The Virtual University and Avatar Technology:
E-learning through Future Technology

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Abstract:

E-learning gains increasingly importance in academic education. Beyond present distance learning technologies a new opportunity emerges by the use of advanced avatar technology. Virtual robots acting in an environment of a virtual campus offer opportunities of advanced learning experiences. Human Machine Interaction (HMI) and Artificial Intelligence (AI) can bridge time zones and ease professional constraints of mature students. Undergraduate students may use such technology to build up topics of their studies beyond taught lectures.

Objectives of the paper are to research the options, extent and limitations of avatar technology for academic studies in under- and postgraduate courses and to discuss students' potential acceptance or rejection of interaction with AI.

The research method is a case study based on Sir Tony Dyson's avatar technology iBot2000. Sir Tony is a worldwide acknowledged robot specialist, creator of Star Wars' R2D2, who developed in recent years the iBot2000 technology, intelligent avatars adaptable to different environments with the availability to speak up to eight different languages and capable to provide logic answers to questions asked. This technology underwent many prototypes with the latest specific goal to offer blended E-learning entering the field of the virtual 3-D university extending Web2.0 to Web3.0 (Dyson. 2009). Sir Tony included his vast experiences gained in his personal (teaching) work with children for which he received his knighthood. The data was mainly collected through interviews with Sir Tony Dyson, which helps discover the inventor’s view on why such technology is of advantage for academic studies.

Based on interviews with Sir Tony, this research critically analyses the options, richness and restrictions, which avatar (iBot2000) technology may add to academic studies. The conclusion will discuss the opportunities, which avatar technology may be able to bring to learning and teaching activities, and the foreseeable limitations – the amount of resources required and the complexity to build a fully integrated virtual 3-D campus.

Key Words: virtual learning, avatar technology, iBot2000, virtual university

Introduction

Higher education has experienced a significant change in the last decade – from a rather closed study environment, where students' physical presence was required during their studies, to a different experience. Universities in many countries now offer courses which allow either studying completely away from campuses or provide a mixed form where students can learn modules at home most of the time and only have to come to the Universities for a few sections. This is especially the case with postgraduate studies. This change supports mature students, who desire to upgrade their education, but are confronted with constraints since working in their jobs at the same time. Additionally, such form of studies allows universities to attract students from all around the world and enables students to select academies in different studies, which may offer special degrees not available in the direct environment where they live. This has brought other advantages for local students, as the interaction with students from foreign countries can help enrich their cultural experiences.

The concept of distance learning is not new. Colleges, academies and universities offer distance learning since a long time. Previously the usual way of studying away from campuses was learning by reading packs in which the student gained the knowledge of modules in written articles and lessons, which were otherwise taught by lecturers. The advantage of such form of learning was that a student could determine the time and the quantity of daily learning by him/herself. But the major disadvantage was that such form is likely to be different from blended learning. This allows students very little interaction and contact with peers for exchanging ideas and creating a social bond, as students will tend to spend most of the time studying alone and will only contact their tutors and supervisors by letters or assignments. It is possible that a good number of those students, who did not finish their degrees may have simply given up, since such learning was not entirely satisfying and the perspective of the achievement of a degree alone may not have been sufficiently attractive to continue with their studies.

The emergence of the new ICT technologies provided new opportunities and challenges for both students and academics. For the first time, appropriate software was developed and offered. This enabled distant interaction opportunities on peer-to-peer, student-lecturer and student-tutor levels. Well-known and still in practice are WebCT, Blackboard and similar tools. Not only teaching material was now available online, but virtual lectures, seminars and chat rooms for interaction has enriched students' learning experience and made distance

learning much more attractive. Among other advantages Biggs et al. highlight the advantage, which computer-assisted assessment (CAA) provides in comparison to offline submissions (2007). To these advantages count the options of immediate feedback, but beyond CAA there is the opportunity that students can ask questions on a topic as well, for which databanks may provide pre-formulated answers (2007). Academies and academics are engaged in different ways to offer distance learning now. For example, the University of Central Lancashire, UK, adopted a mixed model of reading packs for preparation, weekly online seminars and blocks of student presence. Chat rooms for discussion were also made available for students. Such virtual meetings could be arranged through private or university emails. On the other hand, other universities, like the Private Fachhochschule Göttingen or the Europäische Fernhochschule Hamburg, both Germany, still rely much on their reading packs. The Europäische Fachhochschule Hamburg offers virtual meeting rooms for students, but as students report, there is little interaction, since the university does not stimulate them to do so and does not invite students on the same course to interact with each other (Oestreicher. 2009). Such form of studies, prepared reading packs plus limited online interaction, are suggested as a mixed method of studies to which physical presence times may be added. I.e., these are not a fully integrated distance learning method.

