

Computing postgraduate programmes in the UK and Brazil: learning from the experience in distance education with Web 2.0 support

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ABSTRACT

Education can benefit from experiences and collaborations across different countries and cultures. We carried out a study to analyse the experiences of the use of Web 2.0 tools in distance education in the UK, and propose a set of lessons that can be applied in the Brazilian context. The recent economic growth in Brazil has resulted in a strong demand for further education. Distance education has emerged as a strong contestant to address this demand. We present, in this chapter, the case of the provision of postgraduate education for professionals at a distance. Distance education in Brazil is currently gathering support as it offers great potential to address the big geographic and social divides. However, there are many barriers and misconceptions that perpetuate a climate of distrust. Our study draws a set of lessons learned focusing on the benefits that distance education can bring to the development of professional postgraduate education in technical and engineering areas, in the light of the experience of The Open University (OU) in the UK. They emphasise the support that Web 2.0 can bring to these experiences, but also draw attention to the quality that the production process plays in the learning experiences. These lessons address the following: support for skills development with Web 2.0 technologies, the role of the digital educator, Open Educational Resources, Open Education and social dimension, and quality and pedagogy in the educational process.

INTRODUCTION

Education, in an era of globalization, can benefit from many opportunities for collaboration and mutual enrichment across experiences in different contexts. It is relevant to look at comparable situations in different countries, to understand important factors of success in a specific situation, and to discuss what can be learned, adapted and applied elsewhere.

This chapter presents the results of a study of two countries, Brazil and the UK. This study was intended to understand their current situation in terms of postgraduate education, and what could be learned from experience in the development of distance education using Web 2.0 tools. Our case study presents a contribution to the future of postgraduate education for professionals at a distance in Brazil, in the context of the current high demand imposed by its fast economic growth.

Brazil is a country in rapid development but with strong regional inequalities. It has a population of 190.732.694ⁱ, distributed in a geographically large area. Governmental efforts are making the access to the Internet widely spread. According to CGI.brⁱⁱ, the Brazilian Web has been growing since mid 90s, both in the number of users and in the range of services and applications provided through the network. Internet usage by the Brazilian population has raised from 37 million users in 2005 to 65 million users in 2009. The Brazilian plan for postgraduate education 2011-2020 (MEC, 2010) has as one of its objectives to cope with the industry's demands for qualifications. A recent study carried out by Brasscomⁱⁱⁱ (2011), pointed out a need of 78,000 professionals whereas the education sector will only provide half of this demand. Federal, state and private universities provide full Internet support in their postgraduate education. Thus, this scenario creates a unique opportunity to explore how Web 2.0 technologies can support the promotion of postgraduate distance education in Computing in Brazil, learning from the experience in the UK.

The UK has extensive experience in distance education for the last 40 years, triggered by The Open University (OU)^{iv}. The OU is the biggest university in the UK, and the only one providing higher education entirely at a distance (except for full-time research students). It has a strong widening participation agenda, promoting social justice and equality of opportunity. Brazil has a more recent experience (Junior, 2009) with some positive steps being taken in public sector distance education with, for example, the creation of the Universidade Aberta do Brasil^v (UAB) (Costa & Pimentel, 2009) in 2005. Even if growing quickly, distance education has not yet expanded to postgraduate programmes in Computing. There are also still some strong pockets of resistance, which view distance education as synonymous of lower quality (Porto & Berge, 2008; Sommer, 2010a), in particular at postgraduate level.

With the advances of Web 2.0 technologies (Conole & Alevizou, 2010), new pedagogical opportunities have been opened to distance education. In particular, the emergence of social and participatory media has started to challenge course designers to understand, and make the best use of, the way students communicate with others (Conole, 2011). These facilities, together with the widespread use of the technologies, many of which are available as open source tools, make Web 2.0 appealing to educators especially in developing countries.

This chapter starts by looking at the systems in the UK and Brazil for postgraduate education: regulation of curriculum and awards by governments and institutions, and the type of degrees offered. The following section discusses the situation of distance education in Brazil, and analyses the experience in the OU (UK) in particular, with design initiatives for distance education. We then present experiences in using Web 2.0 technologies in postgraduate distance education in Computing. The main contribution of this chapter is presented as a set of lessons from experience of both course design and use of Web 2.0 technologies. This is a contribution to a debate (Almeida, 2010) on the way forward for Computing postgraduate distance education in Brazil. We focus, in particular, on professional masters, which have a great potential for innovation, can provide significant social benefits and promote an improvement in the qualification of many professionals. We finally suggest future directions and conclude.

Throughout this chapter, we will be using the generic context of Computing postgraduate degrees, in particular those geared to the development of a professional body; most of the experiences observed in

this research and presented here are, more specifically, from within Software Engineering (SE). Both authors have a long experience of postgraduate education: the first author at the OU and the second author in Brazil. This research was undertaken with the first author being immersed for one year in the context of the OU and results from extended participation, observation and analysis. This experience underpins the discussion and recommendations of what can be learned from one context and applied in another.

