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The adoption of a virtual learning environment among ‘digital immigrant’ Engineering lecturers: A case study

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Abstract

The use of Virtual Learning Environments in Higher Education has increased significantly in recent years. Despite this there are some teaching staff whose usage is minimal. This research seeks to establish the reasons for this lack of adoption, particularly with regard to staff born before the widespread use of digital technology. A single case study approach with multiple embedded units was utilised. The participants were drawn from the Engineering faculty of an Irish Institute of Technology. The significant findings were that the main factors hindering the adoption of VLEs were the belief that VLEs discourage attendance in class which is essential for some learners, and that academic staff would lose control of their materials to their detriment were they to utilise the VLE. The implications of this research are that the perceptions and beliefs of academic staff play an important role in their adoption of a VLE. Some of these beliefs give rise to concerns as to the appropriateness of VLE use. In order to further promote the use of VLEs there is a need for both academic staff and their Institutes to reflect on how these concerns can be properly addressed.

Keywords: Digital immigrants, Higher Education, Learning and Teaching, Virtual learning Environments, Technology Enhanced Learning, VLE adoption, VLE use

Introduction

“A virtual learning environment (VLE) is a collection of software tools supporting academic administration, teaching and research using the Internet, particularly the World Wide Web” (Trafford & Shirota, 2011, p.143). Since the beginning of the 21st century there has been a widespread increase in the adoption of the VLE in Higher Education (Costello, 2014). A number of studies have shown that VLEs enhance student learning (Kvavik & Caruso, 2005; Urwin, 2011). There is also evidence that VLEs can improve accessibility for students with disabilities as well as facilitating increasing student numbers and widening participation (Urwin, 2011). However despite all of this, there is no evidence that this has led to extensive change in pedagogic practice (Browne, Jenkins, & Walker, 2006; O'Rourke, Rooney, & Boylan, 2015; Rienties, Giesbers, Lygo-Baker, Ma, & Rees, 2014; Van Raaij & Schepers, 2008). Most Higher Education Institutes require their academic staff to interact at a basic level with that Institute's VLE. In many cases the use of the VLE by the lecturer does not progress beyond this basic requirement (Greener, 2012). Some academic staff have failed to adopt any element of a VLE. This is a cause for concern among, and the research is of interest to, educators and academic managers, particularly given the social legislative and economic drivers of increased participation and the incorporation of diversity in Higher Education. This research is of value given the paucity of qualitative research focussed on the adoption of the VLE at the level of the individual academic. Much of the published research relates to the adoption of technology rather than the VLE and does not address those who may adopt technology but not the VLE. There is a distinct absence of research on VLE adoption by academic staff who were born before widespread use of digital technology became the norm. This research hopes to go some way towards addressing this gap in the literature.

Purpose of the Research

The aim of this research is to investigate the reasons for the low level of the adoption of a VLE among some Academic staff in a Higher Education Institute (HEI) where use of the VLE is optional. In particular it focuses on levels of VLE use among staff that due to the time of their nativity fit the label of digital immigrants. The objectives of the research are as follows:

1. To determine the factors that influences the level of adoption of VLEs by academic staff.
2. To establish how a lecturer's use of the VLE is related to their self-perception of their digital literacy?
3. To ascertain the extent to which their rationalisation of this position is based on pedagogic or other principles?

Literature Review

Digital Natives/Digital Immigrants

The concepts of digital natives and immigrants were first articulated by Marc Prensky in 2001. He argued that as a result of the advent and rapid propagation of digital technology towards the end of the 20th century, a seismic shift occurred in the way students think and process information. This differs fundamentally from the way of their predecessors. Those who were born in and have grown up in the digital age are referred to as 'Digital Natives' while those who were not born in this age are classified as 'Digital Immigrants'. While digital immigrants will adapt to their environment they will not acquire the level of digital fluency of the native. They will always retain some elements of their past. Examples include the use of out-dated terminology or language, printing emails or physically showing people a webpage rather than mailing them a URL. Digital immigrant instructors are struggling to teach digital

natives. Prensky believes that the assumption by digital immigrant teachers that learners are the same as they always have been and that the methods which worked for them when they were students are still applicable today is not valid. It is incumbent on teachers to communicate in the language and style of their students (Prensky, 2001) The genesis of the digital native generation is accepted to have occurred at around 1980 and those born prior to that are considered digital immigrants (Palfrey & Gasser, 2008).

