Could Virtual Education (VE) Become a £3 Billion UK Export & Enable Us to Educate a Graduate for £1,000 a year

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Mark Zuckerberg's plan to bring Facebook users into a virtual reality world could have an unprecedented impact on education, with higher education likely to be the first area to experience a "hit".

As the UK's Further and Higher educational providers move in to a more and more commercial environment they will have to adopt, and in some cases, become pre-occupied with, fundamental commercial realities. Three key ones are:

- Reducing costs
- Increasing customer base
- Improving the customer's perception of the value, or benefit, they are getting for their money

Augmented and virtual reality will enable colleges to improve in all three areas.
NB. Supplier reputation is significant, but is basically a trust issue. 84% of us are influenced in our buying decisions by word-of-mouth recommendations from friends and family so successful VE providers have the potential of growing very quickly if they do a good job. Customer loyalty is less significant as, in most cases; this will be a one off purchase.

Let us consider how they work in a practical sense. We have seen computer generated images (CGI) used in films. Two dimensional CGI was first used in the 1973 film Westworld and three dimensional appeared in Futureworld in 1976. The 1999 film, the Matrix, is probably the one which most of us remember for its amazing high quality CGI. Although CGI has been around for a long time, it needs a lot of computer power to generate those amazing pictures.

In the computer world there is Moore's law, this states "over the history of computing hardware, the number of transistors in a dense integrated circuit [a microchip] has doubled approximately every two years." In layman's terms this means that computers double in power every 24 months. That is why we can now get such realistic three dimensional CGI on our tablets, notebooks and smart-phones.

The generic term for this type of media is a "three dimensional environment".

How do we turn our three dimensional environment into an augmented or virtual reality one?

Imagine a three dimensional lecture theatre created using CGI. Next add a lecturer, this could be done in many ways. It could be a completely virtual one; it could be based on a famous person who has agreed to their image being used as the virtual lecturer. It could be a real lecturer delivering a pre-recorded lecture; it could even be in real time. The lecturer could be presenting it from anywhere there is a suitable link; via a satellite from the Atacama Desert, the floor of some ocean, an historical dig site in the Outer Hebrides or inside an operating theatre.

We have our venue and lecturer, we now add our students / consumers / customers.

We need to make it feel real, so let us presume that all those "attending" the lecture are using a device such as a tablet or a notebook with a built in camera. The software can be programmed to pick up the faces of the attendees, add some "bodies" and place them in virtual seats in our theatre. A student might even prefer to use their own personal avatar.

Imagine you are sitting in front of your notebook or tablet. Now, if when you move the mouse left or right, or touch the left or right hand edge of the screen, the image you are watching changes in the same way, as if you were sitting in a real theatre and moved your head left and right. That is, you would see, the people seated to your left and right. What is being displayed is called augmented reality. Although you may have some sense of being in the room your brain is telling you, you are not. You are just looking at some very impressive images.

The beauty of augmented reality is it does not need any special equipment, just a good internet connection and a device with a high quality screen to participate, it is therefore ideal for developing countries, poorer communities and remote locations.

The next step, which is virtual reality, is more like a giant leap. If you were to look at the same images through a virtual reality headset then the brain starts to think you are actually in that lecture theatre, and that is why it is called virtual reality!

Initially there is a weird novelty factor but once that has worn off, the advantage of virtual reality is that there are far fewer distractions in the virtual world than in a real lecture theatre. You won't see your neighbours chatting, texting, watching catch-up TV or repeatedly picking up that pen they keep dropping, and as for the guy with the irritating cough sitting in front of you, he has gone forever. The net effect is to enable the students to concentrate better by removing all those third party distractions. This will result in a higher retention of the information being presented and hopefully, a better understanding of the subject.

