Technologies With Potential to Transform Business and Business Education: Mobile and Micro-Learning

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Among the charges set forth before AACSB's Innovation Committee, assessing the impact of various disruptive forces within the higher education space is perhaps at the forefront. Previous briefs have analyzed the impact that artificial intelligence and virtual reality technologies have had on education, and society at large. Already being leveraged in classrooms and in businesses, and even in the home, these technologies have provided education providers with new avenues for content delivery. Yet, it is possible that micro-learning—education designed to be delivered via a handheld device—could represent an even larger shift within the educational landscape.

This brief is intended as a primer on the subject of mobile and micro-learning. A listing of references and resources is included to help guide further research and understanding on the topic.

For questions or suggestions, please contact the AACSB Business Education Intelligence team at research@aacsb.edu.

What's Inside

Milestones of Innovation in Distance Learning

Mobile learning—the delivery of organized, course-based education outside of a classroom setting—is yet another innovation in distance learning. In 1728, Caleb Phillips developed private-correspondence courses in shorthand, which are now recognized as the first distance education courses.[1] In the 1840s, distance education became more modernized, when Sir Isaac Pitman taught shorthand by "mailing texts transcribed into shorthand on postcards and receiving transcriptions from his students in return for correction—the element of student feedback was a crucial innovation of Pitman's system." The introduction of uniform postage rates in England made this advancement possible, with equal expense for participation.[2] Then, in 1858, the University of London became the first university to offer a true distance learning degree program, with their External Programme, a correspondence-based program.[3] Correspondence-based programs reached the mainstream in the 1890s. And, over the next century, universities experimented with a variety of platforms for delivering education, including radio and television.[4] In particular, China was a major proponent of distance education through the use of radio and

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[1] Subrahmanyam C.V., Venkata, & Ravichandran, K. (2013, January). Technology & Online Distance Mode of Learning, *International Journal of Humanities and Social Science Invention*, 2(1). http://www.ijhssi.org/papers/v2(1)/Version-2/B210513.pdf

[2] Tait, Alan. (2003, April). Reflections on Student Support in Open and Distance Learning. *International Review of Research in Open and Distributed Learning*, 4(1). http://www.irrodl.org/index.php/irrodl/article/view/134/214

[3] Subrahmanyam C.V., Venkata, & Ravichandran, K. (2013, January). Technology & Online Distance Mode of Learning, *International Journal of Humanities and Social Science Invention*, 2(1). http://www.ijhssi.org/papers/v2(1)/Version-2/B210513.pdf

[4] Craig, Ryan. (2015, June 23). A Brief History (And Future) Of Online Degrees. *Forbes*. https://www.forbes.com/sites/ryan-craig/2015/06/23/a-brief-history-and-future-of-online-degrees/#74f97baa48d9

television in the 1960s.[5] But, until the 1990s, most traditional universities did not consider distance learning offerings to be central to their institutions, and such courses were often "relegated to the fringes (extension or continuing education divisions)."[6]

While these early steps in distance learning untethered students from the classroom, there were still significant inefficiencies and added costs in correspondence-based distance learning programs. Advances in computing technology and the advent of the internet ushered in the adoption of electronic learning, or e-learning (sometimes also referred to as online learning). While the original method of distance education still exists (and remains a category for program reporting in AACSB's Business School Questionnaire), it has effectively been replaced in most formats by online or e-learning. The impetus toward the widespread adoption of e-learning was blazed by for-profit programs, such as the University of Phoenix, which "recognized that online delivery represented the logical conclusion of their drive to accessibility," and enabled them to "charge the same tuition which, at scale, would lead to significantly higher profit margins."[7] This is not to say that traditional universities were not heavily engaged—Duke University launched its online Global Executive MBA in the 1990s, and Cornell University launched its own eCornell online certificate programs, alongside many other schools.[8] The marketplace for online education quickly became crowded, as more students continued to demand access to education outside of the classroom through an online platform.

Where online learning gave students the option to engage in coursework outside of the classroom through their computers, mobile learning takes yet another step toward independence and accessibility. With mobile learning, learning is no longer tied to a desk (such as a laptop or computer) but can be delivered "on the go," via a handheld device, such as a smartphone or tablet.[9]

[5] ICEF. (2012, 8 June). 8 countries leading the way in online education. *ICEF Monitor*. http://monitor.icef.com/2012/06/8-countries-leading-the-way-in-online-education/

[6] Craig, Ryan. (2015, June 23). A Brief History (And Future) Of Online Degrees. *Forbes*. https://www.forbes.com/sites/ryancraig/2015/06/23/a-brief-history-and-future-of-online-degrees/#74f97baa48d9

[7] Ibid.

