Digital Universities for Vietnam: Government Strategy, Institutional Autonomy and Departmental Implementation

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ABSTRACT:

This paper considers ongoing research concerning the development of strategies, techniques, and tools for implementing institutional learning technology developments. A process is presented that can be scaled up and adopted by other institutions, locally and nationally. The paper also explores the challenges for leadership and management in developing systems and solutions to the problem of forging closer university-industry partnerships in the area of industry related graduate learning outcomes. The first section presents and comments on recent research on the implementation of learning analytics and learning science strategies within the university. Methodologies to enable the integration of both approaches at the module level are presented. Techniques for changing students' conceptions of learning in a practical and implementable way are discussed. While the contrasting natures of learning analytics and learning science approaches can lead to different impacts on learning behaviour, a strategy for integrating the two approaches is outlined. The goal of enabling the approach to be successfully taken up at a wider level is then discussed. A model and methodology are presented which can be scaled up and adopted by other institutions nationally. The use of learning analytics enabled learning management systems (LMS) like Canvas, Blackboard, Moodle and Google Classroom is crucial to the success of this approach. By using these technologies to implement this strategy, institutional resource efficiency can be increased, and student learning outcomes improved. The integrated use of these systems in this way is not yet widespread in Vietnam or several of its neighbours. However, the framework presented provides concrete suggestions of how this goal can be achieved, especially with the support of institutional and regulatory bodies.

Keywords: digital university, learning management systems, learning analytics, learning science

1 Introduction

With the global pandemic dominating economic and social life worldwide over much of the past two years, there is a requirement to have clear strategies for the future and the post pandemic environment. The ASEAN Digital Masterplan 2025 (ADM 2025), published by the ASEAN Secretariat (2021) is probably the most ambitious document in terms of laying out the future strategy for all sectors of the countries within ASEAN. This includes education with its close links to the development, transformation and regeneration of employment.

The central theme of this paper is that the strategically planned integrated use of three routinely available elements – Learning Management Systems (LMS), Learning Analytics (LA) and Learning Science (LS) – can provide a low cost and effective set of tools and techniques for helping the digital transformation of higher education in several SEAMEO countries.

The ADM 2025 (launched in Kuala Lumpur, Malaysia in January 2021) outlines high level national and international strategies for ASEAN and conceives of "*ASEAN as a leading digital community and economic bloc, powered by secure and transformative digital services, technologies and ecosystems.*" It also recognizes the need for governments and other key stakeholders to "*work together in complementary ways*."

For those stakeholders considering the impact of digital transformations at the institutional (university) level, a key component going forward is the need to identify strategies, techniques, and tools for implementing new learning technologies and other developments within and across our universities.

The World Economic Forum's Digital ASEAN initiative (WEF, 2021) also recognized the importance of the Southeast Asian economic bloc and introduces its widescale and ambitious consultation plan by identifying four main sectors for action, one of which - "*building a shared commitment to train digital skills for the ASEAN workforce*" – will require the sustained involvement of the region's universities and recognizes their key role. However. WEF's Digital ASEAN website (WEF, 2021) also points out that "*these ambitious goals will demand detailed research, visionary policy-making, and substantial buy-in from regional stakeholders*."

The ADM 2025 can be seen as a key document that provides the higher-level elements - vision, mission, objectives, strategies, and even pointers for an outline of action plans – of the strategic planning process. For those of us in the education sector, taking ADM 2025 actions plans and fashioning our own transition to an organisational form of a digital university presents many challenges. Each university will have its own vision and mission, linked to the government's strategic plan, and will also need to take into consideration how to align each set of elements (ASEAN, national government, institutional) to be part of a coherent process of sector and organisational digitization.

There is general agreement (Kansas University, 2021; GIBS, 2020) that the sequence and alignment from the initial vision to the implementation level action plan can be represented by the acronym VMOSA (Vision, Mission, Objectives, Strategy and Action Plan). The vision and mission need to be communicated, aligned and adopted at the national and regional levels and adapted at the organisational level. The vision provides us with an overview of where we are going as defined by our preferred goals. The mission provides a perhaps more detailed picture of that vision and what we are prepared to do to achieve it. Our objectives provide much clearer end products while the strategy provides the blueprint and procedures driving the mission and enabling the vision to be achieved with the best use of the available resources. The action plan then provides much greater details of how the VMOS framework will be implemented.

As stated above, because of the many different high-level local variables involved, each country will need to develop its own detailed action plan. These, in turn, will differ between sectors (public and private) and the institutional focus of each university (e.g., technology, arts, social science). This will require strategic alignment with the recognition that the action plans will have different implementations due to the local conditions pertaining to each individual institution.