THE BACKGROUND FOR POSTGRADUATE PROGRAMMES

This section sets up, for each of the two countries, the generic background in which higher education sits. We look at how curriculum and awards are regulated by government and other agencies, and the type of degrees offered. We can then highlight the major differences in order to further analyse their influence in distance learning practice with Web 2.0 support.

Postgraduate degrees in Brazil

The Brazilian government's educational department, Ministério de Educação e Cultura (MEC), is responsible for the regulation of higher education provided by both public and private institutions. The Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) is the MEC's agency responsible for postgraduate programmes at national level. Postgraduate degrees are classified in *lato sensu*, and *stricto sensu*. The former are shorter programmes, typically one year and a half long, offered for professional training or updating, comparable to postgraduate diplomas in the UK. They are regulated nationally by the MEC, but once established they are not assessed regularly. *Stricto sensu* degrees consist of master and doctorate programmes and are nationally assessed for quality by CAPES. The assessment of postgraduate programmes is a major activity undertaken by CAPES; it consists of a very precise system for assessment and approval of new programme proposals. Existing programmes are assessed every three years and given a classification on a scale from 1 (one) to 7 (seven). Assessment is currently based on: research profiles of staff (20%), research profiles of student body (dissertations and publications) (30%), research publications (40%), and social integration/impact (10%). This determines the value of grants that students receive and the annual funding to programmes according to the classification obtained by each programme.

For historical reasons, postgraduate programmes have been developed geared to the achievement of high academic standards establishing a well-defined research path towards a doctorate. Thus, they have become rather inflexible (Porto & Berge, 2008; Romizowski, 2005) as regards the demands of professional sectors (MEC, 2010). Recognition of this inflexibility has led to an increased interest in professional masters (Ribeiro, 2010); however, these have not yet been widely implemented. Professional masters are also strong contenders for distance education due to the type of people they attract; but, distance provision at this level has not happened yet in Brazil in the public higher education sector. Currently, there are professional masters in Computing in only six state institutions in Brazil. In contrast, there are 53 master (non-professional) and 23 doctorate programmes. Professional masters are fee-paying^{vi}, have a different type of final dissertation, and are assessed, by CAPES. The assessment criteria is similar to the one for academic masters but with different weights for each item: research profiles of staff (15 to 20%), research profiles of student body (dissertations and publications) (25 to 30%), research publications (30 to 35%), and social integration/impact (20 to 25%) (CAPES, 2010).

There is an ongoing debate about the status of professional masters, in particular: whether a dissertation from a professional master can be of the same standard of a dissertation from a non-professional master degree and how it should be assessed; whether or not public money should be spent on education that is going to benefit the private sector; and, whether the negative attitudes towards these masters, in particular from assessors, are justified (Agopyan & Lobo, 2007; Negret, 2008; Ribeiro, 2010; Spink, 1997). A recent assessment of postgraduate education in Brazil (Almeida, 2010) criticises the lack of diversity and flexibility of postgraduate courses. It proposes that master degrees as they exist (strongly research oriented) should disappear in favour of shorter, specialised professional masters that are not directly tied up with a doctorate, and are more widely available. This suggests an approximation between masters degrees in Brazil and those in the UK although the debate is only starting. This chapter contributes to this debate by discussing how Brazil can benefit from the experience with distance education in the UK, to make professional masters reach a wider audience.

Postgraduate degrees in the UK

The UK higher education institutions are responsible for maintaining academic standards and quality (QAA, 2009). The Quality Assurance Agency for Higher Education (QAA) is an independent body responsible for checking that these responsibilities are met, making recommendations and sharing good practice. Within this remit, QAA provides an infrastructure that contains the following components:

- Framework for Higher Education Qualifications (QAA, 2008)
- Subject benchmarks (QAA, 2000, 2011)
- Guidance on programme specifications
- Good practice guidelines

The framework defines the qualifiers for each type of grade in higher education; subject benchmarks define the whole of the cognate area, abilities and skills expected of students in the area, principles of course design and learning, teaching and assessment issues. Guidelines for preparing programme specifications and guidelines on good practice in several areas of activity are also made available by QAA.

The subject benchmark does not impose restrictions on curricula other than in very generic terms. There is, therefore, a wide variation in postgraduate degrees in the UK (HEPI, 2010). Masters degrees are defined, in the qualifications framework, by a descriptor which encompasses a wide variety: those with only taught courses, those following a programme of research, and those which are the majority, and that combine both courses and research. In Computing, even for degrees with taught courses and a dissertation, the variety is wide. Computing attracts not only people from other disciplines, but also professionals with a need for ongoing development. Computing conversion masters became popular, from the 80's onwards, attracting undergraduates from other disciplines converting into Computing. However, this type of master has faced some criticism (CPHC, 2004) with the development of the qualifications frameworks, and the definition of standards required at master's level. This criticism triggered an effort into benchmarking masters in Computing. Recently, the QAA issued a benchmark for

masters in Computing (QAA, 2011); this statement encompasses a wide range of degrees: those building on undergraduate honours degrees, professional programmes, interdisciplinary programmes, masters of research (MRes^{vii}) programmes, as well as “generalist” and “specialist” degrees. The benchmark also defines the learning outcomes in terms of generic subject knowledge, understanding and skills at master’s level in Computing. In addition, it includes guidelines on teaching, learning and assessment and a threshold level. However, these are general enough to allow for a great diversity of masters on offer, and conversion masters have not yet gone away.

