Some current effects of mobile communication technologies on university-level education

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Abstract

Purpose. This paper will explore some effects of current mobile communication technologies on university-level education. For this study, mobile communication technologies include commonly employed devices especially smartphones connected to the Internet. University education as defined here will include conventional "face to face" classes with students located in the same physical space at the same time participating in a "synchronous" activity with a teacher, as well as internet-facilitated "asynchronous" teaching and learning. The focus of this work is student use of communication technologies that may be regarded as possible threats and/or opportunities confronting higher education.

Methodology. In addition to a literature search, data for this exploratory study was collected from a short survey of undergraduate students and teachers at the Department of Management at the University of Verona, Italy; and additional data collected from students and teachers at the School of Engineering Technology, Eastern Michigan University, USA.

Findings. Higher education cannot ignore this disruptive technology. However, the authors do not accept the widely-held premise that these technologies will obviate the necessity of the unique personal student-teacher interaction. Online resources and activities are already critical adjuncts to traditional classroom teaching and learning. There is a great need to change; especially in face-to-face classes with undergraduates which are often 75% theater and 25% academic content.

Practical implications. The paper lends itself to initiating a critical discussion on planning the processes of change which will inevitably affect most universities.

Originality/value. There is little current literature on the threats and opportunities articulated by this paper particularly by way of direct investigation in the field.

Keywords

mobile communication technologies; internet; disruptive technologies; higher education; innovation; face to face course; on line course

1. Introduction: *caveat lector* and goals of this study

Caveat Lector: Parts of this study should be considered immediately obsolete. The authors acknowledge that popular communication technologies and their use by university students will change in ways we cannot predict. At its core, the nature of university-level education has persisted in an uninterrupted trajectory dating from Socrates at the School of Athens almost 2500 years ago. However, the near ubiquity of the internet and associated technologies in combination with surging demand for higher education have historically unprecedented disruptive potential for higher education. In this context, our study and conclusions are necessarily *transient in time*. We aim to compose and communicate a time-sensitive "snapshot" of the effect of the internet and associated technologies on university-level education. (Even though the English word "snapshot" including its figurative use here has had its meaning recently transformed by the omnipresence of billions of smart phones with built-in cameras and instantaneous and almost universally available internet communication.) What we mean by "snapshot" is a *necessarily ephemeral* description or picture of current conditions at two universities – one in Italy and one in the USA. Ephemeral because the technologies discussed in this paper are developing so rapidly that, in a short period of time (probably months, not years), some of our analysis will be made obsolete by the next internet-facilitated "big thing". Academic papers cannot keep pace with the technologies discussed here. Our goal here is to advocate the proposition that current communication technologies may be regarded as possible threats and opportunities confronting higher education knowing utterly that these technologies (but not their potential for disruption) will change very soon.

This paper will explore some effects of present-day mobile communication technologies on university-level education. For this study (executed in mid-2016), mobile communication technologies include hardware such as the Internet (as a ubiquitous, broadband presence), Internet connecting devices such as smartphones/tablets/laptops, as well as ancillary technologies such as Wi-Fi, Bluetooth, and "smart" sensors - all of these linked with the overreaching human interface provided by software. University education as defined here will include conventional "face to face" classes with students located in the same physical space at the same time participating in a "synchronous" activity with a teacher, as well as "asynchronous" teaching and learning in which students may be located anywhere with Internet service, but not necessarily interact at the same time or place. University-level classes with an online component, while not universal, increasingly form a continuum rather than discrete categories. This topic will be further explored in this paper. The focus of this work is current communication technologies and associated social media developments that may be regarded as possible threats and opportunities confronting higher education. Elements of this study were previously carried out by Baccarani (2014) and Booker & Tucker (2014).

1.1 Higher education is more important than ever. This is true for age-grade undergraduate students as well as mid-career professionals. The economic reasons for the continued growth of university level enrollment are quite simple: "the return on investment is high: college graduates have much higher earnings and lower unemployment rates, on average, than people with a lower-level degree or diploma." (Tyce et al., 2014). And, higher education is widely held to be a critical component in economic growth (Wolf, 2002). Globally, college enrollment is growing rapidly: "Some 3.5m Americans and 5m Europeans will graduate this summer... China has added nearly 30m places in 20 years." (Economist, 2014). At least in the US, enrollment in online courses is exploding: "The number of college students taking at least one online course has increased five-fold since 2000, reaching 7.1 million students in 2012 and growing much faster than enrollment in traditional courses. About 10 million students worldwide had enrolled in at least one massive open online course (MOOC) as of late 2013, up from only 1 million in 2012." And "the number of adult learners is expected to grow about

three times as fast as the number of students who are of traditional college age." (Tyce et al., 2014). Adult and continuing education after a four-year degree will become even more important as this technology disrupts many careers: "According to a study from Oxford University, 47% of occupations are at risk of being automated in the next few decades. As innovation wipes out some jobs and changes others, people will need to top up their human capital throughout their lives". (Economist, 2014.)

