

## Robots and the future of employment

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### Abstract

Robots play important roles in various business activities in both manufacturing and service sectors. It is only safe to assume that robots are bound to play even greater roles in the future. It is very likely that this will have different implications on economies worldwide. Also, robotization can impact employment methods and activities worldwide. The very question of the impact of robots on the future of the jobs has attracted many scholars.

This article is a review of some of the literature done to address this topic. Research indicates that robots have been valuable in employment activities. It also shows the potential robots doing work that humans find dull, too hard or dangerous. This article has found out that robots have benefits and limitations for individuals and governments too. This article shows a part of a strong debate that has been going on for more than a century over how robots could affect employment. Those who rage against the machine say robots will steal our jobs, shakeup our societies and are not capable of achieving the same effective results as human workers. Others believe that robots are the key to ultimate freedom from work that humans find dull or dangerous beside many other benefits.

**Key words:** Robot, future of employment, advantages, disadvantages, limitations of robots - individuals, governments, and business

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## 1. Introduction

The history of robot creation dates back to the 18th century. They were invented by Marie Jacquard. Then, industrial robots were built during the 1950s and 1960s. The aim was using robots as powerful tools to advance local productions (Marescaux, et al., 2001). Recently, robots represent one of mankind's greatest inventions. Their influence goes much beyond local productions to affecting the global economy and various structures such as business organizations and even social relations. Robots are defined by the Robot Institute of America and Trade Association of Robot Manufacturing as pre-programmable, multi-functional manipulators designed to move materials, perform specialized activities and complex series of actions automatically through various programmed motions for the performance of a variety of tasks (David, 2015).

At the present time, robots have an important role in developing, manufacturing processes and completing manufactured functions. They are used by many production companies around the world. The reason is that programmable robots are capable of handling complicated tasks effectively and efficiently. In many areas, robots even outperform human beings. Also, robotization enables organizations to complete tasks that human beings are not willing to do for any reason, for example when a particular job is too boring. Apparently, robot technology has improved world productions in a variety of sectors (Krebs, Volpe, Aisen, & Hogan, 2000). Robotization is a way to improve the quality of productions, reduce wasting resources, and save time and cost. Besides, various robots have been able to improve the quality of life both inside and outside our homes. As Evans, et al (1989) stated, a robot is not just used by organizations for the production of goods and services, but it is widely used by governments in major sectors such as defense, health, transport, logistics, customer service, and maintenance. Countries such as the United States, Japan, China, Germany and Italy, among many others, use robots to produce goods and services. They also use robots to aid the development of their

economies. These nations obtain huge benefits by cutting costs of production, improving the accuracy and efficiency of work. Whether used by individuals, organizations or governments, robots can have both positive and negative implications for the public in terms of the impact they have on jobs, economies and the social structure of different societies. This has been the topic of many research and scientific publications. Some authors believe in the robots' positive impact, while others are skeptical. This article tries to summarize both stands to come up with some conclusions and recommendations.

### 1.2. Structure of the study

This is a literature review paper. The study is conducted by analyzing some previous papers that have done by other researchers.

The paper focuses on critical analysis of the advantages and disadvantages of robots for governments, organizations and individuals.

### 1.3. Methodology

This research is conducted using quantitative method to collect data from many sources including journals, websites, books and other publications. Some of the information explained by graphs that are designed to enhance the readers' understanding of how the robots have become a critical part of how humans do business and spend their life.

### 1.4. Research questions

This paper intends to answer the following questions:

- Can robots be the key to ultimate freedom from work that humans find dull or dangerous?
- Are robots going to take over our jobs or enhance them?
- How governments, organizations and individuals can benefit from robots?
- What are the advantages and disadvantages of robots?

## 2. Discussions

### 2.1. Can robots be the key to ultimate freedom from work humans find dull or dangerous?

Recently, the rate of using robots by individuals in their daily activities is increasing rapidly. Robots have become a crucial part of our daily life. Different people utilize them in different ways. Some of those ways include doing things previously done by human beings. In doing so, robots are said to make people's life easier and help people in their daily life inside the house and outside of it. For example, washing machines and dishwashers are two robots that make people's life much easier. These two robots are considered the most popular robots used by individuals (Forlizzi, 2007). Another example is Toyota Motor Corporation's robot, a 155-centimeter-tall robot that weights 130 Kg, can move around and has the ability to distinguish between different objectives with a full sense of recognition. It is a robot that can help individuals in their daily life too (Siciliano & Khatib, 2008). RIBA is another example. It is a semi-autonomous nurse robot that provides therapy and is of a great help in caring for disabled people and elderlies with various tasks, while in the past disabled people might have been suffering due to lack of the services that robot technologies like RIBA is providing. RBIA is the second generation of robots invented by Collaboration Center for Human-Interactive Robot Research. These robots have all replaced human beings in doing things that are considered dangerous or simply uninteresting.

