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Two Models for Sharing Digital Open Educational Resources

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ABSTRACT

Two contrasting models to facilitate the sharing of digital educational resources available for Higher Education are reviewed. The first model is based upon a low-input / open-access format that identifies, reviews then integrates digital resources taken from the global open educational resources pool into a course structure. New resources are added where required and the totality is contextualised for the specific current curriculum requirements. The second model is based upon a membership system linking global schools in any subject but trialled in dentistry to create, structure and curate a common pool of digital educational resources. The models selected have their roots in common initial goals but have chosen different routes to structure and fund their development in their search for sustainability. The models are contrasted and compared in terms of ease of use and contextualisation, and some general lessons for further OER development are drawn.

Keywords: online education; models; OER; sustainability.

Introduction

There has been a growing movement to openly share digital resources over the internet, and although education is currently only a small proportion of this activity, there are signs that the concept is increasing in significance (Organisation for Economic Co-operation and Development [OECD], 2007). The open source movement is part of this enhanced desire to share digital resources, as is the global interest in social media networks (Rennie & Morrison, 2013), but despite the interest from universities, colleges and schools in social media, the main drivers towards sharing have largely been motivated by recreational and leisure interests through services such as Flickr (photographs), YouTube (video clips) and audio files (music, radio programmes, podcasts) for downloading. Of course, these resources also have the potential to be used for educational purposes, but in most cases this was not the primary objective.

By contrast, open educational resources (OERs) *are* specifically designed to be shared for educational purposes, and although a standard definition of OER is "digitised materials offered freely and openly for educators, students and self-learners to use and reuse for teaching, learning and research" (OECD, 2007, p. 10), in practice this definition covers a very wide area. It is not our purpose here to re-hash the arguments in favour or against OERs as these have been well documented elsewhere (Rennie & Mason, 2010; Commonwealth of Learning, 2005; Gurell & Wiley, 2010), but some specific features of shareable digital resources deserve further detailed examination. In particular, the contrast between 'bottom-up' OERs (created, often on the fly, by individual users) and 'top-down' OERs (supported by large institutions as part of a strategic focus) is intriguing as they appear poles apart in terms of motivation, especially in terms of expert review. This leads to debate on the relative quality of the different approaches. Furthermore, the sustainability of a philosophy that invests in creating high-fidelity quality resources then gives them away begs the question of 'why?' In this paper, we specifically exclude consideration of the current vogue for Massive Open Online Courses (MOOCs), which share many of the drivers of OER production but have a much shorter track record (Daniels, 2012; Littlejohn, 2013). We seek to compare two different global models of delivering OERs, namely low-input / open-access (Net-University) and membership (UDENTE) models, respectively.

The selected model for OER deployment adds weight to the debate surrounding the sharing of OERs, and in this paper we review the two models which might be considered to be opposite ends of a continuum. Downes (2006), among others, distinguishes between funding models, technical models and content models for OER deployment and attributes very different functions and requirements to these different structures. In our first example, we consider the Net-University model – a project that was a *co-producer* type of a small, decentralised and low-cost open-access initiative. On the other hand, the UDENTE project is based on a *membership* model, with access restricted to a paying partnership, higher costs and a more tightly centralised control of the quality of resources that are added to the common pool. The two models have aspects of funding, technical infrastructure and content creation that reflect the attributes described by Downes (2006). However, this paper focuses on the differing management of OERs within the two models.

It is important to assert that both models have strengths and drawbacks, and this is not an attempt to value one above the other but rather to analyse the opportunities that each provides towards improving the quality and accessibility of online educational resources. In both models, we currently are only considering digital OERs, and even this offers a huge variety, but we should remember the advice of Downes (2006, p. 2) that "a wider view would include all the supports for an educational system" which he then went on to itemise, including "visiting lecturers and experts", "twinning arrangements", "imported courseware" and "inter-institutional programmes". As many of these arrangements are already commonplace for most universities, we are considering here only the most fundamental and the most problematic component of shareable resources, the curriculum resources that are adopted and made available to learners. This can be the most challenging aspect of OER deployment from an educator's perspective as many teachers may be reluctant to freely share their life's works (Schönwetter & Reynolds, 2013).

