Exponential Growth of Technology and the Impact on Economic Jobs and Teachings: Change by Assimilation

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Today's computer programs, AI, and Robotics, are vastly superior, faster, more accurate, and some people would argue, easier to deal with than most economists, statisticians, and the currently used economic models. If that is the case, what are we to do, and what are the options? There are many. This paper will provide research information on what is working or not, has changed, and what other options might lurk in the future for this holy grail of science. The literature shows that Artificial Intelligence offers a way to amplify and go beyond the current capacity of capital and labor to drive economic growth. UMO is just one of the examples showing what a hive mentality can achieve and how accurate and predictable the outcome can be. We will discuss how to suspend assumptions and why we ought to stay open to different ideas. Organizations such as Accenture research report on the impact of AI in 12 developed economies, stating it "reveals that AI could double annual economic growth rates in 2035 by changing the nature of work and creating a new relationship between man and machine."

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Few people today would argue with the premise that technology is growing exponentially as seen by everyday scenarios such as the child playing on an iPad in the grocery store with their mother or the athlete with a fitbit or iWatch on their wrist measuring everything from their heart rate to the number of steps taken in a day. The growth of data is projected at 40% to 60% per year while the use of big data for analytics has grown tenfold within 2.5 years (Bughin, 2016). While we have seen a significant increase in data growth and use of big data, artificial intelligence (AI) could surpass the performance of human intelligence in all its facets in the near future (Pueyo, 2016). Robotics is yet another area driving change in our society, which is tightly integrated with AI and machine learning and is transforming new economic models such as self-driving cars, Amazon drone deliveries, and the incredible optimization in healthcare such as surgical robotics (Pratt, 2015).

We are seeing dramatic increases in productivity based on these technologies along with the prospect of significant economic growth but does the old credence of economic growth drives job growth still apply with such a strong dependence on AI, robotics and big data? New jobs are created while less complex jobs are replaced. Do the new jobs exceed those that were replaced or are we driving further schisms between those that are educated, such as in these new technologies, and those that are not? We

see today the replacement of jobs in the service and health industry by robotics along with the ability to transform business models due to AI and big data analytics, which also displaces jobs (Qureshi & Syed, 2014).

AI, robotics and big data are tightly integrated and can increase economic output. From a microeconomic perspective, Hitachi, a technology leader, was able to increase efficiency by 8% through the use of all three of these technologies. Accenture delivered a recent report, which provided a macroeconomic analysis of 12 economies that are expected to double their growth rate by 2035 with the use of AI ("Artificial Intelligence Poised to Double Annual Economic Growth Rate in 12 Developed Economies and Boost Labor Productivity by up to 40 Percent by 2035, According to New Research by Accenture," 2016). Of course, many people today cannot help but think of Hawkins prediction of the end of the world or Cyberdine Systems from the Terminator series, which created an apocalyptic world due to the reliance and unlimited capabilities of AI and robotics.

In this article, attention is given to analyzing the impact of these technologies on economic growth and jobs along with the changing dynamics in the economy and lessons learned in respect to the rapid growth and acceptance of these technologies. The method of research used was a literature and document analysis to investigate the questions posed in this article.

The conclusion of the study provides further knowledge and validation that AI, robotics and big data does provide the means to increase economic output, improve quality of products and care, and can, provided the right circumstance such as a focus on re-education and development, provide job growth. It was also determined that these technological advances will continue exponentially and the next phase could be moving from man-machine interaction to man-machine integration. According to P. Diamante, “Exponential technologies are humanity’s most powerful tools for creating new opportunities and solving the significant challenges that we face.”

Big Data

There has been much research on the use of big data by corporations and its productivity impact (Bughin, 2016; Hilbert, 2016; Jobs, Aukers, & Gilfoil, 2015; Obermeyer & Emanuel, 2016; Ouf & Nasr, 2015). Those companies who have implemented big data strategies and analytics have seen a 5% - 6% increase in global productivity (Bughin, 2016). Besides the economic improvements and competitive advantages big data delivers, improvement in healthcare delivery and outcomes have also been found (Hilbert, 2016; Obermeyer & Emanuel, 2016; Qureshi & Syed, 2014).

Internet companies such as Google, Amazon, and many others have been pioneering the use of big data for analytics to track user’s trends and market to them one on one based on their preferences (Bughin, 2016). Big data analytics in retail can be attributed to one of the three pillars focused on customer convenience which are big data, cloud computing and intelligent machines such as self-checkout. Retailers such as Walmart and Target have provided capabilities for self-checkout and in the process, collect large amounts of data on user preference. These technological advancements and use of big data for analytics have led to significant reductions in cashiers which as of 2011 employed 3.3 million workers and declined to 2.7 million in 2015 with an acceleration in the decline expected to continue (McWilliams, Anitsal, & Anitsal, 2016).