1.2 Transformative technology is already in the hands of university students and young people all over the world. "Smartphones/internet… already the key catalyst of the most extensive and fastest technological revolution in history." (BBVA, 2014). In the US, "Those ages 8 to 18 spend more than 7.5 hours a day with such devices, compared with less than 6.5 only 5 years ago… And that does not count the 1.5 hours that youths spend texting, or the .5 hour they talk on their cell phones. And because so many of them are multitasking — say, surfing the Internet while listening to music — they pack on average nearly 11 hours of media content into that 7.5 hours." (Lewin, 2013). According to the Economist magazine (2014): ". The internet, which has turned businesses from newspapers through music to book retailing upside down, will upend higher education." Varied sources in the private and public sector agree that higher education is now posed for disruption by technology. (Hixon, T., 2014; BBVA, 2014; Halewood, et al., 2015)

It is not useful or practical for this study to catalog the associated technologies with potential for disruption, but the focus will be on those elements which now affect the teaching/learning nexus at the core of university education. For our purposes these technologies include Internet (as a ubiquitous, broadband presence increasingly made available through WiFi and cellular connections), Internet connecting devices such as smartphones/tablets/laptops, as well as ancillary technologies such as Wi-Fi, Bluetooth, and "smart" sensors - all of these linked with the overreaching human interface provided by software. For university-based research, the list would be different, but this is not in the scope of this study. As a central construct or mental image for this research, it might be useful to consider two students: (1) the current residential undergraduate student carrying a smartphone using university-provided high speed Wi-Fi or cellular system connected to the Internet with an Internet connected laptop at their residence, and (2) the adult learner with the same smartphone connected to Wi-Fi or cellular system used for personal and professional purposes and also connected via a laptop or tower at home and at work. Both categories of students are potentially "connected" to the Internet all their waking hours with a seamless combination of personal and professional/educational activities.

1.3 What constitutes online classes*?* The delivery of university level classes may be the traditional "live in the classroom with the teacher at the front of the class writing on the board" without any associated technology involved (well, maybe artificial light). Or, an individual student may watch a previously recorded class of a MOOC (Massive Open Online Course), not interact with other students or a professor, and take exams online with few time constraints on completing the class. Or, the student may take the same class via one of the common learning platforms like Blackboard in a standard 15 week semester "with" other students although the classes are asynchronous and the students may or may not be required to interact with each other.

There are almost infinite permutations of live and technology-assisted teaching and learning. One good definition: "Online courses… are those in which at least 80 percent of the course content is delivered online. Face-to-face instruction includes courses in which zero to 29 percent of the content is delivered online; this category includes both traditional and web facilitated courses. The remaining alternative, blended (sometimes called hybrid) instruction

is defined as having between 30 percent and 80 percent of the course content delivered online." (Allen & Seaman, 2010).

1.4 Well designed Internet impacted classes can have equal or better results than their entirely live counterparts. A federal study found strong evidence that blended (live and online) models can produce outcomes that are equal to or better than face-to-face or online instruction alone. (US Department of Education, 2010). "Since first measured in 2003, the proportion of chief academic officers reporting that the learning outcomes for online compared to face-to-face as the 'Same', 'Somewhat Superior', and 'Superior' has increased from 57 percent to 68 percent." (Allen & Seaman, 2010). The meta-analysis of 1000 research studies sponsored by the US Department of Education in 2010 concluded that among college level students: "Students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction." (US Department of Education p. xiv). Similarly, there are many studies on completion/retention in online courses (Aragon, & Johnson, 2008; Willging, & Johnson, 2009); direct comparison of live and online courses (Brown & Liedholm, 2002; Dutton et al., 2002); and experimental assessment of live versus online education, (Figlio, D., et al., 2010; US Department of Education, 2010). Google Scholar returned 3.5 million "hits' on the search terms *online education* and the US Department of Education (2010) identified 1000 studies assessing the value of the same topic. There are also many problems with online and MOOC courses including high dropout rates for MOOCs and poor achievement in online classes for traditionally demanding courses like mathematics and statistics (Lewin, 2013; Selwyn, 2015). Live face-to-face university classes also exhibit a wide variety of attributes and student achievement. It is well beyond the scope of this study to evaluate whether or not online and hybrid/blended university level classes are equal to or better than live classes. Consensus reigns that the online format is legitimate, can have learning outcomes equivalent to live classes, and is here to stay.

