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Innovative technologies in digitalization of higher education

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Abstract

Developments in digital technology offer new opportunities to design new products and services. However, creating such digitalized products and services often creates new problems and challenges to firms that are trying to innovate. In this essay, we analyze the impact of digitalization of products and services on innovations. In particular, we argue that digitalization of products will lead to an emergence of new layered product architecture. The layered architecture is characterized by its generative design rules that connect loosely coupled heterogeneous layers. It is pregnant with the potential of unbounded innovations. The new product architecture will require organizations to adopt a new organizing logic of innovation that we dubbed as doubly distributed innovation network. Based on this analysis, we propose five key issues that future researchers need to explore.

Keywords: Innovative technologies, digitalization, higher education

Introduction

Digitalization of education is a powerful trend in terms of reformation and modernization of global education environment. Digitalization means transformation of all information types (texts, sounds, visuals, video and other data from various sources) into the digital language. Discussing the phenomenon of digitalization it should be noted that various analysts and forecast experts (mostly British, including Tim Berners-Lee - one of the inventors of the World Wide Web (Stuart, 2014)) consider transition of education process into digital stage as the turning point in the history of education. The United Kingdom is assumed to be the first in the world to introduce compulsory software engineering and IT education in the program for school children aged 5 - 16 years in 2015. The stated approach was adopted by the European Union. EU 2020 education development strategy, adopted in 2014, focuses on digital technologies. This document appeared to mirror impressive achievements in IT area with its core objective being integration of state-of-the-art IT-solutions in education institutions' activities across EU.

The use of technology within higher education (HE) changed significantly in the last decades. Predominantly analog technologies, such as whiteboards and handouts, has largely been replaced by digital ones, e.g. PowerPoint presentations, smart-boards and online course platforms (Alavi & Leidner 2001). Given that this technological shift has been an ongoing process, it is likely that this trend will continue into even more advanced technology such as Augmented or Virtual reality. One example of this is the Microsoft Holo Lens which is Microsoft latest augmented reality technology which they predict can create new possibilities within education.

Why Digitization in Higher Education? The modes of teaching in higher education have drastically changed in last 15 years. While some old guards still stay with the old “Chalk and Talk” technology, it is very rare that in these days professors do not use some modern technology in class-room delivery. Abundant information on any subject is available on such

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sources as “You tube”, “Facebook”, “Wikipedia” and “Google”. The online education therefore has added new options of teaching, has created a wide variety of new courses, and has increased the enrollment in many academic institutions. This type of delivery has some substantial conveniences. It has no regional boundaries, so the internationalization of education has become a common phenomenon with satellite campuses mushrooming all over the world. New ways of teaching may include development of new information and communication technologies such as cable and satellite transmissions, audio and video conferencing, PC software and CD Rom and in particular the Internet sources. This wide variety of means increases the accessibility to the rest of the world.

For example, In India there are many institutions such IITs and IIMs that have in recent years opened satellite campuses abroad, or have signed memorandum of understandings (MOUs) with some foreign universities to offer online education.

Imparting Digital Education: Emerging Paradigms in Higher Education

Studies on digitization and internationalization of higher education are of prime interest to policy makers, educationists, and leaders. Studies based specifically on the internationalization in the HE sector have been performed in numerous regions of the world: Alamri (2011) in Saudi Arabia, Liu and Dai (2012) and Chen and Huang (2013) and Mitra (2010) in India, which shows the importance given by researchers and reflects the respective nation’s keenness to digitize and internationalize.

Educators from all grade-levels are coming to realize the benefits of technology in the classroom. Typically, education is one of the last industries to make extensive change, holding on to antiquated methods and practices. But through the digital transformation and the rise of educational technology, teachers have begun making drastic changes to their instruction, assessments, even the physical make-up of their classrooms, and at a much faster rate than expected. These current trends are making headlines in education because of the ways in which they are impacting student learning:

Augmented Reality / Virtual Reality / Mixed Reality

Gone are the days where students are expected to sit quietly at their desks. Educational technology is succeeding in making learning collaborative and interactive. Augmented, virtual, and mixed reality are examples of transformative technology that enhance teacher instruction while simultaneously creating immersive lessons that are fun and engaging for the student. Virtual reality has the capability of bringing the outside world into the classroom and vice versa. Apps such as university can transport students to ancient Greece, while Cospaces allows students to share their virtual creations with the world. Wilkes University online adjunct professor and independent educational technologist Kathy Schrock concludes virtual reality has the potential to increase visual literacy, technology literacy, and attention to audience. The idea of combining AR/VR/MR is highly anticipated. Take, for example, the privately owned company Magic Leap. Even though it has yet to really sell anything, Magic Leap is already valued at four and a half billion dollars! This speaks to the projected endless possibilities of technology transforming classrooms.

