

## **Opening up to Open Source: Looking at how Moodle was adopted in Higher Education**

The Virtual Learning Environment (VLE) has grown to become a piece of complex infrastructure that is now deemed to be critical to higher educational provision. This paper looks at Moodle and its adoption in higher education. Moodle's origins, as an open source VLE, are investigated and its growth examined in the context of how higher educational institutions adopt VLEs.

Keywords: VLEs, Moodle, open source, technology adoption

### **Introduction**

Virtual Learning Environments (VLEs) have grown such that they are now deemed critical to higher educational provision. Here we will look at Moodle's origins, as an open source VLE, and explore its growth in the context of how higher educational institutions adopt complex educational technology. This is done through an examination of a selection of institutions' published rationales for VLE adoption and by identifying common themes in them.

### **Growth of VLEs in Higher Education**

VLEs evolved out of earlier computer based systems and rudimentary websites that were used to support teaching, often created by individual teachers (Weller, 2007). Out of such beginnings the VLE proper was born. Britain and Liber (1999) identified a relatively small number of systems that might be termed VLEs in 1999 in the UK. As early as June 2000 Gibbs, Habeshaw, & Yorke (2000) could point to concrete references to specific VLEs in about half of the Teaching and Learning Strategies published by English Higher Education Institutes (HEIs) while a sizable majority of

them referred to VLEs indirectly. The VLE was coming to be seen as a critical tool for Higher Education. The fact of its appearance in policy documents points to the view that was quickly forming that it would be a key driver of institutional missions. By 2005 research indicated that VLEs had been deployed in 95% of HEIs in the UK (Browne, Jenkins, & Walker, 2006). The VLE was reaching similar levels of ubiquity in Ireland at around the same time and by the time of the first studies comparable to those in the UK, in 2008, VLEs has established themselves as fixtures of the Irish higher educational landscape (Cosgrave et al., 2011). The situation is paralleled worldwide. A survey in the US of close to a thousand HEIs in 2007 reported that only 0.5% of those institutions had not adopted at least one VLE (Hawkins & Rudy, 2008). Something significant was happening: A VLE was rapidly becoming as important to the identity of a university as a library.

Two particular VLES dominated in the early phase of their spread: WebCT and Blackboard. Combined, WebCT and BlackBoard accounted for an estimated 66% of deployments in 2007 in the US (Hawkins & Rudy, 2008), 80% in UK in 2005, and had similar rates of adoption in Australia and New Zealand (Bennett, 2011). WebCT and Blackboard, both commercial companies dedicated to building and selling VLEs to the higher education market, had their roots in research Universities in the US (University of British Columbia and Cornell) in the 1990s. In 2005 WebCT was taken over by its then main rival, Blackboard and the two products were later merged (this was one of several acquisitions by Blackboard including the VLE Angel). Desire2Learn was another commercial VLE, in the mould of Blackboard and WebCT, which had significant market share in the US around this time.

Blackboard, WebCT, Desire2Learn and others had business models that were based around a traditional proprietary licensing of their software. Broadly speaking, the

software underpinning these products was the intellectual property of the company itself and subject to tight restrictions as to its use. Although educational institutions could install these VLEs on their own servers, certain key rights to manipulate the software remained exclusively with the vendor. Moreover, the company also retained the sole right to copy and distribute the source code of its VLEs. However, also around this time a small but growing portion of VLEs in the US (10%) and the UK (16%) were based on an alternative form of software licensing called open source (Browne et al., 2006; Hawkins & Rudy, 2008).

The main open source VLEs around the mid-2000s were Bodington (now defunct) and Moodle in the UK. In the US Moodle was also making inroads but faced competition from Sakai which was created from an initial collaboration of the University of Michigan, Stanford University, Indiana University, and the Massachusetts Institute of Technology in 2004. Other high profile institutions joined the Sakai consortium such as University of California Berkeley, Indiana, UC Davis, NYU and Cambridge University in the UK (although it remained predominantly US-based) (Farmer & Dolphin, 2005). Sakai's source code was licensed as open source under the Educational Community License. It was quickly adopted by HEIs as their VLE of choice, particularly in the US. The Open University (OU) in the UK was attracted to Sakai, and by some accounts almost adopted it as its VLE of choice during a 2005 review of VLE systems (Sclater, 2008a; Sclater, 2008b). However, the OU believed that Sakai was still at that point a relatively immature product; moreover its community governance model appeared less attractive than other open source projects and this was seen as a potential determinant of the OU's influence on the development of the system. Also, Sclater (2008b) noted that it was not growing as rapidly as an alternative open source VLE which was to be their eventual choice – Moodle.

