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The Rise of Artificial Intelligence: An Analysis on the Future of Accountancy

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Abstract

The concern for the replacement of accountants with an artificial intelligence system is a current and pressing issue. As new certified public accountants enter the field, they must adapt to the rapid changes and innovations of today. This thesis will examine and analyze how the accounting industry has been impacted by artificial intelligence, as well as potential threats to new hires. Ultimately, accountants should not fear replacement, but rather must tailor their abilities to the newest technologies. Overall, artificial intelligence will add value to the accounting industry, as certified public accountants can shift their attention from monotonous tasks towards making more analytic and data-driven decisions.

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Introduction

The infiltration of artificial intelligence into the business world has had a major effect on our rapidly advancing society. With technology being at the forefront of all businesses, it is imperative that business people are technologically literate and equipped to work with new technologies. Businesses must educate themselves on new technologies and learn how to adapt their business strategies to fit the needs of those they are serving. It is extremely detrimental to a business if they are not keeping up to date on the most current technologies and could potentially lead to the ultimate decline of the business. It is necessary that businesses maintain their competitive advantage by constantly seeking to develop and achieve optimal efficiency. However, while technology has made business processes occur more quickly and efficiently, the use of artificial intelligence technologies has posed some threats to employees. With information at our fingertips, artificial intelligence has the ability to retrieve and process information instantaneously. As the technologies continue to advance, this has created the fear that robots could eventually replace the need for human brainpower. Specifically for the accounting world, where the industry has changed dramatically since the introduction of the computer, this thesis will analyze how artificial intelligence will affect job opportunities for future certified public accountants.

History of Artificial Intelligence:

The development of artificial intelligence has advanced rapidly over the past century and continues to defy the limits of human creation. What started in 1914 as the world's first computer game, a Spanish inventory named Leonardo Torres y Quevedo had created "El Ajedrecsta". This game was created to automatically play chess due to an algorithm that was designed into the machine's hardware. (A Time Line of AI, 2016). By 1956, researchers from

many different fields were joining forces to discuss and share ideas on the future of artificial intelligence. Most notably, on August 31st 1955, a summer research project on the future of artificial intelligence was proposed at Dartmouth College. This proposal was created by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. The specific goal of the proposal was "to find out how to make machine use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves" (McCarthy, Minsky, Rochester, Shannon, 2006). By creating this summer research project, this sparked other researchers from many different backgrounds to be inspired and intrigued by the overwhelming potential of artificial intelligence. Other notable additions to the field shortly followed. In 1966, Joseph Weizenbaum created "ELIZA", which was the world's first chat program that used programmed phrases to communicate with human users. Furthermore, by 2000 Cynthia Breazeal designed the "Kismet", a robot that was able to demonstrate real interactions with humans by analyzing social cues and expressing emotions. The most recent and grand achievement that was highly publicized was the introduction of IBM's Watson. In 2011, Watson entered a three-night competition on Jeopardy, proving its unprecedented intelligence. The premise of this special competition was to put Watson up against Jeopardy's most successful contestants: Ken Jennings, who had the longest run of 74 appearances, and Brad Rutter, known for the largest winnings in Jeopardy history. Before Watson could make its television appearances, IBM researchers worked tirelessly to ensure that Watson would be fully equipped to dominate the competition. This led to the creation of "DeepQA", a software program that would eventually query 200 million pages of information (Best, 2017). With Watson's defeat of the two Jeopardy champions, this posed new questions and ideas for IBM. The future of artificial intelligence began to look a lot more exciting, and Watson shifted its vision to the healthcare field, using its technologies to work with

WellPoint Insurance and Memorial Sloan-Kettering Cancer Center (Best). Specific uses of Watson for the healthcare field include diagnosing patients, as well as looking at various therapy and treatment options. IBM's Watson continues to develop the field of artificial intelligence, now integrating itself into the business world and by setting an example of a "trail blazer" for other artificial intelligence systems.

