



Impact of Development of Technology on Education: Key Micro and Macro Economies of Australia

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ABSTRACT

The purpose of this paper was to discuss and examine the impact of development of technology on education in key micro and macro economies of Australia. Research for this paper included application of micro and macro economics concepts, presentation of facts that are collected from different sources as well as deeper analysis of the changes in micro and macro economies of Australia caused by technological changes in education supported by a range of other scholarly articles.

The paper provides advantages and disadvantages of development of technology on education as well as impact of technology on education in key micro and macro economies of Australia. Based on the analysis, the education industry in general is benefitted by development of technology caused by increasing access to information and flexible study schedule through e-learning. The paper then moved into micro and macro analysis of the impact technology has on education. The key factors in micro economics that were discussed are long run demand and supply, labour demand and supply, resistance to change and effect on universities and the environment. In macro economics, the key factors that were discussed are

increased access to education in the country, decrease in structural unemployment rate, decreased demand for Australian academics, increased level of global competition and decrease in GDP as well as increase in information asymmetry.

The paper provides detailed analysis on the impact of technological development on key micro and macro economies. In general, this paper suggests that as the inevitable development of technology in education will have both positive and negative effects on Australian economies, the key challenge is in managing the development by minimising its negative impacts and nourishing the positive impacts.

INTRODUCTION

Rapid development of technology has pushed forward the degree of innovation in different industries. In the education industry, the development of technology has shown to have a great impact on a number of aspects including quality and method of delivery. As technology develops, the education industry faces changes that will then affect key micro and macro economies of any country including Australia. This paper will begin by analysing general advantages and disadvantages of development of technology on education, followed by its impact on key micro and macro economies of Australia.

Advantages of Development of Technology on Education

Access to Information

Students can easily get the information required for their academic projects through the internet (Techno Edu 2012). There are a number of online databases

such as Ebsco and Jstor which contain peer reviewed academic journals. Students no longer need to spend hours visiting the libraries searching for the right material. While the process of searching for academic journals may be a lengthy process, the internet has shortened the time consumed during the exercise.

Through the easy access of information through information technology (IT) it is possible for academics to make predictions of trends by quickly reviewing past and current information (Bushati et al 2012). Majority of these online databases have search engines that allow users to categorise the type of articles they need. For example, if a user can type into the search engine “the impact of the global financial crisis” the user would get a list of articles talking about this subject. The information can also be categorised according to the dates e.g. the past 5 years.

Flexible study schedule through e-learning

The introduction of information technology medium such as the internet has facilitated more convenient learning of students through e learning (Cross & Adam 2007 p.78). E-learning is defined as the use of electronic media, multimedia tools such as power point slides and information technology tools in education and involves the use of audio or video to make presentations (Knight 2003).

E- Learning is advantageous to the education industry because institutions will be able to cater for individuals with busy schedules which serves as an alternative source of income for universities apart from the traditional face to face model for full time students (Knight 2003). E-learning is helpful to organisations which need to continuously train and retrain their staff despite their busy work schedules (Knight 2003). E- Learning helps reduce overcrowded class rooms in schools because the classes would now be conducted at a students and teachers convenience which helps both parties; students and teachers save petrol and travel costs because they do not have to travel to the class room (Knight 2003).

Disadvantages of Development of Technology on Education

Self-discipline and Self-motivation in E-Learning

Because E-Learning removes the necessity to convene in class rooms, students need to be self-disciplined and motivated to complete their courses because technology does not always provide the motivation that students need (Roger & Quentin 2003, p.33). This means that e-learning has a high risk of failure.

Technical Problems

Issues may arise in submitting assignments especially via electronic medium (Techno Edu 2012). This may cause delays in receiving students' assignments and the needed feedback on the same. Because majority of activities are conducted via internet, they are prone to setbacks such as viruses which attack equipment such as computers. These problems could derail class activities.

Training on how to use equipment

Students and instructors would need to know how to operate the devices to facilitate their classes (Techno Edu 2012). This could take a great deal of time especially for those who have not been exposed to technology before. The time and resources used to train the participants may outweigh the economic gains to the institutions using information technology.

Management

Because information technology is always developing, there is a need to acquire the latest technology (Techno Edu 2012). For many learning institutions, this could be difficult because the management would have to justify their decision for purchasing new equipment to their finance department.

Impact of Technological Development on Education in key Micro Economics of Australia

Long run demand

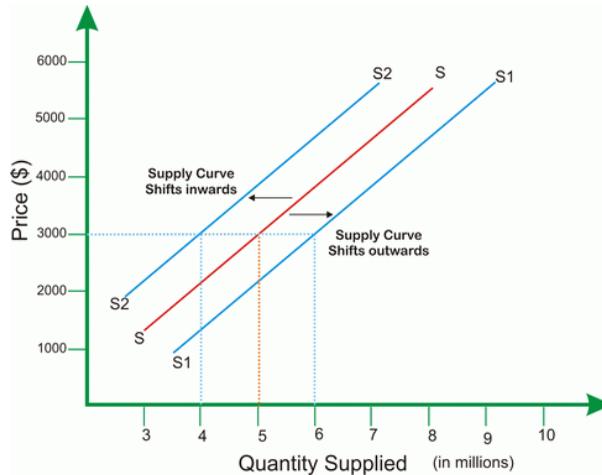
In the long run, families will be able to send their children to different educational institutes depending on the fees of various institutes. Therefore, in the long run the demand curve is downward sloping as increase in price cause families to demand less. In addition, the demand curve for the university is elastic; if the university increase the fees student can choose cheaper institutes. However,

the demand curve for all universities is inelastic as the price of overall educational institutes increases (Li 2013).