## **Moodle**

### *Moodle's Origins*

Moodle started in a computer server room of an Australian University in 1999. Martin Dougiamas was a Computer Science graduate of Curtin University (then Curtin University of Technology) who went on to study pedagogy at Masters and PhD level (Dougiamas & Taylor, 2002;. Dougiamas & Taylor, 2003). After his undergraduate he started working in the University and in 1999 was helping run their installation of WebCT. It was then he became frustrated with the software and his inability, because of its proprietary licensing, to tinker with and adapt it himself (Dougiamas & Feldstein, 2010). This spurred him to begin creating his own alternative VLE, Moodle. It was to be open source and based around social constructivist principles as part of what was then intended to be a PhD.

Dougiamas displayed acuity in recognising that community building might be as important as coding to Moodle's success (Dougiamas & Taylor, 2003). The community hub he implemented to support Moodle was fittingly built on the Moodle software itself. (An "eat-your-own dog-food" decision, a Sakai community member would later remark, that may have conferred an advantage on Moodle. [Dougiamas & Feldstein, 2010]). The main feature of Moodle used to create this community was its discussion forums. Adopters of the software could talk directly with Dougiamas and each other easily. As one early community member described his experience of Dougiamas and Moodle at that time: "The guy, author, was really friendly and there was a cool spirit in their small community" (Interview with Community Member, January 21, 2012). Dougiamas describes the effort it took to sustain this level of interaction that early community members were experiencing:

And then [Moodle] rapidly became used, it just became all my life and just eighteen hours a day while doing my PhD I was basically just waking up in the morning, going to bed at midnight and just basically just powering through it for a couple of years (M. Dougiamas, interview with author, February 20, 2013)

Moodle was released in 2001 under the General Public License (GPL) agreement. Its source code is open and available to anyone. Anyone who attempts to modify Moodle can only redistribute the modified version by releasing the code of their modifications back into the public domain (GNU.org, 2007). However, Dougiamas made an important decision to trademark the word “Moodle” itself. This created a distinction between Moodle the software and Moodle the brand. The terms of use of the Moodle brand were delicately balanced such as to allow for its widespread use and adoption and only controlled in areas where people attempted to directly make money from Moodle. In this case they were required to pay Dougiamas, as the copyright holder, via a company he founded called Moodle Pty Ltd. In 2007 the commercial structure of Moodle was outlined by Dougiamas:

Moodle is funded by a mixture of royalties and annual fees, and supported by 'free' work from a worldwide network of partner companies that provide Moodle-based services to clients. The network is led by Moodle Pty Ltd in Perth, Australia, of which I am the Managing Director. The company sets guidelines for the quality of services, handles issues relating to 'Moodle' in general (such as dealing with software patents, publicity etc.), mediates disputes, runs the Moodle Partner community site, steers and manages the development of Moodle itself, and looks after the Moodle community sites.( Dougiamas, 2007)

One of the central revenue streams for Moodle are Moodle Partners. These are companies that are sanctioned by Martin Dougiamas, who owns the certification mark “Moodle Partner”, to use the word Moodle commercially (Moodle.com, 2012). Partners are allowed to sell Moodle services using the Moodle name and logo, and must pay

10% of their earnings to Moodle Pty Ltd. No company can use the word Moodle to sell commercial services, nor call themselves a Moodle Partner, unless this has been agreed with Moodle the company. This has had two almost paradoxical effects: Dougiamas frees the code, legally speaking, but this remains the part he keeps most control over; Dougiamas trademarks the Moodle brand, holding it tight legally speaking, but he divests most of the control over what people do with it to the Moodle Partners over whom he has a limited control. The Moodle Partners however perform the important function of evangelising and spreading Moodle and allow Dougiamas at Moodle HQ, as his company in Perth became known, to remain focused on developing the software itself (Moodle.org, 2006a).

