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## Designing for innovation around OER

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**Abstract:** This paper argues that designing collections of ‘closed’ educational resources (content and technologies) for use by specific student cohorts and collections of open educational resources for use by any ‘learner’ require different design approaches. Learning design for formal courses has been a research topic for over 10 years as the ever growing range of digital content and technologies has potentially offered new opportunities for constructing effective learning experiences, primarily through greater sharing and re-use of such content and technologies. While progress in adopting learning design by teaching practitioners has appeared slow so far, the advent of open educational resources (OER) has provided a substantive boost to such sharing activity and a subsequent need for employing learning design in practice. Nevertheless there appears to be a paradox in that learning design assumes a reasonably well known and well defined student audience with presumed learning needs and mediating technologies while OER are exposed to a multitude of potential learners, both formal and informal, with unknown learning needs and using diverse technologies. It can be argued that innovative designs for formal courses involve creating structured pathways through a mixture of existing and new content and activities using a mixture of media and technologies in the process. This type of ‘configurational’ design that blends together given items to meet a particular need, rather than designing something fully de novo is typical in many areas of work and not just teaching. Such designs work very well when there is a small set of users of the innovation or their use of the innovation is narrow. However many innovations in information, communication and computing technologies often have multiple types of users and many more layers of complexity. In these cases, rather than heavily pre-define an innovative solution just to meet certain user requirements, it is necessary to design for greater flexibility so as to allow the users to adapt their use of the innovative solution for their own requirements once it has been deployed. The use of such an ‘innofusion’ approach for OER is highlighted using the case study of OpenLearn ([www.open.ac.uk/openlearn](http://www.open.ac.uk/openlearn)).

**Keywords:** Innovation, diffusion, learning design, user requirements, OER.

### 1 Introduction

The design of educational resources has been predicated on the specific use to which they are to be made (Lane, 2008a). The content element of the resources is matched by the creator(s) to the intellectual learning needs of the proposed audience (a student cohort on an approved course or programme of study) while the medium of construction, instruction and delivery are chosen to meet the assumed learning styles of the proposed audience (often based on the experiences of previous cohorts to the pedagogy provided). This structuring process is therefore normally well controlled by the teacher, choosing much of the content and the way tuition is provided, based on the assumed homogeneity of the students. In practice the form of tuition can be varied to suit the particular cohort if it is more diverse than expected but fundamentally innovation around the teaching and learning process is driven and managed by the teacher.

While there is much more detail to learning design and how courses of study may be constructed and configured (Britain, 2004; Conole and Weller, 2008) than implied above, the advent of digital



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technologies has led to two countervailing trends. The first is greater control through the adoption of virtual learning environments (or learning management systems or virtual campuses) by higher education institutions (HEIs) as a growing means to administer student record systems alongside the management of content delivery and certain interactions and transactions with the students (Lee, 2008; Schreurs, 2009). The second is the greater availability and accessibility to content and technologies for learning by students that have arisen as the Web has developed and open educational resources have emerged, even pointing towards an open participatory learning infrastructure (Atkins, Brown, and Hammond, 2007) or laboratories of open educational practices (Geser, 2007). This open movement has led to new opportunities for innovation by both teachers and learners and not just within the confines of the formal course (McAndrew et al, 2010). But just because an innovation has been developed it does not mean that others will readily adopt it or build upon it in any way. So as well as designing and creating innovations that are released on to the Web (technological push) the product or process will only diffuse out amongst potential users if it appropriately meets their needs (social pull) or is simple to use (Toikkanen, 2008).

### **Designing for open educational technologies**

Kahle (2008) has written about the primacy of design for educational technologies and that for open educational technologies in particular he proposed five principles:

1. Design for access – who is the technology open for?
2. Design for agency – the degree of user action and control over the technology;
3. Design for ownership – allowing people to have a stake in the technology through open licensing;
4. Design for participation – encouraging community involvement in developing or extending the technology;
5. Design for experience – take note of the aesthetics of use as users will quickly make judgements on this.

Through all five principles there are elements that involve innovation pre the release of the technology coupled with continued innovation post the release (the concept of perpetual beta as discussed by McAndrew, 2006, among others). At the same time some of those same elements encourage take up or adoption by individual users as well as diffusion amongst communities and populations of users. This interplay between innovation and diffusion of new technologies and particularly the contribution made by users rather than the original creators has been termed ‘innofusion’ by Fleck (1998).