The companies who develop and deliver self-service technologies, not only to retail but to a multitude of industries such as airline, healthcare, banks, travel agencies, internet companies and many others are focused on providing access to big data for analytic purposes in order to increase operational efficiencies and bring customers back through the identification of their preferences (Hilton, Hughes, Little, & Marandi, 2013; McWilliams et al., 2016).

A facilitation of the use of big data is the exponential growth of data and the realization that IT infrastructures can no longer store the massive amount of data needed for analytics on premise which is driving the need to store data in the cloud along with the need to manage this big data. Many corporations such as Microsoft, Oracle and Amazon for example are creating and offering cloud computing for their customers and are allowing these companies to transform themselves and find new avenues for revenue generation and profit. Of course, for these companies they are creating economic efficiencies and job

growth within their companies but there has been little research done in the area of job loss for those companies or institutions that use their services. "Artificial Intelligence is poised to double annual economic growth rate in 12 developed Economies and boost labor productivity by up to 40 Percent by 2035," according to New Research by Accenture, (Accenture, 2016).

Artificial Intelligence

Physicist, futurist, and best-selling author Michio Kaku once said:

"The human brain has 100 billion neurons, each neuron connected to 10,000 other neurons. Sitting on your shoulders is the most complicated object in the known universe."

AI has made large strides in our everyday lives in the 21st century. Everyday examples are self-driving cars, Google recommended searches, Amazon and Netflix recommendations, Apple's Siri, Amazon's Echo, Facebook photo tagging and many more (Gill, 2016; Goertzel, 2014; R. G. Smith & Eckroth, 2017). All of the aforementioned applications are targeted for increasing productivity and the user experience. Besides the breadth of consumer applications, AI has dramatically improved business applications to a point where businesses are transforming themselves based on the new business models being developed through their use (Pueyo, 2016; Scherer, 2016; R. G. Smith & Eckroth, 2017). The rhythm of our times requires us to think and react differently.

Currently, AI is used for specific applications that use machine learning algorithms and/or rule-based systems (Gill, 2016). The idea of a super brain neural network AI system is still theoretical at this point but is what many think of due to the proliferations of movies centered around AI and its deadly threats. In actuality, AI systems today focus on specific productivity or user convenience tasks that can demonstrate economic improvement especially in areas such as healthcare (Obermeyer & Emanuel, 2016). Productivity benefits will continue to grow as AI matures but "currently, most such benefits are concentrated in companies and the capital of their shareholders – including the infamous 1%" (Anticipating artificial intelligence, 2016, p. 1). There is a belief that wealth will need to be distributed fairly in order for all to reap the benefits. Bill Gates was recently in the news stating that taxes should be levied on the use of robots, who supplant labor in order to be used for re-education of the work force and redistribution to those who lose their jobs. Just recently, researchers at Facebook realized their bots were chattering in a new language. Then they stopped it. Mike Lewis, research scientist at FAIR stated, "our interest was having bots who could talk to people," leading Facebook requiring its negotiation bots to return to speaking in plain English. If we can read an exponential roadmap and anticipate where sensors, networks, A.I., robotics, 3D printing, VR/AR and synthetic biology will be in 3 to 5 years, who is to say that the impossible might not become possible?

The Association for the Advancement of Artificial Intelligence (AAAI) is a well-respected consortium for the advancement of AI and provide symposiums, conferences, books and reports on the topic internationally ("Association for the Advancement of Artificial Intelligence," 2017). In a recent article published by this organization they state that they have been tracking trends with AI since 1979 and one of the trends focuses on industry topics around AI. At the top of the trend is business and manufacturing followed by banking and finance which include almost half the topics followed by transportation, military, healthcare, energy and several others. Based on the interest in AI topics within these industries, we would expect a positive correlation of the economic growth and improvement found in these industries. Banking and finance has steadily come back since the financial meltdown of 2009 along with business and worldwide manufacturing. Recent research from Accenture finds that by 2035 economic growth could double in many countries based on the increase of labor productivity and accelerated trend of AI technologies and adoption. Of course, the acceleration and adoption of AI could lead to catastrophe, economic chaos and further delineation of the labor market (Gill, 2016; Scherer, 2016; R. E. Smith, 2016). As is the norm, regulations that protect people's privacy against new and exponentially growing and pervasive technologies follow adoption of these technologies. The internet is a clear example of this trend along with the need to continual update regulatory compliance based on

privacy breaches. AI can be thought of as the internet on steroids in respect to regulatory concerns. For AI, the concern is not only privacy but the possibility of replacing a large sector of our labor force along with, for example, the ability of AI to run everything from home appliances to weapons of mass destruction (Scherer, 2016).