[8] Ibid.

[9] SHIFT. (2018, 13 March). Understanding The Difference Between eLearning and mLearning. *SHIFT eLearning Blog*. https://www.shiftelearning.com/blog/difference-between-elearning-and-mlearning

The New Frontier of Mobile Learning

What is mobile learning?

As mobile learning is still rapidly evolving, its definition can be interpreted in a wide variety of ways. For the purposes of this brief, mobile learning will use the definition as devised by UNICON's 2011 Going Mobile in Executive Education report, which defines mobile learning as:

> Handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance, and extend the reach of teaching and learning.[10]

Mobile learning has a variety of use cases, from the highly customized applications leveraging micro-learning theory (which will be explained in more detail later on), to simple SMS (Short Message Service). Mobile learning is one of the fastest evolving learning platforms and has been driven in recent years by "a tailwind of innovations including location-based technology, proximity beacons, motion sensors, smartphone-enabled virtual reality, mobile augmented reality, image recognition, biological sensors, eye tracking, haptics, gesture recognition, tilt sensors, Fresnel lenses, and biometrics."[11] All of these technologies converge in handheld devices, offering mobile learning providers a bevy of tools with which to craft their content for maximum impact.

Mobile learning can be a standalone experience, where participants use a handheld device for the entirety of the learning. Many phone applications and training programs are designed with this approach in mind. However, mobile learning can also be leveraged as a complement to traditional delivery methods. Hybrid approaches would entail some content being delivered via a synchronous classroom setting (be it online or in a classroom), while other

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[10] Ashridge and UNICON. (2011, November). *Going Mobile in Executive Education*. http://www.uniconexed.org/wp-content/uploads/2017/01/UNICON-Going_Mobile_In_Executive_Education-Schofield-Taylor-West-Nov-2011-1.pdf

[11] Ambient Insight. (2015, August). The 2014–2019 *Worldwide Mobile Learning Market*. http://www.ambientinsight.com/Resources/Documents/AmbientInsight-2014-2019-Worldwide-Mobile-Learning-Market-Executive-Overview.pdf

content is designed for and delivered by handheld devices to continue the learning process. After convening in a synchronous environment, students can adjourn and engage with the content via a slow release throughout the day on their mobile devices. In so doing, the learning process can become an extension of an individual's lifestyle.

What are the primary catalysts for mobile learning?

While the specific catalysts for the growth of the mobile learning market vary considerably from region to region, a few primary catalysts are identified in a 2015 report by Ambient Insight:

- Mobile-only countries leapfrogging legacy learning products
- Boom in demand for [subscription-based] Mobile Learning value-added services (VAS)
- Strong consumer demand for Mobile Learning content
- Large-scale smart device adoption in the consumer and academic segments
- Rapid innovation of new Mobile Learning product types[12]

In certain developing countries, smartphones and tablets have been the first opportunity for individuals to access the internet consistently. For instance, in Nepal, over 93 percent (or 5.3 million) of all internet users access the web via mobile devices exclusively. As such, those in Nepal might be predisposed to seeking an education through a mobile platform, as this is the primary way they are able to connect to the web. The same is true across several other countries in the developing world. In fact, in 67 of the 119 countries analyzed in the Ambient Insight report, "mobile internet access rates [were] higher than PC access rates." The countries that had higher internet access rates via mobile devices are predominately located in Asia, Latin America, and Africa.[13]

Mobile learning does not have to be contingent on internet access. SMS is being used, as well, to reach learners in areas where internet access is spotty or expensive. One African startup, Arifu, relying on SMS to provide learners in Kenya and Tanzania access to skill development, reports that a pilot project with the International Labour Organization found higher rates of completion and performance for the digital learners, as well as increased knowledge retention resulting from daily reminders.[14] The platform uses a "chatbot" and a content "market place" to provide access to educational content related to topics such as entrepreneurship, agricultural practices, and health.[15]
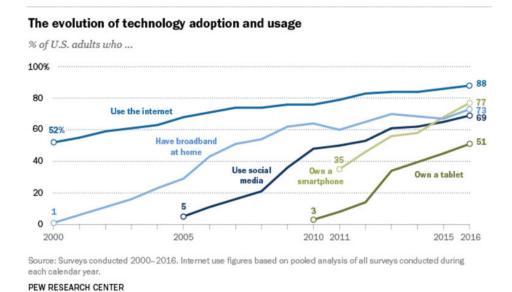
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[12] Ibid.
[13] Ibid.
[14] Arifu™. (2018, April 9). https://www.arifu.com/
[15] Optimizer Foundation. (2018, April 9). Arifu™. http://optimizerfoundation.se/arifu.html