This theory is not without its opponents. Koutropoulos (2011) identifies the assumption by Prensky that the supporting statistics are equally applicable across socioeconomic and national backgrounds as being a major weakness in the argument. This view is supported by Van Slyke (2003) who questions the fit of all students to Prensky's definition of digital natives, particularly with regard to the uniformity of exposure to digital technology. In his rebuttal of Van Slyke's criticism Prensky would appear to agree with this argument when he accepts that the exposure of young people to technology in Hungary may not be the same as it is in the U.S., Japan or Korea (Prensky, 2003). The claims of the existence of a discrete generation consisting of digital natives is viewed as a gross oversimplification by Jones & Czerniewicz (2010) while research has identified that there is no homogeneity of use of new technologies by the post 1980 generation (Jones, 2010). However despite the native/immigrant debate what has been accepted by both sides is the need to incorporate new technologies into their teaching primarily because that is the first place where digital natives go for their information.

Usage of Virtual Learning Environments

There is widespread evidence of the use of VLE as a repository for course material and as a course administrative tool particularly with regard to the taking and monitoring of attendance

and the submission and grading of assignments, while its use for more involved activities such as interactive online assessments and discussion fora is less extensive (Barker & Gossman, 2013; Browne *et al.*, 2006; Risquez *et al.*, 2011). This would appear to support the view that academic staff will adopt those technologies which can be easily integrated into their pedagogical model, supporting what that model does rather than using those technologies to profoundly alter its structure (Kirkup & Kirkwood, 2005). Among the identified advantages of the VLE for both academic staff and students are, flexibility as to the time and place of study, learning based on several sources, increased student capacity, enhanced peer and student centred learning and a reduced administrative burden on academics (Sitas, Dimo, Nikitakis, & Papadourakis, 2007).

The following disadvantages are identified by O Leary & Ramsden (2002):

- The indiscriminate uploading of documentation can lead to a proliferation of material much of which is not suitable for online delivery.
- Infringement of intellectual property rights and copyright of material uploaded to the VLE.
- Setting up a module within a VLE requires considerable time and effort initially.
- There can be problems with off campus access for staff and students.
- There is a need for lecturers to plan online student support carefully to avoid overload.
- Independent learning and collaborative learning at a distance requires appropriate support and ongoing training for both lecturers and students.

One of the main perceived shortcomings of VLEs is that they do not have the same effect as face to face learning. While they can be designed to be interactive this interaction is limited in contrast with the interaction that occurs between the student and lecturer (McWhorter &

Lindhjem, 2013). One of the key issues raised by lecturers in relation to VLEs is the view that it has a deleterious effect on attendance. This is often used by academic staff as a justification for not putting material online. However this viewpoint is not supported by the majority of students. If people do not want to attend class they will not, regardless of whether notes are on the VLE or not (Risque *et al.*, 2011).

Barriers to Faculty Adoption of Technology

The lack of use of VLEs by lecturers has been identified by students as being the most common barrier to their use (Risque *et al.*, 2011). The participation of academic staff is seen as a major factor in the adoption of technology in education (Chen, 2009). Despite the perceived benefits of technology in education there are still a number of academic staff who engage minimally if at all with their learning environment.

Two types of barriers that have a bearing on the integration of technology in the classroom by the lecturer have been identified by Ertmer (1999) as external or first order barriers and internal or second order barriers. External barriers are extrinsic to the teacher and can include among others, resources such as hardware and software, support and training. These barriers can be overcome by the gradual adjustment of the teachers practice increasing its effectiveness without changing the fundamental beliefs which underpin that practice. Internal barriers are intrinsic to the teacher. They can include the teacher's beliefs about teaching or technology, classroom practices and their disinclination to change. External barriers can generally be eradicated by the provision for example of resources and training. On the other hand tackling internal barriers requires the teacher to challenge their beliefs and the entrenched customs of their practice. When applied to the assimilation of technology into

learning this may require a cultural change as well as repositioning of the self with regard to what the nature of learning and even, what actions characterise teaching.

