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The Impact of Technology on the American Academy

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Abstract

This article traces the growth of technology over the last 75 years within colleges and universities within the United States. Particular attention is paid to the impact of Y2K and the COVID-19 pandemic on technological advances employed by institutions of higher education. The impacts of artificial intelligence and ChatGPT are also explored in detail with suggestions for their effective employment. The article concludes with a rather dire warning.

Keywords
computers, Y2K, cyber age, pandemic, AI, chatGPT

Introduction

As a college professor for over half a century, I have lived through a number of technological advances that have significantly impacted higher education. The first of which occurred when I put away my slide rule which was in a case attached to my belt like a gunslinger for a pocket calculator in 1972. At the same time, I began to learn all I could about computers and soon I was writing programs in FORTRAN IV for the IBM System/360. I could often be seen happily scurrying down Mercer Street in New York City lugging heavy metal trays of computer punched cards to the Courant Institute of Mathematical Sciences at New York University to measure voting power using roll call data. Unlike my fellow political scientists of the day, I had training in the hard sciences. I have a degree in mechanical technology and worked as a draftsman and quality control inspector for a government contractor.

Retiring My Keuffel And Esser

My computer programs created initially to assay a variety of phenomena studied by my fellow political scientists at the Department of Politics at New York University even began to pique

the interest of researchers within the hard sciences who were somewhat better acquainted with the technological advancements of the day. Yes, somewhat, since the use of the IBM System/360 Operating System by researchers within the hard sciences was not universal. Many still relied on their trusty handheld Hewlett-Packard-35 Scientific Calculator introduced in 1972, so called because it had 35 keys. And others even still relied on their Keuffel and Esser slide rules that proudly hung from their belts.

In 1974, I was contacted by scientists at the Stanford Linear Accelerator Center operated by Stanford University for my VOTEPOW and PARSUPPORT computer programs to see if they could enhance their own research. VOTEPOW was a computer program for the measurement of voting power using roll call data (Kushner & Urken, 1974) and PARSUPPORT was a computer program for measuring the support of a party member for his party (Kushner, 1974). These Stanford nuclear physicists told me that they were anxious to see how my point-biserial correlation program could be of use to them in their research at their facility in Menlo Park, California. They were part of a group of early computer hobbyists known as the Homebrew Computer Club. The latter played a role in developing the microcomputer revolution and the rise of the Silicon Valley technology complex.

Endocrinologists doing post graduate work at New York University even asked me to teach them the value of my computer programs for their own medical studies. I conducted numerous seminars demonstrating how computers could be used to analyze large data sets and find patterns in medical information. Back then the use of computers in medical research was at its infancy. Today advanced computer imaging modalities, such as MRIs and CT scans, are commonplace in medical research. In the early 1970s, few medical students were versed in the use of computers for medical research. One of my students even told me how his urology professor still smelt and tasted urine as a diagnostic procedure.

By the end of the 1970s, computers began to gain popularity in colleges and universities throughout the United States. In 1983, Drexel University became the first campus requiring every student to purchase a laptop. By the mid 1980s I was being called on to review the use of computers throughout the social sciences and the humanities (see Kushner, 1984). At the end of the twentieth century calculators and computers became integrated in most aspects of higher education.

The Year 2000 Problem: Not

As the millennium was ending and we headed for the very real possibility that computers would malfunction during the year 2000 problem, also commonly known as the millennium bug, Y2K problem, Y2K scare, Y2k bug, Y2k glitch Y2k error, or simply Y2K. The problems that did occur on 1 January 2000 were generally regarded as minor. Then U. S. President William Jefferson Clinton labeled Y2K as the first challenge of the 21st century successfully met (Loeb, 2019). As we entered Y2K, computers were becoming integrated into all facets of university life. They were being used to register and grade students, enhance classroom pedagogy and heuristics, and aid faculty in their development and research. Their use had a salutary effect on the workings of the 20th century academy.

Methods

The research work presented herein is grounded in a variety of logical methods and approaches. These include comparison, analysis, synthesis, generalization, and abstraction, which form the foundation for examining the subject matter. Logical techniques such as induction, deduction,

and analogy are utilized to deepen the analysis. Descriptive and comparative analysis methods have been employed to ensure a comprehensive evaluation of the research questions.

Discussion

The Cyber Age is Here

With the coming of the 21st century universities entered a new era where other space-age technologies such as the internet where gaining popularity. The cyber age would begin to create a tipping point that would eventually call into question the university as we knew it. The internet along with a variety of corresponding cyber age items such as search engines, emails, smartphones, and other technologies slowly became integrated into all aspects of university life (Coccoli et al., 2014; Coccoli, Maresca, & Stanganelli, 2011; see also Barana et al., 2016; Barana et. l, 2015; Coleman, 2014; Kerroum et al., 2020; Puncreobutr, 2016; Nguyen, 2018). They enhanced the paradigm that was the university of the first two decades of the new millennium. More importantly, however, their gradual introduction allowed them to gain acceptance with the usual naysayers of new technologies within the academy.