Given the usage of mobile devices in Asia, Latin America, and Africa, these areas have seen an increase in demand for subscription-based mobile learning access. These services are "sold directly to consumers and organizations by mobile network operators (MNOs), device makers, and content suppliers" as value-added services (VAS).[16] These subscriptions are usually low in terms of both costs and commitment, often including the ability for subscribers to opt out of their subscriptions. While these services have gained little traction in North America, an estimated 600 million individuals (over half of whom are in Asia) subscribe to them.[17]

Consumer demand for the broader class of mobile learning content continues to grow. In particular, the most popular kinds of mobile learning applications on the market are currently language learning applications (such as Duolingo), early childhood learning applications, and "brain trainers" (such as Lumosity). Users are accessing this content earlier than ever before, as demonstrated by the surge in educational applications targeted at young children. It is likely that those who are raised with these tools from an early age will be more accustomed to learning via these devices than a more typical online learning environment designed to be delivered on the computer.

The widespread adoption of handheld devices directly coincides with the opportunity that mobile learning has ahead of it to rapidly expand. A 2016 Pew Research report found that 77 percent of Americans now own a smartphone, with the elderly and lower-income populations "exhibiting a sharp uptick in ownership over the last year."[18]

The evolution of technology adoption and usage

% of U.S. adults who ...

Source: Surveys conducted 2000–2016. Internet use figures based on pooled analysis of all surveys conducted during each calendar year.

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[16] Ambient Insight. (2015, August). *The 2014–2019 Worldwide Mobile Learning Market.* http://www.ambientinsight.com/Resources/Documents/AmbientInsight-2014-2019-Worldwide-Mobile-Learning-Market-Executive-Overview.pdf
[17] Ibid.
[18] Smith, Aaron. (2017, January 12). Record shares of Americans now own smartphones, have home broadband. *Pew Research Center Fact Tank.* http://www.pewresearch.org/fact-tank/2017/01/12/evolution-of-technology/

The rise in tablets has been particularly significant, up from just 3 percent in 2010 to 51 percent in 2016.[19] This increased access opens a large consumer segment for the targeting of mobile learning applications and coursework.

And finally, the last global catalyst, as identified by the Ambient Insight report, focuses on the many innovations within mobile learning itself. Mobile learning platforms are being developed in ways that incorporate, and leverage, rapidly evolving technologies, including virtual or augmented reality and artificial intelligence.

What are the mobile learning growth projections?

These factors are leading to substantial optimism about the market potential for mobile learning technologies, platforms, and educational offerings. The global mobile learning market is forecasted to "grow from 7.98 billion USD in 2015 to 37.6 billion USD by 2020 at a compound annual growth rate of over 36 percent."[20] Analysis by a market research firm focused on advanced learning technologies determined that the top mobile learning countries in terms of overall expenditure in 2014 were, in order, the U.S., China, India, Japan, and South Korea. Additionally, in 66 of the 119 countries analyzed, the firm projects that revenues for mobile learning will more than double by the end of 2019.[21] The broader online learning market size is expected to exceed 65 billion USD by 2023.[22]

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[19] Ibid.

[20] Emerging Strategy. (2016 February 23). *Learning on the go: The rise of mobile learning across the globe*. http://www.emerging-strategy.com/article/learning-on-the-go-the-rise-of-mobile-learning-across-the-globe/

[21] Ambient Insight. (2015, August). *The 2014–2019 Worldwide Mobile Learning Market*. http://www.ambientinsight.com/Resources/Documents/AmbientInsight-2014-2019-Worldwide-Mobile-Learning-Market-Executive-Overview.pdf

[22] Research and Markets. (2018 February 01). Global E-learning Market 2018-2023: Market is Expected to Reach $65.41 Billion. *Markets Insider*. https://markets.businessinsider.com/news/stocks/global-e-learning-market-2018-2023-market-is-expected-to-reach-65-41-billion-1014792530