### ***Dublin City University- Moodle Adopter Microcosm***

Dublin City University (DCU) was an early adopter of Moodle in 2003. DCU's evaluation committee cited its open source nature which they hoped would allow it "unrestricted technical access to [[develop the software]], whether within our own local resources, via collaboration with other users, or by contracting out to commercial support companies" (McMullin & Munro, 2004). Other reasons cited were: Moodle's social constructivist philosophy, seen as being "well aligned with DCU's philosophy and approach"; the high cost of the commercial alternatives such as WebCT; fear of "vendor lock-in" to alternative commercial products; Moodle's online community, including its bug tracker, code repository and public discussion forums; and the growth in the developer community that it was experiencing (McMullin & Munro, 2004). Moodle was ranked as roughly equal to WebCT in terms of usability and although some features were at that time lacking it was hoped that these would come on stream or that the university would develop them itself.

### *VLEs as Identity Markers*

Another of the (albeit post-facto) rationales given by the lead member of DCU's adoption group was the hacker ethos of the project and an intuition that this culture could develop Moodle quickly and successfully (B. McMullin, personal communication, November 13, 2012). Open Source tools such as the relatively lightweight PHP scripting language allowed Moodle to get off the ground and evolve quickly (even if the final product was not always perfect). This has been deemed to be a critical success factor for the web where "only solutions that produce partial results when partially implemented can succeed" (Shirky, 1998). Dougiamas himself described how early iterations of Moodle were not always coded in the most elegant way as he had to balance building a participatory architecture, and encouraging developers to join the project, against the quality of some of the submitted code.

Most people would say that [Moodle's current strict code acceptance policy] is a good thing because in the early days I was fairly lax and I was really out encouraging. I was more social, and psychologically trying to encourage everyone to be open, and making relationships with people and you-know: 'thanks man that's really cool!' you-know 'maybe fix that but otherwise just put it in let's do it. Put it in.' (M. Dougiamas, interview with author, February 20, 2013)

Another important theme was at play in DCU's adoption that can serve as a prism to which to view Moodle's spread: *identification*. McMullin and his DCU colleagues had identified with open source as a community that was a force for good. The positive language in which open source is regarded in the review document attests to a strong identification with this idea as the following extract, with emphasis of positivity highlighted, shows: "as an open source VLE, Moodle offers the *maximum flexibility* to *develop* and *experiment* with *innovative new* functionalities, while *exploiting the common features* of the underlying platform [emphasis added]." (McMullin & Munro,

2004).

Thus the positive features of an idea with which the university and its representatives identify, in this case open source, can be appropriated for the university itself. Another important aspect here is DCU's citing of Moodle's Social Constructivist underpinnings. Higher education institutions were becoming convinced that VLEs were now vital to their missions. They were becoming part of the identity of a University (Williams van Rooij, 2011). Looking into a VLE, and seeing two things in Open Source and Social Constructivism that appeared to embody some of the ideals of what a university should fundamentally be, proved important themes in Moodle's adoption and growth.

### **The Cost of VLEs**

Some factors in Moodle's adoption may be seen as relatively identity neutral (insofar as we can disentangle meaning from identity) or at least to be less overt self-projections of an institutional image. Cost for example is almost universal. The cost saving to be made was a major concern in a sample of twenty six HEIs professed rationale for moving to Moodle between 2003 and 2012 (Barr, Gower, & Clayton, 2008; Bennett, 2011; Bethel University, 2009; Botturi, Cantoni, & Tardini, 2006; Bremer & Bryant, 2005; Bryn Mawr, 2011; Calpoly, 2011; Canale, 2011; Carvalho, Areal, & Silva, 2010; Chao, 2008; Clayton, 2005; Corich, 2005; Croy, Smelser, & McAlpin, 2009; Ivanova & Barnard, 2008; Landa, 2008; Lawler, 2011; Macquarie, 2012; McMullin & Munro, 2004; Monash University, 2010; Munoz & Van Duzer, 2005; Sclater, 2008b; Stewart et al., 2007; Suri & Schuhmacher, 2008; Wainwright, Osterman, Finnerman, & Hill, 2007; Weller, 2006; Whelan & Bhartu, 2008).