Comparative summary

Table 1 summarises the differences in postgraduate education in the two countries under: quality assessment, qualifications, awards, and fees.

Table 1. Background comparison between UK and Brazil.

	Brazil	UK
Quality assessment	Programmes assessed by CAPES. Assessment of masters and doctorates follow similar pattern.	Programmes assessed by institutions and by QAA. Assessment of research done separately from assessment of masters programmes by course.
Qualifications	Definitions centralised at governmental level; close link of all postgraduate qualifications with research. Professional masters defined, but still in small numbers, not well established, and generating still a considerable amount of controversy.	Nationally defined generic qualification frameworks, guidelines, and benchmarks. Variety of master degrees: by course, by research (MPhil ^{viii}), specialist/generalist, interdisciplinary, professional.
Awards	Approval of new awards done centrally by CAPES. Strong homogeneity of awards both in terms of curriculum and structure.	Approval of new awards by institutions. Flexibility of institutions to define structure and curriculum.
Fees	State education is free including that at postgraduate level (masters and doctorates); professional masters are fee-paying.	Postgraduate degrees are fee-paying and there are no limits on fees.

DISTANCE EDUCATION INITIATIVES

Brazilian context

Since the creation of UAB in 2005, a range of different distance education experiences started being reported (Litto & Marthos, 2006), research has been increasing, and, more recently, gathering greater interest. However, distance education in higher education in Brazil has followed a slower path than in some developing countries (Romizowski, 2005).

UAB does not offer its own courses; instead, it integrates all the different distance education offers from the public sector higher education institutions. According to INEP (2010), the number of undergraduate registrations in distance education has raised from 0.2% (of ~3,000,000) in 2001 to 14.1% (of ~5,000,000) in 2009. In addition, there is a high number of *lato sensu* courses not only in the public sector but also in the private sector. UAB leads a massive programme to qualify school teachers (Bof, 2004), and, more recently, a professional master programme in mathematics (PROFMAT)^{ix} dedicated to improve the level of school teachers. The new government (elected in 2011) restructured how distance education is dealt with making it a distributed responsibility of several subsections of the MEC covering different levels of education. CAPES accredits distance education courses, as part of its institutional or multi-institutional accreditation. *Stricto sensu* programmes are approved and assessed under the same system as the face-to-face ones.

There is now a wide variety of offerings and models of distance education (Moran, 2009). Most models require, at least partially, synchronous and/or physical attendance usually in local centres; there is no “entirely at a distance” initiative (MEC, 2007). This is seen as a way to guarantee quality. A common model for large groups is that of the class given at a distance (e.g. tele-conference or video); this model tends to perpetuate the idea of the teacher as the transmitter of knowledge rather than a facilitator for the learning process (Moran, 2009). Junior (2009), although identifying some success stories of distance education in Brazil, agrees that many of these initiatives still follow a traditional “broadcast” model of education.

Litto (2009) gives a snapshot of distance education and highlights the great potential it opens for a country where 40% of municipalities do not have a higher education institution. However, he identifies the conservative mentality of university staff that perpetuates the myth of poor quality in distance education as a major obstacle, together with the lack of references to the more recent literature on the subject, and the existence of a small number of institutions that provide poor quality distance education. This together with the inflexibility of bureaucracy and regulation justify the slow uptake of distance education in Brazil. Porto and Berge (2008) also identify some of the barriers to distance education in Brazil, amongst which is the “rigidity of Brazil’s educational system, and [...] the growing centralized decision-making taking place in Brazil’s education”. They also identify the lack of an “academic tradition in e-learning pedagogy and delivery”. Sommer (2010b) reflects on the polarization of the debate on distance education from the perspective of teacher training and raises some of the questions that could take this debate away from ideologies and party politics; namely, the nature of the educational experience, the relation between learning outcomes, skills development and quality assurance, and the role of the educator in a scenario of reflective practice and “learning to learn”.

The debate is now stronger than ever and contributions to this debate from perspectives other than teacher training are needed in a path for a more mature and well-respected distance education system.

UK experience

The OU has been a pioneer in distance education in the UK, and postgraduate programmes in Computing have been offered there since 1984. Although many other higher education institutions have now adopted distance education, this chapter focuses on the OU, which is representative^x in this area, and where one of the authors is based. Distance education in the UK is subject to the same quality processes as face-to-face education, and its accreditation is not differentiated from that of face-to-face offerings in higher education. Similarly to what was discussed above, for new awards and curriculum, institutions in the UK have also flexibility in defining delivery, there are no governmental restrictions to distance education, and many institutions have now many offerings entirely at a distance.

The OU is entirely dedicated to distance education^{xi} and has developed its own model, called Supported Open Learning^{xii}, as illustrated in Figure 1. By not requiring previous study (“open”) the OU aims to reach those who had not followed a traditional educational path; it also aims at greater flexibility by letting students plan their study around their commitments and places. Students have the support of a tutor and of an online forum to help with study material, activities and assignments, have access to a regional centre with advisers, and network with other students at tutorials, day schools or through online conferencing, online social networks, informal study groups, and events. The model is also based on high-quality teaching materials.