Micro-Learning: Where Mobile Shines

Mobile learning as an experience itself is not necessarily different than traditional online learning. Instructors can, and often do, take standard online coursework and allow users to engage with the content via a smartphone or tablet, with its content simply shrunk or otherwise reconfigured to fit the required device's screen size. This approach is known as using a mobile-accessible design. Mobile-accessible design involves content that is often first intended for a laptop or larger screen, which assumes that the learner is sitting in front of a computer. This structure allows the user to engage in longer-form content, such as watching lengthy videos or doing complicated, multistep tasks. The content is then formatted to be accessible via a mobile device, thus the term mobile accessible.

Where mobile learning shines, however, is through a modified delivery method that is designed with the mobile platform in mind. This design style is known as mobile-first design.[23] With mobile-first design, there is a total reimagining of the learning experience. The content is built with the original intention of fitting onto small screens, and does not assume that the user will be sitting down or has an extended period of time available to engage with any single piece of content. To achieve this goal, mobile-first design often employs micro pieces of content, that are often tactile, and actually allow the user to touch their device to engage with the content more regularly. Coursework designed with a mobile-first design leads to a type of learning known as micro-learning.[24]

Micro learning is unlike most online courses, and certainly unlike a traditional classroom-based education, in that it uses "bite-sized" content. The coursework is constructed such that it is interacted with in small doses at a time, in increments of minutes as opposed to hours. Learners can access a lesson and engage with it for however much time they have available, whether on their train commute into work or waiting in line at the supermarket.

[23] Kang, So-Young. (2018, April 23). Personal interview with author.
[24] Ibid.

Director of learning services at Ashridge Business School in England, Tony Sheehan, shares that, with mobile learning, "[l]earners are no longer dependent on the classroom, as mobile devices allow learners to connect in times of reflection—a long train journey, a daily commute—where the mind is alert and open to new insights."[25] In this way, learners can fit their education into their otherwise busy days in whichever way suits them best. The content in a micro-learning lesson is designed with this need for minimal time commitment in mind.[26]

SHIFT, a producer of mobile learning, breaks down the distinction between typical online learning and mobile learning that uses a micro-learning approach as follows:

Table 1. Online Learning vs. Mobile Learning

Online Learning	Mobile Learning
Structured, formal, and time bound	Best suited for short courses that can be viewed quickly
Computers and laptops	Smarts phones and tablets
Detailed information, complex graphics, media and interactivity	One idea per screen with large buttons and simple navigation
Longer and broader courses	Short and bite-sized modules

[27]

As with most things, there is not universal agreement amongst instructors that one method is better than the other. When deciding whether or not to use a micro-learning approach, it is best to consider the lifestyle of the learners. In some cases, typical online learning offerings may not meet the needs of the learners. So-Young Kang, CEO of Gnowbe and an expert in the field of micro-learning, identifies three key lifestyle considerations and ensuing learning expectations for modern learners that should be considered when developing online content.

Table 2. Learning Expectations by Lifestyle

Lifestyle	Learning Expectations
On-the-go	Engaging, attention grabbing multi-media content
Always-on	Curated, bite-sized content gradually released over longer time intervals
On-demand	Immediate, anytime, anywhere access to relevant information

[28]

[25] Biekle, Cindy. (2012, January 11). Mobile Learning Offers Growing Opportunities for Executive Education Programs Around the Globe. *UNICON Content Hub*. https://www.uniconexed.org/mobile-learning-offers-growing-opportunities-for-executive-education-programs-around-the-globe/

[26] Kang, So-Young. (2018, April 23). Personal interview with author.

[27] SHIFT. (2018, March 13). Understanding The Difference Between eLearning and mLearning. *SHIFT eLearning Blog*. https://www.shiftelearning.com/blog/difference-between-elearning-and-mlearning

[28] Kang, So-Young. (2018). Time to Rethink How We Teach and Learn. Presentation, 2018 EFMD Conference for Deans & Directors General.

For an audience with these lifestyle traits, a micro-learning approach might be the way to go. Micro-learning, more so than typical online learning offerings, is designed for the on-the-go individual who demands immediate information and feedback.