## **2 Drivers of innovation and diffusion in education**

Much of the innovation in educational practices within formal settings involves creating new configurations of the products available (the content and the technologies) but more importantly the people and processes involved in their deployment and use. For instance, an interactive screen experiment can provide alternative learning experiences from the experiments done within laboratories and enables distance learners to experience the processes of setting up, running and evaluating physical experiments (Hatherly, Jordan and Cayless, 2009). But such virtual laboratories are equally useful as preparation for working in teaching laboratories for those in campus based programmes or for reinforcement and revision. Thus the one new element (the content of the interactive screen experiment) can be deployed in a number of different ways to suit different educational purposes (e.g. simulation, familiarisation, formative assessment, and revision). Equally, the technology for constructing and delivering the interactive screen experiment may find uses in other practical disciplines e.g. product design.



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With OER there are potentially many more people and processes that are able to utilise open content and open technologies in novel ways not thought of by their originators. Openness provides an invitation to innovate, even if it is only to learn in a different way. In particular there are different but related factors emerging that enable individuals to innovate (or not) and factors emerging that enable institutions to innovate (or not) around teaching and learning (Sclater, 2009).

With regard to individuals, Wiley and Hilton (2009) discuss several trends in what they see as some of the key features of educational systems in an increasingly digital world; features that underpin and are driving the need for more open design and innovation (Table 1).

Table 1 Trends in the components of educational systems (after Wiley and Hilton, 2009)

Analogue	>>>>>>	Digital
Tethered	>>>>>>	Mobile
Isolated	>>>>>>	Connected
Generic	>>>>>>	Personal
Consumers	>>>>>>	Creators
Closed	>>>>>>	Open

The first trend that Wiley and Hilton (2009) note is that analogue content on paper or acetates is difficult to duplicate and share whereas the same content in digital forms is more available and accessible and can be duplicated infinitely without affecting the original. Digital materials are also easier in some respects to modify than their analogue counterparts. This digital modification is a general innovation which has been readily adopted by users, for instance with music, video and pictures, whether legally done or not.

Second they feel that teaching and learning is moving away from the dominance of fixed locations for a defined period (e.g. Schools, Universities) to many locations (work, home, communities) throughout the life of the learner.

Next they conclude that isolated small group activity in such fixed locations is being replaced by a more widely shared activity amongst distributed communities using the social communication technologies enabled by the Web.

Their fourth trend is that formal generic designs of learning experiences pre-prepared by teachers in fixed locations for defined periods will change to their being more personal designs created by the learners that mix and match formal and informal learning opportunities.

These previous trends are then changing the dynamics of the teaching and learning process with learners moving from just being a recipient of educational experiences to a participant in the creation of educational experiences that meet their learning needs.

Lastly, as well as the digitalisation of content and technologies, another significant factor is that previously closed and protected resources and activities are being opened up to all through the open licensing of content and technologies (e.g. Creative Commons).

The scale of the impact of these six trends on education is difficult to predict as they have emerged at a fairly rapid rate and without any end in sight to such developments. Will many people actually construct their own, personal learning experiences? Will many modify what others have produced? However in terms of enabling innovation these different factors do allow learners to make such choices if they wish. They are not as constrained by pre-defined products and processes and can experiment as much as they might want to.

In contrast, higher education institutions have been the bastions of maintaining pre-defined and pre-determined products and processes, innovating and evolving slowly within managed structures. The



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emphasis for institutions assessing the use of new technologies has been to devise or adopt computer-based systems that attempt to integrate many different functions at the same time – for student records, bulletin boards, content delivery, and as a communication medium – under the title of virtual campuses, virtual learning environments or learning management systems (Schreurs, 2009). These new systems also generally mimic the analogue systems that preceded them and in themselves do not carry much inherent process innovation. However, as detailed by Katz (2008), HEIs are now faced with similar challenges to individuals in the way computing technologies are changing in themselves and so changing how they might construct the architecture of their ICT systems. In addition HEIs have to deal with learners using varied collections of more widely available technologies to do many of the same tasks that are being offered through a comprehensive VLE.

Institutional considerations of OER, both open content and open technologies (but not particularly the major open source software systems e.g. Moodle, Open Office or major free services e.g. GoogleDocs™, Facebook™) seem to go through a set of stages (Table2). To reach the end point of transformative practices requires careful consideration of how the others are tackled. In particular it implies a trend away from tightly designed and managed systems to more openly designed and managed systems that give flexibility to innovate around a looser framework of standards and best practices that also involves the different users.