The Net-University model

This initiative was co-ordinated by the East Iceland Knowledge Network, with academic partners from Lews Castle College (University of the Highlands and Islands, Scotland) and Jönköping University (Sweden). Also involved in the project as contractors were the University of Akureyri (Iceland) and Smart Labrador for the Province of Newfoundland and Labrador in Canada.

There were five clear objectives of the Net-University project (Rennie, Jóhannesdóttir, & Kristinsdottir, 2011):

- To open universities to the public as an essential part of continued vocational training and lifelong learning.
- To make university education more accessible to adults and inhabitants of rural areas, including students undertaking self-directed learning.
- To create a platform for cooperation both between universities / continuing education centres in Iceland and abroad in developing new courses and degrees.
- To create a platform for continuing education centres and institutions in rural areas to develop courses at university level related to vocational educational needs.
- To develop methodologies and support for students in distance education.

The project began by considering better sharing of educational provision within Iceland (particularly ICT solutions) as a means to access resources, avoid inefficient overlap and improve quality learning experiences for students. This thinking led to 1) the investigation of opportunities for networking within Iceland, 2) opportunities for international networking and 3) investigation into the improved use of OERs as a basis for curriculum development. This is new thinking in the Icelandic educational system, and serious further development would mean rethinking the existing funding system that is built primarily on face-to-face teaching. Advantages are not just in cost savings, labour efficiency and driving up quality by networking the best resources but also in supporting regional development through the investment in (decentrallised) rural areas.

To experience at first hand and then to demonstrate the advantages of using OERs to construct degree-level courses, the partnership prepared course materials on a mutually agreed theme (the interaction of people with the natural environment) and documented the process (Rennie et al., 2011). Following a process piloted in previous projects (Rennie & Mason, 2010; Rennie & Weller, 2010), a range of appropriate OERs were sought, identified and linked with contextualised text to produce a (first-year) university-level short course, or module, which was then hosted on an open-access public wiki. In common with past experience, it was found that some of the desired educational materials were not apparently available in OER format, or not entirely appropriate for the proposed use, so a small amount of new resources were created to fill the perceived gaps and then added to the global OER pool. The resultant completed course was intended as one component part of a full programme of university study in this subject discipline.

The UDENTE model

UDENTE (Universal Dental E-Learning) offered a membership model for access to learning resources, in the context of dental education (but applicable to any academic subject) in a not-for-profit business solution for the wider Higher Education (HE) sector. UDENTE consisted of a flexible learning platform (FLP) into which technology enhanced learning tools and digital educational resources were integrated. The educational resources were in the form of peer-reviewed reusable learning objects (RLO). UDENTE was the product of the IVIDENT (International Virtual Dental School) project, a £2.3 million HEFCE (Higher Education Funding Council for England) and Department of Health funded enterprise that ran from 2007 to 2010 (Reynolds, 2011).

The original goals of IVIDENT addressed the then chronic shortage of dentists in the UK (Fitzpatrick, 2009) and also the lack of specialists in smaller disciplines globally (such as dental radiology). By maximising the training and sharing opportunities, the project aimed to widen access to high quality educational resources and tools globally.

The following were the goals of the IVIDENT project:

- To work in partnership with other HE Institutions to provide an innovative solution to national dental educational needs by way of a FLP.
- To enrich the student experience using mobile technologies in the clinic, linked to the development of haptics (technology using the sense of touch) that could ultimately integrate with the FLP (Schönwetter, Reynolds, Eaton, & De Vries, 2010).
- Create and validate the basis for a sustainable national and international high quality flexible learning capability.
- Reflect the common strategic policies and missions of the collaborating partners in the pursuance of world class excellence in the service of society, teaching and learning, research and clinical care.
- Work with HEFCE in completing the project to ensure a robust financial plan and effective management structures; create a flourishing collaborative environment to promote good technology enhanced educational practice.

The IVIDENT project was led by King's College London Dental Institute (KCLDI) and run in conjunction with the founding partners: University of Portsmouth School of Professionals Complementary to Dentistry, Eastman Dental Institute, University of Bristol Dental School (BDS), Queen's University Belfast School of Dentistry and Tier2 Consulting. Other national and international organisations and institutions have offered advice and support consistent with the planned development of the FLP.

The resulting UDENTE platform differs from other currently available virtual classroom and library-style resources by offering a holistic approach to electronic learning and teaching through seamlessly and securely integrating all components of the educational process, from admission to assessment through a FLP (Reynolds, 2011).