### 2.2. Are robots going to take over our jobs?

In the past and the present, some of the jobs such as colour and manufacturing jobs are replaced by robots. On one hand, (Smith & Anderson, AI, Robotics, and the Future of Jobs, 2014) assume that by 2025 robots will take most of our jobs. Then, it could lead to social crises. Similarly, Robert Cannon (2014), an internet law and policy expert, predicts, "everything that can be automated w\*ill be automated. Non-skilled jobs lacking in 'human contribution' will be replaced by automation when the economics are favourable"

(Mauldin, 2014). However, The International Federation of Robotics (IFR) who is an advocacy group for robotics argues that robotics will create between 1.9 million and 3.5 million jobs globally by 2020 (McNeal, 2013). In what follows, both sides of this argument are illustrated in detail.

### **2.2.1. Argument one: Robot technology has been a job creator**

International federation of Robotics IFR (2017) believes that "robots increase productivity and competitiveness. Used effectively, they enable companies to become or remain competitive". Robots are important for small and medium-sized businesses that are the backbone of both developed and developing country economies. Also, robotics enables large companies to increase their competitiveness through faster product development and delivery (International Federation of Robotics, 2017).

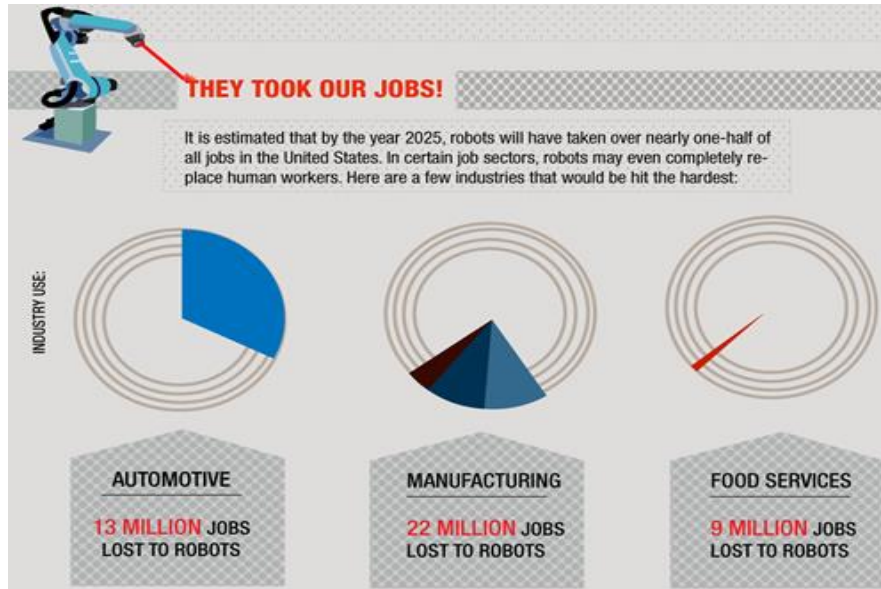
Authors in favor of the robots' positive impact on jobs seem to argue that robots might replace humans in some jobs, but they will create more jobs than they destroy. Smith and Anderson (2014) claim that the job opportunity will increase more than ever due to robot technology. Similarly, many robot expertise argues that robots will become more and more advanced in the future, but still "human hand" will have a great role in finishing tasks that cannot be done by robots alone. For example, airplanes cannot do without pilots and not all self-driving cars can be totally unmanned, as the robots have limitation in their logical abilities (Smith & Anderson, AI, Robotics, and the Future of Jobs, 2014) and human's ability to detect unexpected circumstances and take action overriding automatic driving will be always needed (Grothaus, 2017).