Self-service is also at the core of the potential of AI. If, as much research suggests, that AI outperforms human intelligence soon, we could see a significant rise with AI in self-service in not only the auto industry and financial industry but also the education and military industries which could provide the ability to educate the masses while at the same time providing self-service military drones and other weapons to maximize the ability to effectively drive war campaigns without endangering civilian lives. On the other hand, it is believed that the more human tasks we hand over to AI, the more potential of risk this places on humanity overall (Gill, 2016; Hunt, 2015; Scherer, 2016; R. E. Smith, 2016; R. G. Smith & Eckroth, 2017)

Robotics

Today, there is little debate that robotics and AI are becoming tightly integrated and that robotics are driving productivity increases in manufacturing, healthcare and many more industries (Kimura, 2017; Qureshi & Syed, 2014). Robotics use worldwide, from a proportions standpoint, ranks Japan, Korea and Germany as leaders in robotics usage with the USA proportionately using half as much as Germany. This disproportion could be related to the fact that the top three are much more dependent on manufacturing than the USA. In Europe, many have a positive view of robotics due to rescue jobs, space exploration and other assets they provide that save human lives and keep humans out of danger. Also, within healthcare robots are rampant and advertised to provide the most accurate and beneficial results rather than humans who are prone to error (Qureshi & Syed, 2014). The military industry also saw an increase in productivity due to the use of robotics. For manufacturing, robotics can be the difference between profits and bankruptcy.

Technologically advanced economies such as the USA and Japan lead the world in robotics advancement (Bogue, 2014). We see firms such as Google, Apple, Hitachi and many others make extensive use of robotics and AI technologies (Bogue, 2014; Hunt, 2015; Qureshi & Syed, 2014; R. G. Smith & Eckroth, 2017). Economic improvement can be related to the availability of excellent healthcare and wage increases. Except for Japan, wage increases are prevalent in the most technologically advanced countries (Qureshi & Syed, 2014). We have also seen significant increase in the average mortality age associated with these technologically advanced countries that can be associated with the increased use of robotics and AI (Prettner, 2013). Unexpected convergences of these technologies will create new business models and transform every aspect of peoples' lives.

Many people believe that jobs are lost due to the increased dependence on robots (Bogue, 2014; Kimura, 2017; Qureshi & Syed, 2014; R. G. Smith & Eckroth, 2017). The contradictory perception is that most people believe that robots are good and help people but at the same time they also put many people out of work (Bogue, 2014). It appears in the short time that this is especially true in manufacturing but that over time more jobs are created (Qureshi & Syed, 2014). As of 2014, the robot industry was generating as much as 190,000 jobs throughout the world and with loss of labor in manufacturing it is believed that increased output and demand for lower cost goods also increases employment (Qureshi & Syed, 2014). There has not been much research found in the reduction of jobs due to the usage of robotics outside of manufacturing. It is yet to be identified in recent research if this will be an ongoing trend based on technological advances.

There is much research in self-service and robotics such as Robot Taxi in Japan, which provides driverless taxi services and also the need for robots in areas such as hospitality where seasonal employment is difficult to find (Hilton et al., 2013; McWilliams et al., 2016). For robotics, many countries are investing a great deal of their GDP into building up their military and much of the new weapons that are being developed are based on robotics and AI (Hunt, 2015; R. G. Smith & Eckroth, 2017). What people fear most about robots is not only loss of employment but the possibility of annihilation due to the unparalleled possibilities of robotics and AI in the realm of warfare (Bogue, 2014).

Drone warfare has become common - place today where targets and deaths are not seen on the battle - field but on an LCD display perhaps on the other side of the world. It is especially easy for those in the military who are young and have grown up gaming, watching movies and television to distance themselves from a multitude of deaths they see on an LCD display. The use of robotics and AI has brought about social and ethical questions that still need to be answered and the need to better understand how science, technology and society (STS) are more integrated today than ever in our history and how best to move forward as a civilization.

DISCUSSION POINTS AND CONCLUDING THOUGHTS

What exponential technologies must be leveraged to build world-changing business? How will we turn scarcity into abundance? Retrospective data analyses primarily provide reports, dashboards and business intelligence; predictive data analyses use historical data to extrapolate to the future; while prescriptive data analyses prescribe or recommend actions. Will there be use for these applications in the future once products and services becoming bits and we work on Dematerialization? And once we have arrived at this stage when the cost of replicating and transmitting is almost zero, and we have demonetized services and products what will be the next step? Remember that digital photography totally demonetized the industry. Today there are 3 billion people connected, by 2025 we will be 8 billion connected souls. Marketing across the globe will be open on a yet unimaginable scale.

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