Benefits of Using Artificial Intelligence

Through the various achievements artificial intelligence has made over the past century, it is obvious how artificial intelligence has impacted the way we think and shape future technologies. Businesses are quickly integrating artificial intelligences into their day-to-day functions. This has resulted in a more streamline way of conducting business and ultimately allows the firm to reap maximum financial rewards, as well as improving their overall reputation and the organizational citizenship behaviors of their employees.

1. **Processing Speeds**

   It comes as no surprise that computers are able to process information more quickly than humans. This is the reason that IBM's Watson defeated the Jeopardy contestants with flawless accuracy and speed. While the human brain has a large array of capacities, the computer is designed to process information quickly and accurately. The human mind simply cannot process information like the cutting-edge innovations of today's computer chip industry. With the brain's neurons maxing out at 200Hz, the microprocessors that are on the market can process information at speeds of 2Ghz. This translates to a processing speed that is 10 million times faster than the neurons of the human brain (Urban, 2015). China has also figured out how to develop a technology with processing speeds that highly outrank the abilities of the human brain. The Tianhe-2 is a

supercomputer that was designed by China's National University of Defense Technology. It boasts performance speeds of 33.86 petaflop, which equates to quadrillions of calculations each second (Nair, 2014). With processing speeds picking up more momentum, this is forcing innovators to continually develop the next best thing on the market. This led Jen- Hsun Huang to create Nvidia, a microprocessor and software firm. Over the most recent quarter, revenues have reached $2.2 billion dollars and its share price has quadrupled in the past 12 months. What sets apart Nvidia from its competitors like Intel are its 3,584 cores. Intel's central processing units only have 28 cores (Intel on the Outside, 2017). As a result, businesses are looking to incorporate these technologies into their current systems. With the size of qualitative and quantitative data that firms are handling on a daily basis, this proves the need for artificial intelligence and its processing powers.

2. **Data Analytics**

The next task that artificial intelligence is beginning to grasp is that of data analytics. Programmers are now able to input code that allows the computer to sift through data and draw conclusions. Thus, firms such a KPMG have begun to invest in these technologies in order to increase their productivity. KPMG is specifically using services provided by IBM Watson. These services focus on their audit and assurance practices. The integration of IBM Watson into these practices has allowed the technology to handle large amounts of data relating to financial and non-financial information. KPMG's belief is that "cognitive technology enables greater collaboration between humans and systems, providing the ability to communicate in natural language and analyze massive amounts of data to deliver insights more quickly. Watson integrates machine learning and other

artificial intelligence technologies into a scalable system that can be accessed through a range of applications" (KPMG, 2016). KPMG is not a rogue firm in the sense that many other firms are also looking into the use of artificial intelligence in their practices. Deloitte has started a partnership with Kira Systems, which is a firm that focuses on machine learning. Deloitte's partnership with Kira has made it "possible for client teams to analyze hundreds of thousands of documents in weeks, putting them in a stronger position to advise clients in completing major business transactions under tight deadlines" (Deloitte Forms Alliance with Kira Systems, 2016). The CEO of Kira System, Noah Waisberg, adds "Artificial intelligence has arrived to a point where machines can scale human expertise by extracting information from complex documents. It accurately identifies information by learning from examples versus just reflexively identifying pre-programmed clauses" (Deloitte Forms Alliance with Kira Systems). Not only have these advances allowed the firms to analyze data more holistically, but they are able to cater to their clients' needs more efficiently, creating a reputation of strong and reliable service.

3. **Laborious tasks**

One of the more obvious ways that artificial intelligence is greatly adding benefit to firms across the board is it is able to streamline the laborious tasks that employees are faced with. By shifting the responsibility of these tasks from the employee to the computer, this allows employees to focus their attention to problems that require a questioning mind. Deloitte University has come up with its own framework to decide whether a firm should invest in cognitive technologies. Because a cognitive technology may not always be the best solution to every problem, Deloitte University has released the "Three Vs"

Framework", which is depicted in the diagram below.