And research has shown that learners will grasp content more easily and with greater levels of retention when it is delivered in smaller pieces.[29] To this end, a group of researchers at the Dreden University of Technology found in 2015 that micro-learning can improve the retention of information by as much as 20 percent over other methods of learning.[30]

Gamification

Part of the appeal of mobile learning stems from another frequently discussed trend in higher education—gamification. Micro-gaming boomed into popularity with advancements in smartphones and burgeoning social networks. Games such as Farmville (a farming simulation game that became incredibly popular on Facebook, peaking at 84 million users in 2010[31]) and or Candy Crush Saga (color-matching puzzle game that exploded in popularity on smartphone devices in the 2010's) were designed to allow users to play in increments of mere minutes. Mobile learning advocates do not shy away from the similarities between the rise in mobile gaming and mobile learning.

By delivering content in smaller doses, and by leveraging elements from games into the learning content, mobile learning users can benefit from the same excitement that keep users tuned in to their favorite mobile game. Mobile learning modules can be structured such that users earn achievements, or unlockable credentials, for completing coursework. A steady dose of positive feedback can create what is referred to as a positive feedback loop, where users are encouraged to re-engage with the content because of prior positive experiences, and generate new positive experiences upon re-engagement, continuing the feedback loop.[32]

Through gamification, "the learning environment becomes more informal and your learners are less likely to be anxious and more likely to be responsive when interacting with course material." In this way, "potentially complicated concepts can be simplified into bite-sized chunks of digestible content."[33] Further, game-based learning that offers users instant feedback on their progress "instills a sense of accomplishment and motivates [users] to become self-directed in their learning."[34] Using strategies learned from games

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[29] Fozdar, Bharat Inder, & Kumar, Lalita S. (2007 June). Mobile Learning and Student Retention. *International Review of Research in Open and Distance Learning*, 9(2). https://files.eric.ed.gov/fulltext/EJ800952.pdf

[30] Kapp, Felix, et al. (2015, January 1). Distributing vs. Blocking Learning Questions in a Web-Based Learning Environment. *Journal of Educational Computing Research*, 51(4). http://journals.sagepub.com/doi/abs/10.2190/EC.51.4.b

[31] Takahashi, Dean. (2011, January 3). Zynga's CityVille becomes the biggest-ever app on Facebook. *VentureBeat*. https://venturebeat.com/2011/01/03/zyngas-cityville-becomes-the-biggest-ever-app-on-facebook/

[32] Kang, So-Young. (2018, April 23). Personal interview with author.

[33] Garn, Kristin. (2017, June 5). To Game Or Not To Game: 6 Ways To Incorporate Gamification Into Mobile Learning. *eLearning Industry Articles*. https://elearningindustry.com/incorporate-gamification-into-mobile-learning-game-not-game-6-ways

[34] Ibid.

played on popular handheld devices and merging them into mobile learning content is not only a viable strategy, but perhaps a critical one. Students are more likely to remain engaged with content if it is enjoyable. As such, gamifying elements of mobile learning is a natural fit.

In addition to gamification, mobile learning is well positioned to take advantage of a number of other technologies, such as adaptive learning. As an example, in the U.S, "the oral fluency of kindergartners in New Mexico tripled just three years after educators began using mobile-based computing devices to assess the progress of individual students and tailor lessons to their needs."[35] Adaptive learning was very useful for this young group of learners, and is considered an effective way of instilling concepts in learners at a pace that they can manage. Adaptive learning is already being used in classrooms, through adaptive textbooks, which adjust content based on user inputs.[36] As mobile learning is almost entirely driven by direct user input and is often designed with a single user in mind, it is well positioned to make good use of adaptive learning technology. There are numerous other learning strategies that mobile learning content designers can leverage, in addition to gamification and adaptive learning, but these are two of the more popular ones.

[35] McKinsey & Company. (2012). *Transforming learning through mEducation*. https://www.mckinsey.com/~/media/mckinsey/industries/social%20sector/our%20insights/transforming%20learning%20through%20meducation/transforming-learning-through-meducation-final.ashx

[36] Oremus, Will. (2015, October 25). No More Pencils, No More Books. *Slate*. http://www.slate.com/articles/technology/technology/2015/10/adaptive_learning_software_is_replacing_textbooks_and_upending_american.html

Adoption in Business

Adoption of mobile and micro-learning approaches in the business community corresponds to an increasing focus on lifelong learning. A recent survey of talent leaders by AACSB and Human Capital Management found that 80 percent report that their learning function has been tasked with fostering lifelong learning among employees.[37]