1.5 University faculty and administrators lag in their understanding of these changing formats of the educational processes. At least among the U.S. public universities, administrators of are reeling from decades of reduced funding. From the 2002–2003 school year through the 2012–2013 school year, state funding declined by an average of 2.8 percent per year (adjusted for inflation), reaching its lowest point in decades (Tyce et al., 2013). "In America government funding per student fell by 27% between 2007 and 2012, while average tuition fees, adjusted for inflation, rose by 20%." (Economist, 2014). To US university administrators, online programming looks like "easy money". Logically: "When this report series began in 2002, less than one-half of all higher education institutions reported online education was critical to their long term strategy. That number is now close to seventy percent." (Allen & Seaman, 2013). In the first report of this series in 2003, 57.2 percent of academic leaders rated the learning outcomes in online education as the same or superior to those in face-to-face. That number is now 77 percent. A minority (23.%) of academic leaders continue to believe the learning outcomes for online education are inferior to those of face-to-face instruction. Academic leaders at institutions with online offerings have a much more favorable opinion of the relative learning outcomes for online courses than do those at institutions with no online offering." (Allen & Seaman, 2013).

1.6 Attitudes among university faculty especially impede a positive and functional response to these changes. "In 2013, only 30.2 percent of chief academic officers believe their faculty accept the value and legitimacy of online education. This rate is lower than the rate recorded in 2004. Chief academic officers at institutions with fully online programs have the most positive view of their faculty acceptance, but even for them the proportion agreeing is less

than a majority (38.4 percent)." (Allen & Seaman 2013). This study intends to advance from the conclusion of Baccarani (2014): "For the time being the technology will not able to substitute the teacher, but for the future… it is another challenging story." The authors posit that collecting data from students and faculty right now can help professors understand, confront, and address this titanic impending change. Working for a future which provides an important role and indeed employment for professors, we must acknowledge that most faculty do not accept the legitimacy of online education. Most US faculty believe that teaching online courses is more work than live classes (Allen and Seaman, 2013). Online enrollment is growing faster than traditional face-to-face enrollment. University administrators seek ways to enhance income and reduce costs through online and hybrid programming. The younger the incoming university student, the more likely that they will enter the university umbilically attached to their internet connected smartphone. As put so succinctly by Vladimir Lenin in 1902: What is to Be Done?

2. Methodology

This paper could not have been imagined or written without the Internet. Shared authorship between the US and Italy (and six time zones) requires numerous e-mails and file transfers, now routine tasks. The literature search for the study has been executed almost exclusively via Google and Google Scholar. For example using the Google search engine "online education" yielded more than three billion "hits" and in Google Scholar more than 3 million. Academic papers cannot keep pace with the technologies discussed here. Key sources are non-academic published research done for the private sector such as the Spanish Banco Bilbao Vizcaya Argentaria (BBVA), the Boston Consulting Group, and Forbes magazine in the USA. All of these references are available online-only.

2.1 Michigan, USA. Why do employed graduate students enroll as part-time students in a demanding online MS degree program as mid-career professionals? Since 2001, the School of Engineering Technology at the Eastern Michigan University (EMU) has offered two fully online master's degree programs, Master of Science in Quality Management (MSQM) and Master of Science in Engineering Management (MSEM). Some 300 students are currently enrolled in these two programs; the majority are employed mid-career professionals located all over the world. From the beginning, all online courses were designed to result in similar student participation and outcomes as those achieved from live classes. All online classes were developed by PhD faculty with both extensive industrial backgrounds and university experience working with adult mid-career students in live classes.

When queried in a previous study (Booker & Tucker, 2014), some 50 EMU online graduate students opined that they highly valued the online format. Interestingly, they were overwhelmingly willing to actually do more work than was required (to pass the class) to take advantage of the unique educational opportunity provided by the flexibility of the online course.

In May, 2016 some 20 active EMU MSQM online graduate students were asked to participate in a process improvement exercise. The class demographic make-up was typical of the MSQM online classes: half female and half male; African American, Hispanic, and white students; students employed in the US but originally from Northern Europe, South America, India, the Spanish speaking Caribbean; and an American living abroad. Students completed their largely asynchronous work across some 12 time zones.