The quality processes in place are rigorous; tutors are supported in their work, they are monitored for quality of feedback to students and for accuracy in their marking, and their professional development is a serious concern for the OU. The model of distance education adopted by the OU was created forty years ago, when distance education was not a well-accepted practice. In addition, it was created for an institution entirely dedicated to distance education, which aimed to reach very large numbers of students. This has determined many aspects of the way it works now. Concerns with quality and equity with other institutions were very high in the agenda and the university had to fight for its acceptance; quality, therefore, permeates all its processes.

Many other universities in the UK offer now several postgraduate courses at a distance, in particular in the area of Computing and Software Engineering.

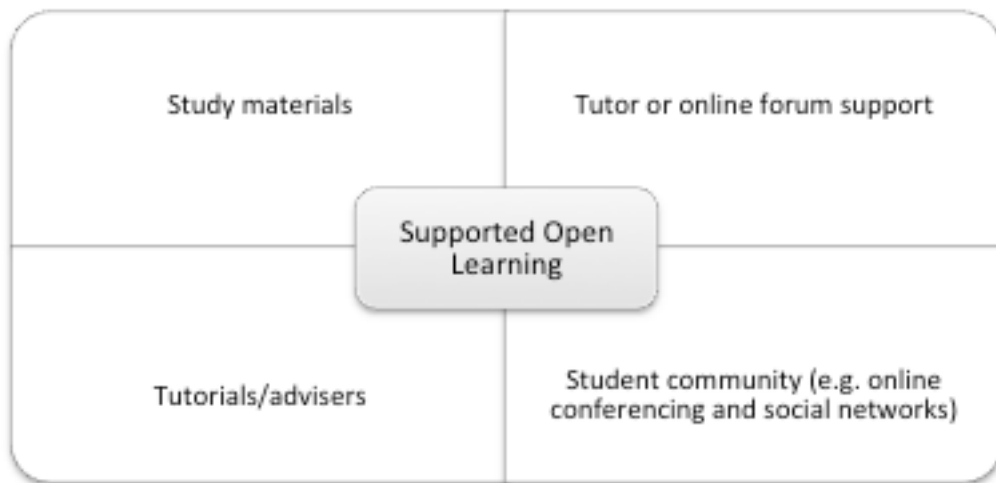


Figure 1. OU's Supported Open Learning

Course design at the OU

Distance education requires an effort in curriculum and course design well above that of traditional education; in a traditional face-to-face setting, teaching strategies are easier to change dynamically as a result of teacher-student interactions. In distance education, the learning process and the supporting technologies need to be planned ahead and play a decisive role in the success of the learning experience. This is particularly relevant in a situation like Brazil where higher education follows a more traditional educational approach and concerns with distance pedagogy are not well established in the academic community (Porto & Berge, 2008).

At the OU, there is a robust and complex infrastructure both for the production and for the presentation of courses. Academics in the OU, for example, do not give lectures (in the traditional use of the term) at a distance; they are instead involved with the preparation of high quality materials that are the main vehicle for education in most of the courses; these consist of not only purpose-written educational materials, but also video, audio and other interactive materials. The production of a course is always done by a team and involves a large number of support staff. This includes, typically, a project manager, a designer, a software developer, a librarian, a student services representative, an educational technologist, and an external academic assessor.

Computing education has been changing with the development of new learning pedagogies (Seffah & Grogono, 2002). Denning (1992) did recognise already in 1992 the need to transform engineering education in universities from a broadcast mode where only good engineering concepts are taught, to one where students also acquire the skills to listen, reflect and become self-learners. In distance education, course design has to support explicitly the development of these skills. At the OU, every degree, and every module is designed based on a well-defined set of learning outcomes that comprise:

- knowledge and understanding – content and subject matter of the course;
- cognitive skills – analysis and synthesis of the course content;
- key skills - more general and concerns like ability to communicate, use relevant ICT and information literacy, or work with others; and,
- professional & practical skills - particular skills related to the subject area.

The design of a course assessment is dictated by what is generally required of each type of award (like a project with dissertation at the end) and from its learning outcomes; all skills are assessed to guarantee the achievement of the expected outcome. This is particularly relevant at a distance where the assessment also helps the students to pace their study and measure achievement.

Course design is important when using Web 2.0 tools so that they can be well integrated with the pedagogical objectives. The information literacy skills required and the technology and tool support to be used are part of the design of a module. In Computing, in particular, students will engage with techniques and tools specific to the discipline, on top of those incorporated in the design of the distance education. The design of the teaching module needs to make explicit decisions on how these tools will be made available, and how students can be supported in their use. The next section provides some examples of what is currently being used.

The OU has developed and refined its own course design processes. These have evolved with experience, with pedagogical practice, and with technological innovations. The OU is also heavily involved in research related to pedagogical theories and practice. Recently, OULDI^{xiii} is a research initiative to develop a “methodology for learning design composed of tools, practice and other innovation that both builds upon, and contributes to, existing academic and practitioner research”. Tools being developed to support this initiative include CompendiumLD^{xiv}, to visualise course design, and Cloudworks^{xv}, a social network “for sharing and discussing learning and teaching ideas and designs”.