The IVIDENT project achieved this integration through the use of a Service Orientated Architecture (SOA) that universally connects tools that are standards-based web-services. The linked technologies included any institution's own VLE, an enterprise-level Learning Content Management system to archive all the learning objects and a series of apps built to add to existing VLE capabilities such as standards-setting and double blind marking. In addition, a security component – the Integrated Authentication and Administration Service – allowed secure logins through a subscribing partner institution whilst recording all activities within the extended learning environment by way of analytics. IVIDENT, therefore, could be considered to fulfil many of the criteria for the next generation of virtual learning environments as a VLE 2.0 (Weller, 2007) but differs in that the e-contents are generally not freely available except to subscribing institutions.

Particular features of good practice were identified in the IVIDENT project:

- Development of a robust quality assurance workflow for learning objects in the repository.
- Judged to have met the criteria of HEFCE's seven strategic priorities for supporting higher education institutions in the development and embedding of technology enhanced learning (TEL) through a benchmarking exercise in May 2009 by senior staff and students from ten international institutions (HEFCE, 2009).

- Development of administrative tools to measure user activity (analytics).
- The provision of legal documentation covering copyright and licensing issues for authors, institutions, industry, subscribers and proposed Charter membership.
- Exceeding expectations in aspects such as international collaboration through Charter Membership, benefits for developing countries (Roberts, Carruthers, Hatzipanagos, Comfort, & Reynolds, 2010) and provision of extended e-resources through the partnership of major publishers.
- Promotion of leading-edge research such as haptics (HEFCE, 2009) as part of the IVIDENT dissemination and future research opportunities.
- Creation of a business plan for sustainability under a new badge, 'UDENTE' (Universal Dental E-Learning).

Comparison and contrast of the models

Our purpose in contrasting these two different approaches of the Net-University and UDENTE towards sharing digital resources for education is, as previously stated, not to value one above the other but rather to explore the variety of situations in which each model is most appropriate, and ultimately to consider the implications for practice and further research for each approach. The main comparisons may be summarised in Table 1.

What we see here in microcosm is the current debate between 'small OERs' (individually driven and created; e.g. contributions to YouTube, Slideshare etc.) and 'big OERs' (institutionally driven and supported; e.g. MIT, UKOU etc.). The advantages of 'small OERs' are that resources can be created easily, quickly, and cheaply, often championed by innovative individuals, but the disadvantages are that resources may be of variable quality and are generally unsupported. On the other hand, 'big OERs' are backed by 'big-name' institutional brands and are fully supported but may have a high cost in time, money and institutional support, as well as a certain ponderousness in the procedures for creation and deployment.

In practice, the Net-University and UDENTE models can produce both high-quality and less-useful materials, but they have radically different solutions to the problems of ensuring the sustainability of the resources. There have been several attempts to classify different models of such resources, based upon the degree of centralisation required (Wiley, 2007), on user-groups (Dholakia, King, & Baraniuk, 2006) and on funding models (Dholakia et al., 2006; Wiley, 2007; OECD, 2007; Guthrie, Griffiths, & Maron, 2008). Crucially, in terms of sustainability, it is the funding models that attract the most attention, rather than the resources themselves, for it has been rightly pointed out that the capital cost of creating and/or remixing digital resources may be a small sum compared to the revenue costs of making the resources openly available and in maintaining accessibility to the repository.

The disciplinary area of OER use and of shareable digital resources is a recent technical and pedagogical topic and, like much else in e-learning, is quickly evolving. The jury is still out on the balance of 'community moderated' versus 'institutionally moderated' resources. There is little doubt that there is an appropriate (but different) context for both ends of the continuum and that some mid-point meeting might be a natural evolution for inter-institution online learning in Higher Education. In this compromise position, creative, innovative educationalists would be encouraged and supported by their own institution to develop new digital resources, and these resources would be peer-reviewed and supported by the infrastructure of their institution, thereby ensuring the best of both models. Following the OECD (2007, pp. 93–94) terminology, a key factor in the future adoption of OERs more widely may be the drift from the (Net-University-style) *replacement* model, "in which open content replaces another model and can benefit from the cost savings resulting from the replacement", on one hand, towards the opening out of the *contributor pays* model, "in which the contributors pay the cost of maintaining the contribution, which the provider makes available for free". Alternatively, the *contributor pays* model might be replaced by a *membership* model, in which interested institutions form a compact to contribute seed money on a fixed basis. Perceptively, this report also noted that both the *contributor pays* and the *membership* models may be a transitional stage towards either the *segmentation* model, in which the provider makes the resources available freely but also offers links to 'value-added' services, or the *conversion* model, where the provider gives something away for free then converts the user into a paying customer. Significantly, these last two models are not mutually incompatible. Anderson (2008) has reviewed the trend for business organisations to give away products free in order to secure paying customers further down the line. This 'loss-leader' approach is currently being piloted by some