However, there is another disadvantage involved. The University of Central Lancashire offered its online seminars for their Master's Degree in Strategic Communication each week at seven o'clock Greenwich time. Each session lasted from 60 to 90 minutes. In the years 2004 to 2005 the course consisted of students from Europe, Asia and Canada. The major problem to attend such online seminars was the different time zones. European students did not suffer from substantial disadvantages, since the time difference was marginal. However, for Asian students attendance in such seminar times meant a weekly virtual presence in the middle of the night, while their Canadian peers could only attend most of the time for about 30 minutes, the time of their lunch break, since they had to return to work afterwards (Oestreicher. 2005). In an equal rights understanding, this time problem imposes much more pressure on students from other Continents. The fact that these online seminars were stored on the university's WebCT helped those students to a certain degree, but it is not considered as being equal to the live experience the European students had and many of those students outside Europe hence did not attend the online seminars regularly. The recommendation to students is that when they adopt a university they need to be aware of these disadvantages and should consider this prior to their enrolment. But this reduces the idea of global cultural

exchange and is against the general idea of creating a multinational learning environment. However, there is little, which universities and other Higher Education academies can do to tackle the problem of time zones, when real-time interaction is involved.

ICT enabled many new forms to bring distance learning close to blended learning. Previously reading packs were either photocopies or black and white prints-outs. Nowadays they can be offered as fully coloured downloads. PowerPoint presentations can be presented online, groups can work on common papers independent from a student's present location and much more. The idea and supporting concepts of ICT, global and real-time interactions have been furthered since the beginning. More sophisticated tools, such as pebble-pad, have been developed and implemented into universities' online applications, which promotes better learning experiences. However, lecturers and students have also discovered other popular applications, such as Facebook, for dealing with their social needs and interaction. Academics and students frequently interact via blogs or communities by such sites being outside university's Web structures. This way, not only blended distance learning has received many new options and opportunities, but as well studies and education have left the traditional organisation of studies inside academies. It is suggested that by ICT academic interaction is shifting to a mixed behaviour since using popular and academic software at the same time.

A Shift in Needs and Perception

In many countries universities' progress and economic welfare depends on attracting sufficient student numbers. Due to many reports in the media, the latest economic crisis has brought advantages and disadvantages to academia. On the one hand, it is considered that many students have taken the crisis as an opportunity to improve their qualifications for better employability, on the other hand, many companies have restricted their financial support for employees being interested in studies.

Like many innovations, especially radical and architectural ones, ICT has two sides (Abernathy et al. 1984). Firstly it provides the opportunity to attract and satisfy students from all around the world, despite of the issue of the time difference. On the other hand, like in any other industry, they made universities more comparable – the competing academy is just one click away. Organisations wishing to support their employees through further education thus have opportunities to select carefully, which courses they intend to support and which not. The comparison of curriculum has become as easy as the comparison of a car's manual. As

Christensen et al. tend to hold, companies wish to support especially those courses offering immediate solutions to existing corporate problems (2004:99-107). Some pro-active universities, such as the Fachhochschule Ingolstadt in Germany has developed courses and double degrees with corporations, to satisfy these companies' specific needs. The double degree offers the student an apprenticeship, which involves a practice degree and an academic degree at the same time (Schweiger. 2008). The proposition is that – for the good and the bad – organisational influence on the curriculum is highly likely. Corporations have already founded their own academies, whether own universities in the USA or by supporting and funding private universities in Germany (e.g., Fachhochschule für Ökonomie und Management, Munich, Private Fachhochschule Göttingen). There is likelihood that businesses will have a stronger influence on academic degree and course designs over the future. The German academic system provides two further options, like the Universities of Corporate Education, in which a student works rotationally three months in a company and studies three months with the university. Here, the corporate tutor is a member of the examination board and influences the academic outcome directly. A second option is a co-educational study, where a student works in a corporation and studies at a public university at the same time to achieve his/her undergraduate degree. Christensen et al. predict that these developments may grow to have a disruptive impact on traditional academic education (2004).

The usual perception of the practitioners is that academia is too theoretical, which does not offer sufficient solutions to their daily problems and fail to meet their specific expectations. By founding or supporting private academies and influencing the curriculum, businesses can expect graduates, who are better fit into the corporate environment and can provide more immediate solutions to help solve problems. At the same time such approaches are likely to drive the ICT opportunities further. In a global context, where HR sourcing has already gone out of the national borders whilst hiring international staff has become more and more common, ICT indeed plays a very important role within international academic education. Nevertheless, the problem of different time zones still needs to be bridged to provide better and equal opportunities for students from all Continents.

Further Developments: From Student Interaction to the Virtual University

As discussed, the difference in time across the globe causes major problems for student interaction. Moreover, further interaction has already expanded over the campuses by using public communities (e.g. facebook) and other existing ICT-tools. The corporate desire of

better graduates' fit into organisational problem solving is becoming a salient topic for the future of academic education. Therefore employers and employees are frequently looking for special academic courses and degrees providing the right fit for organisations beyond local or national borders and – not to forget – academic research has become globally organised, too. In this understanding it is further suggested that a university's location has already decreased significantly in importance. The Swiss Virtual University, The Virtual University of Pakistan and the UNESCO Virtual University are a few examples following the virtual concept, representing dissolved physical (infra)structures. This is suggested as being an academic parallel to the model that Kotler et al. suggested for corporations (2002). For example, how much do universities depend on *physical places* and which part of the offerings they can transfer to the *virtual space* instead? The underlying principle is, whether the present applications, such as Blackboard, will still be sufficient as primary online resources and whether tutorials or interaction with lecturers in virtual seminars as performed today will still meet students' expectations of an increasingly global learning experience?