WEB 2.0 SUPPORT FOR COMPUTING POSTGRADUATE DISTANCE EDUCATION

It is now accepted that pedagogy and technology can head to a harmonious integration (Beetham & Sharpe, 2007). Currently available Web 2.0 tools can significantly improve production and access to information, as well as providing means to facilitate computer-mediated communication and collaboration amongst education players. Moreover, computer and network services are increasingly widely available in most people’s daily life. This leads to a higher demand for mobility and digital media that support teaching and learning. In postgraduate Computing this is more the case, as students are familiar with the use of tools due to the technical character of the discipline.

This section looks at some experiences of using Web 2.0 in postgraduate courses and discusses some issues raised by their use. We use the categories for educational Web 2.0 activities presented in Crook et al. (2008): media sharing, media manipulation, conversational arenas, online games and virtual worlds, social networking, blogging, social bookmarking, recommender systems, collaborative editing, wikis, and syndication (RSS feeds).

The use of Web 2.0 technologies in OU courses is varied. Moodle (an OU customised version), and Elluminate^{xvi} are universally used in existing programmes and courses. Students have access to *StudentHome* which is a gateway Moodle website that gives them amongst, many other facilities, access to a set of social Web 2.0 tools (e.g. forums, wikis and blogs). Each OU module has its own Moodle website with access to the module's materials and assessment, access to online forums specific to the module, and an extensive set of resources, from library links, to virtual classroom sessions. Students are given access to Google Apps for Education^{xvii} that include: email account, document creation, storage and sharing, and web space.

Wikis and collaborative editing tools have been effective at supporting reflection, and collaboration; they can help students with teamwork, and in developing academic writing skills. We look, as an example, at one of the modules, Requirements for Business Systems, of the MSc in Software Engineering. This module adopts a well-accepted software requirements textbook; most of the modules in this programme have their teaching material entirely written by OU academics. It also provides research papers, and case studies. A study guide was written as the spine of the course. It takes students through the different topics and associated resources provided with the module. This guide supports students in their study through the acquisition of the required knowledge and skills, in their self-assessment (e.g. quizzes) and mandatory assignments. Course activities are planned by weeks of study in the course calendar. They include reading, group or individual tasks, and assignments that are submitted online. Forums are used for discussions and a wiki for online collaborative work. The wiki supports the collaborative development of a requirements specification document. Students are allocated to teams according to similar interests or geographical location. They define their specific roles in the team to collaboratively develop the requirements specification. Students are assessed both by the quality of the specification and their contribution to it. Collaborative work on the production of a requirements specification is a key skill in the module's learning outcomes. Therefore, student assignments and participation in team discussions are marked taking this into account. Students can use a personal journal tool, in the module website, to keep a record of their reflections or notes of their experiences on the collaborative activities. Reflection is seen as a strategy that facilitates learning through re-examination and re-interpretation of experience. It is central to effective learning and development. A student has also a personal calendar and a pointer to a set of structured resources with support material to access information. As stated in Schroeder et al. (2010a): "The scenario not only allowed students to learn the practice of wiki-based collaboration, but also contributed to a better understanding of the intricacies of identifying and negotiating systems requirements".

Another experiment with Web 2.0 for postgraduate Computing at the OU includes the Web 2.0 infrastructure to support research students entirely at a distance, for a Virtual MPhil (research degree) in Computing. A rich and flexible combination of synchronous, asynchronous and immersive tools, was put together in order to foster an interactive online research community and promote the development of research skills at a distance. This includes a Moodle-based site integrated with an ePortfolio system, a synchronous virtual classroom system that uses Elluminate, and a purpose-built virtual campus in Second Life (Barroca et al., 2010). Students have also the flexibility of using other popular freely available technologies, like free phone calls over the Internet (e.g. Skype or Google talk), or social

networking tools. The structure developed to support these students is centred on research themes that include research students, supervisors, and their research collaborators. Students are encouraged to use the technology to develop a sense of belonging and to develop the skills that will make them independent researchers; they are given opportunities, as they would have in a face-to-face environment, such as to give presentations, get feedback and access other researchers.

Other Web 2.0 tools have been used in education even if not specifically in the OU, or in postgraduate Computing (Fitzgerald et al., 2009; Minocha, 2009); we describe a few cases of use in what follows.

There are many uses for blogs in education (Downes, 2009). They introduce a more interactive and lively version of what was previously done with personal web pages. In Software Engineering, for example, blogs maintained by respected academics are effective at keeping a live running commentary on a specific area, and providing useful references, opinions, innovations and challenges (e.g. <http://se9book.wordpress.com/> and <http://www.easterbrook.ca/steve/>). Blogs can be also an effective communication tool between educators and students. However, the effort and time required to maintain these blogs cannot be dismissed, mainly as this activity is not usually deserving of academic recognition (Weller, 2011).

Social bookmarking tools like BibSonomy^{xviii} and delicious^{xix} are well accepted and have been increasingly applied in education, in particular, to support literature review, research groups, and the writing of final year projects and theses. For instance, library services, like those at the OU, do refer students to these tools to help them manage references^{xx}. Computing students, in particular, offer little resistance to the use of software tools, and should be encouraged from early on to use them.

