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Yizhi Ma

Missouri University of Science and Technology, Ymcy2@mst.edu

Keng L. Siau

Missouri University of Science and Technology, siauk@mst.edu

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Yizhi Ma

Missouri University of Science and Technology
Ymcy2@mst.edu

Keng L. Siau

Missouri University of Science and Technology
siauk@mst.edu

ABSTRACT

Artificial intelligence (AI) will change the world and higher education is no exception. AI will change the way we work, the way we learn, and the way we live. This study analyzes the impact of artificial intelligence on higher education. Specifically, this qualitative research will study the changes in higher education caused by AI. This study will also look at how higher education can contribute to AI development. Further, this research will examine the use of AI in higher education delivery and support. As a pioneering research in this field, this study will provide insightful information for educators and detailed knowledge for academic theory building.

Keywords

Artificial Intelligence, Robotics, Automation, Higher Education

INTRODUCTION

Artificial intelligence (AI) is defined as the ability and development of an information technology-based computer systems or other machines to complete the tasks that usually require human intelligence and logical deduction. Even though AI can make the world a better place, AI comes with its own issues (Siau, 2018). Take the example of driverless vehicles. Driverless vehicles open a new era of technology advancement in transportation. It brings huge benefit to both the car industry and the customers from both economic and practical aspects. The usage of driverless vehicles frees the drivers from the mundane task of driving and reduces accident rates (e.g., fatigue driving). Nevertheless, driverless vehicles will replace taxi, truck, and Uber drivers!

Researchers from MIT, Daron Acemoglu, and Boston University's Pascual Restrepo, found out that each additional robot takes over 5.6 workers' workload in the US, which means almost 6 people are losing their jobs with each robot implementation (Gray, 2017). Another research conducted by scholars in Oxford University (Grace, Salvatier, Dafoe, Zhang, & Evans, 2017) estimated that at least 47% of the current jobs in the United States are at a very high risk of being taken over by AI. More than 54% of the current jobs in Europe are facing the same threat from machines, not in the coming 100 years, but within the next 20 years. Facing such a severe threat from AI, robotics, and automation, what should people do to stay competitive in the job market has become the new million-dollar question? Further, how should higher education react to help their students compete in the AI age?

This nascent study will research on the AI impact on higher education, and the proactive and reactive changes made in the higher education. This will be a longitudinal action research as one of the researchers is an administrator and will be formulating curriculum and policy changes to react to and take advantages of the upheavals caused by AI.

LITERATURE REVIEW

Artificial Intelligence (AI)

Artificial intelligence (AI) can be classified into Weak and Strong AI. Weak AI, also known as artificial narrow intelligence, is designed to be focused on a narrow task. One example of Weak AI is the self-driving vehicle. It is specialized for a specific task. Another category is the Strong AI, also known as artificial general intelligence. Strong AI is capable of most (if not all) cognitive functions that a human may have and can apply intelligence to more than one specific problem (Kurzweil, 2005; Voss, 2017). Strong AI is considered by many prominent researchers and industrialists such as Stephen Hawking, Bill Gates, and Elon Musk as an existential threat to human civilization. In this research, we focus on Weak AI and the use of the term AI subsequently in this article means Weak AI.

Impact of AI

Forbes Technology council predicts that by 2030, the potential of artificial intelligence will reach \$15.7 trillion in the global economy. The use of AI is not limited to Amazon and Youtube advertisement applications. AI has also been applied to recommending new stylish clothing or filtering spam emails. Virtual assistant has been a new trend globally such as Siri, Google Assistant, and Cortana. These virtual assistants are now part of people's life. AI is also playing an important role in the Finance sector such as securing bank accounts and monitoring transaction requests. Another application of AI is the self-driving vehicles. A number of countries have already put the self-driving vehicles on the road and start experimenting with driverless trucks for delivering goods.

These AI advancements, however, come at a cost (Siau and Wang, 2018; Siau and Yang, 2017). Researchers from MIT estimate that the usage of automated transportations could threaten 2.2-3.1 million existing jobs in the U.S. (Rotman, 2017). University of Oxford's Future of Humanity Institute estimates that there is a 50% chance that machines will be able to take over all types of human jobs in 120 years. The research surveyed 352 scientists from different areas and their answers were compiled to predict how long it might take for machines to replace human on job positions. The collected result indicates that there is a good chance that more than 70% of the job functions will be replaced by machines in 50 years (Gray, 2017).

AI Effects on Higher Education

With the job replacements and displacements generated by AI, future job market and required skillsets would be significantly different from now (Siau, 2017, 2018; Rainie & Anderson, 2017). Multiple studies concluded jobs that involve tasks that are routine and structured are easier to automate and will be replaced by AI soon. On the contrary, job tasks that are more unstructured and involved managing people are harder to be replaced by AI. Higher education needs to be adaptive and evolve continuously.