Student interaction and the desire of international learning experience may find some future orientation by using popular web applications like 'second life' (Christensen. 2008:144). Its popularity of virtual interaction and community membership may be a model, which could enrich academic studies. This paper does not intend to discuss the advantages and disadvantages of the Web 2.0, second life based applications. It intends to shed some light on opportunities, which may offer a combination of an already rather popular online behaviour and future-oriented student experience by exploiting what many students practice already. This intention leads to the potential combination of three main concepts:

The community concept
Web 2.0 and second life
Avatar technology

The final combination would result in a totally virtual academic world. Students of a course are creating a second life character of their own imagination, study, walk and interact in a virtual campus and are attached to virtual lecturers presented by interactive avatars, virtual robots. There is no doubt that this sounds initially like a fantasy, but the necessary components have already existed. Thus, this paper intends to shed some critical light on these components and their impact by presenting

The iBot2000 case study – a virtual interactive robot technology

The design of a virtual (3-D) campus

The design of a second life student

The options and restrictions, which students may find and express in accepting such form of virtual studies

Limitations of such an approach and options of actualities of the situation

Avatar – Human Interaction

One of the chief appeals of the immersive virtual environment is that it serves as a medium of communication among remotely located people and that they are able to meet and interact in a virtual 3-D environment (Garau et al. 2003). There are a variety of applications and uses of avatars and 3-D interactive applications in a virtual university environment. For these systems, visitors usually communicate with the programme through a command driven system and have a virtual representation of their requests. For example, they can "walk" through a virtual building with different floors and interact with a human-like virtual guide, or avatar (Panayiotopoulos et al. 2001:109-110). The avatar is a virtual human that helps the user navigate inside the application, and can display places, walk from one area to another, and load information on the screen (Panayiotopoulos et al. 2001:113).

Video conferencing is one application that can be effectively used within the 3-D university environment. Initial attempts at this type of video conferencing were less than effective due to insufficient bandwidths and inefficient video compression techniques (Kauff et al. 2002). However, recent technical advances have decreased these issues and have opened up the applications to a wider audience. The ability for instructors to create virtual tutors is another possible application that can be used in the educational environment. These virtual tutors are available 24x7, and can offer students a much more flexible schedule when their regular instructors may not be online.

The use of avatar and 3-D technology can provide educational institutions with a number of advantages. Culbertson explains that by using avatars, firms can combine the best of face-to-face training with computer-based training, and save money on human trainers or faculty (N.D.). Avatars may offer an almost human touch that some students may find as an effective

substitute for instructors who may not be available during specific timeframes. Culbertson also lists some direct advantage to learners of using avatars (N.D.):

> Motivate learners and have the ability for avatars to interact on the student's schedule, as opposed to a human instructor's limited availability.
>
> Can create interest and fun in learning.
>
> Can demonstrate soft skills, which are important in business success.
>
> Can drive higher rates of learning and completion of subject.

Grégoire et al. indicates that because of the deep affinity that children seem to develop for interactive lifelike characters, the potential use of avatars in educational learning effectiveness can be substantial (1999). By creating the illusion of life, avatars increase the quality of learning experiences as well as increase the amount of time students spend on learning activities.

The use of virtual reality and 3-D technology has been successfully used in the higher education environment, although it is still considered a relatively 'new' method of teaching and learning within academia. Yellowlees et al. (2006) conducted a study using Internet virtual reality technology as an education tool about the hallucinations of psychosis. They conducted a pilot project using Second Life, an Internet-based virtual reality system, to simulate the auditory and visual hallucinations of two patients with schizophrenia. With over 500 survey respondents, approximately 76 percent thought the environment improved their understanding of auditory hallucinations, 69 percent thought it improved their understanding of visual hallucinations, and 82 percent said they would recommend the environment to a friend.

Another successful study of this environment in a university setting involved using virtual avatars in a medical school to test the interaction between patients and doctors using gestures and speech with the avatars. The study confirmed that this immersion had a positive impact on the students and they found it a powerful tool for teaching and training (Johnsen et al. 2005). Not only can the use of 3-D technology benefit students in the university setting, but it should be noted that it can be expanded and used successfully with a variety of students of different ages and abilities. A study by Lanyi et al. of students with special needs, including autism, found it helped these students markedly during speech therapy (2006).

Although using avatars in a university environment can be of benefit, there are also challenges and issues to overcome. One significant limitation is the low level of expressiveness of avatars compared to the rich visual expressions shown by human faces (Garau et al. 2003). The authors list technical limitations and the computational complexity that comes with attempting to increase the level of expressions on avatars facial features. With current technology, it is difficult to obtain the full range of non-verbal cues on these applications. When people communicate, the non-verbal cues obtained in facial expressions are as often as big an impact on understanding as the verbal conversation. A lift of an eyebrow can convey specific messages to the observer, and these types of communication cues are not as developed in the 3-D avatar environment. However, it may be difficult to perfect these cues and expressions to ensure that they work with all audiences. Studies have shown that there is a difference on how males and females respond to nonverbal cues (Garau et al. 2003). In addition, different culture may respond to cues, such as the difference in eye gaze time. Thus, programming the same types of verbal cues to avatars will still result in issues with non-verbal communication.