Classroom Set of Devices

Schools are moving away from BYOD, or bring your own device, and students no longer have to go to the technology lab for access to a computer or laptop. Recent years have shown an increase in classroom sets of computers that was made possible in part by federal funding. Title I schools have received funds via The Every Student Succeeds Act, and several grants and donations have outfitted classrooms all over the country with i-Pads and laptops for each student. Google Chrome books account for over half of the devices in US classrooms. In 2014, more than three million Chrome books were used in educational institutions. As that number continues to grow, so does the need for increased focus on programs that teach digital citizenship skills. Today’s pervasive online environment poses exciting possibilities; ones that necessitate students are properly educated on cyber safety and individual responsibility.

Redesigned Learning Spaces

Walk into most classrooms across the country and it’s unlikely you’ll find rows of desk all pointing toward the front of the room. Educators have since realized their classrooms must mimic the workforce, which has inspired them to create collaborative-friendly spaces to facilitate student learning. The on boarding of technology has supported their endeavor. 21st century classrooms are SMART boards instead of chalkboards and pods of SMART desks instead of individual seating. Students are going on virtual field trips instead of merely reading from a text; they are creating media instead of just looking at it. The redesigned learning space is laden with integrated technology, which means students aren’t just using these things, but they understand *how* to use them in order to achieve a specific goal. Moreover, some of these learning spaces aren’t even in the classroom. Colleges and universities are creating more informal campus learning spaces because they understand the importance of creating and collaborating 24/7, not just when class is in session.

Artificial Intelligence

The use of AI in higher education has already proven useful. Australia’s Deakin University used IBM Watson to create a virtual student advisory service that was available 24-hours a day, seven days a week. Watson’s virtual advisors fielded more than 30,000 questions in the first trimester, freeing up the actual advisors to handle more advanced issues. Another use for AI includes chat bots. Because chat bots are equipped with Natural Language Progression, as found in Siri, they have the human capability of answer questions about homework, helping students through a paperwork process like financial aid or paying bills, and easing the workload of the people who would normally serve these roles. Other applications of AI in education include personalizing learning (which is discussed in more detail below), evaluating the quality of curriculum and content, and facilitating one-on-one tutoring with the use of Intelligent Tutoring Systems. Technology doesn’t aim to replace teachers, only to complement them.

Personalized Learning

We are able to personalize learning more now than ever. From school choice — public, private, charter, virtual — to the options available for how a student learns, education can be tailor-made to suit each individual. Blended

learning gives more responsibility to the student, as it involves less direct instruction from the teacher and more discovery-based methods of learning. Blended learning is an example of how students can control certain elements of their learning by making decisions about things like where and at what pace they move through material. Adaptive learning is similar to blended in that it, too, allows students to make decisions about things like the timeframe and path of their learning. Adaptive learning technology collects information about student behavior as they're answering questions, and then subsequently uses that information to provide instant feedback in order to adjust the learning experience accordingly. Educational tools with adaptive SEQUENCE continually analyze student data in real-time and make split second decisions based on that data. It automatically changes what comes next in a sequence, be it altered content or a different order of skills, in response to how student a student is performing. Another learning platform, Osmosis, was created by doctors for doctors and has revolutionized the way medical students study: "Using evidence-based educational concepts such as questions, flashcards, and videos, images correlated with memory anchors, adaptive spaced repetition, collaborative learning and gamification, Osmosis maximizes learning and retention." Such personalization is turning education into a "choose-your-own-adventure" method of learning, capitalizing on student interest and engagement.

Gamification

Playing and learning collide when classrooms utilize gaming as an instructional tool. Gaming technology makes learning difficult subject matter more exciting and interactive. As the technology progresses, it is quickly being used to enhance educational games in every discipline. Drexel University's Senior Vice President of Online Learning, Susan Aldridge, credits these games with mirroring real life issues, requiring students to use a valuable skill set to solve them: "These virtual game worlds provide a unique opportunity to apply new knowledge and make mission-critical decisions, while identifying obstacles, considering multiple perspectives and rehearsing various responses." Because these games are designed to provide immediate feedback, students are intrinsically motivated to keep playing them, honing skills throughout.

New technology and new learning models are exciting and offer previously unthinkable possibilities to students, but they require constant IT support. As educational institutions continue to jump on the bandwagon and adopt these digital transformation trends, we must consider the current paradigm for technology instruction and move toward a team-based approach. As student expectations increase, responsiveness to those needs must increase as well.

Conclusion

The higher education landscape will change more than ever in the next ten years than it has in the previous one hundred. Internet revolution and Technology has challenged traditional assumptions about learning, not only the proliferation of MOOCs and vocational training programs but also Virtual Reality and BYOD has led to new choices for aspiring students.

Digital Education is now a global phenomenon, with vast numbers of students seeking to go for it and these shifts all points to one truth: rapid globalization and enormous flood

of knowledge across the world and an increasing number of choices about what, how, and where.

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