Table 2 Stages in OER project development (McAndrew, 2010)

1. Legal: release of copyright through creative commons
2. Practical: provide access to content
3. Technical: develop an environment for open access
4. Pedagogic: understand the designs that work
5. Economic: devise a model for sustainable operation
6. Transformative: change ways of working and learning

These many ideas about innovation around education and the effects on developers and users alike are now explored further through a case study – that of OpenLearn ([www.open.ac.uk/openlearn](http://www.open.ac.uk/openlearn)) from The Open University in the United Kingdom.

### 3 Designing for innovation: the case of OpenLearn

The Open University has always been innovative in how it designs and delivers teaching and learning, and in evaluating the impacts of those innovations on the users of them, particularly through its Institute of Educational Technology (<http://iet.open.ac.uk/home.cfm>). The greater openness that informs the University's activities has led to more flexible and accessible educational provision reaching out to more people than at most Universities. Even so there are many constraints on what formal learners (students) and informal learners can do, with innovation controlled by The Open University through sets of content and technologies structured and designed by academic and support staff. The advent of OER (both tools and content) after the launch of MIT Open CourseWare (<http://ocw.mit.edu>) has offered yet more flexibility to both content and technologies and encouraged The Open University to open some of their own content and technologies up as well, thus providing innovations for others to build upon.

The starting point for The Open University's own in depth deliberations in 2005 over what it should do to join in with this new movement was based on reinterpreting its mission of 'openness' through the assumption that OER and The Open University are a natural match (Gourley and Lane, 2009). Amongst several challenges we wanted to explore were:



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- How do we make it easier or more effective for adult learners of all abilities to engage with OER and gain from that experience?
- How do we make it easier or more effective for teachers to use, re-use, rework and remix OER for their own purposes?

This required a flexible design approach and attitude as we took on board all the trends noted by Wiley and Hilton (2009) and Katz (2008) and also adopted the Web 2.0 ideas set out by O'Reilly (McAndrew, 2006). Much of what we did and discovered about our users in our first two years of operation are covered more fully in McAndrew et al (2009), as well as the mixed methods and data sources we used (although the challenges of collecting evidence in this field must not be underestimated as discussed in Godwin et al, 2008). What follows are reflections on how we have fared against the six stages of OER development and the five principles of design discussed earlier. This is done by looking at both what we did on OpenLearn and how different categories of users reacted to those innovations.

First, the six stages of OER project development. As with any new operation there has been considerably more work done on the first four stages for OpenLearn but less on the others in the first four years of the initiative.

**Legal:** For OpenLearn initial plans were to develop an individual open license that could be tailored to deal with large quantities of third party material in Open University content. However, in the end a Creative Commons license was selected as it offered the advantage that we did not need to explain the license and material could be transferred to other sites that used the same license. In fact the use of a license with a non-commercial element has helped the University to further develop its good relationships with third party content providers by making it clear that OpenLearn is not aiming to establish or assist rival commercial content providers. Indeed, as reported at a workshop held in 2008 for academic publishers who had granted use of their copyrighted content on OpenLearn, some of those academic publishers saw working with us as a way for them to better understand the open and free movement and what it might mean for their activities and business models. They were innovating by proxy!

**Practical:** The feasibility of providing existing content in a free and open version had been established by a number of initiatives prior to OpenLearn but more often than not, while this content was available and accessible on a website and could be openly downloaded, there were not many examples where it was possible to do anything with it on the site. In addition to making content freely available in a particular format, we wanted to make the content available in as many formats as possible to give greater choice to the users of the site and to allow activities to happen on site. By basing the content on an XML schema and using Moodle for our platform we have ended up with 8 different formats for our courses (or study units as we call them on OpenLearn) incorporating 5 media types (e.g. PDFs, MP3 files, Flash animations). Growing numbers of individuals and institutions have used this functionality within the LabSpace (<http://labspace.open.ac.uk/>) of OpenLearn to takeaway and/or modify our published content. Currently downloads across all 8 formats amounts to nearly 60,000 per month, although the most format popular is printing the study unit to get an analogue version. Some examples of the ways in which content is being modified are described in McAndrew et al (2009, pp 50-60)

**Technical:** Content from existing initiatives had tended to place any additional tools within particular content being offered; for example java programs in OpenCourseWare. For OpenLearn an overarching open environment of learning and sense making tools was devised, using an open source learning environment, Moodle, enhanced by custom tools from our Knowledge Media Institute. As many of these tools worked separately from any particular piece of content some users, particularly learners, would use them widely (e.g. keep a Learning Journal) or to do activities not related to any of the content on the site (e.g. FM videoconferencing or Compendium knowledge mapping). We also found it



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easy to remove tools or functions that did not seem to work or gain acceptance such as an instant messaging system which few users used. Equally we introduced some functions, like in situ editing of material in the LabSpace, at the request of users (McAndrew et al, 2009, pp 25-26, 58-60).