You may say, how do I take notes if wearing a pair of virtual reality "goggles". This is where this technology can be so clever, a drop of the head could activate a camera enabling you to see and operate your keyboard. In the future it could even display a virtual keyboard and identify which keys you are touching. You could also record specific parts of the lecture. A pre-defined action could highlight the start of the current section, another stop highlighting. After the lecture, highlighted sections could be replayed; this will improve the learning process as one often misses something when writing notes. With difficult subjects students can just run through the lecture again and again. Alternatively one could use digital dictating software to record your notes as either speech and / or text so you could completely do away with writing notes.

With live lectures it would be simple to enable some interaction with the lecturer; most of us are familiar with the red button on our TV remote control. Adding on screen buttons would enable people to ask questions or respond to those asked by the lecturer. The lecturer will see the question and be able to acknowledge it in a variety of ways. There could be an opt in twitter type feed so that students could add their comments as the lecture proceeds. Both these features may require some form of arbitrator to filter them to ensure they are relevant. This would be an ideal role for post graduate students. The conversation feeds could be multi-lingual and would be recorded. If you are the sort of person who is easily distracted you may decide to switch off the feed during the "live" lecture but then review the lecture later with the feed on to find out what other students were thinking.

Most lecturers will want some form of visual feedback. The easiest way is for them to face a large curved TV screen where the faces of the attendees are randomly displayed in a way to emulate a real lecture theatre; this would then make it a truly two way virtual experience.

We now want to start maximising our customer base, so we need to look at translating into foreign languages. If a prepared lecture then that is relatively easy to arrange. If in real time, then that requires a bit more technology, with possibly a few seconds delay to ensure those receiving an electronically translated feed always see complete phrases.

The same concept can be extended to tutorials whereas any one to one sessions[2] would be managed via Skype, Face Time etc.

Who will be the first to supply this Virtual Education? From a commercial standpoint, those with the both the vision and the most to gain financially. For a college with a solid reputation in a regularly oversubscribed subject then this really is a "no brainer".

The potential market could be massive and will be made up of:

- Those that were rejected because the entry level was artificially raised due to the course being oversubscribed.
- UK students who cannot afford the cost of fees and accommodation.
- Bright foreign students that cannot afford all those additional travel costs. We always have to remember how small the UK is relative to India and China. With the middle class in China getting richer and richer by the minute, what a huge market that could be[1].

The pricing model is going to be determined by a college's target market:

- If heavily oversubscribed they may be able to charge a cost similar to their standard courses.
- Where under subscribed they may offer a competitive fee.
- There is a third scenario; this is where non-academic commercial organisations regard this as just a way of making money. Everything will probably be bought in and re-sold.

The UK government has, over recent years, forced colleges into a commercial world so they have to expect it to become even tougher over the next few years. With prices possibly coming down to £3,000 per year for the most popular "off the shelf" VE courses. This would leave a student living at home with a debt of around £10,000 which could result in a significant increase in the number who decide to go into higher education. This will affect both school leavers and

those wanting to gain a new qualification later in life.

If you are a fully subscribed university you have limited student accommodation so the cost of physically expanding the college would be very costly. Or it could be that the local community may not be able to absorb a major increase in the student population. In either case the quickest and easiest way to increase surplus income / profit is provide a virtual version of your top courses on a worldwide basis.

In example A below we set a target of adding 2,000 VE students at £5,000 a year, that is a potential £10 million of additional revenue[2]. A guesstimate of the capital start-up costs for the technology would probably be in the order of £0.5 - £0.7 million, allow an extra £3 - 4 million for additional staff and administration costs and a college could be pocketing a significant surplus.