Moreover, there is no shortage of evidence arguing that robots add to the already existing jobs. Vint Cerf, the vice president and chief internet evangelist for Google, says that in the past robots have created more jobs than they terminated (Maan, 2013). Therefore, people shouldn't necessarily think about job replacement, but about the change robots have brought about; as "technology will continue to disrupt jobs, but more jobs seem likely to be created." It is assumed that robot technology will create between 1.9 million jobs

globally by 2020 (International Federation of Robotics, 2017). IFR also mentions that three to five million jobs would not exist if the robot technology had not been developed. Moreover, IFR also indicates that currently 300,000 people are working in the robot industry and an additional 45,000 workers will be demanded by the same industry in the next five years (International Federation of Robotics, 2017).

### **2.2.2. Argument two: robots will have a negative impact on jobs**

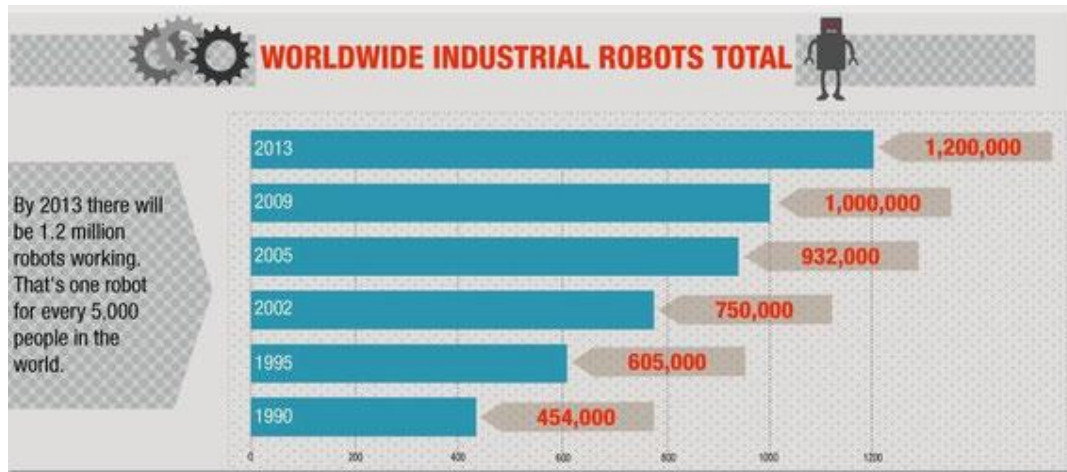
Like the authors who write in favor of robots, there are others who believe that robots have a negative impact on the jobs available. For instance, Geoff Livingston, author and president of Tenacity5 Media, wrote a research and predicted that in 2025 many jobs will be replaced by machines (Smith & Anderson, 2017). Also, the same research by the Pew Research Center conducted a research in 2013, in which 1900 scientists participated and 48 percent of them claimed the likelihood of people losing their jobs due to robot technology. The jobs under this threat are many. For example, pilots might be the first ones to get downsized, as they are very expensive and the job is already highly automated. Accounting jobs are also at risk, leading to hundreds of accountants being out of jobs (Maan, 2013). Likewise, research says that robots might even replace surgeons in the future and the robots have already started to play a vital role in this important sector (Pinkerton, 2014).



**Figure 1. World Robotic Report 2010, 2009, 2008, “Robotic Nation” by Marshall Brain, IEEE Spectrum**

Further, according to the above infographic 13 million jobs in the automation sector will be replaced by robots in 2025 and in the manufacturing sector, 22 million jobs will be missed as well (Brain, 2014). Similarly, in the food industries, humans are likely to lose 9 million jobs to the robots. The figure also indicates that in 2025, the robot will have taken over one –half of all jobs in the United States. To sum it up, there are enough scholars who think of robots as a threat to the existing jobs. They indicate that the number of the jobs at the mercy of robotization is tremendous. On contrary, many believe that robotization can have a positive impact on the number of jobs through their positive contribution and job creation. So, while robots take over some of the jobs previously done by human labor, it is safe to assume that they create enough jobs to balance it out. So, their effect on the job market is more of a disruptive change than a takeover.

### 2.3. How governments, organizations and individuals can benefit from using robots?



**Figure 2. World Robotic Report 2010, 2009, 2008, “Robotic Nation” by Marshall Brain, IEEE Spectrum**

The number of robots at work is only getting bigger. Figure 2 shows the number of robots used in manufacturing and other industries between 1990 to 2013 in different countries. In 1990 only 454,000 robots operated in the world. Yet, the number of robots increased rapidly for 605,000 in five-year's time. Moreover, in 2009 one million robots were operating in the United States. The figure also shows that by 2013 there will be 1.2 million robots working in the majority of sectors. Furthermore, Joe Gemma (2017) predicts that there will be 1.7 million new robots to transform the world's factories by 2020; as the requests from all customer industries are on the rise (International Federation of Robotics, 2017). Brain, M (2010) found that using robot machines increase progressively and there will be one robot for every 5,000 thousand people. Based on the summarization of the figure two, the rate of the robots increased from 454,000 to 1,200,000. Researchers and practitioners assume that this movement has many job implications and it increases the job opportunity and the risk of unemployment as well.