Long run supply

Archibald and Feldman (2011, p. 32) analysed that the long run supply curve for higher education is horizontal and flat for the last few decades. Use of technology is known to reduce costs and increase efficiency yet higher wages for professors to remain competitive thus increases costs. As cost increases rapidly, the increase in other sources do not increase at the same pace therefore this shift the supply curve upward. Online distance learning programs (recorded lecturers) are less expensive to conduct therefore such programs can shift the supply curve to the right hand side, if a university increase maximum number of enrolment for online courses (Li 2013).

Technology is a non-price determinant of supply and changes in non-price determinant always shift supply curve either right or left. Improved technology always decreases costs and therefore increases supply (Layton et al 2012, p. 67). If technology does not decrease costs then it would not be used by the education institutes and they will continue using the same old technology.



Shift in Supply Curve

Source: Bakshi n.d.

It is important to answer the question that if technology decreases the cost of production and increases the supply then why university courses are more expensive compared to past? There are two factors that can justify increase in program costs in educational institutes. The first factor is inflation and the second factor is product differentiation. Consider an example of Business discipline. Universities in 1980's traditionally offer MBA but now they offer more specialised programs inside the business discipline such as Master in Strategic Management, Master in Supply Chain, Master in Sustainability, Master in innovation etc. Therefore, it is completely different product /service and does not justifiable to compare those programs with MBA.

Labour Demand and Supply

Education and training industry has a relatively higher ratio of older employees which shows that there will be higher demand of teachers in the coming future after the retirement of current workforce (DEEWR 2013). Hugo (2005) established that Australian education sector has the oldest workforce compared to any other sector. Australian educational institutes will face one of the worst

shortages of teachers, researchers, scientists and other academic staff for the next three decades. It is highly important for the Australian universities to use innovative strategies to maintain their current position of excellence among international education providers. Due to this shortage of skill workers it is obligatory to use technology such as online and distance and e-learning to effectively utilise the scared human resources. Online learning environment helps educational institutes to use their human resources efficiently by recording the lectures and producing machine readable assessments.

Domestically, demand for education and skills in Australia are changing from semi-skilled jobs to highly skilled jobs. Improvements in the Information Technology (IT) have changed the workplace practices significantly and employers need workers with general technology literacy regardless of the type of work. Therefore, it is now compulsory for tertiary education to train students with the latest equipment and technology. Educators use Power-point and other audio visual ads to build the capacity of students to use the technology in an effective way (Vallance & Towndrow 2007).

Resistance to change

There is a high ratio of aged workers in the education workforce. Therefore, there is more resistance to adopt new technologies among baby boomers. The economic costs of people not being able to use technology are substantial. For individuals, the cost can be seen in the form of lower incomes, fewer employment opportunities and potential social isolation. Some group of academics who adapt technology can have better opportunities to grow as compared to non-adaptors. On a collective basis, society will bear the social cost in form of taxes for the welfare of those individuals who are not willing to use technology in educational departments (Fisher & Wesolkowski 1999).

Effect on Universities

The economic benefit of technology in form of reduction in production cost can be seen in the case of Australian Catholic University (ACU). ACU implemented two tools that illustrate the benefit of technology. The first tool is Turnitin, the online solution to check the originality of student work. Academic misconduct and plagiarism are the two main issues for any research based university including ACU. Turnitin helps ACU to find the level of plagiarism in student assignment submission. This automation not only cut the cost for manual checking but also helps to recognise the importance of original work among student communities. Furthermore, Turnitin can be integrated with student blackboard systems for comprehensive online course management (Johnson n.d). The second tool is Student Connect portal that facilitates online enrolment for students. Using online course enrolment system, student can enrol their courses online. On the one hand, this software saves student's time and prevents them from standing in a queue at the student centre. On the other hand, ACU save enormous amount of money due to automation of process and less involvement of human resources. Apart from these two tools, ACU is also enjoying many other technology gadgets to save enormous human costs such as self-book checkout machines, online fees payment, Lynda for online video tutorials and training etc.

Effect on the Environment

According to Moore's law, the processing power of computers increased up to twice from 12 to 18 months (Piccoli 2012, p. 13). This exponential change in the technology forces educational institutes to upgrade their systems to run modern software and applications which require more computational power. The average computer life in organisations is 4.5 to 5 years (Meredith 2010). After retirement these computers are one of the main hazards for the environment if not

recycled properly. Computer circuit boards contain mercury, arsenic, cadmium and other toxic chemical which are known to cause health problems when exposure occurs in large doses (Toothman n.d). If computer components dump in landfills then these junkyards are particularly harsh source for pollution.

