

Industry 4.0 Manufacturing Technologies.

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Assignment 1 Written Report

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Summary

The term “Industry 4.0” was first introduced in 2011 (Springer, 2019). Businesses, manufacturing operating within this current fourth industrial revolution today as opposed the first industrial revolution, simplistically put would be like comparing a horse and cart to a Ferrari Tesdarossa. Industry 4.0 is an immergence of collective innovation and technology constantly accelerating. Whether intentionally or not and in many cases business are utilising Industry 4.0 on literally and an hourly basis or more probably minute by minute.

A simple task, such as increasing or decreasing the temperature in the home. Today with the gesture of a finger-tip on a device referred to as a mobile phone (which is a massive understatement) or spoken command, can release an unbroken chain of IoT (Internet of Things) events to carry out the task, that if explained fully and in depth would equate to library full of books. The overall extent and depth of IIoT (Industrial Internet of Things) is breath taking and a phenomenal extent covering all aspects of; banking, sales, procurement, logistics, manufacturing, medical, security, design, research and development and many more. It would be true to say that any activity done during a normal day utilises and in the acts IIoT. How all this comes together and interacts is clearly documented by the likes of; (Gilchrist, 2016), (Goldratt, 2012), (Marshal, Larry, 2016), (Schwab, 2016) and (Stallings, 2016).

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Introduction

Socially over the last 30 plus years, the internet has been with us, for many, it is now a life-blood. From its humble beginnings in the 1990's to where it is today its incomparable. During these early formative years for most it was dial up access, slow, clunky and limited in just about every way, yet it was a marvelous thing of wonder and awe. Stories of what was to come, visions and speculation of its potential whereby large taken with a pinch of salt.

However, now today, how and the pace at which it transforms is apparently limited only by imagination. Whether, shopping, travelling, entertaining, socially interacting or working it is virtually impossible to escape technology. Without doubt almost everything, touched, seen or heard is interconnected to labyrinth communication channels, hardwired or by wireless means.

Is it business commerce, retail, manufacturing or society driving the trend? Probably all of them, unquestionably they are in one form or another or to a lesser or greater degree. Now, in what is called 'Industry 4.0'. To quote Daniel Burrus "The general definition of Industry 4.0 is the rise of digital industrial technology... Industry 4.0 transformations allow us to work alongside machines in new, highly productive ways".

What exactly is this new wonderful industry 4.0?

Industry4.0

There are currently nine technology aspects or pillars that form Industry 4.0. The digital and physical attributes are linked by innovations, enabling autonomous and smart systems. Industry 4.0 comes to the fore and demonstrates its power when manufacturing, technology and people come together. These nine elements collective gather under the heading of the ‘Industrial Internet of Things’

The following identify and categorise the ‘**Industrial Internet of Things**’.

- i) **Big data and Artificial Intelligence analytics.** Data is collected from many varied sources, devices, equipment, software and computer systems. This data in turn is analysed artificially intelligence and learning applied to the data in real time to improve decision making in research & development, asset & logistic management, supply chain or purchasing.
- ii) **Horizontal and vertical integration.** Horizontal, the production areas either singular or multiple and the supply chain. Vertical is where all the layers of a business are linked and data transfers seamlessly from top to bottom and back, such as quality, design, engineering, industrialisation and any other departments, freely sharing data and knowledge.
- iii) **Cloud computing.** This gives business the means to the end for innovation, cost efficiencies, storage, speed are just a few of the elements for enabling; the internet of things, machine learning, artificial intelligence
- iv) **Augmented reality.** Is a game changer for training, technical support, maintenance, servicing and is still an emerging technology. This is the use of mobile device visualisation of smart glasses that allows the wearer to

see real time digital data and/or information overlaid on the physical thing when being looked at, instruction, guidance, model overlay and more.

- v) **Industrial Internet of Things (IIoT).** Also sometimes referred to as the Internet of Things. These are the physical things, machines, devices, robots, equipment sensors (providing real time data). These help to run product more smoothly, modify or design parts rapidly, reduce or prevent equipment downtime, track inventory and many other functions.
- vi) **Additive manufacturing 3D printing.** This technology allows for many types of media to be printed, plastics; soft or rigid, silicones and metals. While able to produce extremely complex components that would be impossible to make conventionally, currently it is a lengthy process. While there are cost benefits to be gained, it does not lend itself at present even to cost effective low volume production but will surely change as technology progresses.
- vii) **Autonomous robots.** Not strictly something new. Nevertheless, with the additional connectivity with new modern technology, cameras, laser positioning, sensors, machine learning and co-bots (human movement taught). These can now conduct far more complex and delicate tasks being equipped with artificial intelligence and state of the art software.
- viii) **Simulation/Digital twins.** This is a digital model twin of an actual piece of equipment or machine etc. It allows virtual simulation of real equipment, machine, product and process that can be analysed giving accurate data for improvement or correction prior to actual real manufacture.

- ix) **Cyber security.** The greater the innovation, the greater the development and thus the greater demand for connectivity and exchange of big data, the greater the risk of threat to cyber-attack, compromise of critical data or production processes. Innovations such as blockchain a smart encryption system that grows and sequentially re-encrypt, allow businesses to automate detection of potential threats from cyber-attack, reducing risk of data theft or escape of data exchange through networks.

Conclusion.

It cannot be denied, where technology stands today within business is unprecedented. There are significant gains that can be made from the **Benefits of Industry 4.0**.

- i) **People**, irrespective as to how fast or great technology such as artificial intelligence, data from sensors, wearables or augmented reality, progress or becomes, these are technology enablers the key is to ensure that people are empowered make quick informed decisions and deal with problems as they arise.
- ii) **Factories**. Highly developed digital production environments make full use of the elements identified in the previous section, fully employing 4.0 manufacturing, enable businesses to run factories that can produce efficiently and cost effectively deliver a vast varied array of parts are also known as smart factories or Factory 4.0.
- iii) **Assets**. It is almost certain, that any piece of equipment bought in this current era will be intelligent assets with sensors, IoT feedback devices and such providing data that enables predictive maintenance, equipment status, production output or changes, allowing equipment to be monitored assessed and controlled in real time 24 hours a day from anywhere in the world and conduct changes or adjustments seamlessly.
- iv) **Products**. Even these can be accessed, monitored, assessed, manipulated or updated as in (iii above).

These are just some examples of the capabilities and benefits afforded from today's technologies.

Recommendations.

- 1) Before embarking on changes or commencement of a digital transformation for Industry 4.0. implement thorough extensive lean activities across all aspects of the business.
- 2) The process as it stands today is not always completely relevant to the requirement and may oppose the principles of 'Industry 4.0'.
- 3) Fully understand processes and procedures for the business that allows for non-restrictive manufacture of a product or products. Ensure that all blockers are identify that exist in the process currently in use and removed.
- 4) Fully identify exactly what critical data requirements and pathways are for the business needs are required. Verify processes and procedures for the business, re-check to ensure everything present is exact and correct with, invoke amendments and add them, update accordingly.
- 5) Manage the change; include people, processes and procedure. This will ensure that robust, streamlined, lean processes and procedures applicable to the requirement developed and put in place.
- 6) Validate, monitor, check and review the changes made and adjust or redefine accordingly until everything functions seamlessly.

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