Research Design

Population

The population being studied consists of lecturers in a Higher Education Institute. They all lecture exclusively on undergraduate degree programmes which are delivered in the traditional classroom mode. While the use of the VLE to support classroom learning is encouraged by their Institute, it is not mandatory to do so. Within that population there is a substantial variation in the use of virtual learning environments. This ranges from what Rogers (1995) has classified as the innovators and early adopters to the laggards.

Sampling

Rather than generalising a population, the purpose of a qualitative study is to explore in depth a specific phenomenon. In order that this phenomenon can be best understood individuals and sites are purposefully or deliberately selected by the qualitative researcher. This is referred to as purposeful sampling (Creswell, 2012). In this case the focus of the study is the rationale for the level and extent of usage of Virtual learning Environments within the population.

Extreme or deviant case sampling is a type of purposeful sampling which involves selecting cases or units which are classed as outliers. These can lie at the ends of the distribution of the case and might be expected to yield data which would be especially rich (Teddlie & Yu, 2007).

The site was selected on the basis of convenience in that it was easily accessible and contained an adequate number of subjects willing to participate in the study. One of the

disadvantages of this form of sampling is that without any other selection criteria there is no way to tell how representative the site is or how it might differ from other sites (Tansey, 2007). Sampling occurred prior to the commencement of data collection. There was a certain degree of homogeneity about the participants chosen since all those selected were from the 50 to 65 years age group. The purpose of this was to ensure that they are all what are classified as digital immigrants. Another criterion was that participants would have at least 20 years lecturing experience and be in permanent employment. All of the participants had a mathematical/engineering background and lectured in subjects which had a significant mathematical content. They were all male and were native English speakers.

Methodology

In a qualitative study it is important that for the researcher be cognisant of their own ontological/epistemological perspective. In this instance the research was approached from the viewpoint that reality results from the subject's experiences and interactions with the world. Knowledge is arrived at through personal experience. This is consistent with the interpretivist paradigm (Gray, 2014). The role of the social scientist within this paradigm is to "understand, explain and demystify social reality through the eyes of different participants; the participants themselves define the social reality" (Cohen, Manion, & Morrison, 2007, p.19).

The case study is defined as "an empirical enquiry that investigates a contemporary phenomenon within its real life context especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2014, p. 4). Case studies are preferable to other methods in specific situations where:

1. The research questions being addressed are 'How' or 'Why' questions

2. The level of control exercised by the researcher over behavioural events is minimal
3. The study is contemporary in its focus.

There are a number of different ways that case studies can be carried out. These include qualitative and/or quantitative methods and range from a highly structured positivist deductive investigation to an unstructured interpretative, inductive investigation. They can also investigate single or multiple cases (Cavaye, 1996). In this instance the case study approach was considered to be the most appropriate. This was based on a consideration of the nature of the phenomenon being studied with respect to the definition of a case study provided above, as well as the level of alignment of the research with Yin's three criteria.

Consideration was also given to the most appropriate type of case study. The type selected was a single case study with multiple (three) embedded units. An embedded case study is one in which data is collected at different levels or from different sources (Yin, 2014). This was preferable to multiple case studies as there were three different sources which were part of one social system (in this case the same faculty).

A case is defined in the abstract as, "a phenomenon of some sort occurring in a bounded context" (Miles & Huberman, 1994, p.25). In this case the phenomenon being studied is the 'why' of the level of adoption of a VLE. The boundaries are contextualised socially, within the setting of a particular faculty & sampling is limited to experienced faculty who are digitally immigrant. Students, faculty management and administration were excluded from the study.

Data Collection

One on one semi structured interviews were used to elicit and collect data. Despite being time consuming this approach was chosen as it is suited for interviewing participants who are forthright, eloquent and are comfortable in sharing their opinions (Creswell, 2012). These interviews were face to face and took place in a private location suggested by the subjects.

Audio recordings were made of the interviews. This approach was chosen to allow the researcher to concentrate on the questions and responses, and to ensure that all details were captured (Blaxter, Hughes, & Tight, 2006). Following the interviews the recordings were uploaded to and stored on the researcher's computer. A backup copy of the recordings was stored on an external hard drive and retained in a secure place by the researcher.