2 Digital Universities and the transformation of higher education

One ambitious goal that will require much planning and careful implementation is encapsulated by the much-used term "Digital University." What does this term mean when applied to the complex interactions that comprise the delivery of higher education in the current decade? What are its implications for those of us involved in higher education in Vietnam and neighbouring countries, and indeed, the government, industry, and business and other stakeholders in society? The ADM 2025 Desired Outcome 7 (DO7) is defined as providing "*Digital skills for the digital workplace*" – an ambitious outcome that points to the major challenges facing universities and other educational and training organisations in the next five years and beyond.

The task of achieving DO7 and providing digital skills for the digital workplace will require us to have universities, colleges and training organisations that provide a digital environment for the teaching, learning and training activities being developed. Universities will need to design and develop effective systems to ensure that the aim of educating and training a digitally enabled workforce can be achieved.

The methodologies and techniques of process modelling help us to visualise the existing or desired processes in a system and are powerful tools in helping us to understand what is happening at any stage of the overall system (or sub-system). This includes how each process interacts with other processes and levels of procedure. One of the central aims of using this technique is to identify the information needs and flows within the organisation. The representation of a business process model of a typical university shown in Figure 1 helps us to recognize the complexity of the change management process at the institutional level.

Four hierarchical levels of the university business process model

Learning and teaching process	Research process
Study programme accreditation	Research planning
Teaching process preparation and realisation	Research preparation
Teaching process outcomes monitoring	Research conduct
Teaching process assessment	Research outcomes monitoring
Student and teacher mobility realisation	Research evaluation
Enabling processes	**Planning and governance processes**
Student administration services	Organization management services
Library services	Change and business process management
Staff provision and development services	Plan development
Finance and accounting services	Budget and funds planning
Marketing, sale and distribution services	Performance assessment
Procurement services	

Figure 1 Digital Transformation Business Process Model (Hakan-Kuzu, 2020)

While the model provides a representation of the main processes involved, actually implementing the activities in each sub-section at any national or even institutional level can be a complex process. Another model (Figure 2, Nichols, 2020) provides a clear and simple diagram which represents a nested set of the complex entities and activities that are part of the transformation. It is indeed a "High-Level University Capability Map" showing the stakeholders and digital services supporting the student journey.

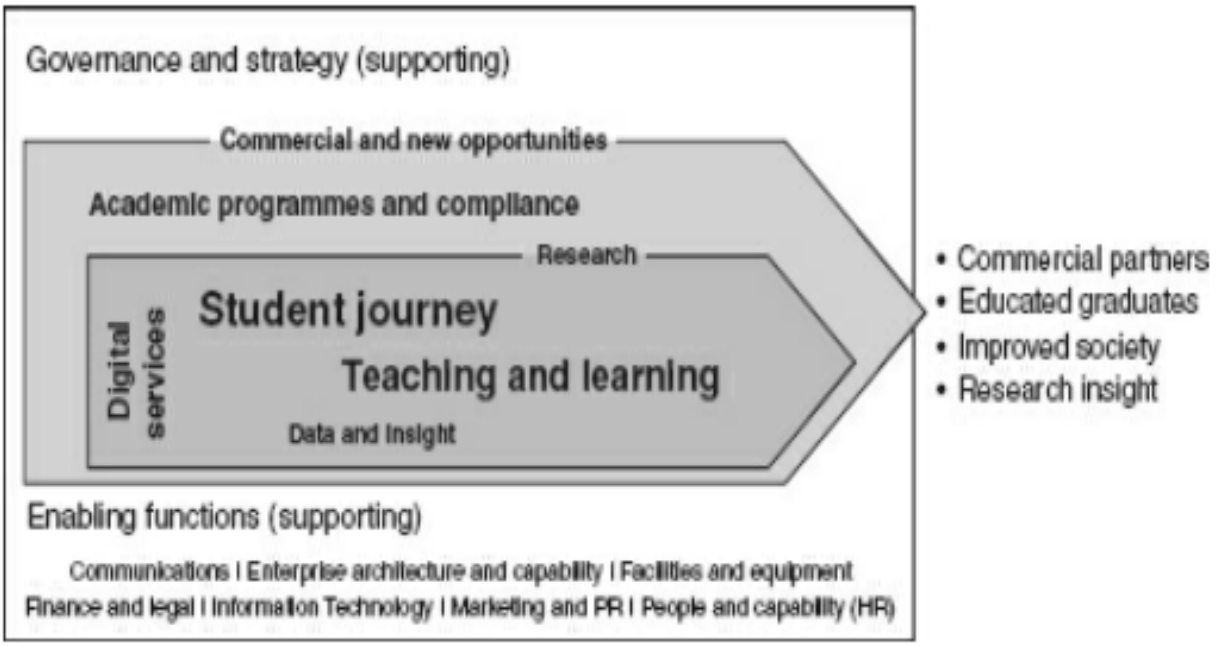

Figure 2 High-Level University Capability Map of the Student Journey. (Nichols, 2020, p. 146).

