‘What advances in robotics and artificial intelligence could impact on youth employment in South Africa?’

Contents

Introduction

Robotics and artificial intelligence are two topics that have generated consistent interest in the last few years. From Google's self-driving cars to apocalyptic predictions about unemployment they have been a constant presence in media outlets as well as in the public imagination.

South Africa as a country is facing increasing discontent from its youth. This can clearly be seen through the increasing discontent at the universities. From #FeesMustFall to #ZumaMustFall there is no lack of discontent from the youth in South Africa. However, these movements only display the youth that are lucky enough to attain the financial support to attend university. The vast majority are either unemployed or doing manual and semiskilled labour. As of 2010, the youth population (according to the broad definition of 15-34 years of age) was 18 825 743. Of these, 5 660 214 were employed, 3 154 935 were unemployed, 1 407 895 were discouraged jobseekers and 8 602 699 were not economically active (Meyer, 2011). These statistics show a dismal situation for the youth employment in the country and therefore, the country's economic future.

Several advances will make these two topics increasingly relevant to each other as youth employment is likely to become increasingly susceptible to automation. Paradoxically, through education and "human capital" policies youth stand to gain the most economically in this new economic age, the fourth industrial revolution.

The relationship between robotics/artificial intelligence and youth employment

Youth employment is accepted as a good measurement of economic activity. In a study of youth employment in New York, Thomas Bailey and Roger Waldinger stated: "That youth employment is highly sensitive to the overall level of economic activity is one of the few generally accepted findings in the massive corpus of research on youth." (Waldinger & Thomas, 1985) Furthermore, the paper put emphasis on the fact that youth employment is a necessary stepping stone to the transition into the world of work. Youth gained valuable experience from the adults around them in their initial employment environments.

Unfortunately, youth employment is generally unskilled and easy to automate. Simple tasks that have traditionally been performed by teenagers are now automated or have been replaced by technology that is too complex for relatively unskilled youth to perform. This trend is worrying as it does not give youth an opportunity to be exposed to the employment environment.

Advances in robotics and artificial intelligence

Artificial intelligence

Artificial intelligence has undergone significant advances in recent years. Many of its sub-disciplines including but not limited to: Machine learning, machine vision, computational statistic and Data mining (Oxford Martin School; Citi Bank, 2016). The advances are allowing an increasing number of non-routine tasks to become automatable by dividing them into well-defined problems (Oxford Martin School; Citi Bank, 2016).

The increasing capabilities of artificial intelligence are making software increasingly adept at automating knowledge-based jobs in the service sector of the economy.

Sensors and big data

The quality, precision and the variety of sensors deployed in robotics is increasing systematically. In conjunction with this trend the cost of these sensors, the mainstay of robotics, is decreasing. According to the BCG, the prices of the software and hardware deployed in robots deployed in manufacturing will decrease by 20% in the next decade and the performance of these robots will increase by about 5% year-on-year in the same period (Sirkin, Zinser, & Rose, 2015).

The increase in the quantity and quality of sensors being deployed in robotics, particularly in non-routine roles, has resulted in an exponential increase in the amount of data being collected. The term for the large amount of data being collected and the interpretation of this data is “big data”. The increasing prevalence of this data will allow, “Engineers to overcome a wide range of engineering bottlenecks that have hindered robotic development in the past.” (Oxford Martin School; Citi Bank, 2016)

The possibilities for the use of robotics in non-routine manual tasks are increasing because of the increasing availability of more adept sensors. Baxter is an example of such a robot. Designed by Rethink Robotics, Baxter makes use of advanced sensors and manipulators (which give the robot’s arm seven degrees of freedom). (Oxford Martin School; Citi Bank, 2016) A robot such as this, with two arms and programmed through movement, is adept at numerous tasks previously thought to be too difficult for robots.