It is important to have a means for structuring the interview. An interview protocol aids the researcher in ensuring that all of the questions are asked and all topics covered (Creswell, 2012). Mind maps are a well-established technique to aid the creation and understanding of the structure of a subject (Tsinakos & Balafoutis, 2009). As the researcher is at ease with and has a preference for the use of mind maps in certain situations, the template provided by Creswell (2012, p.226) has been adapted to mind map format and was used for the interviews. The data was then prepared for analysis by its verbatim transcription from audio to a Microsoft Word text file.

Analysing and Interpreting Data

There is no one individual correct way which qualitative data is presented and analysed. However regardless of which method is chosen it should be fit for purpose (Cohen *et al.*, 2007). In this case thematic analysis was used to identify, analyse and report on themes

within the data. The six steps of thematic analysis as outlined by Braun & Clarke (2006) were utilised as follows:

Step 1. The researcher familiarised himself with the data by transcribing and rereading it to gain a sense of it.

Step 2. An initial coding of the noteworthy aspects of the data took place and relevant data was classified to each code.

Step 3. The codes were organised into potential themes.

Step 4. The themes were refined. This involved reviewing the themes to determine whether the data justified their inclusion as a theme or whether there was enough evidence to split a theme into separate discrete themes.

Step 5. The themes were analysed in the context of their relationship with the research questions and in relation to each other.

Step 6. The interpretation of the data and the production of the report.

Inspection of Artefacts

The participants VLEs were inspected as were samples of the print based and other resources handed out in class. Screenshots of sample pages were taken and retained by the researcher along with copies of samples of the resources inspected. These were used to validate claims made by the participants regarding the quantitative and qualitative nature of both their VLE usage and resources provided offline.

Ethical Considerations

The ethical approach taken was based on the principle of voluntary prior informed consent (BERA, 2011). Ethical approval was sought and received from the researcher's Institute and the research was carried out in accordance with the conditions of the approval.

Findings of the Study

The Participants

All of the participants are in the 50 to 65 age bracket and have extensive experience in teaching ranging from 19 to 35 years. For the purposes of this paper they will be identified as Jonathon, Patrick and Gerard. All had tenure which predated the introduction of the VLE in the institute in 2003. Their own educational experiences were similar, since they were all educated in the traditional classroom setting and their experiences were generally positive. They all teach at undergraduate level exclusively. All participants have reported behaviour which would be considered typical of digital immigrants. Examples of this behaviour include printing out notes or a book chapter or the taking of attendance by hand. They have varied perception of their own digital literacy.

Attitude towards Technology

The general attitude of all of the respondents towards technology is positive. Technology was viewed by Gerard as a "good thing", while Jonathon offered the view that his attitude towards it was very positive with the caveat "if I see a use in it fine, no use, not interested". All of the participants have adopted some elements of technology in their private and business lives. For example all use email and most have used social media to some degree. There is a degree of selectivity however in their use of such technologies with the perception of relevance and usefulness playing a key role. For example Patrick uses Facebook as a means to access

information with regard to his hobby and is a member of a Facebook hobby group which exchanges information and tips online. All of the participants have varied perceptions of their own digital literacy but with the exception of Gerard do not consider that this has an effect on their use of technology. Gerard felt that were he more digitally literate he would have the confidence to utilise other more complex technologies.

Use of Technology

The participants were asked to rate their own use of technology by comparison with their colleagues on a scale of 0 to 10, with 0 being no use and ten being a high level of use. The ratings ranged 'three to four' to 'eight to nine'. The participants with little or no use of the VLE were on the lower end of the scale. All of the participants used technology in the classroom with even the low level VLE users using local area networks within the classes to demonstrate on the student PCs. The use of software packages for the creation of resources is widespread. The types of software used range from basic Microsoft Office features such as Word and PowerPoint to the use of screen casting software for the creation of videos. With the exception of Jonathon the early adopter, the participants teach the use of software packages with one in particular teaching the use of high end industrial standard packages.