Figure 1. The Three Vs framework for assessing applications for cognitive technologies

Screen	Cognitive technology indicators	Application examples
Viable	All or part of a task, job, or workflow requires low or moderate level of skill plus human perception	Forms processing, first-tier customer service, warehouse operation
	Large data sets	Investment advice, medical diagnosis, oil exploration
	Expertise can be expressed as rules	Scheduling maintenance operations
Valuable	Workers' cognitive abilities or training are underutilized	Writing company earnings reports; e-discovery; driving/piloting
	Business process has high labor costs	Health insurance utilization management
	Expertise is scarce; value of improved performance is high	Medical diagnosis; aerial surveillance
Vital	Industry-standard performance requires use of cognitive technologies	Online retail product recommendations
	A service cannot scale relying on human labor alone	Fraud detection
		Media sentiment analytics

Graphic: Deloitte University Press | DUPress.com

The framework ultimately suggests that in order for the investment to be justified, it must be viable, valuable, and vital. This is done by creating a process map, which highlights the tasks that "rely more on human perception than special skills, are costly, where scarce expertise might be able to be encoded as rules for use in an automated reasoning system, or where the value of improved performance is high" (Schatsky, Muraskin, Gurumurthy, 2015). These are the types of tasks that can be categorized as laborious, such as processing forms, planning and scheduling, finding basic evidence, and answering basic questions. Next, Deloitte University suggests creating a staffing model, which will look at where training is underutilized or there is a lack of expertise in a certain area. For example, if there is a role that focuses on reading many documents and comparing keywords, this is something that a cognitive technology can produce with more efficiency.

Lastly, Deloitte University emphasizes the need for a company to differentiate itself from the competition. By using market analysis, a firm can discover where using artificial intelligence can create new market segments and add value to what already exists. By understanding that some laborious tasks can benefit from computer automation, this allows an organization to focus and shift its efforts to work on its differentiating factors.

4. **Size and Storage**

With the stressful environment of the business world, employees are forced to juggle many tasks along with a plethora of information. On the other hand, the computer chip has no issue with an information overload. In fact, the computer chips of today that are used in artificial intelligence systems are designed to digest information with absolutely no hesitation. With transistors on integrated circuits growing smaller and smaller, this allows for even more information to fit on a given area of silicon (McLellan, 2015). This allows for artificial intelligence networks to continuously be fed information and have no issue storing large amounts of data. Additionally, this notion of increasing storage sized can be summarized under Kryder's Law, which in 2005 stated that the areal density of hard disk drives would more than double every two years, leading to similar exponential increases in capacity and decreases in cost per gigabyte. This observational 'law' held up well until around 2010, being that since then the pace of hard disk development has slackened somewhat (McLellan, 2015). However, this has not discouraged innovators from delaying chip manufacturing. The industry continues to thrive, as depicted by Intel's revenues of nearly $60 billion dollars in 2016 alone (Intel on the Outside, 2017).

Risks of Artificial Intelligence

Artificial intelligence certainly has transformed the business world. However, despite the unique ways that computers are changing the industry, there are certain aspects of the business world that simply cannot function without human interaction. Artificial intelligence could potentially damage the reputation of the firm if it is not used in the proper manner.

1. **Business Ethics and Compliance**

   The reputation of a firm is based heavily on the business ethics and compliance with enacted regulations. If a firm is caught employing dishonest practices, they will ultimately lose the trust and respect of their clients and society. By shifting business practices into the virtual hands of artificial intelligence systems, this could potentially create a slippery slope. Businesses trust their coders to properly program artificial intelligent robots to perform their most vital functions. If there is a malfunction, this could be extremely detrimental. More importantly, many of these programs are given the liberties to make judgements and draw conclusions. By giving the computers free range, the firm is becoming less involved in the process. Thus, Illah Nourbakhsh, a robotics professor from Carnegie Mellon University states "educators need to teach computer science and robotics students a basic understanding of ethics, because the technologies they are creating are so powerful that they are changing society" (Vanian, 2017). It is imperative that a firm is confident in their technologies and able to stand behind the work that they produce. Nourbakhsh also fears that because robotics is ultimately increasing the productivity rate at factories, this will ultimately boost the nation's GDP. However, this could ultimately increase the gap between the rich and the poor (Vanian, 2017). Another way in which the ethics of artificial