Currently, innovative technology allows states to use programmable robots inside hospitals to offer many benefits for both doctors and the patients. Giri, S., and Sarkar, D., K (2012) found that that robot-assisted surgery appears comparable to traditional surgery in terms



of feasibility and outcomes but that costs associated with robot-assisted surgery are higher because of longer operating times and expense of equipment. "While a limited number of studies on the da Vinci robotic system have proven the benefit of this approach in regard to patient outcomes, including significantly reduced blood loss, lower percentage of postoperative complications, and shorter hospital stays, there are mechanical and institutional risks that must be more fully addressed. Robotic assistance will remain an intensively discussed subject since clinical benefits for most procedures have not yet been proven. While the benefit still remains open to discussion, robotic systems are spreading and are available worldwide in tertiary centers." (Giri, S., and Sarkar, D., K, 2012).

Figure three indicates that the number of the robotics surgical procedures in 2000-2012. In 2000, was only 100,000 thousand robots used while this number has been increased dramatically. For example, in 2012, the number of surgery robot increased to 500,000 thousand robots around the world.

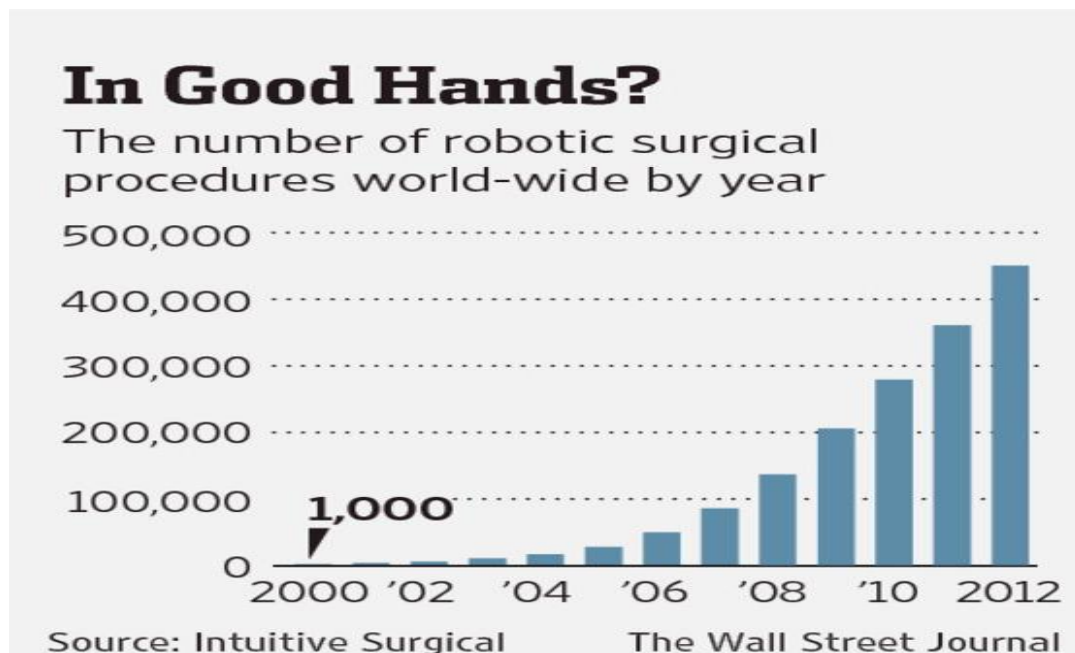


Figure 3. Number of robotic surgeries worldwide

**2.4. What are the advantages and disadvantages of robots?****2.4.1 The advantages of robots**

Machines have several advantages over manpower. The first advantage is their ability to work more efficiently, leading to lower cost of productions (Garcia, Jimenez, Santos, & Armada, 2007). Robots lower production cost due to their ability to work continuously without getting tired. Also, the industrial manufacturing robots are not paid by the hour. The only major operational cost that robots have seems to be their maintenance only (West, 2015). As a result, return on investment will increase rapidly, adding to a company's financial bottom-line. A company's effective use of robots can also be a competitive advantage over their rivals (West, 2015). As such, market competition is another reason for companies to use robots in their manufacturing activities.