Table 1 Contrast of models

Net-University	**UDENTE**
Large range of existing digital resources already available	Large range of existing digital resources available
Subset of 'open' internet-based system of general subject relevance	Subset of 'closed' system of specific subject relevance
May or may not be peer reviewed before adding to the collection (may be difficult to ascertain)	Each resource is peer reviewed before adding to the collection
Resource co-created by informal institutional or individual collaboration	Resource co-created by collaboration in a formal institutional partnership
Free to view and use for all web users	Free to view and use only for institutional members of the formal partnership
Relatively weak marketing brand although individual OER may have been produced by a high-reputation source	Relatively strong marketing brand based upon the reputation of the constituent members
Inexpensive (or free) to create and use	Creative costs may range from moderate to high
Inexpensive to maintain (distributed partner costs)	Expensive to maintain (shared partner costs)
No structured updating (reliant upon individuals)	Formalised updating through partnership monitoring activities
Resources will require contextualisation	Resources may already be contextualised for use
Updating and maintenance is left to individual diligence	Resource maintained through an institutional cost of membership, or reduced costs for developing countries
Wide variation in quality and educational level (which is not necessarily fully apparent to a casual user)	Greater consistency in the quality and educational levels (explicit in the guidelines)

MOOCs and other initiatives that make learning resources freely available – for example, the UK Open University reports an increase in student numbers through participation in the OpenLearn activity (Littlejohn, 2013).

Reusable learning objects and open educational resources

The concept of reuseable learning objects (RLOs) has been around for some years. It could be argued that, with increasing openness of access, the concept of RLOs segues naturally into the concept of OERs. That is a discussion for another place; however, an inherent danger with both concepts is that many resources will be created by enthusiastic educationalists, but a much smaller number will be reused. There are many reasons for this; cultural resistance, technical difficulties as well as the need for contextualisation and/or for meta-tagging, among others. Furthermore, the context of the resource use is undoubtedly influenced by the granularity of the resource being made available (larger, more complex resources may need to be used in their entirety or lose context in the editing process). The granularity varies widely among the major providers of such resources; e.g. MIT (2010b) provides podcasts of individual hour-long lectures but indexes these into a sequenced course of study; the UK Open University hosts whole modular courses (OpenLearn, 2010) comprising a structured package of linked OERs; academicearth.com tends to broadcast complete but long video clips of lectures, whereas YouTube and TED talks emphasise short, stand-alone presentations of between three and 15 minutes.

The Net-University project specifically selected digital resources with a small granularity so that they could be combined and contextualised flexibly into carefully crafted courses (adding external links and creating new resources to fill perceived 'gaps' when relevant). This was a deliberate attempt to build whole open-access courses by aggregating small, specific digital resources, adding context and maintaining the flexibility to integrate with a variety of different learning platforms.

UDENTE, on the other hand, by restricting the degree of openness to within the membership of the partnership, has been able to provide a comprehensive suite of tools for the identification, delivery and monitoring of shareable digital resources using a common FLP that is compatible with a range of institutional VLEs. Each institution can therefore choose from a variety of quality assured building blocks (RLOs, ranging from single images to whole courses) to create their own teaching resources. The locally created programmes are then quality assured through the institutional member's own quality processes. One of the aspirations for UDENTE is that it will provide materials for dental schools in emerging economies that do not have sufficient staff to create or solely deliver the curriculum. This will enable face-to-face teachers to maximise their teaching capabilities by freeing them up from repetitive academic tasks, and, in the case of dentistry, allowing them to focus on practical training. It also means that smaller specialities, where there are no local experts, can be taught by non-expert staff, with online supplementation (Roberts et al., 2010). This 'blended learning' approach is particularly relevant in the case of emerging economies, where there is often a lack of expert and non-expert faculty. A not-for-profit business approach in the membership model can mean that first world economies can help subsidise online training in developing economies. This also means that there could be some negotiation in the degree of openness of the materials to be made available. It is worth noting that the publishing and pharmaceutical industries, whilst being for profit, already have differential pricing in emerging economies in many cases.