The author of Transforming Universities with Digital Distance Education: The Future of Formal Learning, Mark Nichols, has extensive experience and expertise at both a teaching and managerial level, especially with the UK's Open University. This institution has been a world leader in promoting innovative learning support systems and providing best case examples of using technologies to enable them. Nichols' model comes from his student-centred systems approach which allows multiple perspectives to be considered and effective solutions to be suggested.

2.1 Global or local?

In a recent paper discussing changes in global education and the need for local strategies, Dr. Christina Zhang, commented:

> *"The motto of the United Nations is, 'Think globally, act locally.' In a globalized economy, every student should be educated* ***as an international student, a global citizen with the aspiration to compete globally*** *(author emphasis)."* (Zhang 2021).

This will be much more difficult for some countries and institutions because of different visions and different levels of finance, support and development. As the term Glocal suggests, the strategic masterplans will require different local adaptations given the varying mix of economic, social and developmental factors within and across ASEAN. The pedagogical aspects of this transformation are potentially very complex as well. Although central and crucial, they are but one of the large number of factors involved (Friedman et al., 2015).

In May 2021, Times Higher Education magazine ran an online conference/promotional event entitled "*THE Digital Universities Week: Transforming teaching, learning, and the campus experience*" (THE 2021). Three major themes were: The Student Journey; Teaching and Learning; and Planning for the Future.

Although most of the participants of THE Digital Universities Week were representatives from large and small learning and technological companies (plus some major universities), these themes could provide a useful framework for considering digital universities from the learning and teaching perspective. While that conference was perhaps more Eurocentric, the topic and those themes are of interest to all stakeholders in higher education.

We can see that some ASEAN countries have designated digital universities. For example, Malaysia has AeU (Asia e-University) which is described as *"Malaysia's Digital Global University: AeU is one of a new breed of global digital universities – agile, entrepreneurial and ubiquitous"* (AeU, 2021).

2.2 The Digital University - an alternative view

This contrasts somewhat with Richard Harvey's informed and clear-sighted, if slightly sceptical, commentary (Harvey, 2020) entitled "*The Digital University and Other Mythical Creatures*", in which this very experienced professor of artificial intelligence and information systems argues that many universities already have the ability and basic technological systems to operate as digital universities. Central to this are the processes developed by the Open Universities of many countries (including the Hanoi Open University and the Ho Chi Minh City Open University in Vietnam) over the past several decades and their current delivery using a team of development and learning support actors with Learning Management Systems as the delivery vehicle. The mythology is not in the idea of the digital university, but in the sales pitch of the technology companies with which they persist in trying to persuade universities that the digital university remains out of reach unless their products are purchased on a regular basis.

The theme is expanded on in more detail by the author of Figure 2 (above), who, as stated, has spent more than two decades on both sides of the teaching/management fence in the UK Open University and its New Zealand equivalent (Nichols, 2020). Both institutions have been leaders in providing alternative and digital forms of student learning for many years now. As Nichols points out, if we reflect on the educational sector's experiences with distance, online and blended learning over the past half century, then the processes and technologies already exist to enable higher education institutions to function as digital universities.

During an interview just prior to the publication of his recent book, Nichols commented that: *"If the students of any university are going to seriously benefit from the accessibility, scalability and personalised potential of online education, ways of working and processes need to be redesigned."*

2.2.1. Human Resources Management: The key factor for digital transformation.

Redesigning ways of working for personnel and the processes involved in any organisational transition is often the area where most problems occur. This is the same for the transition to digital universities even though the problems faced will vary enormously even within ASEAN due to the resources and experience available to institutions in different member countries. The Rector of Van Lang University, Professor Tran Thi My Dieu, identified the area causing the greatest problems in managing organisational change when she stated (Ngan, 2021):

> "*Human resources are the key factor for digital transformation. Making investment in human resources means providing an environment for lecturers to prepare lesson plans*

online but also helping them upgrade their teaching methods and improve their capability."

While this is undoubtedly true for lecturers, there are many other personnel and roles involved in supporting the student journey. Human resource issues are widespread and require a major rethink by all the stakeholder groups involved. This paper remains focused on the centrality of teaching and learning to the student experience but recognises that many other university departments and services support the delivery of a positive student experience. Both social and technological changes need to be suitably harnessed to provide digitally supported effective and personalised learning for our students.

Technological developments will clearly drive much of the change and the commercial sector as a key stakeholder is central to these developments. More importantly, at the institutional level much of this is about leadership and the management of change. It is about the need to produce coherent strategies that will allow for the phased introduction of new technologies, and more importantly, the process of underpinning the transformation of the learning and working practises of all key stakeholders in this transformation process - management, students, learning support, administrative and academic staff (Andre, 2013). This part of the change process has a greater impact than that of the technology companies in terms of educational outcomes for the institutions, the sector, and national and regional economies. Experience in the implementation of new technologies and information systems in any sector informs us of the difficulties and costs of focusing too much on the technology and too little on human resource management.