Higher education will be impacted by AI in many ways and the two major areas are curricula and enrollment. First, AI will have a sweeping impact on curriculum in higher education. The strength of AI is its speed, accuracy, and consistency. It is a lost cause to compete with AI on these dimensions. On the other hand, AI is still weak in soft skill such as creativity, innovation, critical-thinking, problem-solving, socializing, leadership, empathy, collaboration, and communication. This is not to say that we should ignore the hard skills such as science, math, and engineering. Higher education should still train the students in the fundamentals of science and math, and at the same time provides opportunities and training for students to enhance their soft skills. Some universities are already offering AI and Machine Learning courses to not only computer science students, but also business students as business managers and executives need to understand the capabilities, limitations, and implications of AI in the business world.

The other impact of AI in higher education is enrollment. Liberal arts and humanities majors may become more popular as these areas are less susceptible to "AI-invasion." Areas such as accounting and financial analysis that may be hit hard by AI may see a drastic drop in enrollment. Also, with the wealth gap and potentially millions (if not billions) out of jobs, higher education may no longer be affordable to many.

Other possibilities include the use of AI assistants and AI instructors in teaching. Below are some examples of the use of AI applications in education:

AI Application	Function	Reference	Title of Article
Virtual AI Teaching Assistant	Be able to answer frequently asked questions without the help of humans	http://www.news.gatech.edu/2017/01/09/jill-watson-round-three	Jill Watson, Round Three
Intelligent tutoring systems	Using cognitive science and AI technologies to provide personalized tutoring in real-time	https://elearningindustry.com/intelligent-tutoring-systems-what-happened	Intelligent Tutoring Systems: What Happened?
Smart Education	Using AI technology to make education more effective, efficient, flexible, and comfortable	Zhu, Z. T., Yu, M. H., & Riezebos, P. (2016). A research framework of smart education. <i>Smart learning environments</i> , 3(1), 4.	A research framework of smart education

Theoretical Foundation

Organizational Change

Organizational change studies how an organization changes its structure, strategies, operational methods, technologies, or organizational culture to affect change within the organization, and investigates the effects of these changes on the organization (Hussain, Lei, Akram, Haider, Hussain, & Ali, 2016). Organizational change can be continuous, active, and evolving (Weick & Quinn, 1999). As AI is expected to result in organizational change in higher education, the following discusses some of the organizational change theories and models that can form the conceptual and theoretical foundation to understand such changes.

Lewin’s Change Management Model

Kurt Lewin (1946) concluded that a successful change happens with a three-step process -- unfreezing stage, changing stage, and freezing stage. In the unfreezing stage, people must be open and encouraged to evaluate their current situations objectively. This can be the hardest step as one needs to break open the shell of complacency and self-righteousness. When people have accepted that changes are necessary, then it comes to the changing stage. To implement this step, a long-term view and positive attitude are necessary. This is particularly true for AI impacts on higher education as the future can be complicated and unpredictable. After the transition stage is over, the freezing stage takes place to ensure that the changes stay rather than switching back to the original status.

Kotter’s 8 Step Change Model

Kotter’s 8 step change model is proposed by John Kotter in 1995 (Kotter, 1995). After observing and studying countless leaders and organizations from the beginning of transformation to how they executed their strategies, and till they completed the whole transformation successfully, he summarized 8 steps for a successful organizational transition:

1. Increase the urgency for change

2. Build a team dedicated to change
3. Create the vision for change
4. Communicate the need for change
5. Empower staff with the ability to change
6. Create short-term goals
7. Stay persistent
8. Make the change permanent

The focus of this model is on preparing and accepting the change itself and how to get people and employees on board rather than the actual change.

RESEARCH METHODOLOGY

In this research study, a qualitative longitudinal action research will be conducted. Action research focuses on solving an immediate problem and providing a reflective process of progressive problem solving led by individuals working with others (Fals-Borda, & Rahman, 1991). It is also defined as a part of a "community of practice" to discover potential issues and resolve them.

Action research involves actively participating in a change situation and simultaneously conducting research. It is often designed to be in an existing, long-term organization so as to ensure the continuity of the whole research. Action study can help to create a better understanding of the research questions and provide supportive evidence to address the research focus.

One of the researchers in this study is an administrator of a college. The administrator is interacting with other administrators and faculty within and outside his college and institution to formulate policies and plans to better prepare his college for the AI age. Action research is an appropriate research methodology in this case. Action research enables the researcher to examine his own plans and policies systematically and carefully, using a scientific and known research method.

EXPECTED THEORETICAL AND PRACTICAL CONTRIBUTIONS

AI will be impacting higher education in a significant way. Many jobs will become obsolete and new skill sets will be required. Higher education needs to rise to the challenge to prepare students for the AI revolution and equip students with the necessary skill sets to compete in the AI age. This nascent research aims to shed light on the higher education evolution and revolution as AI advances.

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