Another issue to overcome using virtual technology in the educational environment is overcoming the lack of situational awareness. According to Sonnewald, when people collaborate face-to-face, they share an immediate environment and can quickly develop situation awareness using contextual, process and task information gained through exploring and experiencing the immediate local environment (2006). However, if students or faculty use simulated virtual environments, they no longer have the same opportunity to directly experience the local environment. Instead, their experiences are mediated by technology. Thus, 3-D designers have to design systems that can incorporate situational awareness to enable effective remote collaboration.

A final consideration when using this technology is how the educational institution defines the policies and procedures for student and faculty use. Robbins-Bell lists one example of a college's virtual campus policy was that all students were required to use one of a few, mandated avatar options and other restrictive policies. However, the author cautions that extremely restrictive controls can inhibit the ability of students to experiment and learn outside the box (2008). Thus, it is critical that a balance be maintained between a totally open system versus one too tightly managed.

The iBot2000 Avatar Technology – a Case Study

Avatar technology was already introduced in the 1990's but suffered at the time from technical problems, as it required long interaction times and had high restrictions of its capabilities. Today, avatars have developed to become a more and more sophisticated opportunity. One of its major protagonists is Sir Tony Dyson, best known by its robot R2D2 performing in the Star Wars movies. After his long Hollywood career, Sir Tony turned towards education and worked intensively in the environment of teaching and learning, which brought him his knighthood.

For Sir Tony the stream of robots from physical to virtual involves a rather direct progressing line, nevertheless, the shift of conception from physical to virtual performance cannot be underestimated. In 2006 Sir Tony started to develop his own technology, which he named iBot2000. Since then, he became an internationally acknowledged protagonist of this technology holding lectures around the world. The basis of iBot2000 is a virtual interactive robot, which is per se similar to other competing technologies. The robot can have different faces, so that it can look like a real robot or a real human being. This brings it closer to the second life attributes. The robot can be designed differently to attract various audiences, whether for corporate use, for children or academia (see right hand characters). The features of this technology are wide. iBot2000 can present brochures for download, can play movies or present music, may present games and so on. This type of technology is rather comprehensive, but considering these features only does not exceed today's expectations yet.

However, iBot2000's unusual approach is the specific interaction between the user and the avatar. For example, a user can type a question into a specific field and the robot replies by speech making the iBot2000 technology rather specific. Sir Tony has developed the technology that it come across to a real-time chat function – a question receives a logical reply, which can be used for further (logical) discussion with the virtual robot. The additional speciality is that such interaction can take on up to eight different languages. This offers a

vast opportunity of direct interaction – as tested – especially the logic of replies is very high. A further application is the botcards. These are cards, which offer a specific code that can be typed into the question field to provide extensive spoken explanations by the avatar. Sir Tony has tested these botcards in the environment of schools for dinosaurs, Egyptian gods and planets (see left-hand examples). The human instinct of collecting seemed rather attractive to young pupils. As a limitation it needs to be stated that entering the botcard's specific code replays consciously the same message of the robot-player each time. According to customisation, these pre-formulated replies can receive extended information through further explanations, sourced from the web. Such features bring the iBot2000 technology closer to the teaching and learning environment and may be considered as a first step to academic education.

Botcards are a very good application within children's education. These may be collected and the repeated interaction with the robot player performing presentations by speech, cartoons or films engages school children in a learning environment by playing and involves many senses at the same time. The notion of blended learning may find its introduction at an early stage in learning. As Sir Tony's studies with pupils at schools in Malta in 2007 and 2008 provided evidence, the interactive virtual learning environment furthers children's preparedness and increases the fun in learning. It helps children overcome many known obstacles in dealing with school subjects. Further successful tests were run at US-schools in Pittsburgh in 2008.

Using a technology like iBot2000 is suggested to provide a number of advantages:

- Interactive and innovative multimedia learning involving important human senses
- Attractive presentation of learning content
- Inviting to repeatedly studying content for intensified learning of details
- Offering the opportunity of learning at any place with web access by using the virtual space or learning in the physical place using the virtual space
- Customisation of teaching to specific groups of ages

Overcoming certain language barriers

Leading to student satisfaction by the use of popular applications known before in different context

Intensifying learning outcomes by application of multimedia ICT technology

Leading towards blended learning

Based on these experiences and outcomes with pupils, Sir Tony then developed the iBot2000 technology further to address the need of higher education by implementing Web 2.0 applications. The proposition for universities is that they may now use iBot2000 to reconstruct their physical campus in a virtual world (see graphics 3 and 4). This virtual environment will help students feel as if they are in a real world university. The avatar technology may present lectures and seminars similar to a real lecture presented in a lecture theatre. However, with the present implication that the function of asking the virtual lecturer questions is rather limited, since a) this development is still at its beginning and due to financial restrictions not fully developed yet and b) the

programming of logic answers is highly complicated because questions can be asked in so many ways that this process is overwhelmingly complex and thus needs substantial further funding for research and development. Foreign students may ask questions using various grammar and words, which are not recognised by the fixed avatar programmes. This can either result in a wrong reply or none at all. Nevertheless some underlying fun is provided, as students may create their own character (similar to second life) and walk in the virtual world as if it is the real campus. The learning atmosphere may become more attractive, for example, instead a lecture theatre, the student can choose to receive the lecture in a beautiful green meadow.