Moodle is built not only of open source software but also upon it. Because the database and operating system for running Moodle can be open source and free, the cost



of set-up can be as little as the hardware. Another way that Moodle costs are kept relatively low is due to its business model. Institutions can install and support Moodle entirely themselves if they wish for no costs other than their own labour. For a large institution this may be significant but equally a motivated lecturer or group may decide to install their own local copy of Moodle at class, school or faculty level. Moodle's unrestricted usage terms for non-commercial purposes sometimes constitutes a vector for its spread. Thus it finds its way into a computer science department firstly as an interesting teaching tool for some faculty members but may later go on to displace the incumbent proprietary VLE such as in the University of Minho, Portugal (Carvalho et al., 2010) the University of Botswana (Masizana-Katongo, Mpoeleng, & Nkgau, 2008) or Monash University in Australia (Suri & Schuhmacher, 2008). Under Rogers' model of innovation diffusion this concept is known as "trialability": the ability of a user to test an innovation before deciding to adopt it (Rogers, 1995).

For an institution-wide deployment of Moodle an institution can choose to engage the services of Moodle Partners of which there are over 50 worldwide (Moodle.com, 2012). Although Partners have an effective monopoly on providing commercial Moodle services (due to the restrictions in use of the Moodle trademark) they do compete against each other and also against the cost of the doing-it-in-house option, theoretically driving down prices in a way that Blackboard and WebCT can not.

Bennett in her review of Moodle adoption in New Zealand and Australia, as part of Auckland University of Technology's VLE review report, noted that cost appeared to be a big factor for institutions but that actual figures were hard to come by (Bennett, 2011). Sometimes authors give the costs associated with the proprietary incumbent VLE but remain coy about the comparative costs of Moodle except to imply that they are some lesser amount. Or, the overall saving might be given though the cost of Moodle

not disclosed. For example Purchase College State University of New York (Landa, 2008) (circa 4000 students) claimed in a presented paper that it would save US\$ 50,000 annually in its switch to Moodle. In some cases the problem appears to be fear of potential future cost rises. So for instance DCU (circa 11,126 students) in 2003 reported the cost of the licensing of WebCT for its use to be US\$ 13,000 but that a change in the pricing structure could see this rise to US\$75 000. University of North Carolina at Charlotte (circa 25,277 students) estimated moving to Moodle as a 53% saving (Croy et al., 2009).

### ***Blackboard's Dark Shadow***

Fear of “Vendor lock in” is a factor closely related to cost. The process of moving from one VLE to another is more costly and difficult the more one has invested in it: teachers and students must be retrained, the VLE must be connected to other IT systems, and existing content may have to be migrated to the new system. Economists have noted that this is a feature of software markets where a small number of winners may emerge who may, because of high switching costs, be tempted to extract rents from customers and also try to lock them in further to their products (Shapiro & Varian, 1998).

The fear of becoming stuck with an existing VLE was exacerbated when Blackboard bought its main competitor WebCT, as the two vendors could no longer be played off against each other in negotiating pricing (Bethel University, 2009; Croy et al., 2009; Ivanova & Barnard, 2008). Blackboard went on to buy the Angel LMS which had small but significant market share in the US. Perhaps more worrying for institutions however, was Blackboard's attempt to enforce a broad ranging patent on VLE functionality that might effectively have given it a legal stranglehold on the entire VLE market (Downes, 2007). Although Blackboard later agreed not to enforce the patent

against open source products, and eventually dropped it altogether, it was not before it had done significant reputational damage to itself. Bethel University in Minnesota transitioned to Moodle in 2008, and it is not just fear but outright opprobrium that is apparent in their commentary on “Blackboard’s corporate ethos”:

Blackboard Inc. has become increasingly aggressive and litigious toward other educational software vendors over the past few years. This pattern of behavior includes a series of patent-infringement-related legal actions against Desire2Learn (in the face of almost unanimous critique from the educational community) and the acquisition of WebCT and Angel (Blackboard's primary marketplace competitors). There are legitimate questions as to whether Bethel should want to be identified with an educational organization that does not exemplify the collaborative spirit so central to our ethos. (Bethel University, 2009).

Bethel makes an explicit claim here of its “ethos” being a factor in its strategic thinking regarding VLEs. What is worth noting here is Bethel’s projection of its own identity and its use of Blackboard to cast that identity in its antithesis. Perceived threats in the external environment may have as much influence on technology choice as perceived opportunities (Bates, 2005).