On another hand, with the digitisation of print, there has been less need to print books and magazines (Schwartz 2000, p.50). Consequently, there is less paper used in the manufacture of print media thus conserving trees which is the raw material for paper. This is an important step towards environmental conservation, a hot political issue in the contemporary world as governments and business around the world begin to take responsibility for the environment. This is advantageous to the education industry because it would put them in a leadership position in protecting the environment.

Impact of Technological Development on Education in key Macro Economics of Australia

Increased access to education in the country

The greatest impact of improvement of technology to education is in the introduction of e-learning facilities. In a lot of ways, e-learning is proven to be less constrained by location, entail less cost (Chandnani 2003) and able to generate more income due to the fact that there is no limit on the number of participants (Fornefeld 2006) compared to traditional learning model. As cost becomes lower, universities will be able to provide their services in a cheaper rate and hence education becomes more accessible. Increased access to education will lead into increase in the country's productivity, better standard of living as well as higher consideration towards issues such as climate change (Varga & Palosi n.d.). In the case of Australia, in the past, access to education has been constrained by distance and availability in the area in which the individuals live

(Leach & Jenkins 1996). For instance, people living in a small city in Brisbane might choose not to pursue higher education due to the cost involved in moving to bigger cities to attend universities or colleges. With the existence of online courses, this problem can then be minimised.

Decrease in structural unemployment rate

In the macro level, Australian government now has better solution in tackling structural unemployment. Structural unemployment, such as one caused by lay-offs of City Rail employees, usually requires development of people's skills that can only be facilitated by education (O'Brien 2013). However, education is not always affordable and often there is also a gap between the skills that are needed and the availability of education that provides such skills due to the limitation of the on-site education provider. On the other hand, online learning platforms often have the capacity to provide wider range of courses (Davis 2012) and give qualification and accreditation that are needed by the structurally unemployed. In this sense, it can be argued that the increase in technology will lead into better access to education and hence reduced rate of structural unemployment in the long run (Duvenhage n.d.).

Decreased demand for Australian academics

Despite the optimism that arises because of the increasing availability of education facilitated by technology, the phenomenon might also lead into increase in the number unemployment if seen from another perspective. In the traditional learning model, lecturers and teachers need to be physically present to conduct their classes. This means that Australian universities will preferably employ knowledge workers (i.e. academics) from the Australian labour market or choose to hire academics from overseas that entail additional costs of relocation and sponsorship. However, the notion of e-learning means that whilst students

can attend their classes from anywhere, lecturers can also conduct their lessons from anywhere (Britland 2013). This is not to mention that some classes can also be recorded for future use - hence reducing the cost of repetition. Considering the fact that Australia is one of the countries with high labour cost (Keen 2013) and that there are academics with better reputation from other countries who might be able to provide same service at lower cost in a pre-packaged form (Kolowich 2013), it is not impossible that demand for Australian academics will decrease in the long run, leading into oversupply of academics and unemployment.

Increased level of global competition and decrease in GDP

The impact of technology in education, mainly in the context of e-learning, might also increase the level of competition within Australian education market due the reduction in barriers to entry (Gerhard & Mayr 2002). In the past, renowned universities often refrain from expanding overseas to maintain their brand and prestige. However, with the rise of e-learning, the Australian education industry is no longer subject to local/national competition but rather global competition as renowned universities from overseas can now offer their services in the global market of e-learning that is no longer constrained by distance (Gerhard & Mayr 2002). By way of illustration, local university in Queensland that used to compete with other universities in the state will start competing with universities in U.S. that provides quality online courses and prestigious qualification. If the local universities are unable to match the quality of services provided overseas, in the long run it will lead into decrease of Australia's net export and consequently its GDP as more education are 'imported' to Australia.

Increase in information asymmetry

Last but not least, Australian job market as a whole might also be affected by the development of e-learning. In the past, education has been used as signalling

method to counter the problem of information asymmetry between employer and future employees. However, qualities that are often assumed in traditional learning method such as perseverance and teamwork (Altonji & Pierret 1996) might not necessarily be fostered in e-learning. Rostaminezhad et al (2013) suggests that drop-out rate in e-education is higher than traditional learning method. Furthermore, Goold et al (2008) suggests that it is harder to perform group work in an online environment as communicating online is difficult and often time consuming. Due to this, the notion of teamwork becomes less embraceable in e-learning. With this in mind, there is a possibility that future employers might end up valuing prospective employees with qualifications obtained through e-learning lower than employees with qualifications from on-site education providers due to higher information asymmetry caused by the nature of e-learning. In such situation, e-learning might become counterproductive or less contributing to the economy and cannot be seen as substitute to on-site education.

Conclusion

In conclusion, the development of technology has shown to empower the education industry primarily due to the facilitation of e-learning. However, the research has shown that such development might have both negative and positive impact to the key micro and macro economies of Australia. Unfortunately, the development of technology is an unavoidable phenomenon that cannot be prevented nor reduced and hence slowly but surely the negative and positive impacts will appear in the Australian economy. The key challenge for the future is in managing the development, minimising the negative impacts and nourishing the positive impacts of technological development on education.

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