Use of the VLE

The use of Moodle among the participants varies from extensive to practically no use, to absolutely none. Jonathon the most extensive user attributed his use to the fact that he became an early adopter as a result of being influenced by a departmental colleague who pioneered the use of the VLE within the Institute. In his own words "he had been looking around for something as a repository in the 1990's" as the shared drive was only available within the Institute and of no value to students outside of College. He now uses many of the more

advanced features such as quizzes and feedback and he creates his own resources which he uploads to the VLE. The other participants had minimal use of the VLE. This level of use was attributed to two common reasons. One of the barriers articulated was extrinsic to the participants and related to a lack of trust in the academic management. The fear was that if the participants were to embrace the VLE they would lose rights to any material that they had created and placed on the VLE. This could lead to a situation whereby they could be removed from a module (or even their job) and their material would be given to someone else to deliver. Gerard commented “I actually have no problem with Moodle. If the college gave me guarantee that if I put stuff up on Moodle that it would be my stuff I would gladly put it up because Moodle is better”, while Patrick offered the view that “there was a resistance to it, people felt that it could be used against them in the sense that they could put their notes up there and those notes could be taken and they would be disbanded”. The other barrier to the adoption of the VLE was intrinsic to the participants and related to their viewpoint that for the students that they had, the traditional classroom based face to face model was best. They viewed the majority of their students as being weak and in need of extra attention. This was the opinion of all of the participants not just those who did not use the VLE. The divergence occurred in the view of the role of the VLE. On the one hand the VLE was viewed as an efficient means of distributing information and documentation that supports the class based role while on the other hand it was perceived as undermining attendance at the face to face sessions. Patrick felt that “it can have a negative effect on attendance. There is a big correlation with success and attendance” while Gerard believed that one of the disadvantages of the VLE “is that students might not turn up at all”.

Advantages and Disadvantages of a VLE

There was unanimity among the participants that the main benefit of the VLE was its accessibility to students on a 24/7 basis regardless of geographical location. This was particularly seen to be the case for students who may have had to miss class as a result of illness or sports commitments etc. It is also seen as a locus for contact between the lecturer and staff for items such as class announcements and student queries and an administrative centre for the processing of assignments and feedback. On the negative side the VLE is perceived by Gerard and Patrick to undermine the attendance at the classroom sessions. On the other hand the only negativity expressed by the Jonathon was, that because of recent industrial agreements increasing the teaching load for academics, there was not enough time available for lecturers to fully realise the potential of the VLE. For those who viewed the VLE as a repository the question of time and remuneration were not viewed as significant. Typical of the comments received were from Gerard “I don’t think money is an issue” and Jonathon “I’d say setting up PowerPoint presentations takes time as well, and once I’ve it set up it only takes a few seconds to put it up.”

Pedagogy

It was the view of all of the participants that for the students they had (and the consensus was that there were many weak students) the best method of teaching was the traditional face to face method. This allows lecturers to gauge the level of comprehension among the students through a number of means such as asking questions and the interpretation of visual cues. Physical attendance also provides them with a confirmation of the level of a student’s participation on a course which may not always be apparent online. However the classroom activities were supported by the use of resources and other study materials whether they were provided through the VLE or in the form of handouts or digitally on a USB device.

Discussion

The literature has identified a number of factors which influence the adoption of VLE use among academic staff. The participants are in broad agreement with the advantages outlined by (Sitas *et al.*, 2007), however in the cases where there is a non-adoption of the VLE the perceived disadvantages outweigh the perceived advantages. The individual lecturer makes the judgement as to the appropriateness of the VLE for use in the modules for which he is responsible. The view offered by Kirkup & Kirkwood (2005) that technologies which integrate easily into their pedagogical model in a supportive manner will be adopted by faculty is not supported in its entirety by the evidence in this case. While the rationale of the adopter is clearly aligned to this view, the evidence in the case of non-adopters runs contrary to this. All of the participants provide resources and notes to support their classes. Based on an inspection of samples these notes and resources appear to be of a very high standard. What differs is the manner by which they are distributed to students. In one case they are distributed through the VLE while in the other case the student has to attend class to physically take possession of them either in printed form or by downloading them to a USB device. It is accepted by the latter that there is considerable effort and time invested in this approach much more so than would be the case were the VLE to be used. Therefore there must be compelling reasons why the non-adopters will persist with an approach which is cumbersome and time consuming.

The participants' perception of their own digital literacy has little if any influence on the decision to adopt the VLE. They all use technology where it is perceived to be of use to them and there is evidence of this being so with respect to all of them. This is exemplified by the use of the local area network, spreadsheets and other software packages.