Example A

Running Costs	**Calculation**	**Amount**
Administration, support staff and help desk, processing computer marked assessments (CMAs) etc.	5 hours per year per student * 2000 students @ £30 per hour	£300,000
Creating 40 lectures per week	Preparation time 5 hours per lecture * 4 courses * 10 lectures per course per week averaging 60 minutes * 40 weeks @ 50 per hour	£480,000
Electronically submitted tutor marked assessments (eTMAs)	15 mins per paper * 1.5 eTMAs per week per student @ £50 per hour	£1,500,000
Tutorials – 20 students per tutorial	100 * 60 minutes per tutorial * average of 2 per week * 40 weeks @ £50 per hour	£400,000
Annualised contribution to final exams	Cost of final exam £240 plus local assessment centre fee of £60	£200,000
Technology platform	The equipment should not be expensive to maintain and a team of 4 should be able to keep it running and provide technical assistance to the lectures.	£550,000
Total guestimate		£3,430,000
Cost per student		£1,715
Surplus @ fee of £3,000 per year		**£1,285**
Gross surplus @ £3,000 pa		**£2,570,000**
Surplus as % of revenue		**43%**
Surplus @ fee of £5,000 per year		**£3,285**
Gross surplus @ £5,000 pa		**£6,570,000**
Surplus as % of revenue		**66%**

At £15,000 for 3 year course it would be competitively priced against an OU degree at £16,716[6].

Many of us use budget supermarkets like Aldi and Lidl, we know our choice may be limited but we can get the basics and a few luxuries at very reasonable prices. Could we adopt the same

attitude with parts of HE. Taking our model in example A, slimming down the number of eTMAs to one a fortnight and increasing the number of students to 1,000 per course then example B shows us that the costs could drop below £1,000 per year.

NB. If you would like to experiment with these figures there is a handy modelling tool on the www.peternoblett.com website.

Example B

Running Costs	**Calculation**	**Amount**
Administration, support staff and help desk, processing computer marked assessments (CMAs) etc.	5 hours per year per student * 4000 students @ £30 per hour	£600,000
Creating 40 lectures per week	Preparation time 5 hours per lecture * 4 courses * 10 lectures per course per week averaging 60 minutes * 40 weeks @ 50 per hour	£480,000
Electronically submitted tutor marked assessments (eTMAs)	15 mins per paper * 0.5 eTMAs per week per student @ £50 per hour	£1,000,000
Tutorials – 20 students per tutorial	400 * 60 minutes per tutorial * average of 2 per week * 40 weeks @ £50 per hour	£800,000
Annualised contribution to final exams	Cost of final exam £240 plus local assessment centre fee of £60	£400,000
Technology platform	The equipment should not be expensive to maintain and a team of 4 should be able to keep it running and provide technical assistance to the lectures.	£550,000
Total guestimate		£3,830,000
Cost per student		£957

From the figures in the above examples it will become obvious why some purely commercial organisations may start to take a serious interest in this market, they will view that surplus as profit.

There is the potential of "white labelling" courses. College "A" buys in courses from college "B" but "labels" them as their own. Just in the same way manufacturers white label some of their products. The advantage of white labelling is that you gain the economies of scale and can use lower cost locations. If your lecturers are based in Chester or Carmarthen rather than London your salary bill will be a lot lower. If they were based in the rather pretty French colonial university city of Da Lat in Vietnam, the salary bill would be even lower.

VE would bring about a new distributed studying model, with less students having to move away to universities. If the professions were willing to redesign their training models, skills shortages in such areas as nursing, medicine, teaching and social work could be addressed by instigating local practical training with VE theory training.

Think big, think China, what if UK HE providers could get an extra 100,000 Asian students a year signed up. In July 2014 7.26 million graduated from China's universities[3], our 100,000 represents

just 1.3% of that market. If each was studying for 3 years the revenue potential is significant. We have been selling financial services around the world why not start selling our educational services. In 2014 the UK exported £16.7[4] million to China but imported a massive £37.6[4] million. EV education could increase UK exports to China by 9%.

Potential revenue, once target of 100,000 students has been reached in all three years		
Annual fees for 3 year course	Revenue	% increase in revenue for the UK's HE sector[5]
3,000	£0.9 billion	3.1%
4,000	£1.2 billion	4.1%
5,000	**£1.5 billion**	**5.1%**
6,000	£1.8 billion	6.2%
7,000	£2.1 billion	7.2%

If a further 100,000 students could be achieved from the rest of the world the above figures would be doubled to £3 billion of additional income for the HE sector.