## **Adapting Moodle**

### ***Adaptability: The Promise of Open Source***

Dougiamas claimed that Moodle was borne out of the frustration of not being allowed to modify the source code of WebCT to his own ends (Dougiamas & Feldstein, 2010). He ensured, via his licencing of Moodle, that anyone would be allowed access to the source code and have the right to modify it. These rights are very dominant professed rationales in the Moodle adoption literature. Otago Polytechnic New Zealand (circa 3,342 students) was an early adopter of Moodle and cited the ability to customize

Moodle just after cost:

We have had no real issues with Blackboard apart from the yearly cost of licensing which has made us start to look for alternative systems. We also take issue with the license restriction against customizing Blackboard as we would wish. (Bremer & Bryant, 2005)

The perception that Moodle is easier for institutions to adapt to their own needs is widespread. “Moodle has no licensing fees [and] allows easier customization” was part of the summary conclusion of a VLE review at the Polytechnic California State University (Calpoly, 2011). The ability to customize Moodle was also in the adoption rationale in DCU (McMullin & Munro, 2004) and this often comes under the label “flexibility” (Bennett, 2011; Canale, 2011; McMullin & Munro, 2004). Expressing sentiments similar to those of DCU and the OU, Royal Roads University, British Columbia, Canada, in its 2006 move to Moodle, could align developing and contributing to the VLE, with one of its objectives as an institution: to be at the forefront of “teaching innovation” via “learning technology advances” (Chao, 2008). The identity of an institution here is to be as a co-creator and developer of innovations rather to simply buy them already packaged up.

### ***Ways of Adapting Moodle***

Large organisations such as La Sapienza University of Rome (circa 50,000 students) or the OU (circa 200,000 students) had specific functionalities they wanted to develop themselves in their VLE such as accessibility enhancements (Moodle.org, 2006a; Sclater, 2008b). The Roles and Permissions architecture, which allowed allocation of very specific rights within the VLE to classes of individuals, was a functionality that the OU decided to contract Moodle HQ directly to implement (Bierhals, 2009). Other features such as enhanced discussion forum features (including interestingly

functionality from a previous VLE which OU teachers said they could not live without) and a more advanced wiki for Moodle were developed in-house by the OU's own Moodle developers (Sclater, 2008a; Sclater, 2008b; Sclater, 2009). A major amount of work was also done on the Quiz module in Moodle by the OU. To this end, OU developer, Tim Hunt, spent a year on sabbatical in Moodle HQ in Perth, confirming a strong collegiate relationship between Moodle and its biggest single user. This model helped allow the OU to directly write code into the heart of Moodle. In contrast to plugins this code was available automatically to all users of Moodle worldwide, and did not need to be installed or configured separately. It became part of canonical Moodle.

Other customizations may occupy a messy middle ground: they are not plugins that can be easily plugged and unplugged from Moodle nor are they part of the canonical code. Rather this type of code must be rewritten into the OUs version of Moodle every time they upgrade the software (Hunt, 2010). So, in many cases it is desirable to have an institution's modifications become part of canonical Moodle. This (in theory) means that the functionality that this code expresses will always be in Moodle and obviates the need for any local customization i.e. because Moodle HQ are now committed to looking after this code. The importance (but also the difficulty) of having locally developed innovations accepted back into canonical Moodle is alluded to by OU developer Sam Marshall in the title of his 2011 talk: "How to change Moodle: Working with Moodle HQ" (Marshall, 2011).

### ***The Complexity of Adaptation***

The OU thus has a rich and complex strategy for its development of Moodle which includes locally controlled customizations that remain outside of canonical or core Moodle (although plugins are often released publicly for others); a developer who was

embedded in Moodle HQ; paying Moodle HQ for certain developments; and key members of its team of developers working closely with Moodle HQ to develop desired features. So although Moodle is flexible and can be adapted locally, doing this work, and more crucially sustaining it, may require significant commitment on the part of institutions.

Although Moodle adopters are attracted by Moodle's "flexibility" the process of actually adapting Moodle to one's needs may not be so straightforward. For Hultin (2005) a common mistake in choosing a VLE is selecting customization instead of configurability. This is illustrated by one Moodle adopter who complained about proprietary software: I can fix my car so why am I not allowed to fix my software? (Clayton, 2005). The answer may be precisely that many people *do not* fix their own cars. However his analogy highlights that the *potential* to do-it-yourself is always there with Moodle. Potentials are often a more exciting and easier sell in strategy documents advocating adoption of an open source VLE than more nuanced or messy portrayals of the issue.