At present, such technology involves high complexity, since lectures need to be prepared accordingly, programming of such lectures requires intensive work, hence cost and the creation of the whole environment creates its own complexity. Furthermore, the acceptance of students to engage in such different type of studies needs to be assured, hence studied and tested, since there is an initial danger that the distraction provided by the extra features may reduce learning outcomes and knowledge gained. On the other hand, once prepared and available, students can take advantage of consuming such lectures as often as they want and take advantages of those additional comments, which were raised and discussed within the lecture, either amongst peers or between lecturer and students. The real-time recording of such interaction during those lectures makes them more interactive and enriches the experience when consumed later or repeatedly. This is considered as superior to consuming pre-recorded lectures, e.g. using YouTube, as those pre-recorded lectures are static and cannot add additional discussion. As previously discussed, at the moment there are a bundle of technological restrictions that require further technological developments and innovation. However, avatar technology still presents a great opportunity, as the basic options are ready to be developed further technologically. Such advantages may support those future students, who suffer from the disadvantage of different time zones. Students may find this different learning environment interesting and more attractive and employ second life features to support their intention of gaining a degree in higher education. The expectation is that in the next few years technological developments will be able to overcome many of the current restrictions. Converging technologies make this concept of iBot2000 even more future-oriented, since it is designed and prepared for different interfaces, including both computers, mobile phones and other devices.

Compared to the rather basic features (e.g. reading packs, chat rooms and rudimentary virtual office) that are currently offered by many universities offer, iBot2000 and related technologies provide development opportunities for fully integrated virtual studies. They may also facilitate the need of corporate business and organisations. For example, a virtual campus avoids the foundation of a physical university and the high investment in full infrastructures. Moreover, this kind of courses can attract those professors, who corporations consider as especially useful for delivering modules meeting their intentions, wherever these academics are located and without the need of being present. Respecting that the iBot2000 technology offers options of various languages, academia and corporations can – after specific

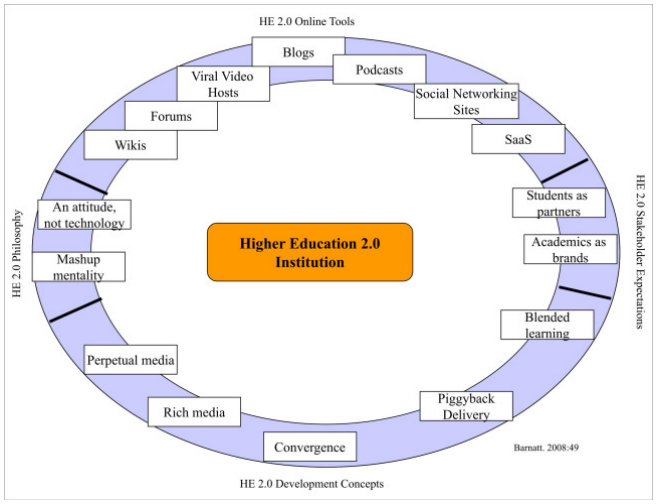
preparation – sell and use courses and modules internationally. The virtual campus application supports the framework of intercultural communication in a different, but potential way to design modules and courses for students of multinational organisations with different cultural background as it allows universities to found offshore universities without creating the and investing in full infrastructures.

Despite major efforts invested in the iBot2000 technology, it could not be fully developed yet, due to financial restrictions and the lack of testing in a real higher education environment. Emphasis is drawn upon present technological restrictions, which prevent it from taking full advantage of the potential opportunities. Nevertheless, many innovations (fax machines, computers, telephone and so on) faced similar obstacles in their beginning. In the past, a good number of radical, epochal, or architectural innovations also strived for a rather long period before they took off (Utterback. 1996:158-160). With reference to many governments' efforts to increase their number of academic graduates, a rather radical innovation as iBot2000 may offer further stimuli as it may additionally help to fight against 'non-consumption' of academic offers (Christensen et al. 2004). For example, easiness of access, individual customisation, the likeliness of some fun for specific persons may invite easier to enrol for higher education beyond those factors of individual learning existing already. This may attract those students, who did not consider higher education before or faced personal obstacles such as other competing commitments, e.g., looking after a child. With his iBot2000 technology, Sir Tony's intention is to further the reduction of such frequently psychologically induced barriers.

The iBot2000 technology is readily developed to the extent Sir Tony Dyson's research and previous tests allowed, but it has not been fully implemented yet. The next step in this research and development process would be to test it in the higher education context working with a University. This means that for academic purposes an adequate research budget needs to be allocated by investments in time and funds. It would be speculative to forecast, whether sustainable student acceptance or commercial success can presently be achieved, since academies need to adopt the idea and the concept first. At the moment, it seems difficult to imagine that a full course or module may be run using iBot2000, since not only academic standards, as by the British QAA, have to be respected, but as well a decisive success factor is the acceptance of students. Therefore, it is suggested that with specific consideration of commonly available technological capabilities, avatar technology may support successful

learning and teaching in higher education by enriching the experience of distance learning with additional features simulating and supporting live courses.