That is a "local" UK view; the real changes are going to be on the world stage. Mark Zuckerberg could follow the other tech multi-billionaires down the philanthropic route or decide to add another nought to the value of his wealth. Judging from previous performance whichever route he takes he is likely to make such a success that others will quickly follow. Google and Apple have their electric cars, so the one corporation that is uppermost in the author's mind is Amazon.

The "retired" population around the world is growing every day; they do not all, as some teenagers believe, have Alzheimer's. Most still have very activate and inquisitive minds. Could Saga and Amazon team up like Morrison and Amazon to create the University of "Sagamazon". Like old movies, old lectures may be the afternoon viewing of the future for millions.

The UK's foreign aid budget in 2015 was around £12 billion. 8% of that budget is £960 million; that could provide 1,000,000 or more students around the world with a high quality higher education.

One could visualise a battle developing between say, Facebook and Amazon. This would quickly create a US dominance in the worldwide provision of VE. As usual Europe will be left sleeping in a quagmire of bureaucracy, China will do what it has always done, copy the idea and create their own virtual world with the state controlling the content so that it can program the next generation.

Another possibility is Apple, because they are sitting on a huge load of cash. If Apple wanted to become a player, they might start by buying a University, or even a couple, they just have so much money!

The frightening thing is that it could be relatively easy to start a VE college from scratch; it might be very tempting for anyone wanting to re-write history. Would we see a billionaire with creationist beliefs building their own university with not a single evolutionist theory on their site? I reckon with $100 million dollars they could be up and running in 2 years.

Currently the world finances are dominated by a few thousand of the super-rich, will, in the future, the education of the world be controlled by just a few hundred.

VE has the potential to open up a wealth of opportunities for both the HE and FE sectors but will chancellors and vice chancellors in their robes and ivory towers want to change from being Gandalfs to education techno geeks. Sadly I think most will not. In 15 years' time, many may still be there, surrounded by a core audience of students from the more financially well off families; whilst the masses are studying at the university of I-lidl or I-aldi.

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Notes & References:

1) Research by McKinsey suggests, more than 75 percent of China's urban consumers will earn US$9,000 to US$34,000 a year by 2022. So spending US$15,000 for a quality UK education becomes more than a reality. *All income figures relate to annual household disposable income in real (2010) terms.*
Source: http://www.mckinsey.com/industries/retail/our-insights/mapping-chinas-middle-class
Article Dated: June 2013

2) Additional tutorials: Some students may need these but they could be classified as chargeable extras that have to be purchased as and when required. To simplify the administration they could be bought through the college website with the revenue split between the lecturer and the college on say a 40% college and 60% to the tutor basis. This will generate welcome additional income for both parties and ensure the weaker students may have to pay a bit more. It could be that this additional revenue is much higher than a lecturer's standard salary. Could we see some colleges no longer employing tutors but getting them to actually bid for a job. Just imagine a principal's face when you tell them in 15 years time lecturers will actually paying them to work at their college! This may be exceedingly far-fetched but just look back 15 years, now try looking forward 15.

3) Source: http://www.bbc.co.uk/news/business-28062071

4) Source: Office for National Statistics – The National Archives
http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/rel/international-transactions/outward-foreign-affiliates-statistics/how-important-is-china-to-the-uk-economy-/sty-china.html

5) Source: In 2014 the sector revenue was £29.1 billion
http://www.universitiesuk.ac.uk/highereducation/Documents/2014/PatternsAndTrendsInUKHigherEducation2014.pdf

6) Cost of an Open University degree
Modules cost £1,393 (30 credits) or £2,786 (60 credits).
Most OU students study 60 credits a year over six years for an honours degree.

6 Years at £2,786 = £16,716
Source: http://www.open.ac.uk/courses/fees-and-funding#

7) Sources include:
http://www.cs.manchester.ac.uk/study/undergraduate/your-typical-week/
http://university.which.co.uk/subjects/maths
http://www.thestudentroom.co.uk/showthread.php?t=906003
http://www.thestudentroom.co.uk/showthread.php?t=3018667