3 Change management, human resource management and systems failures

Managing and changing the working practices of the large complex organisations that are modern universities requires a lot of planning, good leadership, and the informed involvement of all stakeholders. While the management planning may take place, it is often not successful in terms of involving all stakeholder groups (Swords, 2020).

This is frequently the result of an utter belief in the technology to solve any problems without recognising that the human factors are generally much more important. Well developed technology will function correctly. The technology companies have spent much time and effort in the research and development of excellent products. The universities and other organisations purchase these system and products with the expectation of a high level of performance. So in the right setting with the right support and suitable processes in place, the technology will function correctly. However, as Tran Thi My Dieu (mentioned above) reminds us, "*Human resources are the key factor for digital transformation*" (Ngan, 2021).

This is not a new phenomenon. Both authors have extensive experience of both the technology and higher education sectors. The alarming failure rate has existed unchanged for many years (Webster, 2003). The key factor is often the lack of recognition of the complexity of both the change management process and the human elements – reinforced by a senior management's over reliance on new technologies to provide simple and straight forward solutions to highly complex problems.

The figures remain alarming. An established technology professional commented last year that:

According to Standish Group's Annual CHAOS report, 66% of technology projects (based on the analysis of 50,000 projects globally) end in partial or total failure. Despite ***larger***

> ***projects being more prone to encountering challenges or failing altogether****, (author emphasis) even the smallest of software projects fail one in ten times.* (Swords, 2020)

A relatively recent and very large example from the UK was the 2013 cancellation, after development costs had exceeded £10 billion (US$14 billion), of the hugely important National Health Service Digitisation Project (Honeyman et al, 2016).

We are too often seduced by the perceived magic of new technologies in business and must beware of the same issue in higher education. Having possession of a technology is very different from having the systems, training, expertise, etc. to allow the technology to be properly used. Self-driving cars are an extreme example of this but we can perhaps more clearly understand the threats, problems and management of change issues involved because we are more familiar with driving and the complexity of road traffic systems.

4 Supporting student learning with available, effective low-cost learning technologies

Given the above difficulties, it is still possible to suggest a standardised sector-wide model using low-cost readily available learning technologies that will support student learning and improve learning outcomes. This section outlines a pragmatic approach to implementing effective technological solutions at the institutional level in those ASEAN countries where such developments are occurring at a slower rate than, for example, universities in Singapore, Malaysia and the Philippines. Key components are Learning Management Systems (LMS) such as Moodle and Blackboard plus the integration of Learning Analytics (LA) and Learning Science (LS) approaches to support student learning, as show in Figure 3. This combination will match diverse national needs for skill sets that function well and are suitable for the education of graduates with skills set suitable for working in the 4IR world.

