# The Transformation of the Workplace through Robotics, Artificial Intelligence, and Automation

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**Abstract**

Robotics is the fastest growing industry in the world, poised to become the largest in the next decade. The use of robots requires design, application and implementation of the appropriate safety controls in order to avoid creating hazards to production personnel, programmers, maintenance specialists and systems engineers. The increasing use of artificial intelligence (AI) and related technologies in the workplace are dramatically changing the employment landscape. The impact of robotics technology on workplace policy is dramatic and complex. The robotics revolution calls for a comprehensive approach to job training, and retraining, to mitigate worker displacement and enable workers to benefit from the new jobs that the technology will generate. It calls for a thoughtful, forward-thinking approach by lawmakers, regulators and employers to prepare for the oncoming transformation of the workplace and workforce**.**

**Keywords:** Design, Artificial Intelligence, Programmers, System Engineers, Robotics, Transformation.

## I. INTRODUCTION

Industrial automation, computer programming, and data storage have been integral to the modern workplace for decades, a number of factors in recent years have spurred the evolution of modern robotics, AI, and 21st century automation. Ongoing advances in micro-computer, networking, and sensor technologies, combined with a corresponding decrease in costs,[1] is fueling a next-generation computer revolution highlighted by the exponential rise of connected, mobile devices. Such devices are able to sense, capture, and analyze information about the surrounding environment and to communicate the relevant data in real time to human operatives and online databases.ever-improving computer software algorithms are able to aggregate and analyze the massive amounts of information collected by the networked devices, identify trends, predict outcomes, make recommendations and decisions, and, to a growing extent, initiate and take autonomous action in situations where humans have delegated the authority to do so.When these advanced computing systems are combined with complex physical machinery, cutting-edge robotic systems are born. Increasingly intelligent and autonomous mechanical devices networked to powerful servers will yield an array of robotic systems and applications destined to have an enormous impact on every aspect of our society.[2] The impact of these technologies on the workplace is significant and far-reaching.

Modern robotics and AI systems are being deployed in a variety of industries, including food service,16 medical,[3] airline,[4] energy,[5] and ground transportation,[6] among others. For example, robots already fill more than 350 million prescriptions each year at over a third of the medium and large hospital pharmacies in the U.S.[7] While many assembly line job tasks have been mechanized for years, [8] trainable robots are being developed to improve and streamline the process [9] Some robots are even taught how to "think" like a human to improve performance and object recognition [10].

"Human-like" robots are being used to fill the growing need for elder care. According to one report, the Japanese economy, Trade and Industry Ministry anticipates the market for elder care

robots will be valued at more than 400 billion yen ($4.09 billion U.S. dollars) by 2035 [18]. Recently, a Japanese company has developed a "caring robot" to reduce the workload for nurses.26 Another option to assist with elder care in Japan is a type of battery-operated suit that functions as a robotic exoskeleton to help workers lift patients. This exoskeleton can also be worn by the patients themselves to increase mobility and muscle function. Cyberdyne, the company that manu-factures this apparatus, has already delivered more than 330 such motorized suits costing about $1,780 a piece to care centers in Japan. The suits have been touted as the "first assistive nursing mechanism to be certified under a draft international safety standard for personal robots". The mission of this research is to facilitate the inevitable arrival of these transformative technologies into the workplace, while maximizing job creation.

Many other types of "wearable" robots are being developed to assist with walking, lifting, and performing other physical tasks. Such robotic exoskeletons can allow a user to exert several times their normal strength while greatly reducing muscle strain. One of the premiere producers of such exoskeletons, ekso Bionics, expects to have a million people using exoskeleton technology within 10 years. Such systems could greatly reduce workers' compensation claims and potentially become a safety requirement for various dangerous jobs. For those who suffer back or other injuries, their return to duty could be three times faster wearing an exoskeleton robot. Additionally, as prices continue to fall, these may soon be classified as a reasonable accommodation allowing disabled individuals to perform the essential requirements for employment.

The federal government has similarly taken notice of the robotics revolution. The Transportation Security Administration (TSA) is reportedly considering the expansion of biometrics and other automated screening techniques to use for airport security purposes in place of TSA agents [11] Moreover, the Federal Aviation Administration (FAA) has approved six testing areas for the commercial use of drones [12]. As the robotics, AI, and automation fields advance, so, too, will the interconnectivity of these technologies. According to Cisco Systems,a whopping 50 billion devices will be wirelessly interconnected and communicating with each other by the end of the year 2020, up from approximately 10 billion devices today. And if that is not impressive enough, Rob Lloyd, Cisco's president of development and sales, has said that "the value at stake of the Internet of everything is $14.4 Trillion" [19].The robotics revolution is a truly global phenomenon. China has established a five-year plan to bring robotic technology to its factories and "all areas of society" to remain an industry leader.33 In the U.S., no factory is built without a complete review of the efficiencies that can be achieved using robotics.In sum, robotics is one of the fastest-growing industries in the world. It has been estimated that by 2025, half of the jobs in the United States will be performed by brilliant machines and intelligent systems.

Robotics is the next major innovation to transform the workplace, and will have as great—if not greaterimpact on how employers operate than the Internet.Thispaper traces the changes that ema-nate from the introduction of robotics to the workplace and the resulting challenges this poses to innovative job creation technologies.

# 2. ROBOTIC SYSTEM

A "robotic system" is a computer system that, using intelligent, networked devices, the Internet, big data, AI algorithms, and other advanced computing technology, is capable of: automatically and continually "sensing" what is going on in a changing physical or other environment; "thinking" by analyzing data it collects from the environment it is monitoring, identifying trends, and reaching conclusions; and autonomously "acting" by carrying out one or more physical or non-physical functions. Stated more simply, it is any computer system capable of sensing occurrences in a dynamic situation or environment, capturing and analyzing the relevant data, and subsequently reaching conclusions, providing recommendations, making decisions, and otherwise taking action, whether of a physical or non-physical nature.