intelligence are being questioned is that there are few government regulations on what artificial intelligence is capable of accomplishing. Because there are no compliance standards, this could allow businesses to take advantage of certain privacy policies. In a report released by Stanford University, the authors released a statement which reads "the study panel's consensus is that attempts to regulate A.I. in general would be misguided, since there is no clear definition of A.I. (it isn't any one thing), and the risks and considerations are very different in different domains" (Markoff, 2016). While this report is not suggesting that there be no government regulation of artificial intelligence, it certainly raises concerns for how the government will be able to constantly keep up to date on the newest cutting edge technologies. Therefore, Massachusetts Institution of Technology plans to launch a study that will look into how artificial intelligence will affect social and economic policy issues. Their main focus will be to discuss the design of robotic systems that keep "society in the loop" (Markoff, 2016).

2. **Need for Human Interaction**

Business is conducted on the notion that there must be human interaction. In order for ideas to be shared, questions to be raised, and problems to be solved, there must be an open dialogue and line of communication. By integrating artificial intelligence into business, this will ultimately disrupt the business world. With e-mail, instant messaging, video conferencing, and screen sharing, the business world is getting less personal. It is less common for colleagues to sit down and meet in the same room when new technologies have allowed for greater convenience. However, this has greatly affected the business decisions of today. Because decisions are made virtually,

this can allow employees to feel less invested in their work. Top management is suffering by not have face-to-face interactions, as body language and tone of voice are completely removed from the equation. Artificial intelligence takes this idea of lessening the need for human interaction to an even greater level. Benjamin Kuipers, a computer science professor and researcher from the University of Michigan explains that "although humans typically program AI- powered robots to accomplish a particular goal, these robots will typically make decisions on their own to reach the goal. What we're seeing here are robots pursuing human-generate goals in unconstrained ways" (Markoff, 2016). This idea of "unconstrained ways" is a major threat to businesses. By removing humans from the equation, the robot is free to make its own judgments. Furthermore, international business will encounter a plethora of issues as a result of artificial intelligence integration. International business must account for language barriers and social customs. While a robot could be programmed to formulate quick translations, it will not be able to reproduce and tailor itself to the needs of different cultures. Moreover, while the United States might be more accepting of new technologies, American companies might face resistance from their foreign partners who may not fully accept the use of artificial intelligence in their business practices.

3. **Lack of Creativity**

The most profitable and cutting edge technologies of today have been crafted from humble beginnings. Facebook was created in a dormitory at Harvard University while Steve Job's childhood garage has earned itself the title of a historical landmark for being the location where the first Apple computer was produced (Griggs, 2016).

Artificial intelligence has the potential to be a major hindrance on the creativity of all visionaries. By placing the focus on developing robots to take on more human responsibilities, this is reducing the efforts of what the human mind is capable of. Rather than shifting the efforts to building the most advanced artificial intelligence system, researchers and business people alike must focus on tackling modern day problems. While artificial intelligence certainly can be used as an aid in business, it should not strip one of his or her creativity.