While support for lifelong learning takes many forms, a 2014 survey by TowardsMaturity found that seven out of 10 individuals with responsibility for implementing learning technologies in the workplace are now adopting or experimenting with mobile learning solutions for their employee training. Top drivers for using mobile technology are to "make learning more accessible, more integrated into the way of life—and more fun."[38]

In fact, according to a 2016 outlook survey conducted by Brandon Hall Group and Human Capital Management, "mobile learning is one of the top three learning priorities for companies in the coming year, ranking only behind the need for business alignment and stronger analytics."[39] A separate, 2015 survey by the same group examined the experience level that companies have with mobile learning. Over 75 percent of employers reported having at least some level of mobile interaction with learning.[40]

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[37] AACSB and Human Capital Management, forthcoming report.

[38] Towards Maturity. (2014, June). *Mobile learning in the workplace*. http://mybenchmark.towardsmaturity.org/library/1410/0000/0000/In_Focus_2014_Report_Mobile_Learning_in_the_Workplace_Aug_2014.pdf

[39] Eubanks, Ben. (2015, December 21). The State of Mobile Learning Maturity. *Brandon Hall Group Blog*. http://www.brandonhall.com/blogs/the-state-of-mobile-learning-maturity/

[40] Ibid.

One case study of mobile learning in the financial industry is the development of Learn@IBF by the Institute of Banking and Finance (IBF) Singapore. Learn@IBF is a mobile app that delivers concise, bite-size content mapped to a set of IBF Standards for Future-Enabled Skills. These are skills—in areas including data science, human-centered design, tools for innovation, agile approaches to technology, and risk and governance in a digital world—that are thought to be critical areas of knowledge development for finance professionals.[41] Marketed in video[42] as "By Finance practitioners, for Finance practitioners," the app is offered through partnerships with companies such as Amazon, Facebook, IBM, LUMA, and Rainmaking Innovation, as well as with institutes of higher learning, training providers, and the IBF community of financial institutions.

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[41] Monetary Authority of Singapore. (2017, September 29). Skills for the future – Welcome Remarks by Mr. Ravin Menon. http://www.mas.gov.sg/News-and-Publications/Speeches-and-Monetary-Policy-Statements/Speeches/2017/Skills-for-the-Future.aspx

[42] YouTube video, IBF Singapore. (2018, January 3). How user-friendly is Learn@IBF? https://www.youtube.com/watch?v=Xb07DOCd6rw

Adoption in Higher Education

Some business schools have been early to mobile learning adoption, particularly with respect to their executive education offerings. INSEAD, a business school with campuses in France, Singapore, and Abu Dhabi, partnered with Microsoft to develop an executive education program on a global scale for Microsoft's sales executives. They were tasked with developing a program that used a mobile-first design. INSEAD used techniques and technologies found in Massive Open Online Courses (MOOCs), such as Coursera and edX, but tailored them to the needs identified by Microsoft, and delivered a mobile-first executive education program that had tremendous success, including an 80 percent completion rate (far exceeding the typical MOOC completion rate of less than 10 percent[43]).[44] A case study released by INSEAD on this partnership concludes that this training method "is clearly the way of the future for Microsoft."[45]

Similarly, Ashridge Business School established Virtual Ashridge, a platform for their own executive education clients, which allows their learners to pursue their own interests and employ a style of learning that best fits their own learning habits. Virtual Ashridge was created to be engaging across all device types, including mobile devices. Ashridge's Tony Sheehan, notes that "mobile and e-learning tutorials provide a cost- and time-efficient way of educating staff that avoids the travel and accommodation costs of off-site courses."[46]

[43] HarvardX. (2018, August 18). https://harvardx.harvard.edu/reich_12814

[44] INSEAD. *Microsoft-INSEAD Customized Online Programme: An Innovative Solution for Global Business.* https://www.insead.edu/sites/default/files/assets/dept/ee/EFMD_2016/EFMD-Case-Study-INSEAD.Microsoft-2016.3.pdf

[45] Ibid.