### **More ways to compare VLEs**

Almost all institutions that enter into a VLE review process perform an internal usability evaluation, comparing the incumbent with Moodle or similar (Itmazi & Megías, 2005). These studies are so abundant that a meta-analysis of them would not only be probably less costly but its findings would presumably be more sound.

However, the process of changing VLE must be seen to be believed. Abstract results of studies elsewhere may not be enough to convince people when they face a major change of technology. Many studies find either, relatively little difference between the old VLE and Moodle in terms of functionality and how easy or satisfying it is to use each, or that there is a preference for Moodle. This is unsurprising as we are not including literature

here where Moodle was evaluated but rejected (Itmazi & Megías, 2005). However, pressures exist upon those doing VLE reviews to find in favour of Moodle as the existence of the review itself indicates unhappiness with the current VLE and thus may be likely to assume some bias towards positive outcomes for the alternative. Despite this, some studies ranked Blackboard/WebCT as equal to Moodle for usability (Bremer & Bryant, 2005; Bryn Mawr, 2011; Canale, 2011) or even slightly above it (Corich, 2005) but still went on to adopt Moodle. Sometimes adopters make reference to “pedagogical fitness” which can mean various things but is often related to usability (Whelan & Bhartu, 2008). An interesting finding of one recent piece of research into factors affecting the adoption of e-learning found that “perceived usefulness” is more important than “ease of use” (Šumak, Hericko, & Pušnik, 2011). This appears to be borne out in Moodle’s adoption where its open source promise of adaptability outweighs usability if it ranks equal or lower than the alternative.

### **Moodle and Social Constructivism**

Many adopters refer to Moodle as being based on “social constructivist” principles or theory (Chao, 2008; Clayton, 2005; Corich, 2005; Ivanova & Barnard, 2008; McMullin & Munro, 2004; Sclater, 2008b; Wainwright et al., 2007; Weller, 2006). In some contexts, this becomes quite a widely sweeping claim:

While most [VLEs] are instructor-oriented and largely concerned with how course content is delivered, Moodle is based on a learner-oriented philosophy called social constructionist pedagogy, in which students are involved in constructing their own knowledge” (Chavan & Pavri, 2004, p.129)

Or as another source (albeit from a book on Moodle) has it: "This is revolutionary, as

most [VLEs] have been built around tool sets, not pedagogy. Most [VLE] systems are tool-centred, whereas Moodle is learning-centred.” (Cole & Foster, 2007, p.4)

Dougiamas often outlines his understanding of pedagogical theories and how they shape his thinking and they indeed were very important to the early development of Moodle (Dougiamas & Taylor, 2002; Dougiamas & Feldstein, 2010; Dougiamas & Taylor, 2003). Some commentators see VLEs including Moodle as pedagogically neutral (Sclater, 2008b). It may be difficult to answer the question as to whether one VLE is more socially constructive than another (Costello & Johnston, Forthcoming) (or even to frame this question itself) and there is a very vast and long standing debate on the interplay of technology and pedagogy. However we can leave aside this particular polemic and instead note that another way of viewing these claims in the Moodle adoption literature is as a particular language that Universities and other higher educational institutions identify with. It becomes a cultural marker for a VLE review committee to latch onto in the very serious but hugely complex task that they face. Social Constructivism becomes something to distinguish Moodle from WebCT/Blackboard (other than price). As an interesting counter example the Sakai VLE badges itself as “technology that enhances teaching, learning and *research* [emphasis added]” (Farmer & Dolphin, 2005). Moodle makes no such claim. Quite which features make Sakai stand out from say Moodle or WebCT as specifically a research platform are unclear but Sakai spread most rapidly and became the VLE of choice proportionally most often amongst research intensive universities (Williams van Rooij, 2011).

### **Peer Pressure: Network Effects and VLE Spread**

Selecting and then moving to a new VLE is a major endeavour. Moreover, as VLEs increase their importance the decision takes on ever increasing seriousness to the point



that it may pose an almost existential threat to an institution. Fear of vendor lock-in is one manifestation of this threat: “the (almost) complete visibility of the life of an open source community provides more information about its hope of survival in the eLearning market than the financial reports of super-protected commercial players” (Botturi et al., 2006, p. 4). As the preceding quote shows survival, visibility and protectionism are worrisome themes of VLE adopters.