Robotic systems, AI, and 21st century automation are developing at an exponential pace, creating work environments and conditions unimagined a half century or more ago. Nonetheless, designers, builders, and users of this technology are expected to seek to offer increasingly insightful and useable observations as to how robotics, AI, and 21st automation which will inevitably dominate the world's economy and impact workplace law.

### 2.1 Software Robots or Virtual Agents

A "robot" could be a software program that performs a task previously done by humans, or a virtual assistant, such as a telepresence robot that

performs services remotely. Tele-robotics is the area of robotics concerned with the control of robots from a distance, chiefly using wireless connections, 'tethered' connections, or the Internet. It is a combination of two major subfields, teleoperation and telepresence" [13].

# 3. ARTIFICIAL INTELLIGENCE (AI)

It is defined as "the intelligence exhibited by machines or software, and the branch of computer science that develops machines and software with intelligence"[14]. Computer scientist John McCarthy, who is credited with coining the term in 1955, defines it as "the science and engineering of making intelligent machines"[15]. AI is included to underscore that the scope of this Research paper covers both hardware and software that do tasks previously performed by humans.

# 4. AUTOMATION

It is defined as the "automatic operation or control of equipment, a process, or a system."[16]. While auto-mated processes can be traced back centuries, the terms automation" did not come into popular use until 1947, when General Motors established an "automation department." Automation refers to an operation or control system that uses intelligence. Robotics and AI are subsets of automation. However, in many instances, product manufactures and system designers have avoided the terms "robotics" and "AI" in favor of some form of the word "automation." For example, contemporary jet aircrafts are capable of taking off, flying, and landing by themselves with "automatic pilots." Similarly, the term "vehicular automation" encompasses the "self-driving car,""robot car" or"autonomous vehicle."

# 5. CREATING EMPLOYMENT

Historically, the infusion of new technologies into the workplace has greatly increased productivity and human employment. At the same time, the jobs people perform have radically changed. One hundred years ago, one in three Americans worked in agriculture; today, less than 2% of the workforce produces a food surplus resulting in exports. What is different now and over the next decade is the speed of change, the challenge of displaced workers to retrain and quickly adjust to the new economy, and the unprecedented demand for STEM-qualified job candidates. In this research paper, we acknowledge the inevitable worker dislocations and offer employers practical solutions for easing the effects of necessary layoffs while using technology to address the growing skills shortage.

New technologies increasingly are replacing humans in dangerous assignments, taking over repetitive, lowerskilled tasks, and filling needs to perform unwanted work such as harvesting lettuce and grapes. Higher-skilled, better-paying jobsare created, which in turn create downstream service jobs. While for the next decade more jobs will likely be created than lost, the intense public debate about net job creation may be misplaced. The practical reality is that we are all part of a global economy and innovation cannot be stopped as restrictive legislation in one country will merely transfer the technological advancement to another. Nor will any nation be willing to give up the great benefits of innovation for humanity.

# 6. WORKPLACE CHALLENGE-S AND SOLUTIONS

## 6.1 HumanDisplacement

This section begins by discussing robotics most well-known and perhaps least understood effect: the displacement of jobs and workers. One of the most common debates regarding robotics, AI, and automation is whether the industry creates more jobs than it eliminates. This analysis gets repeated for almost every kind of robot or AI innovation that is introduced. By definition, robotics fulfills its purpose when it outpaces human accomplishment. Thus, the automation of routine work is both the goal and the inevitable result of an increased use of robotics. At the same time, new technologies are creating new industries, new jobs, and more efficient uses of human capital. This displacement is both vocational and geographic, as automation and telepresence realize the potential of a globalized workplace only decades after the rise of

outsourcing. On apositive note, recognized human displacement encourages a combination of retraining opportunities sponsored both by employers and government.

### 6.2 Healthcare

This section explores the rapidly expanding use of robotics and telemedicine in the healthcare industry. Healthcare is clearly an industry of choice for robotic expansion. Approximately one-third of all robotic systems and AI start-ups are connected to the healthcare industry. It is predicted that in a decade, 80% of what a doctor does today will be done by brilliant machines and software programs. everything from medical waste transportation to remote presence surgeries are being performed by robots. Advanced computing systems are even being used for diagnostic purposes.

### 6.3 E-discovery

This section addresses the ability of ediscovery technology to harness information in litigation. Increasingly, digital robots and software systems are replacing attorneys in the collection and classification of electronic evidence. Meanwhile, other robotic systems generate massive amounts of data providing a digital reproduction of activities and events. This is opening new vistas for ediscovery and corporate planning for data preservation. For example, self-driving cars can be engineered to provide detailed electronic records if a traffic accident occurs.

## 7. CONCLUSION

New jobs will be invented, the need for STEM-educated workers will accelerate, training and non-traditional web-based education will thrive, distance work will become more common, and high-level contingent workers will prosper. Forty percent of the Fortune 500 companies will no longer be on the list due to disruptive technologies.[17]. Certain organizations attempting to maintain the status quo will seek restrictions on the use of new technologies as a flawed means of saving jobs. Ironically, in a global interconnected economy with real-time competition, these efforts will result in lost jobs through global competition. This paper intends the businesses to look at the future through the eyes of the workforce on this emerging technologies and the evolving workplace and recommend ways to meet needs and preserve workplace values that do not change, such as respect, fairness, and rewarding ingenuity and hard work.

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