Convergence and the inter-operability of devices, and software for manipulation of the digital resources, are also key aspects to be considered in resource uptake and sustainability. UDENTE has attempted to solve this problem in a closed system by ensuring the universal connection of digital tools and enabling future development towards connecting haptics devices as new technical opportunities present themselves. The use of open Web 2.0 social networking and communications software can be facilitated through a secure portal arrangement with a third party, whether this be an open source solution or a freely available community group. This arrangement exists with a dental community group called Dental Companion (Dental Companion, 2009). Conversely, the Net-University model is built on an open system – connecting to digital resources wherever they are available – and utilises the tutor as a facilitator to identify and select relevant information – a sort of trusted map-maker – rather than functioning as the sole (or even main) transmitter of subject knowledge.

The student experience

In both models there is an emphasis on placing the student at the centre of control of the learning experience by presenting multiple paths to knowledge accumulation, by offering information access through a variety of devices and by encouraging students to learn how to search and identify quality educational resources for themselves rather than to read and memorise only that which they are given. Evidence for the success of this approach is that, currently, over 85% of the 70 million visitors to the MIT OpenCourseWare initiative are identified as students or self-learners (MIT, 2010a). In the longer term, the issue of quality assurance by peer review might be resolved by users themselves in the wider online community – by selecting and commenting upon individual resources and possibly by grading the usefulness of a) the resources themselves, or b) the creators of the resources (e.g. as on eBay and Amazon suppliers).

Finally, it is interesting to speculate that both the 'completely open' and the 'open-to-membership' models may both be 'Trojan horses' in transition to a model that provides a free leading edge of digital educational resources, leading to more in-depth resources that are 'pay-for-view' (e.g. customised learning packages, access to faculty expertise, assessment, certification).

Implications for the deployment and sustainability of OERs

In adopting the use of OERs as a strategy to make learning resources easily available to students, the sustainability of any model needs to be considered in two parts (OECD, 2007, p. 90): 1) the sustainable production of OERs and 2) the sustainable sharing of resources.

In the Net-University model, sustainability is sought through distributing the workload throughout the (voluntary contributions of the) entire open education online community (which hides the costs among individual contributing authors), whereas in the UDENTE model, attempts to ensure sustainability are through institutional membership and shared responsibility (which has a recognised institutional cost, although the resources are then available to all the membership). In both cases, the individual contributions of OERs are aggregated to produce a total benefit greater than the sum of the individual components. In the apparent trends towards greater openness, digital flexibility and increased personalisation, there are some fundamental challenges that we should mention here.

Both the Net-University and the UDENTE models raise important legal and management issues for the production (publishing style, copyright, intellectual property rights [IPR], dissemination) and the utilisation (personalisation and support) of OER collections, and these issues are summarised below:

1) New ways of publishing

The UDENTE model has many similarities to traditional publishing models, whereas the Net-University one has a greater reliance on

digital social media for the dissemination of the resources. Some intriguing issues result from this contrast:

- As the use of all resources in the enterprise level UDENTE repository can be measured, contributing publishing houses with resources in the repository have potential access to important market survey information. The Net-University example has a less clear structure (the OER may be published on diverse social media), which makes it more difficult to survey the frequency and form of use of these resources.
- Publishers may also benefit from licensing opportunities for their assets shared by the UDENTE membership. However, as publisher assets may no longer need to be in the libraries of institutions as books or e-books, a potential saving to member institutions can be made.
- Newly devised courses and programmes ('derivative works') need careful consideration in relation to Creative Commons licensing arrangements and digital rights management in general. For the UDENTE membership model, a suite of licences has been created with the aim of clarifying these issues. In the Net-University example, the onus on licencing rules lies with the individual creator of the OER.
- The development of an integrated 'e-shop' further allows the members to market their courses and resources according to specific licensing agreements. This may include, in the Net-University case, the utilisation of commercial management options such as Amazon.
- Combining the knowledge of which resources are the most used in the UDENTE example with user feedback, collections can be generated (e.g. the 'hundred best articles on…') with important marketing implications. This is more difficult in the Net-University example, but not impossible by using net analytics.
- Changing the way that publishers choose and deliver their materials may further a change in publishing practice towards flexible published works and resources, especially those that can be linked through various forms of social media.
- Creation of collaborative works as per the Bologna Process can incentivise the development of high quality materials that may become agreed core materials. The last model already exists for some online accredited programmes in public health medicine such as NetDOC, a global consortium led by the University of North Carolina.