Potential Threats to Accountants

It comes as no surprise that as technology advances, our demands change. Just like in business, it is important for companies to remain current in order to prevent decline. Unfortunately, some businesses just are unable to keep up with the times. For instance, Kodak quickly became antiquated as the introduction of smart phones with cameras were introduced, ultimately leading to its bankruptcy. The accounting profession faces major threats as new technology is specifically made to enhance the field. Therefore, the profession has had to adapt dramatically since the introduction of the computer. However, this can potentially cost accountants their jobs. In fact, the Boston Consulting Group predicts that up to 25% of jobs will be replaced by software or robots by 2025, with accounting professionals being in the top 10% of jobs that are most likely to be automated (Peccarelli, 2016). With firms like KPMG and Deloitte already using artificial intelligence, the firms must keep a watchful eye on how involved these technologies become. For instance, when auditing a client, a computer can easily look for material misstatements in the financial statements with close to 100% accuracy and with optimal speeds. This could eventually phase out the need for auditors if the technology can work at a faster pace and the labor would be cheaper. Similarly, taking a look at the tax practice of many accounting

firms, it is required that certified public accountants are verifying that their tax formulations are compliant with the overwhelming amount of tax codifications. What would take a tax accountant some time to search for, a programed robot could look up and have instant verification within seconds. Another major threat to the accountancy profession is the idea that machines could act as fiduciaries. The benefit of using machines over humans is that this could remove the misinterpretations and biases that occur, potentially making the machine a more reliable source. Because the machine is programmed with just the raw data, this allows for decisions to be based solely on the data (Jariwala, 2015). In regards to the consulting practices of accounting firms, artificial intelligence can make predictions that humans never saw coming. Another important factor is that accounting firms may look into the cost savings that they will incur as a result of commissioning more robots. While the initial funds to develop the technology would be hefty, this would eventually allow the firm to hire less employees, resulting in tremendous savings into the future. This phase out of hiring new certified public accountants will be extremely detrimental to fresh graduates. Thus, this type of phase out may shift the amount of accounting majors to lean more towards a career in fields such as engineering or computer science. Lastly, it is important to mention one of the most renowned accounting scandals of the 21st century. The Enron scandal is summarized by a scheme which used off-balance sheet special purpose entities. These special purpose entities were able to hide massive amounts of debt and toxic assets. Ultimately, the goal of the scheme was to represent a false reality of the company's financial position (Investopedia, 2016). The Enron scandal led to the demise of Arthur Andersen LLP, giving way to government interference and the creation of the Sarbanes Oxley Act of 2002. The act mandates strict policies and procedures to ensure that accounting fraud is prevented. One main point of emphasis is the need for implementing internal controls. This requires management

and auditors to certify that the financial statements are free from material misstatements and fraud. The threat that arises after a scandal like Enron is that it depicts the capabilities of humans. With corporate greed and power being prominent drives at large firms, this may lead top management as well as other members of a specific organization to be enticed to commit fraud. By using artificial intelligence, programmers have the ability to write code that strictly follows U.S. GAAP and prevents any rogue employees from employing dishonest practices.

Examining the future

With artificial intelligence on the rise, the limits of modern technology continue to be surpassed. In today's world, a business without advanced technology would simply be unable to exist. Thus, accounting firms are needing to adapt their practices to these transformative technologies. While some may suggest that there will eventually be no need for accountants due to artificial intelligence, this is simply untrue. What the research does in fact suggest is that the day to day tasks of accountants will change dramatically. This will allow audit and tax accountants to focus less on number crunching and data entry, allowing more time to be spent analyzing real world problems. Accountants will become more valuable as their attentions can be narrowly focused. Furthermore, I predict that the advisory practices of accounting firms will grow and make up the largest practice. While the computer can be programmed to analyze data, the need for human interpretation and creativity is something that can never be replaced. It is an impossibility to suggest that a computer, despite being programmed with billions of data sets, can predict and consult evolving businesses. There is also the fear that if businesses place too much reliance on artificial intelligence, this can ultimately disrupt the economy. Overall, accountants need to embrace the changing technological climate. I also predict that accounting curriculums across undergraduate and graduate programs will begin teaching computer programming to students.

This will ensure that future certified public accountants are able to interact with the technologies that will allow them to become more productive and visionary business people.

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