**Pedagogic:** Closed resources for student use at The Open University already have a pedagogic structure which was retained for the open resources. So most resources were transformed under an integrity model whereby it was the medium of delivery that changed rather than the pedagogic structure (McAndrew et al, 2009, pp 30-31). However, using the XML schema and Moodle based environment did simplify the delivery of resources with embedded audiovisual resources rather than on separate DVDs and allowed dynamic click and reveal of in text questions. Many people, through both an online survey completed by 2,011 people (Godwin, S, 2008; McAndrew et al, 2009, p 38-43) and lab-based and remote observation of users (McAndrew et al, 2009, p26; San Diego and McAndrew, 2008), have commented favorably on this functionality and the ability to print out material for reading at other times rather than spending time reading a lot of text on screen. The XML schema also enabled further innovative investigations such as creating audio versions of texts (Brasher and McAndrew, 2009).

**Economic:** while OpenLearn has been largely experimental to date there has been tracking of its effects on student recruitment and selection of courses and of the new opportunities that could arise from selling other products and services on the back of free content (McAndrew et al, 2009, pp 9-10). More importantly much work is now going on the embed OpenLearn into the University's existing and developing policies and practices (Lane, 2008b).

**Transformative:** Stage 6 is seen as beyond the scope of this initial experimental phase; however as just noted the influence of the project has been wide-ranging and is now being taken forward to impact on production techniques, research approaches and business models. The initiative may therefore have a reasonable claim to have been transformative of our thinking if not yet of our practices (McAndrew et al, 2009, pp 8-14).

Having looked at the six stages of OER initiative development introduced by McAndrew (2006) we will now work through the five principles of design for open educational technologies set out by Kahle (2008).

**Design for access:** A key early decision was to split OpenLearn into two main sites – a LearningSpace for learners to engage with the content with (hopefully) easy to use tools and a LabSpace for teachers to be more innovative in remixing old content or uploading new content (McAndrew et al, 2009, pp 24-26). It was also decided that everyone can browse almost everything on the site but that they would need to register to use the tools on the site. This has meant that there have been over 10 million browsing visitors against 130,000 registered users since launch, with 95% visiting the LearningSpace rather than the LabSpace. However this did mean that we could treat the LearningSpace as the safer, more robust site and use the LabSpace for greater experimentation with tools and content. This easy initial access to the site coupled with the ease of taking away the content in many different formats has also helped access to using and reusing the content (McAndrew et al, 2009, pp 35-43).

**Design for agency:** The next design decision was to avoid being too prescriptive about which educational content to publish and to provide the content in a number of different formats as noted above. While the wide variety of resources we published from across all programmes and levels gave a wide choice of material to attract and interest visitors the large number of formats gave greater choice to users to manage how they technically used or worked with the OER (there can be up to 15,000 printings and 10,000 downloads per week of the 600 or so Study Units as they are known). And although there have been fewer visitors to LabSpace (less than 10% of the total number of visitors) many have experimented with the opportunities to make versions of Study Units to edit in-situ or to test uploading content into a new Study Unit (over 200 instances to date). Moreover, some groups from other institutions have been given spaces to undertake collaborative projects and which have



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enabled them to experiment and use the site for personal and professional development, learning about OER and its affordances (over 40 such spaces have been created to date, with examples noted in McAndrew et al, 2009, pp 50-60). Such activities are enabling further investigations into new forms of learning design (Dimitriadis et al, 2009).

**Design for ownership:** The decision to go beyond having a store of content to display the content within a formal learning environment (Moodle) meant that users could then variously engage with the content and communicate and collaborate with other users. However the testing of some functionality has not been as great as we would have liked because there are still not enough heavy users or because users did not immediately find the functionality appealing or of any use. While the absolute number of heavy users is small compared to all the browsing visitors many do spend much time posting to forums or making entries to their Learning Journals (e.g. over 360 forum posts and 188 journal entries in July 2010). In fact their visibility and permanence also gives other users additional value to the primary content itself. That is, they have liked the flexibility to add to or augment the content they have looked at, and sometimes making those entries publicly available to all users (McAndrew et al, 2009, pp 38-43). But undoubtedly, just providing tools is not enough, if users are not ready for them or do not see the value they might add to their teaching and/or learning practices.