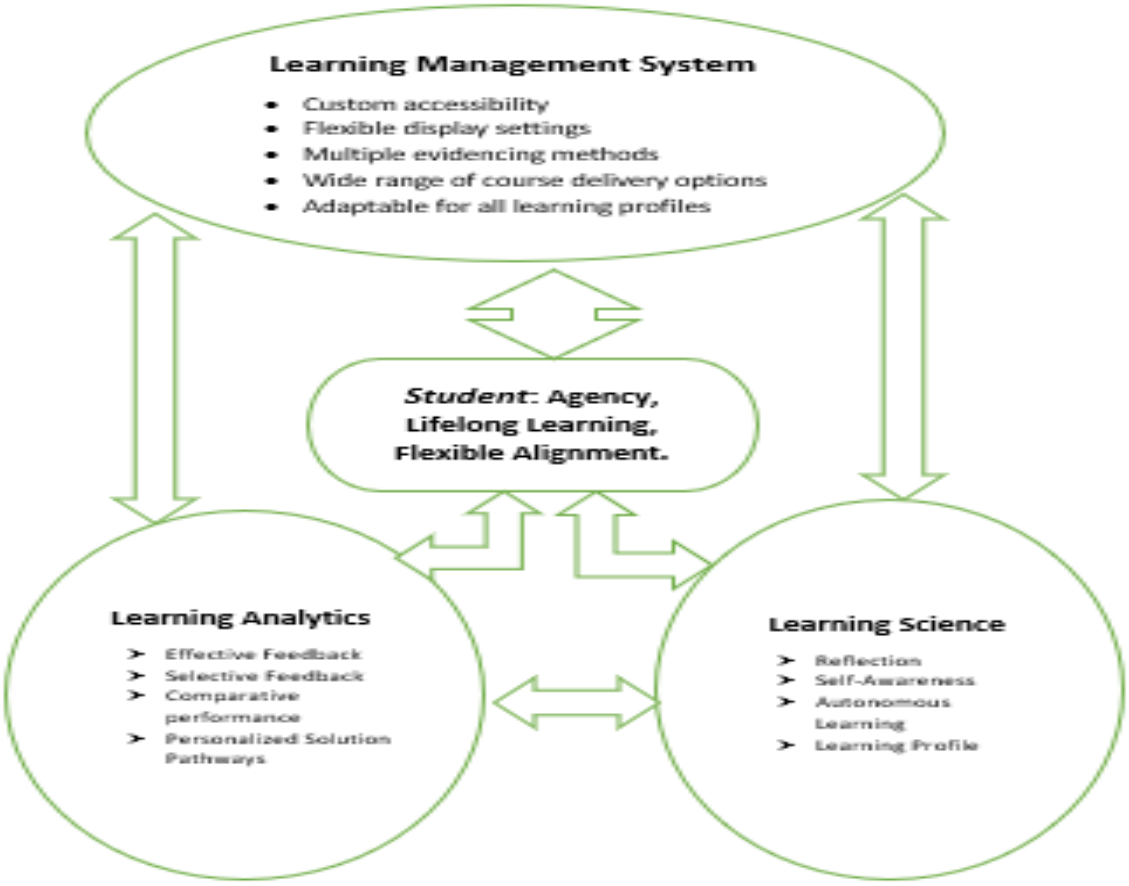

Figure 3. Digital Universities: Student learning systems functions.

4.1 LMS importance and usage in local universities

The central existing key component, as suggested here and supported by Harvey (2020) above, is the LMS. These robust and effective systems have been fundamental to the efficient and widespread delivery of e-learning and prototype digital universities of many countries over the past decades. However, this is not the case in all countries and ASEAN provides a good example of this differentiation. In Singapore, Malaysia, and The Philippines, the adoption level has been greater while for other member states, the usage of the technologies is much less widespread. Furthermore, while the adoption of Zoom and Microsoft Teams has been very useful as a response to the pandemic, these technologies are neither as well developed nor as effective in terms of learner support and opportunities for development and LMS. The freely available and well-supported Moodle LMS is the most widely used system currently in use. Moodle has around 80 million registered users in 222 countries worldwide.

A study was undertaken in late 2019 which reviewed LMS usage in local universities (Andre and Webster, 2021). Most (58%) faculties within the sampled public universities in Hanoi do not use any LMS at all. This makes it difficult to do anything with learning analytics (LA) currently. Also concerning is that an additional 23% of these faculties use Google Classroom which has very limited LA abilities (Martínez-Monés et al., 2017). This leaves only 19% of faculties who have any option to take advantage of the potential benefits which come with using LA in higher education (see Andre et al., 2019). Since then, most organisations and people have felt the impacts of the pandemic on the delivery of online and remote education. This has been the case in the Higher Education sector as

elsewhere. This further underscores the importance of implementing a freely available, fully developed and tested Open-Source LMS the core learning support technology.

It is important to recognise that while the increased use of communication tools like Microsoft Teams and Zoom have proved extremely valuable for maintaining class contact and excellent for increasing the level of familiarity with online tools among the general population, this is only a small part of the overall solution in the digital transformation process.

The educational advantages of an LMS, whether open source or proprietary, have been much discussed and debated over the past 25 years of the usage. On the other hand, the availability of a technology and its widespread use within society are very different things. The latter requires recognition, investment, leadership, training and systematic implementation before the full benefits can be realised (Ulker and Yilmaz, 2016).

If Vietnam is to meet the international standard in educating students in the most complete way possible, then LA will likely be one part of the solution. However, before higher education institutions can begin the process of exploring what aspects of LA work in Vietnam and what aspects do not, the technological foundation must be in place. The most important technology here is the LMS – specifically an LMS which can support full access to the underlying data store, which some LMS (e.g., Google Classroom) do not.

As stated elsewhere, the central theme of this paper is that the strategically planned integrated use of three elements – LMS, LA and LS – can provide a low cost and effective set of tools and techniques for helping the digital transformation of higher education in several ASEAN countries.

4.2 Learning analytics and improving educational outcomes

There is considerable variability within ASEAN in the infrastructural and process readiness in introducing effective digital learning support. In December 2016, Singapore Management University produced a report addressing these and broader issues. The authors commented that:

> *"Finally, except for Singapore, Malaysia and the Philippines, none of the ASEAN member countries have a comprehensive digital strategy in place"* (SMU, 2016).