2) Copyright and IPR

Attributable rights to all materials in UDENTE exist, either as the publisher (UDENTE initiative) or in individual collections of already peer reviewed material of established publishers. This may or may not be the case in the Net-University model as the OER have been drawn from a widely different educational background, context and authorship. An interesting avenue of exploration will be to investigate how OERs can be combined with peer review processes and utilised in open course environments. Although both the approaches of Net-University and UDENTE offer the potential for such recombination, it seems likely that the more controlled, and member-restricted, environment of UDENTE may provide more immediate opportunities.

Although Creative Commons licences may provide a template for establishing 'ownership' of a wide range of OERs, illustrations, articles, opinions etc. (in both of the models discussed), it also seems likely that the main benefits to institutions may be the subsidiary benefits associated with establishing a high quality in brand name. In particular, the opportunities provided by linked data in a semantic web environment (Goddard & Byrne, 2010) enable providers of content (educational institutions, media and broadcasting, individual artists) to simultaneously provide 'free' digital resources and also to 'pull' users towards other (paying) aspects of their business.

3) Personalisation

Various authors (Downes, 2005; Attwell, 2007) have emphasised that personal learning environments (PLEs) are best considered as an educational approach rather than a specific application. This description refers to both the Net-University and the UDENTE initiatives. A review of personalised and self-regulated learning using social software (McLoughlin & Lee, 2010, p. 30) drew attention to:

> *…two quite different interpretations of PLEs. The first entails the understanding of personalisation as the need to embrace a learner centred but provider-driven approach to education; the second adopts the view of a wholly learner-driven approach that transcends the walls of any classroom, institution or organisation.*

In these contexts, both the Net-University and UDENTE enable tutor-facilitated education compliant with the first interpretation, and they can also enable self-regulated learning according to the second interpretation; the Net-University approach is more flexible and anarchic in its use of all freely-available OERs to be found on the web, the UDENTE approach is more structured and confined to the boundaries of the initiative's agreed membership. Both styles have obvious pros and cons, and it remains to be seen how 'open' OERs will evolve to suit users' demands.

4) Training and Support

McLoughlin and Lee (2010, p. 33) noted that the role of "teachers" in a personalised learning environment changes from one that is dominantly transmissive, to, firstly, a *supportive* role (introducing new resources and helping to make sense of these in context) and, secondly, a strengthening of the *diagnostic* role (continually examining students' activities and suggesting further learning activities). This is consistent with the 'tutor-facilitated' interpretation of PLE above, but also provides a necessary grounding for learners to acquire the skills to evaluate their own learning requirements. This latter point highlights the crucial requirement that: "Moving towards the personalisation of learning environments also entails aiding learners in developing the fundamental skills that enable them to manage their own learning" (McLoughlin & Lee, p. 37).

This entails providing a comprehensive structure to 'scaffold' the learner, while at the same time supporting the development of generic competences and real-world skills. The functionality of UDENTE to track what learners view, provide opportunities for self-assessment, and then to provide immediate feedback that includes suggestions for further learning activities and/or links to other learning resources is a fundamentally important component of this specific learning environment. An important next step is to explore how this functionality can operate effectively within the more open environment of web-based OERs in general. The UDENTE model has greater focus on creating learning resources for a specific subject area, which are then shared with the membership; whereas the motivation in the Net-University model is to pull together already existing learning resources (to avoid 'reinventing the wheel') and only then create new OERs to fill specific gaps in the course of study.

Lessons for academic practice

New ways of delivering and sharing digital resources are evolving, and the comparisons above signpost new considerations for academic practice concerning the creation, use and maintenance of OERs. It does appear that attitudes of academic staff are changing towards the greater use and promotion of OERs (Rolfe, 2012); however, key lessons from the analysis of these two models indicate two fundamentally different approaches to the creation, deployment, and maintenance of OERs.