A Critical Inspection of Avatar Technology in Higher Education



As we stated at the beginning of this paper and with regard to the short case study, academics and students have already discovered the world of Web 2.0 for their exchange, needs and interactions. Many of the popular applications were adopted and created an environment in which academia is a centre and profits from web-based structures in- and outside its own ICT-channels. Barnatt highlights that the impact of the Internet on higher education institutes cannot be ignored. His graphic divides Web 2.0 in four quadrants with the Web 2.0 HE institute at its centre [see Figure 5] (2008).

This suggests that a wide variety of tools and applications is already in use and raises the question about the potential interface for avatar technology. For instance, where is the useful point avatar technology can add value to academies and increase the student experience?

Avatar technology in combination with the creation of a virtual campus may be a rather attractive approach. It may even provide the idea to unite several of Barnatt's points in the graphic in one common starting point represented and moderated by an avatar (2008). Nevertheless, there is little space for enthusiasm. Outcomes need to offer values for both, academies and students. This could find early limitations, since not all of students' locations may provide sufficient broadband lines allowing quick interactions. Language barriers and cross-disciplinary influences of academic subjects require a vast effort of content to be made available. An underlying danger could be the perception of what may be (technologically) possible in a few years is not easily to achieve today. For universities being always restricted in their investments it can be a rather complex and expensive project, while for students a problem zone may be distraction, which could result in engaging too much in second life, than in using second life for learning, i.e., a possible reduction of intended achievements. It needs always to be in mind that at this present time, a virtual robot is similar to prototypes of

physical robots, what they can really do and what they cannot do is subject to a lot of further research and development. Addressing academic realities in this context means as well that there is a decisive difference in interacting with real tutors and lecturers and a robot missing human attitudes and behaviour. As Richardson's citation of Kitto and Higgins provides evidence, tutors with broad face-to-face tuition experience have reported problems in doing so online (Richardson. 2007:2). When such present forms of online interaction cause already problems, then a following question should be how could an avatar application provide satisfactory tutorials then? As Richardson states further, most students (80%) of a study preferred face-to-face tuitions (2007:4). The proposition is that avatar technology will create here even more distance between lecturers and tutors and students. With reference to access of lectures at students' preferred times, avoiding the stated problems of different time zones, academics have started to present lectures of different length on YouTube. Inside academies' offers, the University of Western Australia developed the "Lectopia" system enabling academics to record and post lectures on the web (Biggs et al. 2007:127). The Worcester Business School has started to present pre-recorded video lectures with a lecturer being based in New York. Students' reactions are reported to be very positive (de Francesco. 2009). All these options provide opportunities of different kinds of distant studies, which are facilitated, too, by convergent technologies, such as MP3-players or mobile phones. As Biggs et al. stated, the interactive use of Education Technology (ET) dissolves boundaries of time and space and allows many different types of interaction between people (2007).

This proposes that avatar technology can at least presently not replace tuitions and restricts their use in this field raising the assumption that human interaction will always be the most important, as students prefers interacting directly with lecturers. Nevertheless, changes enabled by advanced technologies are taking place. "Immersive Education" allows users to create virtual reality environments (refer to the iBot2000 graphics shown in this paper), which is similar to second life but dedicated to learning (Christensen et al. 2008:144). Additionally, Christensen et al. mentioned that technology has become so easy that lots of people can create their own animations today (2008). The resulting central questions to be asked are:

> At which point of academic interactions avatar technology can be a meaningful supplement to presently available and used online tools?
>
> Do they increase the online learning experience of students?

Such questions should not only concern distance learners, but the current students as well.

Research: Interview with Sir Tony Dyson

Following these critical reflections, an in-depth interview with the developer of the iBot2000 technology was undertaken to find out more about his driving ideas about those opportunities the iBot2000 technology can bring to Higher Education 2.0 applications (2009, Barnatt. 2008). As discussed here, despite being different, this technology is in competition with other available technologies, such as facebook, Blackboard, YouTube and alike, which are already in use. Therefore, the creator's objectives within iBot2000 need to shape an edge in competition offering advantages to lecturers and students, exceeding what have been currently offered by facebook, google, WebCT, etc.

Sir Tony's perception is that at the moment the other competitive interactive applications are developed and based around the old idea of community software being either re-packaged or sold for advertising revenues, which may reduce the fundamental part of interaction by their promotion-oriented design. In his opinion, for profit reasons such competing public software applications do not place learners at their centre. For instance, for students with specific learning needs, those applications do not offer enough or any opportunities of adaptation to meet those specific learning needs. E.g. YouTube online lectures are likely to be disadvantageous for blind students as soon, as there is a presentation of charts, graphics, etc. There is no way a blind student can switch to another medium, which helps to overcome this disadvantage. The iBot2000 multimedia features may be programmed that charts or graphics are explained by speech, too. A deaf student could turn to written text-to-text explanation, while a YouTube lecture cannot.

Sir Tony states two major competitive advantages of iBot2000:

1. The use of a single virtual robot programmed to introduce a distance-learning module to students. The robot may function as a form of mentor, which is programmed exclusively for the use of one particular module.

