink-wrapping" of knowledge. Having been drawn into a "unified national system" in the late 1980s (DEET 1988), are three quarters of Australia's universities now slipping into a unified pedagogical system? What are the possible effects of the commercialisation of academic content on university teaching? What are the consequences of such an intimate alignment of pedagogy with technology? How tolerable, or indeed attractive, are the risks, uncertainties and possibilities of open source LMS compared with a possible future of franchise universities?

DEVELOPING ONLINE LEARNING MANAGEMENT SYSTEMS IN HIGHER EDUCATION

The future of LMS in higher education needs to be the subject of vigorous and broad educationally focused discussion and debate. These online systems have tended to attract the attention of technicians, administrators and a typically small number of academic staff with a direct interest in online learning. Given the likely effects of the systems, however, it is essential that discussions about online learning

systems involve a wide range of people and perspectives. Decisions about university teaching and learning should not be restricted to checklist evaluations of technical and organisational factors. It is vital to maintain the educational perspective rather than emphasise any technological determinism which takes specific characteristics of online systems or teaching for granted. In particular, discussions about the adoption, implementation, use and review of LMS should involve ongoing iterative dialogue with the large and diverse group of academic stakeholders who are, and will increasingly be, affected by the systems.

Institutional managers and leaders need to play key roles in such discussions. Institutional leadership needs to ensure that staff are educated in online pedagogy, and that they are exposed to more general debates and questions surrounding online LMS. At the same time, institutional leaders need to develop support for the staff who use LMS by, for example, developing best practice models and setting up fora in which staff can share ideas and discuss their experience with the systems. It is important that steps are taken to identify how online LMS can be used to augment and complement rather than substitute for an institution's core teaching objectives.

The adoption and deployment of a LMS underlines the importance of a cluster of high-level reviews and investigations. It is important, for example, that leadership initiates and endorses ongoing evaluation of the educational and organisational effects of online learning systems. It is also important, as discussed, that institutions adapt their quality feedback mechanisms or undertake specific reviews to investigate the influence of online learning systems on students' learning and general engagement. There may be a further need to explore and develop strategies to manage new patterns and dynamics of academic work, and to conduct curricula reviews which consider educational as well as operational risks and opportunities arising from the increasing commercialisation of academic content.

It is important that institutions adopt and deploy LMS in ways which are open, inclusive and educationally informed. Institutional managers and leaders can play a key role in setting the parameters and tone for the complex adoption processes. Indeed, leadership can play a formative role in promoting the institutional research and reflective practice required to develop understanding of the educational role of LMS in institutions, and in higher education in general.

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