Creation

The digital nature of the OER allows the easy creation and distribution of resources, but a greater balance of effort is required in the creation/editing stage than in the publishing/distribution stage. As with more conventional publishing models, the preparation of the resource (writing, peer-review, editing, proof-reading, graphics, IPR) requires meticulous attention to detail in order to ensure a high-quality product and a good brand name. Publishing the completed resource on the internet (with whatever degree of access) is a relatively simple task. The Net-University is not so reliant on unique branding as the UDENTE model, but high quality resources from well-known authors and institutions are a key feature in the recognition and uptake of resources in both models. The development of the OER used in the Net-University model relies upon aggregating the ad hoc creation of resources by diverse individuals and institutions, while the UDENTE model has a much greater predetermined structure, although the degree of 'openness' is more limited.

Use

Both models described in this paper used digital learning resources to construct courses of study that followed a social constructivist pedagogy, and although the digital format allowed easy embedding in a 'course' structure, the freewheeling Net-University model of completely open access required greater attention to proper contextualisation, quality checking and link maintenance. As the learning resources were drawn from different authors and diverse contexts, the ease of locating and incorporating resources into a 'course' was offset by this very diversity in quality and stability of links. These issues are routinely addressed in ensuring the stability of the membership model of which UDENTE is an example.

Maintenance

The sustainability of the open-access model gives wider access to potential users, but it is dependent upon the enthusiasm (and ability) of the creators to maintain the quality and the links. Institutional creators of OERs are pitching at the high-end market for quality, but this comes at a price that needs to support a sustainable business model. It seems attractive that some middle ground should emerge to: a) collate and curate 'small OERs' through a well-regarded public-good site; b) make some proportion of institutionally-supported 'big OERs' freely available as a 'loss leader' to encourage uptake of other membership services.

Conclusions

This paper has compared and contrasted two models of sharing digital resources, the Net-University 'open to all' model, and the UDENTE 'open to subscribers' model. It may be that these two models can be considered as simply occurring at different points on the continuum, from free (total costs of production covered) to commercial (total cost of production fully recovered), and that, as Anderson (2008) has argued, both are based on a new business logic that gives a product away free (educational resources) in order to secure a larger customer base (students registering for other courses). There are advantages and limitations to both approaches, mostly centred around the perceived value of the 'open' (Net-University) and 'membership-only' (UDENTE) models.

Most specifically, the UDENTE model offers a firmer control over quality and sustainability (membership supported) but has disadvantages in the cost of creation/maintenance of resources and the costs of access. The Net-University model has a wider quality threshold and is co-dependent for sustainability upon mass user engagement in the creation, maintenance and quality control of resources, but it has the advantage that resources are easily available and inexpensive to create and sustain.

The development of peer evaluation services for OERs (trusted brands) as well as the ability to better contextualise (semantic web) resources may increase confidence in the quality and the value of open-access OERs. Conversely, the more formal structure of the UDENTE model should create a strong brand, augmented by the ability to track and control the availability of the resources (analytics). The membership model may also lead to a tiered repository of resources, with free access to good quality resources being used to draw in paying customers to use other (restricted) resources, or perhaps a 'pay-for-view' model similar to iTunes or satellite TV. Market intelligence from the analysis of user statistics of online use may attract the eye of publishers, not least because the alternative may include expensive face-to-face surveys of stakeholder preferences for educational resources.

Quality assurance, access, analysis and affordability are key factors in both models, with the Net-University relying upon the quality and licencing to be provided by OER creators prior to the selection for inclusion in a course, whereas the UDENTE model takes responsibility for these issues as a condition of institutional membership. Issues of personalisation and who is able to get access to the resources are strongly influenced by the motivation behind the construction of the OERs. In this respect, the two models can be seen as part of a continuum, with the Net-University model trading wider, more open access, and flexibility of use for a more diverse quality and format of resource type, while the UDENTE model trades a more restricted access to resources for greater certainty in the quality, relevance and usability of the digital resources. As OERs of widely different granularity become more common (from simple images to entire short courses), it is the space between the two models, most especially at the points where they meet and named brands compete, that need to be carefully watched.

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