Instant messaging tools such as Skype chat, Google talk, Messenger, and Twitter (conversational arenas) are already part of the everyday life of Computing educators and students. At the OU, for example, supervision sessions are often run using these tools. Microblogging tools like Twitter are also being reported; for example, Schroeder et al. (2010a) report the use of Twitter by an Engineering educator at a UK university to improve communication with students, and to make announcements.

Social networking tools like Facebook are now widely used and Universities have now set up presence there as well. At the OU, for example, several modules have their own Facebook group, and the Library maintains a regular presence with announcements, discussions and references to interesting articles. Students use Facebook for socialization but it is not clear whether they are willing to mix tools used for social purposes with tools used for work or educational purposes. Conole et al (2010) report evidence of the use of social networking in higher education, and Schroeder et al. (2010a) report the use of Facebook in a UK university to run induction for new students.

Academics and students have been largely using Web 2.0 tools to broadcast and share knowledge through videos, audios, slides and texts (media sharing, manipulation, mash-ups and recommender systems). Popular tools are Youtube, Flickr and Slideshare. Students use such tools both to search for additional data, and informal knowledge. They need to develop skills to scrutinize information in order to use these tools effectively. At the OU, for example, students of a Digital Photography course make

use of Flickr (Minocha & Kear, 2009) to present their course work and receive feedback from colleagues in the course.

Existing studies report the potential use of games in higher education (Freitas, 2010). They have been commonly used for professional training. However, Freitas (2010, p. 25) indicates that “while current research points to learner driven trends associated with games usage, many of the cutting edge examples of games use are in schools rather than in HE/FE, reflecting a broader uptake of game-based approaches amongst younger learners”.

Given the context above described, Table 2 summarises learning experiences of Web 2.0 tools.

Table 2. Summary of learning experiences in the use of Web 2.0 tools.

Web 2.0 tools	Examples of application
VLEs, e.g. Moodle and Elluminate ^{xxi}	Act as the main gateway of interaction between institutions and students.
Wikis and collaborative editing tools, e.g. wikis in Moodle.	Support reflection, and collaboration; they can help students with teamwork, and in developing academic writing skills.
Blogs, e.g. http://se9book.wordpress.com/	Support teachers and groups to organize and disseminate knowledge in a more interactive and lively way than of what was previously done with personal web pages.
Social bookmarking, e.g. BibSonomy ^{xxii} and delicious ^{xxiii}	Support literature review, research groups, and the writing of final year projects and theses.
Instant messaging, e.g. Skype chat, Google talk, Messenger, and Twitter	Support supervision and communication with students and amongst students.
Social networks, e.g. Facebook, Google+, Cloudworks.	Support student integration.
Broadcast and Media sharing, e.g. Youtube, Flickr and Slideshare	Search for additional data, and informal knowledge.
Virtual world, e.g. Second life	Provide a purpose-built virtual campus for students.
Games, e.g. SIMPLE, the SIMulated Professional Learning Environment ^{xxiv}	Commonly used for professional training.

As Web 2.0 is being more widely used, research is also highlighting the challenges and risks of integrating its tools in the learning process (Conole, 2009). Schroeder et al (2010a; 2010b) discuss the use of social software to education, by analysing several tools and evaluating how they contribute to the critical factors for a successful higher education experience as in Garrison et al. (1999; 2007); they use examples from UK higher education institutions. Under social software, they include tools in the categories of: conversational arenas, social networking, wikis, blogging, social bookmarking and syndication. They identify strengths, weaknesses, opportunities and threats in a set of case studies, at both undergraduate and postgraduate level. A report of these case studies can be found in Minocha and Kear (2009) . They identify concerns about security and privacy as most tools are publicly available; they also mention anxieties created, by the use of these tools, on students who are required to accept a level of public exposure to which they are not necessarily used to. Moreover, they highlight a change of role for the educator: deciding on what level of involvement to have, accepting that extra effort may be required to set up, manage, moderate, but also adapting to a major change of attitude. The educator is no longer the “provider of information”, but rather a facilitator or moderator with implications for their training needs.

LESSONS FROM EXPERIENCE IN COMPUTING POSTGRADUATE DISTANCE EDUCATION

The lack of experience of the Brazilian state sector in postgraduate Computing distance education and the high demand for qualified IT professionals motivated the authors to learn from the experience in the UK, and formulate suggestions of what can be applied to the Brazilian scenario.

The debate is open now about the future of professional masters and the new Brazilian plan for postgraduate study (MEC, 2010) sets the background for that discussion. There is a strong concentration of professional masters in the southeast of the country (56%), and the private institutions offer 44.4% of all professional masters. They have grown in number between 2004 and 2009 of 104.2% for all curricular areas, and they are forecast to continue growing. The new plan puts a strong emphasis on the need to develop professional education and mentions specifically “critical spirit and reflection” as skills that should come out of that education. Amongst the main challenges for the next decade, the new plan identifies the expansion of professional education to take into account local, regional and national needs and to promote sustainable development and social inclusion. The plan, however, does not make recommendations in relation to the mode of delivery.