This may have changed somewhat over the past five years, especially in the availability of the technologies, but there are still enormous challenges facing human resource management in transforming technology into working systems at the institutional level. Alongside Malaysia and the Philippines, Singapore is recognised as having made great progress in this area. Nanyang Technological University (NTU) has made solid progress with the use of LA and big data to improve educational outcomes. A leading researcher at the university's National Institute of Education recently stated that "*AI technologies such as predictive analytics, machine learning and deep learning have majorly transformed teaching and learning, and AI will continue to disrupt job markets"* (Chen, 2021).

Predictive analytics, machine learning, deep learning, etc. can provide mechanisms for instant and automatic feedback to help students understand where they are going wrong and how to improve their performances.

As suggested above, A key component is the introduction and early standardisation of university LMS. These LA capabilities help administrators and teaching staff to monitor learning and academic

performance of the students. Students can also benefit from their own ability to look at how they are doing on the courses they are taking and compare their performance with that of other students, as explored in our recent work and outlined below.

Additionally, for real advances in student learning, we must also consider how to enable students to understand and improve the personal and individual aspects of their own learning, not just respond to learning patterns from LA (Webster et al. 2019). This perspective has also been emphasized by research in both the public and private sectors in the USA (Zhao et al, 2021; Thille & Zimmaro, 2017). For real improvements in learning, we need to combine data analytics with developments in learning science to produce more effective gains in the implementation of self-directed and lifelong learning.

This point was made using an example of data driven (learning analytics) and learning science driven (cognitive science and metacognition) inputs into creating explanatory and predictive models (Thille, 2015). A different graphical model was used by other researchers in the field to illustrate the same point in the form of a process-type model (Rose et al, 2019).

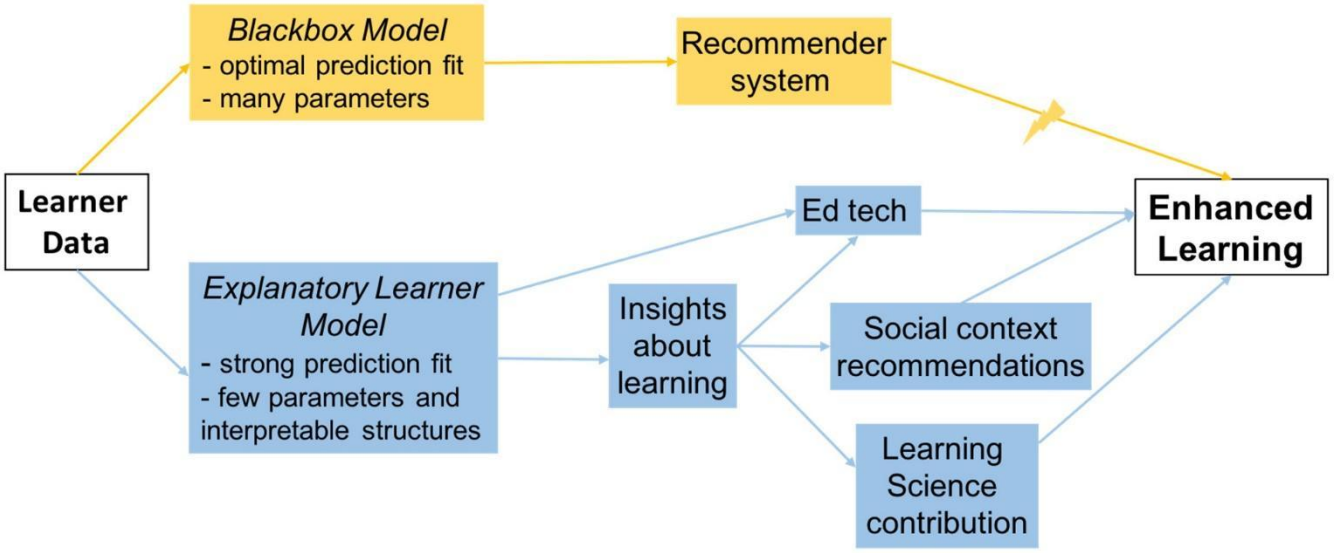

Figure 4 Explanatory Learning Models using different paths (Rose et al, 2019)

4.2.2. Using learner data to enhance learning.

Drawing on different perspectives and themes from theories of learning theory (Schiro, 2007; Entwistle, 2021; Ifenthaler et al., 2019), the authors have been actively considering the impact of learning science elements on the learning outcomes of their students. This has been done within the context of departmentally continuous LMS usage over the last decade in Vietnam. In recent years, the focus has also taken in learning analytics usage. An experimental approach has been taken with students receiving LA-driven feedback on their weekly performance compared with other students. A key component of this experiment has been the use of Moodle LMS and its learning analytics facilities.

For a parallel focus on the learning science approach, a reflective and participatory method using personal learning profiles (Webster, 2008) was used in another module. Both approaches are aimed at increasing agency and independent learning through self-awareness and the understanding of cognitive, social and behavioural factors.