For the most part, college professors not engaged in the hard sciences are notorious for adhering to maintaining their old ways of doing business. They need time to ruminate about the practical use of a new technology. Consider, for example, the introduction of email. Many of my humanities and social science colleagues as well as my own staff in my professionally oriented department baulked at its use. Those that failed to adopt the new technologies were not punished by not being rehired, promoted or tenured. Retirement, not punitive actions, would be the way to replace those not interested in adopting technological advancements. In short, the cyber age at the beginning of the 21st century fit the very definition of a tipping point in that it represented the point at which a series of small changes became significant enough to cause a larger, more important change. The latter being the adoption of the new technologies such as search engines, emails, smartphones, and other technologies into all aspects of university life. And these changes did not call into question the university as we know it but COVID-19 was another story.

Results

The Pandemic And The Academy

COVID-19 which was declared by the World Health Organization a public health emergency of international concern on January 30, 2020 and a pandemic on March 11, 2020 ushered in change that impacted institutions of higher learning like no other in recent memory. As societies across the globe began to lockdown to reduce the spread of SAR-CoV-2, the virus that causes COVID-19, so did most educational institutions. Never in our history when similar control measures were implemented was the scale of the lockdowns at these institutions so widespread. After more than 18 months of public school closures, K-12 schools throughout the United States reopened with the hope of going back to were they were before the pandemic. Institutions of higher learning must realize that they cannot.

In order to conduct business during the pandemic, colleges and universities throughout the United States needed to immediately adopt a variety of video conferencing platforms such as ZOOM and Google Meet. Through a computer desktop or mobile app (or mobile application), these platforms connect online for video conference meetings, webinars, and live chats.

They quickly took the place of traditional synchronous education where communications are scheduled in person. Virtual learning environments (VLEs) such as Blackboard Learn and Brightspace were also employed to further enhance the new synchronous learning experience. VLEs are educational technologies that are web-based platforms for the digital aspects of courses of study within educational establishments.

Instead of just merely enhancing the synchronous learning experience, these VLEs worked to rapidly convert much of synchronous education into true asynchronous communications that would never have to meet face-to-face. As a result, students began to learn how to better use cyber age technologies to fend for themselves. Absent the importance of social interaction with your peers, classroom learning during the pandemic quickly saw the internet along with smartphone capabilities make many aspects of the traditional classroom and university experience unnecessary. Take, for example, the university library for doing research. No longer do students have to wait until the library opened for information when their Google App is accessible all day every day from the comfort of their home. Today's student has no knowledge of the card catalog or the Dewey Decimal System. The open-stack or closed stack holds no meaning for students entering today's college or university library to do their research. Today's library features vending machines offering all sorts of comestibles that were banned in the past. Cappuccinos and lattes are served up to students using their university issued meal cards. The university library of today is replete with computers and devoid of individuals constantly shushing students.

During the pandemic AI (Artificial Intelligence), the intelligence of machines or software in contrast to that of humans and animals, impacted the American academy in the form of generative and creative tools such as ChatGPT (Chat Generative Pre-trained Transformer). ChatGPT is a chatbot developed by OpenAI an American artificial intelligence research organization registered in Delaware that allows students to refine and steer a conversation towards a desired format and level of detail. Before the pandemic was declared over in the United States on May 11, 2023 (Hetter, 2023), ChatGPT became the fastest-growing consumer software application in history with over 100 million users worldwide including numerous university and college students throughout the United States.

Conclusions and Recommendations

All the above is not to say that AI at institutions of higher learning was not in use before the pandemic. Applications such as advanced web search engines like Google Search and understanding human speech assistants like Siri and Alexa were all in play by students and faculty alike. These wonders of modern technology enhanced the educational process by aiding research in a very positive way. For example, they allowed students to continue their studies whenever they so desired**.** There was no need to visit the library. One only had to consult an app on either their laptop or smartphone. ChatGPT and the like, however, impacted the educational process in a very different way. Specifically, it called into question how students might be graded since the software was capable of writing papers and answering exams. The AI Spring or AI Boom — that is, the ongoing rapid and unprecedented progress in the field of artificial intelligence since the early 2020s-necessitates the undivided attention of the American academy. The latter has to rethink how students will be tested given the advent of AI.

The pandemic with its lockdown of college and university campuses demonstrated just how quickly cyber technologies can be used to supplement the way institutions of higher learning do business. The switch to and successes of online asynchronous education during the pandemic should illustrate just how rapidly cyber-age technologies can adapt and grow. Academia can no longer slowly integrate new technologies as they become available. The hal-

lowed halls of academia must put aside its staid ways of operation and learn to quicky adapt to cyber technologies as they grow exponentially. No longer can one wait for a paradigm shift to take place as was so accurately explained in Kuhn's *The Structure of Scientific Revolutions* (1962). Today's paradigm shift is almost instantaneous. In our ever changing technological age, failure to act swiftly will surely call into question the relevancy of the academy.

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