2. The same interactive technology can be used in a virtual university with what he calls "amazing effects". These he terms as:

    Universities beyond locations [space instead of place (Kotler et al. 2002)]

    Architecture as conditions of classes and lectures being designed in a relaxing environment [for comfortable learning experience]

A lecturer's communication with students by text or voice to an individual or a group with automatic translation to most popular languages in the text mode [facilitating immediate understanding of non-native speakers]

Multimedia presentations of photos, videos, Power Point presentations, etc.

A guest appearance by additional telephone link or Skype application [additional external expert]

3-D object presentation to a certain degree

Filming of the class by pre-configured cameras for unlimited reviewing of a session [adding comments and discussions made during such lecture]

Replacement of a lecturer's person by a clone [the virtual robot], which can be questioned after the session

The variety of avatars to increase the impact of performance [Sir Tony uses the example of President Lincoln addressing the nation]

Student avatars bonding distant students together [increased social interaction within the specific environment of the virtual campus]

Easier [social] acceptance among peers, since virtual [second life] students can look the way they are created

The social impact for distant learners, who can create "real" communities in the virtual university, which they cannot build otherwise at being physically at distant places

Sir Tony Dyson highlights that all these features have been successfully implemented into his iBot2000 technology and were tested in lectures he had conduced to great effect.

Advantages and Restrictions

In contrast to existing promotion- and profit-oriented software, the avatar technology has three major fields that deserve specific discussion. The first is the automatic translation that is provided by the iBot2000 avatar technology in the text modus. Such function achieves many advantages for foreign students in facilitating better understanding of the lecture's content. This is considered as an important criterion, which none of the mentioned competitive software provide at the moment. Nevertheless, with regard to existing translation software and its known problem of translating things in the appropriate context, this may not be able to provide students the precise reproduction of lecturer's words into a different language during a real-time discussion. But immediate translation, if correctly reproduced in different

languages, is likely to facilitate students' instant understanding and may then result in more lively and immediate discussions (text-based). However, whilst assignments need still to be submitted in the taught language of the university, this translation tool may be against students' progress in speaking, formulating and understanding of the taught language. Maybe one day the translation programme has advanced and can be used reversely – translating students' assignments from their mother tongue to the taught language. Nevertheless, such process requires the acceptance from not only the university, but also the national degree awarding authorities.

The second advantage is the replacement of a lecturer and multiple viewing of lectures. This could be replaced by some video performances or recorded lectures. The major difference is that the iBot2000 avatar can run Q&A sessions after the lecture, as the technology enables users to have a logical chat of necessary depth and width with the programme. At the moment, the degree of logical discussion tested in iBot2000 is already high, but with regard to the many different forms that questions may be asked by students using different words and notions, the need of cross-disciplinary knowledge need to be programmed. A long period of development, test and experiment will be considered necessary in order to provide a dialogue, where students of different origins, with various learning styles and ways of thinking can all find it helpful and satisfactory.

The third field of interest is the creation of virtual communities. It is suggested that one of the success factors of second life is that individuals, who for various reasons find it difficult to be accepted in their real life social environment, may overcome such difficulties in a virtual university environment. The idea of placing such a community within a campus environment has the advantage of increasing the feeling of social bonds. This advantage does not necessarily need an avatar technology and may be designed as well using existing second life software, but similar to real life, virtual student leagues could be of their own specific attractiveness.

Based upon the discussions, in order to compete with current technology, the strategy of differentiation should be considered. This is suggested as a) the implementation of an avatar software and b) the creation of a virtual university. A good number of the arguments allow the conclusion that a virtual university does not necessarily need avatar technology, which may be introduced as a second step later or on top of the virtual campus. In addition, some of the

features may not necessarily require the design of a virtual university, i.e. the avatar could function as a stand-alone application without needing to be placed in such virtual campus. Such differentiated options may offer extended opportunities for the use of this technology and may additionally reduce complexity, when the programming of the avatar is focused on specific tasks only. However, Sir Tony's concept combined the interdependent implementation of both – virtual 3-D university and avatar and this inclusive strategy has provided a comprehensive framework. It could then concentrate on the further the technology advancement on both paths, either simultaneously or separately and focuses on satisfying the needs of students of different origins, located at different places, or with different learning styles.

Currently, a number of the functions have already been fulfilled by existing software and some of them are used as parts of universities' ICT-systems. The complexity of the full iBot2000 technology is likely to present a number of adoption problems to interested universities. This is seen in the areas of quality assurance of learning outcomes, acceptance by students, complexity within ICT-systems, extent of necessary programming, changed requirements of lecture presentation, high investment in complex interactions between lecturers and the ICT-department and so on. Different learning styles in respecting to different students' individualities suggests an additional problem – for instance, such virtual environment may be for some students too distracting and could cause a negative effect on their pursuit of a good degree. However, in the future, we could expect the technology to offer a number of powerful advantages for E-learning – by the time when most of the problems are overcome due to technology advancement. Meanwhile, an immediate adoption of such technology still presents a significant amount of challenges and difficulties.