Consequently, during the previous academic year (2020-21) a course with strong learning analytics (using data from the LMS) and learning science (guiding students to develop their own metacognitive awareness) support and another course with a greater learning science focus but no analytics support were run in parallel. It is suggested that the former supports personalized but directed learning, while the latter supports exploratory self-direction. It is hoped that student participation, assessment and feedback will enable the authors to identify and combine the most effective elements of each approach for future courses and research.

4.2.2 Data analytics for improving students learning

The field of data analytics has been used in business for many years to reduce costs and increase revenue (Andre and Webster 2018). A natural development has been to consider whether similar techniques can be used to improve student learning. To explore this, many researchers have sought to answer a common question: "What LA data can best predict student learning?" In some cases, the goal has been to identify students most at risk of dropping out and to allow teachers, or others, to intervene and help struggling students before it is too late (Hlosta, Papathoma, and Herodotou 2020; Jayaprakash et al. 2014). In other cases, the goal has been simply to attempt to predict student grades.

4.2.3.Using LMS and LA to change student behaviour

The experiment reported below used social cognitive theory, specifically focusing on learner agency (Bandura 2018) in an attempt to modify student learning behaviour. It is suggested that to be prepared for working effectively in the 4IR period, students need to learn how to become self-directed as agents of their own learning (Webster, Andre and Trinh, 2019; Bandura 2006). An agent here is someone who, by their own actions, can cause a desired effect to come about (Bandura 2018). Agency is a critical component of social cognitive theory and the key components of agency include forethought, self-reactiveness, and self-reflectiveness (Bandura 2018). Below are examples of how this experiment addressed each of the three components.

Forethought: Students can achieve the goal of higher performance with the help of feedback and comparing their actions and performance with that of their classmates. This can help them to recognize that by changing their behaviour it is possible to achieve higher performance in their studies (e.g., by aiming for improved performance).

Self-reactiveness: Deciding to target higher usage of the LMS is one method to achieve their improved performance.

Self-reflectiveness: Students will be able to evaluate their performance (grades) and activities against the data that is reported weekly. Further reflection (double-loop learning) can help individual students to review the methods and values they bring to their learning performance.

As is outlined above, the experiment used social modelling to help students to recognize they could change their learning behaviours to help improve their learning performance. The research assumption was that as social modelling has been used to promote widescale changes in personal conduct (Bandura 2006, 11), it can be used in the field of education to motivate students to change their learning-related behaviour.

In a randomized experiment (Andre, 2021) it was found that providing students with weekly feedback on the relationship between LMS activity and student performance (grades) made it possible to modify student behaviour. That is, it was possible to increase students' LMS usage by providing weekly evidence that LMS usage was positively correlated to grades. While it was not possible to identify a statistically significant causal relationship between increased LMS usage and grades, the increase LMS activity can still be further utilised in ways that can help students to translate the activity into higher student grades.

Interestingly, female students in the treatment group accessed their weekly report on average about 5 - 6 times while the male students did so only 3 – 4 times. Female students also achieved higher grades, but that was simply a continuation of previous patterns of achievement. Encouraging student interactivity with the LMS can be seen as a step in the right direction as constructive online and LMS usage will be fundamental to digital learning.

Other possible ways of using LA to help develop student learning include using LA to help students to understand and further use data analytics and data-driven decision-making. Both areas are particularly useful for business students such as those who were the subjects of this study. Using weekly prompts can also help to improve student meta-cognition (Millis, 2016). This is an area of key importance as it helps to move the locus of control more towards the students rather than the LA system.

Furthermore, the increased student awareness of the connection between LMS usage and possible academic success can then be more effectively utilised for increasing learner agency by linking the feedback to personal student learning attributes (Webster and Andre, 2018).

5 Learning science: metacognition, self-awareness and student learning

Even though the system feedback approaches of Figure 4 (either Explanatory or Blackbox) might be sound and extremely useful going forward, it still possible to argue for enabling students to more fully understand their own learning preferences and processes, rather than receiving only system-directed feedback. Insights from areas and factors such as metacognition, personal learning profiles, the social context and student mindset can be seen as also contributing to enabling self-awareness for autonomous and agentic learning.

These elements underpin the development of the RAPAL methodology (Reflective and Participative Approach to Learning) which is used to promote Flexible Student Alignment (FSA) (Webster and Andre, 2018, Webster, 2009). FSA is the outcome of a process, implemented through RAPAL, which is designed to enable students to become more autonomous in terms of self-directed learning. Reflection and participation are central to this student-centred method to help students to become metacognitively aware of their own learning preferences. Techniques are then used to enable them to adapt and apply their personal learning preferences to different learning scenarios. It is a student-centred alternative to Biggs' (1999, 2003) organisation-centred concept of Constructive Alignment. FSA aims to facilitate alignment from the perspective of the student and to allow for more (much needed) flexibility, given the personal, learning and professional demands that modern higher education and business environments place on most students (Webster and Andre, 2018).