**Design for participation:** By creating different spaces for different functions we hoped to not mix together the possible communities of practice and by making it easy to register and giving users control over certain features has encouraged participation and some innovation (McAndrew et al, 2009). In the LabSpace both the PlaySpace (now IndieSpace) for individuals and the Collaborations area (now ProjectSpace) for groups and projects has enabled cross border and cross institutional experimentation without the need to set up formal agreements (McAndrew et al, 2009, pp 50-60; Santos, 2008)). As noted above, this has generally acted as continuing professional development for many of those involved (Wilson, 2008). In fact one of these grant funded projects, POCKET or Project on Open Content for Knowledge Exposition and Teaching (<http://labspace.open.ac.uk/course/view.php?id=3452>), provided a major test bed for institutional collaboration and development that has been a precursor to another grant funded initiative enabling wider involvement with others HEIs through SCORE - a Support Centre for Open Resources in Education (<http://www8.open.ac.uk/score/>).

**Design for experience:** We tried to offer innovative choices by adding to Moodle functionality through a perpetual beta approach with 4 monthly releases of revisions and new features. We often had difficulties in assessing the usefulness of some of these functions when often the only measure was apparent use through user logs and tracking systems rather than impact on practices, although we did run user testing in a special UserLab, sometimes involving eye tracking equipment (San Diego and McAndrew, 2009) to get richer feedback. But as noted above some features are very closely tied up with a Study Unit. Others, such as the free knowledge mapping facility, are greatly liked by some users, not as an adjunct to their study of Units, but simply as a useful technology in its own right (there are an average of 171 downloads of the software per month from OpenLearn compared to an average of 30 knowledge map downloads across all study units per month and only two map uploads across all study units per month). Other functionality, such as users being able to create Learning Clubs (modelled on book clubs), has been taken up and such clubs have been created in some numbers (over 100 in the 18 months since being introduced) but only a few have been used seriously for learning.

## 4 Conclusions

Open Educational Resources can be viewed as an innovative development in their own right as the open licensing inherent in them enables content and technology creators to make their content or technologies more available and accessible to more people than would otherwise be the case. However, for OER to aid innovation in the teaching and learning process, they also have to be easy to use and/or provide significant value to teachers or learners to adopt and adapt them. The Open





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University has tried to meet the differing needs of learners and teachers by creating two linked, but separate, OER sites based on Moodle ([www.moodle.org](http://www.moodle.org)) that offer both a number of open technologies as well as much self-study open content derived from regular formal courses and other teaching projects. In both cases we have introduced innovative features that have given users the scope to innovate in how they work with the content and the technologies in situ and away from the site. As noted earlier, innovations have to be useful to be adopted, so much emphasis has been placed on researching and evaluating user reactions to OpenLearn features and as a whole.

For teachers it appears that there has so far been more interest in the technologies and their capabilities than the content itself. The evidence for significant repurposing other than using Study Units 'as is' is limited. But the opportunity to learn by trying and explore innovations in a space not involving their regular students has been seen to be of value to some. Where activity does happen it is noticeable that it involves groups of people already working together for some purpose. This finding points to greater value coming from collective team working than lone working when engaging with OER.

For learners, both students in HEIs and self learners not currently studying at an HEI, the main value has come from the content and the fact that it is designed for self-study. Many registered users also value the technologies that allow them to augment their study e.g. through learning journals or make contact with fellow learners, the latter particularly happens where students waiting for the start of their Open University course start up conversations on a related Study Unit, and then stop doing so when their course actually starts and they have the online course forum to use. However, so far more users are interested in the content than connecting with other learners and with most visitors coming through search and given the levels of downloads it appears that the majority are more information seekers than looking for a richer learning experience. Nevertheless, users have adopted and adapted their practices and readily provided suggestions for changes to the site or for new content they would like to see.

For higher education institutions, OpenLearn has shown that they can experiment and innovate in an open way to help their own development and understanding of how to publish and use OER. While this has not yet led to much innovation in content or curriculum development, it has shown a willingness to collaborate across institutions in new ways. For The Open University itself OpenLearn has been an institutional innovation that has stimulated many new project led innovations each feeding off and feeding into each other both within and without The Open University (McAndrew and Lane, 2010). This has only been possible because of the original adoption of a more open design and innovation process. With OER it is important to design for use by all possible users through more open innovation rather than just design for publication for a narrow 'student' audience.

Overall, these trends do seem to support the 'innofusion' notion set out by Fleck (1998) that OERs support innovation both pre-release and post release, as users adopt and adapt them yet further.

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