Further Research

Due to the aforesaid, a decisive question for the application of avatar technology in higher education is what Stefik et al. described in the context of innovation as the dance of the two questions, "what is possible?" – to which extent will virtual robots be able to take on specific tasks of lecturers and meet students' expectations – and "what is needed?" – will students accept to interact with human-machine interfaces [HMI] (2006).

Whilst avatar technology is constantly under development, giving always logical replies to different questions still remains a major challenge. Would students be able to engage in an in-

depth discussion with a robot using different kinds of language or different sentence structure? In order to tackle this problem, constant extension and improvement on the database is needed. However, to which depth is it needed? Which width? When will it be able to reach the point where an integrated database is considered sufficient to be used? Further research is required to explore the possibility of developing and maintaining a functional database, as this task requires foreseeable resources and investment, which a single university might not be able to afford.

With reference to the existing applications (e.g. second life, Blackboard) in and outside the university based ICT-structures, the need of installing the avatar technology is under debate. Will the avatar technology bring additional benefits for promoting learning and teaching activities at Universities? There is little doubt that avatars could be applied by many business organisations to replace many FAQs and to offer guided tours on their corporate websites. However, with regard to the present options available to students, future study is needed to explore students' perception on the avatar technology. For example, what kind of functions could be provided to engage them? What kind of interface do they prefer? This may help identify the need of the avatar technology and shed light to the future development of the iBot2000, so that it is consumer-oriented and user-friendly. It may also assist Sir Tony to refine its development, which could be beneficial for meeting both academics and students' expectations.

Conclusion

The technology can offer a different and enriching perspective for future learning and teaching activities. Future research is needed to provide direction for further developments on the project. This may help iBot2000 overcome the technical problems so that it can offer users an increasingly satisfying and engaging learning experience.

Technologies like iBot2000 are suggested to have the potential of a higher degree of innovation in the curve from marginal to radical innovation. With reference to relevant research, this paper concludes that it is likely to take a certain period of time until all embedded advantages may be fully detected and adopted, with regard to students' benefits developed and become technologically viable. During this time such new technology is likely to be in strong competition against the software that is undergoing permanent improvement e.g., facebook, google, WebCT, etc. For the quick operational use of iBot2000 technology we

suggest a potential implementation within the learning environment of corporations, which – have invested more and more in the field of further education for their employees, either by providing in-house training or founded programmes at universities.

As Tidd et al. (2005) argued, *"[a] core characteristic associated with high-performance organisations is the extent to which they commit to training and development"*, what these authors rely as well to the concept of the learning organisation (2005:484-485). Such learning within organisations is an important activity for building corporate competence in those innovative organisations, as well as traditional organisations (Edquist. 2005). Markides' citation of Cisco, which has created learning portals for its employees or as another example Audi's Training Centre are suggesting opportunities for implementing such technology advantageously (2008). As discussed earlier, businesses and organisations are interested in training their employees in specifically focused fields for solving specific problems. This may require a narrower than a wider field of knowledge base, compared to academic interdisciplinary challenges. As a result, the present technological capabilities of iBot2000 may find the ground for immediate application and offer businesses and organisations direct use and advantageous implementation. Whilst organisations tend to have access to higher budgets than universities, this may in return support Sir Tony's continuous development of the technology at the same time.

Our concluding argumentation is that a corporate learning environment is frequently centred on specific problems. This suggests that in comparison to an academic learning environment, the complexity of cross-disciplinary requirements at business organisations is reduced and thus requires less extensive programming effort significantly.

The issues on immediate translation, the ability to offer a logical Q&A session and element of social bonding may be of interest to multinational organisations. They shed light on a number of solutions for the requirements of intercultural management. Additionally, organisations are expected to prefer a closed and protected environment in which customised applications are implemented in their own ICT-structures providing better solutions to them than open software.

For academics, a present opportunity may be the extension of the virtual library (E-resources) to a 3-D library: Research papers, academic articles and other literature can be made available

as before, but an avatar could act as a high-speed interactive and more precise search guide. This allows the reduction of individual costs, since various universities, which may come from different countries or even continents, could share the necessary investments. Online, recorded lectures could be made available, presentations shared and worked on by scholars, 3-D artefacts could be available as additional support and the avatar could search the web to find more about specific subjects of interest. This way the development of this technology can be enhanced ongoing as more and more material is added, search terms and cross-references are expanded. Finally scholars may find the virtual environment of a virtual library more attractive as searching by search engines.

Other favourable uses (such as in primary education) are likely to be founded. Due to the nature of the subjects, the depth of the contents are likely to be less demanding, this may not overstress present technological hurdles and cause complexity. iBot2000 may present itself as an attractive learning and teaching tool to pupils offering simulative fantasy and enriching learning experience. This may help satisfy students with different learning needs and preferring different learning styles. As a result, it offers a further addition to blended learning.

Steinmueller argues that the progress of technology offers an "*ever-expanding array of possible applications for ICTs*", which may be time-consuming and expensive to make (Steinmueller, 2007:202). Whether avatar-technologies can result in Christensen et al.'s proposition of the *disruptive class* remains unclear yet, since such rather radical development depends on a widespread adoption and has to compete against existing applications, which are available free of cost and have been developed on a constant basis (2008, Steinmueller. 2007).

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