The personal learning profiles, which are central to the reflective process, are made up of psychometrically measured items such as cognitive style, learning preferences and personality type.

The ASSIST (Tait et al., 1998) questionnaire for the self-assessment of learning preferences has proved a particularly effective and accessible element of the process. ASSIST was developed from the earlier versions of the Approaches to Study Inventory (Tait et al., 1998). The main section of ASSIST consists of a self-report questionnaire. It measures approaches to learning on three main scales – Deep (D), Surface/Apathetic (A) and Strategic (S). Each of the main scales is comprised of several sub-scales and for the Strategic these sub-scales included: organised study; time management; alertness to assessment demands; achieving and monitoring effectiveness.

Perhaps most interesting and significant finding for long-term effectiveness, was the performance of the students with a dominant strategic approach oo several different assessment formats (see Table 1). The table shows the ranking of each average assessment type mark and suggests that students with a dominant strategic approach performed best in all four very different forms of assessment. The confirmation of the strategic dominated sequences by qualitative data from interviews and open-ended questions (Webster, 2009) suggests that aiming for a strategic dominated profile would help improve student learning outcomes.

Table 1 ASSIST and assessment outcomes by mean mark and ranking (Webster, 2009, p124))

Approach	**RJ**	**ILE Doc**	**ILE Imp**	**Exam**	**Final**
Strategic (S)	72	74	79	62	69
	(1)	(1)	(1)	(1)	(1)
Deep (D)	66	62	75	61	65
	(2)	(3)	(2)	(2)	(2)
Surface / Apathetic (A)	63	64	71	49	57
	(3)	(2)	(3)	(3)	(3)

Key to assessment type: RJ=reflective journal; ILE Doc=Individual Learning Environment design document; ILE Imp=Individual Learning Environment implemented web interface; Exam=summative examination; Final=final course mark.

In almost all cases, the sequence of the styles S, D, A (Strategic, Deep, Surface/Apathetic) predicts the sequence of the assessment scores. There was an exception that for the ILE Doc, which was SAD, but it is still clear that the Strategic dimension was dominant, implying that those who are primarily Strategic learners regularly outperform those who are not.

This potentially very useful connection was largely confirmed in a more recent project (Entwistle, 2018). The relationship between the main scales and elements of student learning were considered for a total sample of over 4,500 students.

Table 2 Correlations between students' ratings of attainment and approaches to learning (Entwistle, 2018, p.221)

	Student Ratings		
Scale scores	**Knowledge acquired**	**Academic progress**	**Interest & enjoyment**
Approach			
Strategic (S)	.29	.33	.28
Deep (D)	.38	.29	.39
Surface / Apathetic (A)	-.33	-.39	-.37

In one analysis, shown in Table 2, the correlations between ‘approaches to learning’ and students’ ratings of their current level of achievement were considered. The student ratings were based on feedback received from teachers (outcome measures). As can be seen, students with high scores for the Strategic dimension were the best predictors of perceived academic progress. This was especially true where low levels of ‘surface approach’ were found.

In summary, it can be seen that the metacognitive development of students can have a profoundly positive impact on student outcomes. When used in conjunction with learning analytics to change student behaviour, universities now have an avenue for leveraging technology to embrace, enable and enhance lifelong and agentic learning.

6 Conclusions

It is the contention of the authors that many universities already have the ability and basic technological systems to operate as digital universities. What is needed now is the integrated leadership and vision, from government at ministry level (.e. MOET), through universities at the institutional level (e.g. NEU), down to the university faculties and departments which implement the systems and work at the operational level. Central to this scheme are the processes developed and implemented by the Open Universities of many countries over the past several decades. This has led to their current delivery using teams of development and learning support actors with Learning Management Systems as the delivery vehicle. If we ally this technology with those of learning analytics and elements of learning science as outlined above, then it is possible for local universities and colleges and other educational institutions to implement integrated functional digital systems that will support and enhance the learning processes and learning outcomes of their students.

It is important to recognize that low cost (and often free) open-source materials and technologies are available and that public forums exist to provide widespread networked support for the various stakeholder groups. As Professor Harvey inferred, the technologies, methodology, tools and techniques are readily available and have been for some time. As Professor Tran stated ““*Human resources are the key factor for digital transformation* “.

While recognizing and embracing the role of technological change and digitisation in education, we need to reject the sales force driven narrative of the mythology of the digital university (that it is always just out of reach unless we buy their latest technology). The key roles encompassed by an enabling government strategy and institutional autonomy, will be performed byv effective and examplary university leaders and managers supervising well planned and executed change management processes. The combination of leadership and effective change management processes which involve, inform, support, and train all stakeholder groups can deliver working digital universities in the shortest time..

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