“Big data” is not merely an enabler for the development of robots involved in automation but in the automation of knowledge based jobs in the service economy. The development of several subfields of artificial intelligence such as machine-learning has enabled for non-routine tasks to be divided into well-defined problems that are susceptible to automation. For example, Work Fusion is a company that develops software that breaks up work into simple defined tasks and then sells the remainder of the work that is too difficult to automate to an online crowdsourcing program were it is completed by free-lancers. After a period of time the software “learns” how to complete the task on its own, thereby making humans redundant in that particular task (Oxford Martin School; Citi Bank, 2016).

The proliferation of more adept and cheaper sensors has thus increased the amount of data automotive processes, robotic or otherwise, make use of and the program used to interpret this “big data” has improved. Running parallel to this advancement in physical automation is the systematic improvement in the ability of software to replace knowledge based work in the service economy.

The adoption and subsequent benefits of the increasing advancement and lowering prices of robotics and artificial intelligence will be concentrated in large corporates and in developed countries unless local initiatives take advantage of these advances.

Industrial robotics

The capabilities of industrial robots have been enhanced through advancements in sensors in big data. However, the increasing accuracy and dexterity of robotics, as well as the decreasing costs of production as the economies of scale are achieved are also allow for industrial robots to be increasingly cost effective in both replacing and complementing human labour in industry.

Low cost robotics and computers

Robotics systems that are traditionally employed in factories such as robotic arms typically involve huge capital expenditure. This makes such systems unfeasible for small scale local deployment in a developing country such as South Africa. However, recent advances in open source software and hardware and the reducing cost of such hardware have made the access to this technology possible. In other developing countries this is being put to good use. For example, in Sri Lanka low cost demining robotics are being developed in order to remove mines from the civil war and to open up the agricultural land to the north (Bernardine, Ayokor, & Nanayakkara, 2005). While this is an isolated example, low cost robotics could be implemented in many societal niches such as this. For example, in South Africa low cost robotic arms could be used to aid local, small scale, manufacturers in delicate parts of the manufacturing process.

The technology for this kind of robotics has already been developed. Companies such as Arduino and Raspberry Pi are already making electronics that can be used to make relatively high quality robotics for a fraction of the cost of a traditional robotics. The decreasing cost of several integral components on robots such as such servo motors and sensors have enabled robotics to become financially and technically accessible.

The innovative use and deployment of such robotics could provide a valuable resource to many companies seeking to be both competitive and innovative.

Conclusion

For the purpose of the essay the technological advances will be separated into two categories of influence on youth employment: positive and negative.

Positive influences

The positive influences on youth employment in South Africa that originate from advances in robotics and artificial intelligence are likely to be “grassroots” entrepreneurship and skills development that arises from the decreasing cost of electronics and the increasingly availability of online education.

The development of innovative, locally relevant, technologies that have a commercial application will be crucial in creating employment opportunities. Hence, the increasing availability and development of low cost robotic systems, and sensors, and software that automates simple processes will be positive influences on youth employment. Such advancements will allow local entrepreneurship to flourish, if they are complemented with effective human capital policies.

Negative influences

The negative influences on youth employment that will arise from the continuous advance of robotics and artificial intelligence will stem from the concentration of the economic power of the advances into the hands of large companies. The main use of robotics in large companies is to replace human labour and increase efficiency and productivity. Hence, the advance of robotics in large companies is unlikely to result in advances in unemployment as these innovations and economic gains will be concentrated in the hands of the few.

Therefore, the high level advancements in robotics and artificial intelligence such as big data and machine learning make many jobs, usually filled by youth, susceptible to automation. Such jobs include repetitive manual tasks and basic knowledge-based tasks.

Pre-emptive measures to improve youth employment and economic growth in South Africa

With the current position of youth in South Africa, the introduction of automation and robotics is likely to have a large negative effect upon employment. However, with the development of the correct human capital policies, automation and robotics could have net positive effect on youth employment. There will certainly be a short term loss of jobs as the process of creative destruction occurs. However, if the industries surrounding automation and robotics are significantly developed in South Africa then these industries could be a large source of youth unemployment. In order to do this tertiary institutions need to implement courses that promote skills in the areas of automation and robotics and furthermore encourage entrepreneurship. Finally, vocational training at FETs throughout South Africa needs to be improved and expanded in order to improve and expand the local robotics industry in South Africa.

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