The students were asked two simple questions:

1. What is the single most important advantage of taking a class online as opposed to live (face-to-face)?

Virtually all students mentioned logistical issues having to do time; time for class, time for commuting etc.. Most said they could not pursue an MS degree in a live setting due to work and family obligations, and many said their geographical location precluded live graduate study.

2. What is the single most important disadvantage of taking a class online as opposed to live (face-to-face)?

All mentioned the lack of human/face-to-face interaction with the professor and fellow students as well as the serendipitous learning which ensues. Mid-career professionals especially value the interaction with peers which may provide more education than the class itself.

2.2 Verona, Italy. In a previous study (Liverpool, 2014), we identified the four main reasons for which the students involved in their first year in the faculty of management at University of Verona recognized relevance to the teacher role even in the age of internet.

The results were the following in order of prevalence:

The university teacher is useful in the age of internet where he or she:

1) Is able to transmit emotion, passion and interest in the subject presented
2) Is able to give a sense and meaning to the information and spread critical and selective abilities
3) Is able to foster dialogue and generate forms of personal and social interaction
4) Is able to act as a guide and mentor

To investigate the value of these results during this academic year (2016) we proposed to a similar group of students enrolled in the same academic course for their first year to answer a simple question: Is the professor still useful in the age of internet? Then, we asked students what were the reasons for their response.

In this second question we included the four main reasons identified in the 2014 mixed with other studies to see if the same four from 2014 were still the main responses. Students could respond with values on a scale from 1 to 5 where 1 is not important and 5 is very important. Forty-nine students answered the questions proposed in a lecture hall with about 180 students. The questionnaire was offered online.

The data collected in the table show how students recognize a significant value in the role of the professor at the university with an average of 4.19 points with the higher values of males, working students and students from the scientific and classical schools as if to emphasize the value of learning relationship skills both at work and in training particularly for males.

As stated the main goal of this new phase of the study was to see if the four main reasons why the professor was recognized as having value even in the age of internet detected in the earlier study were or not confirmed. The responses to the proposal's motivations with the previous main reasons put in a random order together other reasons are gathered in the table below:

The professor is still useful in the age of internet if she or he is able:

To create conditions under which the student can learn to learn	3,94
To seek to understand complexity	3,83
To foster curiosity and the ability to ask oneself questions	3,90
To act as a guide and mentor	3,83
To emphasize the role of the individual in groups	3,40
To transmit emotion, passion and interest in the subject presented	4,52

To give value to human conversation and convey emotions 4,21
To foster dialogue and generate forms of personal and social interaction 3,96
To challenge current thinking and encourage creative thought 4,21
To give a sense and meaning to the information and teach critical abilities 4,33

The analysis of the data reveals the following order of the most significant reasons:
1) To transmit emotion, passion and interest in the subject presented: 4,52
2) To give a sense and meaning to the information and teach critical abilities: 4,33
3) To challenge current thinking and encourage creative thought: 4,21
4) To give value to human conversation and convey emotions: 4,21

The analysis of these data reveals that the first two reasons are the same and in the same order of priority identified in the previous 2014 survey, while the second two with *ex equo* rates, are new and emphasize the values of personal interaction and creativity.

3. Conclusion and recommendations

This study articulates the vast differences in attitudes regarding education between younger undergraduate students enrolled in live classes on campus and mid-career older graduate students working full time and taking online classes part-time. The more traditional on campus students accept the role of the internet but continue to expect the personal interaction and creativity inherent in the live format. The online graduate students would also like to benefit from the same personal interaction and useful serendipity of the live format. However, the older students are willing to sacrifice the more human and personal aspects of live education for the convenience of asynchronous online classes. University faculty should be prepared to serve both populations.

The vast and increasing majority of university students live in a connected world. We can ignore (at our peril) the impact of the opportunities proffered by the technologies or we can accommodate an educational model in which technology augmented live and live/ hybrid classes are considered as valuable as fully online classes. University faculty have been recalcitrant in accepting the legitimacy of technology-augmented education. As this research documents, growth on fully online and hybrid higher education is growing despite faculty support. If university faculty wish to take part in influencing their own future, they must begin to understand the nature of the issue and the scale on growth.

Based on the findings of this study, the authors propose initiatives directed to meet the needs of undergraduate students to interact in a better way with mobile technology and the need of the online graduate students to interact with the teacher. For the undergraduate group we propose to divide the courses in two parts: one on the basic concepts of the course which students complete online, and one on the critical approach to problems and on creativity done face to face. This could also facilitate active student participation in the teaching lessons. For the graduate students, we can imagine a week-end spread around the world so the students and teacher can "meet" face to face or other synchronous activity among the students.

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