An institution may claim it “will have more autonomy” upon a shift to Moodle (Monash University, 2010). And then, paradoxically, institutions frequently display forms of herd behaviour in the face of such threats. This is perhaps unsurprising when making decisions that are so complex and involve so many variables. Rogers in his theory of diffusion of innovations refers to this as *homophily* - that given the option, an agent will usually choose to interact with those others who are most similar to him or herself (Rogers, 1995).

As Rogers’ theory predicts, institutions are strongly swayed by their geographical peers. Auckland University of Technology considered only what Australian and New Zealand Universities were using when looking at VLE usage in the process of deciding on its VLE strategy (Bennett, 2011). University of North Carolina at Charlotte referenced its neighbours’ use of Moodle in the Appalachian State University and Louisiana (Croy et al., 2009). Indeed, in this case a very strong network effect was at work as Charlotte has been previously part of a consortium of Universities who had banded together to negotiate a bulk license with WebCT but was now facing a rise in their licensing costs due to the breakup of the consortium as one member moved to Moodle. The powerful dynamics of group behaviour are clearly at work here. In Australia (quite strangely given that Moodle originated there) Moodle had been slow to take hold. However, after The University of Southern Queensland adopted Moodle in

2008 others soon followed suit such as Canberra and the University of Canterbury (Barr et al., 2008).

Moodle was already well established in New Zealand which was home to some of its earliest adopters, in part due to a tranche of funding from the New Zealand government secured by universities and companies and used to develop Moodle (Clayton, 2005). Some New Zealand institutions had specific language requirements and the localised and cultural aspects of the adoption decision process are apparent:

Available proprietary learning management systems tended to reflect a “first world North American” environment that did not reflect the cultural populations of Aotearoa -New Zealand (particularly Maori and Pacific peoples), there was significant incentive to adopt a transparent and open code-base to modify to meet these cultural needs (Clayton, 2005).

Peers might not necessarily be geographical. A distance learning university might cite adopters of Moodle such as Athabasca or the OU as the University of the South Pacific did (Whelan & Bhartu, 2008). Bethel University of Minnesota cited large regional adopters but also fellow Christian colleges and universities (Bethel University, 2009). Thus adopters seek to situate themselves in a particular peer group in their VLE adoption rationales. A university may have an individual culture or identity (Silver, 2003) and universities certainly act in co-ordinated ways. Daniel (2012), for example described the move towards MOOCs by universities in loaded terms as a “gadarene rush”.

## **Conclusion**

The OU became the prime example that Moodle was a valid choice. It has world-wide recognition, as an open and distance learning university it would be heavily reliant on Moodle, and due to its size would require a very robust and scalable system. The OU

itself of course had chosen Moodle in part because it appeared to be growing faster than Sakai (Sclater, 2008b). So success becomes a factor of success (Katz & Shapiro, 1994; Whitt & Schultze, 2009). This network effect may even become the dominant force over time that drives institutional adoption of Moodle (Spinellis & Giannikas, 2011). It is closely tangled with a University's perception of itself vis-à-vis its peers. It may be that an early important factor in Moodle's success was institutions' citation of peer use as an attempt to establish their own identity via those peers. This in part, along with the other factors mentioned, led to an eventual cascade of adoption. As this process went further on in time, institutions caught up in the cascade, may be merely engaging in a process akin to psychological rationalisation, claiming that they still have a choice but in many respects merely going through the motions. This is because of a gradual consolidation of the VLE market where the numbers of people using VLEs massively increased while the number of available VLEs diminished.

This is not to paint a bleak picture however, far from it – the move towards open source VLEs such as Moodle has many positives. Universities show that they can recognise potential threats and avoid what they perceive to be rent-seeking behaviours of proprietary VLE vendors. Moreover the positive spin-offs of the lowering of the cost of technology via open source will undoubtedly have positive impact for developing countries where Moodle is growing rapidly (Dougiamas, 2013). If trends highlighted here continue, open source software such as Moodle will continue to be adopted and play a consequent role in opening education.

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