The discussion of the findings is in the context of the barriers being either extrinsic or intrinsic as defined in the literature by Ertmer (1999). Generally speaking the extrinsic barriers as identified such as resources such as hardware and software, support, training, remuneration and time are not seen as critical. The question of security of module tenure was seen as important. A lecturer is more likely to invest time in setting up a module on the VLE if they are going to be delivering that module over a number of years rather than being moved from it after one offering. This is also tied in to the fear expressed that as any material uploaded onto the VLE becomes the property of the Institute the material can be provided to any other person or body for use. As a result of this the creator of the material could be supplanted by contract or other staff and lose their employment. This could be classified as either an intrinsic or extrinsic factor. It could be intrinsic in that it refers to the participants inherent beliefs and suspicion about managerial motivation and action or extrinsic in that the matter can be addressed by the actions of management. In this case it is classified as extrinsic as it has its genesis in explicit documented management policy. A revision or clarification of this policy by the institution would remove the barrier.

On the intrinsic level the main barrier is the view of the participant that in order to optimise student learning there is a need for them to attend class. It is not within the scope of this study to address the issue as to the superiority of VLE supported teaching over other methods. However perceptions in this regard are critical to this study. This view of the need to attend class is consistent with the participants own experiences in learning. There are very strong opinions that the provision of notes and resources on the VLE will result in a lack of attendance by students with the resultant effect on academic performance. This viewpoint is identified in the literature (Risque *et al.*, 2011). This is particularly seen to be the case with the courses the participants are lecturing on where they perceive many of the students as

being “weak”. It is not necessarily seen to be the case with all students. In this case the non-adopters do not view their students as being disadvantaged by their non-use of the VLE. All of the material that would be distributed on the VLE is provided to the students in class, with the added bonus that it promotes attendance in class.

This study has examined the adoption of a VLE among digital immigrants. While the participants can be classified as ‘digital immigrants’, the usefulness and relevance of this term to the study is questionable. In this case it may be no more than a label of convenience for describing more elderly academics. All of the participants were taught in a similar manner involving the traditional classroom setting, supplemented by note taking and textbooks. They have all expressed a belief that for their students, the model which worked for them is the best way to promote learning. It is not surprising that they would draw on their own good experiences when it comes to promoting learning in others. They all have integrated technology to varying degrees to support this model. Therefore rather than describing the population as digital immigrants it may be more appropriate to label them in accordance with their learning experience. This also raises the question as to the adoption of VLEs by academics that did not have a positive experience with the traditional model. This is an area of possible future research.

Conclusions

In conclusion this study has found that the factors which negatively influence the level of adoption of VLEs among Academic staff are primarily the perception that attendance in class is necessary for weaker students and that the use of a VLE discourages attendance .On the other side the perception that the VLE facilitates interaction and communication with the

students and also expedites course administration is seen as to positively promote VLE usage among staff.

The self-perception of digital literacy does not appear to have a major influence on VLE usage with the main rationalisation for the lack of use of the VLE being based on principle rather than self-interest. The principle is that students learn best in the classroom environment and that anything which subverts that process should be avoided.

The issue of ownership of materials is also a significant factor in VLE use with fears of job and module security proving to be a major obstacle among many lecturers for its adoption.

What is clear from this study is that the decision to use or not use a VLE is made by the participant based on their perception of the balance of the advantages over the disadvantages. This perception varies from lecturer to lecturer and is based on the level of significance given by the individual to each of these advantages and disadvantages.

Recommendations

The implications of this research are that the perceptions and beliefs of academic staff play an important role in their adoption of a VLE. If it is accepted that VLE use is beneficial to students and is therefore desirable, it follows that there is a need for academic staff and their institutes to reflect on how the intrinsic and extrinsic barriers can be addressed.

Limitations

Case studies are not generalisable in the orthodox sense and can not be considered typical. A replication of this study within another setting may not necessarily lead to the same findings.

This case is defined within a particular faculty and it is possible that the culture within that faculty may have influenced the findings. The study did not examine the effect of this culture nor did it research the perceptions of management or students. This has to be considered a limitation of the research.

Areas for Future Research

As well as that referred to earlier, areas for future research identified include an investigation of the effect of organisational cultures and subcultures on VLE adoption. The influence of professional development programmes in Technology Enhanced Learning on VLE acceptance is also an area worthy of research. Research as to the differences in the rationale for VLE use or non-use between ‘digitally immigrant’ and ‘digitally native’ academic staff could also be useful.

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