Our take on the debate on the future of professional masters is that distance education and the use of Web 2.0 technologies open opportunities for innovation in the education of, and increase in the reach to, professionals in a country with considerable geographical and social inequalities.

In what follows we raise a series of issues that should be taken into account when thinking about implementing distance education professional postgraduate Computing degrees in Brazil. We separate them in two groups, those that can be facilitated by the use of Web 2.0 technologies, and those that have wider implications and for which technology is not the answer.

Web 2.0 technologies

- **Support for skills development with Web 2.0 technologies** – there is now a wide body of research on Web 2.0 technologies support for skills development. This literature should be taken into account when deciding which technologies to support and with what aims. There is, however, a need for more domain-specific evidence for the aspects of postgraduate Computing that can be better supported through these technologies. Thus, Web 2.0 tools should not only be used for social integration but also to build knowledge in the specific subjects.
- **Tool support** – there is a highly dynamic production of Web 2.0 tools, some are becoming widely accepted in the education area, whereas others are widely disseminated in the media but still have not found a systematic usage in courses. Course designers need to take reasoned decisions on what tools should be formally incorporated in a course and what tools students should be encouraged to try informally. Institutions need also to define strategies and the right balance between maintaining control over data and tools vs. open source adoption. Course design should consider the application of Web 2.0 tools taking into account benefits and risks.
- **Resources and supporting material** – support materials need to be planned: existing books, study guides or purpose written material. A great amount of Open Educational Resources (OERs) (Conole, 2010) is now available from many different sources: MIT OpenCourseWare^{xxv}, OpenLearn^{xxvi} and iTunesU^{xxvii}. This can significantly improve dissemination of knowledge in emerging countries as well as reducing the cost of courses. UNESCO has a programme to disseminate OERs (UNESCO, 2011) , and one of its recent forums, which took place in Brazil, focused on Latin America^{xxviii}. However, there are still few OERs in Computing produced in Brazil (Santos, 2011).
- **The role of the digital educator** – digital educators should be well supported and be seen as highly qualified staff whose professional development should be a concern for their institution. Their activities will cover a wide range: from the production of digital content, to maintaining well-informed blogs and articulating professional and academic networks. This new type of intellectual production in the academic scenario needs to be recognized within institutions and nationally (Weller, 2011). Web 2.0 tools are available but educators need motivation and recognition for their good use.
- **Training of digital educators** – the role of distance education educators is fundamental for the success of the learning experience; it is necessary to promote their training for distance education and guarantee that workloads take into account the effort required with distance education. There is still scepticism in the advantages of Web 2.0 tools. Educators need both training in the tools and awareness of the improvements these tools can make to overcome the required learning curve.

Distance learning issues

- **Flexibility of regulations** – regulations of postgraduate education need to allow for greater flexibility in the creation and assessment of postgraduate degrees that are educationally

innovative and fulfil professional needs; there is a need to rethink the link between these degrees and research-based ones.

- **Planning ahead** – a process needs to be in place for the design of courses and modules; this process defines the workflow of activities to be undertaken, associated roles, tools and support material.
- **Pedagogy** – learning at a distance is challenging but it also offers new opportunities for interaction and experiences not necessarily present in a face-to-face setting. Delivering lectures at a distance in a broadcast mode is not necessarily the best way to teach; best pedagogic practices for distance education that are skills-centred, involve reflection, and collaboration, have been well researched and need to be taken into account.
- **Outcomes not incomes** – the learning experience at a distance needs to be thought in terms of the learning outcomes (knowledge and skills) to be achieved from that experience and these should determine the assessment of learning. Reflection and collaboration are important skills that can be developed at a distance as long as this is planned and integrated in the learning experience.
- **Scale** – distance education can scale, but this requires investment in infrastructures to support students, tutors and assessment.
- **Quality** – without processes that guarantee quality distance education will have no future; to survive it has to demonstrate that it can deliver high quality that competes in equal terms with face-to-face education.
- **Social dimension** – distance education programmes can be an important step for democratisation of education, and a means to achieve social and economical benefits for the nation. In the context of professional postgraduate Computing this requires recognition of the context of the profession and an understanding that professional masters will develop different skills to those leading to a research career.
- **Factors for success** – distance education initiatives and adoption of Web 2.0 technologies tend to appear in a bottom-up manner and resulting from individual's initiatives; for a wide success these initiatives need to be supported at different levels: institutional, professional, and governmental.

FUTURE RESEARCH DIRECTIONS

This chapter has looked at examples of distance education in higher education, and of application of Web 2.0 tools to support it. It reflected on the issues that should be taken into account when developing similar initiatives in a context like Brazil. From this research two main areas of further research have been highlighted: one related to the lack of evidence of empirical data to support emerging ideas about the support offered by Web 2.0 tools; the other related to what is needed for a successful implementation of distance education in professional postgraduate Computing in Brazil. For the former,

there is a clear need of research that provides feedback, with empirical data, on the application of Web 2.0 tools to support development of skills on domain-specific areas of Computing education. For the latter, there are several more specific areas that need further research. These include the following.