Besides, robots tend to be even more effective than humans and they are programmable. That makes them less prone to making mistakes. For instance, "the microsurgery robot used to repair blood vessels or nerve fibers can perform without shaking and is five times more precise than the human hand, where before only a select few humans could do the same task" (Taylor et al., 2009). Robots can also achieve identical results time after time, while if a company sets ten employees to do a job, they might get different results every time they do the task. However, there are some serious contra arguments. Critics say that generally robotic surgeries are safe, but if the robots don't have proper training, they can cause inadvertent injury. The cost of the robotic operation is a limitation (Garcia, Jimenez, Santos, & Armada, 2007) as Pinkerton (2014) argues that most patients cannot bear these costs unless supported by the government. Yet, all of this is bound to change in the future. Corruption and financial manipulation reduce due to using robot machines instead of the human capacity ( Khdir, 2016)

### 2.4.2 Disadvantages of robots

Naturally, using robots have disadvantages too. Robots can lead to social as well as economical drawbacks among other problems. Some of these social disadvantages are explained hereinafter.

Beyond the disputable argument of whether robots increase unemployment, there is the argument of robots having a negative impact on the family structure. It is said that they can increase social issues such as divorce. Families will live under the financial burden and other problems such as job dissatisfactions that pressure people to separate from their family (Smith & Duggan, 2013). Further, robots can lead to increased inequality between individuals and higher crime rates, Hagan and Peterson (1995) argue in their book Crime and Inequality.

Robots can also weaken the social ties between relatives and friends. In general, fast-moving technology has an impact on almost all people everywhere and are making individuals more disconnected. For example, many relatives working in the same company or business or industry when replaced by robots they will tend not to stay in touch as often.

Finally, robots can even hurt our education systems. Education, which is an important sector in every society, will face a huge problem; if too many universities decide to use robots to run classes. This probable action can cause reduced learning effectiveness, as robots cannot interact with students the same way as human lecturers can. Furthermore, the ease of depending on robots for almost all necessary tasks can demotivate students to a great deal. For example, students may think if robots become any smarter, they will need not to learn anymore, because robots will do every job.

### 3. Conclusion

To sum everything up, this article showed that robots are programmable physical machines that provide humans with unique services. Robots were originated to help humanity in their daily activities and have been advancing significantly ever since.

On one hand, some people believe robots will replace human beings in the workplace leading to a high rate of unemployment. On

the other hand, there is the argument of robots being job creators instead.

This article has covered both sides of this argument and concluded that robots' role in the job market is more about changing job structure than destroying them. Beyond that, robots have been found to enhance our jobs. Leading to various organizations utilizing their existence.

Robots provided a comprehensive support for organizations by cutting costs, increasing productivity and more reliable operations. Also, they help the states in military operations, drug discovery, medical sectors and variety of other services such as road mapping and securities. Further, advancing robot technologies has made individual's life easier in many ways, both inside the house and outside of it. However, robots have been found to have a negative impact on our social structures too. They are thought, by many scholars, to promote inequality, increase the rate of crimes and lead to divorce and dissonance between friends and relatives. As robots are not yet able to make the optimal judgment, many are also skeptical about their decision-making capabilities.

#### 4. Recommendations

Based on the critical analysis of several articles and other publications, concerned organizations have to take many actions for the future of robots, including the following.

Firstly, one of the current major issues of robots is their inability to think logically and ethically. Therefore, it is recommended that government should have clear policies and procedures that make users of robots liable for their robot's actions.

Secondly, one of the things that more people are concerned about is replacing jobs by robots. Smith (2014) argues that robots cannot replace the humans who have proper educational backgrounds. Based on Smith's view, educational programs should undergo a major change to accommodate those threats. One such change should be training students to be more competitive and poses a variety of skills and encouraging them to take specializations in areas that are hard to be done by robots. For example, if people

study engineering, robots will not replace them, but they actually need them, as robots need engineering specialists to update and change software for instance. The same recommendation is true for every individual's efforts in personal development.

Also, Organizations should feel responsible for the future of jobs and use more human hand in their operations. It's recommended that organizations use more human workers instead of robots, but some tasks should be done by robots such as dull, dirty and dangerous work in the manufacturing and services. Finally, individuals, companies and even governments should pay a great attention to the use of robots for good purposes.

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