# Skills within the Built Environment: The 4th Industrial Revolution

F

architecture engineering andscape architecture & construction management property valuation guantity surveving

Mokgema Mongane: Chief Operations Officer (COO) at CBE 07 February 2019

#### ABOUT 4 000 YEARS AGO





### **REQUISITE CONSTRUCTION SKILLS THEN**



Measuring



#### **Setting Block in Place**



# **EVOLUTION OF SKILLS (INDUSTRIAL REVOLUTIONS)**

Over the years, with the emergence of the subsequent Industrial Revolutions certain skills have become obsolete and have been replaced by machines





Automation and mass production have had an enormous impact

on many jobs and skills

# THE 1<sup>ST</sup> INDUSTRIAL REVOLUTION

- In the 18<sup>th</sup> century (1700s), we had the invention of the STEAM ENGINE AND HYDRO POWER which ignited a industrial revolution, we could then use this new technology in machines to perform jobs faster and grander thus beginning Automation and Mass Production (certain jobs thus became obsolete).
- Eg. Steam boats, Steam Trains, Steam Sewing Machines, (Mechanization and Automation)







## THE 2<sup>ND</sup> INDUSTRIAL REVOLUTION

- Later in the late 19<sup>th</sup> century (1800s) and beginning of the 20<sup>th</sup> century (1900s), we had the invention of ELECTRICITY, this too ignited a industrial revolution, we could then use this new technology in machines to perform jobs quicker and grander thus advancing Automation and Mass Production (additional jobs thus became obsolete).
- Eg. Mass Production, Assembly Lines, Everything was now powered by electricity







# THE 3<sup>RD</sup> INDUSTRIAL REVOLUTION

- During the 1970s, we had the invention of the computers and electronics, this too ignited a industrial revolution (the 3<sup>rd</sup> Industrial Revolution), we could then use this new technology in machines to perform jobs quicker and grander thus advancing Automation and Mass Production (additional jobs thus became obsolete).
- Eg. Calculators, Word Processing, Automation etc.









### THE 4<sup>TH</sup> INDUSTRIAL REVOLUTION

- We are now at the dawn of the 4<sup>th</sup> Industrial Revolution (4IR) (Cyber Physical Systems)
- A. Advancements in Computing Power
  - Artificial Intelligence (AI) and Machine Learning (ML)
  - Quantum Computing
  - Cloud Computing

#### • B. Advancements in Digital World

- Virtual Reality & Augmented Reality
- Block Chains
- The Internet of things

#### C. Advancements in Bio and Material Hacking

- Gene Editing / Synthetic Biology
- Nanotechnology / Material Hacking
- 3D Printing
- Which jobs are next in line to become obsolete, to be replaced by machines?









### ARE OUR JOBS AS PROFESSIONAL SAVE???

Construction & Project Managers

Landscape Architects

Property Valuers



Engineers



Quantity Surveyors

As professionals within the Built Environment, we may image that our skills are way too complex thus machines will never replace



us

#### **MACHINE LEARNING**





Machine Learnings has already become so advanced that it is now able to learn and master complex tasks, becoming significantly better than humans (as seen with AlphaGo)

#### **ALPHAGO VIDEO**









## **TRADITINAL PROGRAMMING VS MACHINE LEARNING**

#### **Traditional Programming**



#### **Machine Learning**



- Observes many examples and deduced rules by itself
- Used neural networks which are based on the fundamental operations of a human brain



 Example: Recognition of Cats vs Dogs



## WILL PROFESSIONAL BE REPLACED

- **HYPOTHESES 1**: Just as machines replaced labourers during the previous three industrial revolutions, during the 4<sup>th</sup> Industrial Revolution, machines will now replace professionals!
- HOW: Through Machine Learning, machines will observe numerous constructions projects perhaps through an augmented reality platform, they will then deduce all equations, methods, techniques, tactics, policies, regulations within the built environment by themselves (can also mine additional information from the cloud)
- Machine will be able to:
  - Design the structural aspects of infrastructure better than any Engineer (Machine Learning, Quantum Computing, Augmented Reality)
  - Design the aesthetic aspects of buildings better than any Architect professional (Machine Learning, Augmented Reality)
  - Design the landscape of buildings better than any Land Scape Architects (Machine Learning, Augmented Reality)
  - Manage and construct infrastructure projects better than any (Machine Learning, 3D Printing, Drones, Robotics) Construction and Project
    Managers
  - Estimate the cost of infrastructure projects better than any **Quantity Surveyor** (Machine Learning, Block Chains, Cloud)
  - Evaluate the said property better than any **Property Valuers** (Machine Learning, Block Chains, Cloud, GPS)



## WILL WE ALL LOSE OUR JOBS???

- The population of the world is 7.7 billion, and about 70% of people in the world are working and this gives a staggering figure of about 5 billion jobs in the world.
- [More people working on earth today that ever before in the history of mankind (more than before 1st, 2<sup>nd</sup> and 3<sup>rd</sup> IR)]
- But how is that possible if the industrial revolutions rendered certain jobs obsolete
- Industrial revolutions rendered certain jobs obsolete but they also introduced new industries with more job opportunities
- So we must skill and reskill on a continuous basis.
- What we need are individuals with a high level cognitive ability to learn and relearn on a continuous basis





### WILL PROFESSIONAL BE REPLACED

- **HYPOTHESES 2**: The 4<sup>th</sup> Industrial Revolution will not necessarily replace professionals howerver professionals who embrace it will **become much much more productive!**
- **HOW**: Professionals will use Machine Learning for various core tasks while overseeing and directing the activities to achieve work of the highest quality in unprecedented quicker timeframes.





#### **CBE'S APPROACH TO LEAD SA INTO THE 4ID**

Conduct research into the impact of the 4IR on <u>skills</u> and job creations

Incorporate the 4IR into the curriculum of academic Institutions (Accreditations of Programmes)

Incorporate the 4IR into the Continuous Professional Development (CPD) and stop regurgitating what we already know





# WITH A CLEAR STRATEGY IN MIND

# (4IR)

# THE 4<sup>TH</sup> INDUSTRAIL REVOLUTION

# LET US FACE

#### THE END