- Development of open educational resources (OERs) that are domain-specific and in the local language.
- Understanding of the economic models for distance education.
- Understanding of the relation between distance education and cultural specificities.
- Implications of a successful adoption of distance education, in particular, in an educational system in Brazil that is not strong in developing “learning to learn skills” such as the use of reflective learning, and student autonomy.

CONCLUSIONS

This chapter presents the results of a comparative study of the situation of postgraduate education in Computing in both the UK and Brazil. It surveyed Web 2.0 applications and their support in the delivery of distance education. Based on this study it has made a contribution to an ongoing debate on the future of postgraduate education in Brazil. There is a recognised need of a wider implementation of professional masters to fulfil market demands for the education of professionals in technical and engineering areas. Web 2.0 technologies have an important role to play in this implementation. However, other factors need also to be discussed, in particular, the current regulations for postgraduate education in Brazil that make professional masters inflexible and difficult to implement more widely.

This chapter has argued that professional masters, through distance education, can provide significant social benefits by reaching a wider population and breaching the many geographic and social inequalities. Distance education initiatives in Brazil are still fighting for credibility and recognition as equitable to traditional education. Quality processes need to be in place at all stages to guarantee success of any new initiatives. This chapter has contributed with some lessons in distance education, from the experience in the UK, which can be adapted to the specific cultural situation of Brazil. The chapter has highlighted the issues related to course design for distance learning, and the support that Web 2.0 technologies can provide, and potential for innovation in the educational experience.

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ADDITIONAL READING SECTION

In this section, please provide a list of 25-50 additional readings (e.g. journal articles, book chapters and case studies). You, as the contributing author(s), are the best source for suggestions on additional readings in your respective field.

Web 2.0 and skills development

Beetham, H., & Sharpe, R. (Eds.). (2007). *Rethinking Pedagogy for a Digital Age*. Abingdon, UK: Routledge.

Conole, G. (2011). Designing for learning in an open world Retrieved July 19, 2011, from <http://cloudworks.ac.uk/cloudscape/view/2155>

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Schroeder, A., Minocha, S., & Schneider, C. (2010b). The strengths, weaknesses, opportunities and threats of using social software in higher and further education teaching and learning. *Journal of Computer Assisted Learning*, 26(3), 159-174.

Distance education context in Brazil

Almeida, M. H. T. d. (2010). A Pós-Graduação no Brasil: onde Está e para onde Poderia Ir (in Portuguese). In CAPES (Ed.), *Plano Nacional de Pós-graduação (PNGP) 2010-2020, Volume II (in Portuguese)* (pp. 17-28). Brasília.

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KEY TERMS AND DEFINITIONS

Distance education – education delivery mode that does not assume the presence of the student in a face-to-face situation. It is associated with pedagogical and technological advances to support the learning experience to be of high quality.

Professional master – a postgraduate qualification at master’s level that is directed to those practicing the profession.

Learning outcomes – statement of what is intended to have been learned at the end of a module or course. They include knowledge and understanding, and skills.

ⁱ <http://www.ibge.gov.br/home/estatistica/populacao/censo2010/default.shtm>

ⁱⁱ A committee set up by government to coordinate and integrate Internet services in Brazil.

ⁱⁱⁱ Brazilian Association of IT Companies, <http://www.brasscom.org.br/>

^{iv} www.open.ac.uk

^v www.uab.capes.gov.br

^{vi} All other state education in Brazil is free, including masters and doctorates.

^{vii} MRes is a master’s degree by course preparing students for research and a route to PhD.

^{viii} An MPhil is a degree by research usually lasting two years full-time and corresponding to the first two years of a doctorate.

^{ix} www.profmat-sbm.org.br

^x 9% market share of Postgraduate IT and Computing in the UK in 2009/10 and 46% of Postgraduate IT and Computing distance education students in 2010/11 (<http://www.hesa.ac.uk>)

^{xi} The only students on campus are full-time PhD students.

^{xii} <http://www8.open.ac.uk/about/main/?samsredir=1308134592>

^{xiii} <http://www.open.ac.uk/blogs/OULDI/>

^{xiv} <http://compendium1d.open.ac.uk/>

^{xv} <http://cloudworks.ac.uk/>

^{xvi} Now under Blackboard Collaborate (<http://www.blackboard.com/Platforms/Collaborate/>)

^{xvii} <http://www.google.com/apps/intl/en/edu/>

^{xviii} <http://www.bibsonomy.org/>

^{xix} <http://delicious.com/>

^{xx} http://library.open.ac.uk/help/howto/manage_ref/index.cfm

^{xxi} not actually classified as Web 2.0 tools but is increasingly providing interactive and collaborative resources.

^{xxii} <http://www.bibsonomy.org/>

^{xxiii} <http://delicious.com/>

^{xxiv} <http://www.ukcle.ac.uk/projects/past-projects/tle/>

^{xxv} ocw.mit.edu

^{xxvi} openlearn.open.ac.uk/

^{xxvii} itunes.open.ac.uk/, itunes.stanford.edu, itunes.ox.ac.uk/

^{xxviii} http://www.unesco.org/new/en/communication-and-information/resources/news-and-in-focus-articles/all-news/news/brazil_hosts_latin_america_open_educational_resources_regional_forum/