[46] Biekle, Cindy. (2012, January 11). Mobile Learning Offers Growing Opportunities for Executive Education Programs Around the Globe. *UNICON Content Hub.* https://www.uniconexed.org/mobile-learning-offers-growing-opportunities-for-executive-education-programs-around-the-globe/

Even simpler uses, such as through SMS, have a chance to make an impact in some contexts. A body of literature exists about the adoption of SMS technology by the Malaysian higher education sector, with the experience of initial experimentation at the Universiti Sains Malaysia (USM) described in the *Malaysian Journal of Educational Technology* as follows:

> School of Distance Education in USM started to offer the Mobile learning system for their students in academic year 2008/2009. The main focus of the Mobile learning is to allow the learners experience the different approach of learning process which is widely used in abroad. School of Distance Education in USM creatively convert the innovation from the traditional E-learning to the Mobile learning so that the learner can receive and update the data at any place at any time. The lecturers will send e.g. notes, definition, important notice and reminder to their students everyday additional to the original E-learning portal. All the SMS sent to learners were shortened and edited by the lectures into 160 character. As a result, the content of the SMS is very short and brief but very powerful (straight to the point).[47]

Where internet access is more reliable, students are using their mobile phones as access points to pre-existing online content. And faculty or their institutions are taking steps to accommodate content access via mobile devices, for example, turning course readings into electronic publications or PDF documents that are compatible across most devices, rather than designing course experiences that are specifically aligned to a mobile approach.

Great potential seems to exist in taking mobile-learning principles—brevity, notifications, and just-in-time delivery—and applying those elements using more advanced communication technology. Mobile learning platforms that offer content creators "self-authoring and curator tools," without the need to be (or acquire the services of) web designers and programmers, are poised to help reduce barriers of cost, technology, and expertise.[48]

Despite several successful adoptions of mobile learning, there are still numerous challenges for its widespread adoption in higher education. The 2015 Pearson Student Mobile Device Survey found that while 73 percent of U.S. college students report daily usage of a laptop at school, for their schoolwork, a smaller but still significant 42 percent use their smartphones

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[47] Ismail, Issham, Gunasegaren, Thenmolli, Koh, P.P., & Idrus, Rozhan M. (2010, December). Satisfaction of Distance Learners towards Mobile Learning in the Universiti Sains Malaysia. *Malaysian Journal of Educational Technology*, 10(2). https://www.researchgate.net/publication/267247852_Satisfaction_of_Distance_Learners_towards_Mobile_Learning_in_the_Universiti_Sains_Malaysia.

[48] Gnowbe. Gnowbe's Micro-Learning Solutions. https://www.gnowbe.com/platforms/

in this way.[49] At the same time, according to an Educause study on students' mobile learning habits, just 30 percent of instructors say they are currently incorporating any form of mobile technology into their classroom, and in fact, more than half of instructors ban the use of mobile devices in their classroom. Smartphones and tablets are often perceived as being a distraction in classrooms—even among students. The Educause study also found that 47 percent of students and 67 percent of instructors believe mobile devices are distractions.[50]

But training and awareness on best practices, such as when or how to use mobile learning as a stand-alone complement or integrated component of an existing higher education course, are needed. Decisions about tools and technological features must be carefully navigated, especially when additional features such as use of sensors, cameras, and location detection might enhance the learning experience but at the same time limit the benefit to those with access to those tools.[51] Understanding how best to design a mobile learning course, for traditional higher education as well as broader, non-degree "lifelong learning" opportunities, still represents a challenge that will benefit from additional experimentation and research.

[49] Pearson. (2015, June). *Student Mobile Device Survey 2015*. https://www.pearsoned.com/wp-content/uploads/2015-Pearson-Student-Mobile-Device-Survey-College.pdf

[50] Chen, Seilhamer, et al. (2015, June 22). Students' Mobile Learning Practices in Higher Education: A Multi-Year Study *Educause Review*. https://er.educause.edu/articles/2015/6/students-mobile-learning-practices-in-higher-education-a-multiyear-study

[51] Alhajri, Rana. (2016, October 10). Prospects and Challenges of Mobile Learning Implementation: A Case Study. *Journal of Information Technology & Software Engineering*. https://www.omicsonline.org/open-access/prospects-and-challenges-of-mobile-learning-implementation-a-case-study-2165-7866-1000189.php?aid=84267

Recommended Viewing and Reading List regarding Mobile and Micro-Learning

The following list of recommendations for further viewing and reading are among a broader list of references cited in the enclosed briefing paper.

Recommended Viewing

Gnowbe. (2016, June 22). A mobile-first, micro-learning solution. https://www.youtube.com/watch?v=aR8AIKeXRmk

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Recommended Reading

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