

ENGINEERING SOCIETY

DJJ 40132

Volume 1

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ABSTRACT

This e-book is successfully prepared in which it explores the latest syllabus content of DJJ40132 Engineering Society from the Mechanical Department of Polytechnic and Community College Education, Ministry of Higher Education.

In this version, the e-book covers two chapters out of four chapters that have been designed in Engineering Society syllabus. Chapter 1 Introduction to Engineering in Society will cover the fundamentals of engineering in society such as relationship, history, responsibilities, and challenges in engineering. Whereas Chapter 2 Engineering Challenge in Globalization comprises engineers' roles in Industrial Revolution 4.0 and solving the challenge of globalization and the new economy.

This e-book includes a well-organized feature that will expedite the learning process. These learning aids include illustrations to visualize what is being presented; notes and mind maps; end of chapter questions and problems, solutions to selected problems to help in self-assessment.



ACKNOWLEDGEMENTS

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01

Introduction to Engineering in Society



CONTENTS CHAPTER 1

This chapter consist eight topic :

1.1 Introduction to Engineering in Society

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Engineer Definition
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1.4 Social, Economic and Industrial Development Issues in Malaysia

1.5 History of Engineering

1.6 Engineering as an Indicator of Development

1.7 Engineer Responsibility to Organization

1.8 Engineer's Challenges in an Organization

1.1 Introduction to Engineering in Society

Engineering is a discipline that applies scientific and mathematical principles to design, develop, and improve products, processes, and systems. It is a vital field that drives progress and innovation in every aspect of society, from transportation to communication to medicine. However, engineering does not exist in a vacuum. It is intrinsically tied to society and the broader context in which it operates. This relationship between engineering and society is complex and dynamic, with each influencing and shaping the other in various ways.

The impact of engineering on society is immense. Engineers are responsible for designing and building the infrastructure and technologies that support modern life. They create everything from buildings and bridges to cars and airplanes, from computers and smartphones to medical equipment and renewable energy sources. The work of engineers is essential to the functioning of our society, and their innovations have transformed the world in countless ways.

However, engineering is not without its downsides. The products and systems designed by engineers can have unintended consequences and negative impacts on society. For example, the proliferation of automobiles has revolutionized transportation, but it has also led to congestion, air pollution, and a dependence on fossil fuels. Similarly, the widespread adoption of technology has improved communication and productivity but has also led to concerns about privacy and the impact on mental health.

Engineering also has social implications. Engineers must consider the needs and values of society when designing products and systems. They must consider the environmental impact of their designs, as well as the economic and cultural implications. For example, engineers developing renewable energy sources must consider their impact on local communities and the potential disruption to existing industries. They must also consider the economic and political factors that may influence the adoption of their technology.



Furthermore, the field of engineering itself is influenced by broader social and cultural trends. The demographics of the engineering workforce, for example, have historically been skewed towards white men. This has led to a lack of diversity in perspectives and ideas, which can limit innovation and creativity. Efforts to increase diversity in engineering, therefore, can have a significant impact on the field's ability to solve complex problems and drive progress.

In recent years, there has been a growing recognition of the importance of considering the social implications of engineering. This has led to the emergence of fields such as "engineering and society," which seek to explore the relationship between engineering and broader societal issues. Engineering and society courses typically cover topics such as the history and ethics of engineering, the social and cultural context of engineering, and the impact of engineering on society.

In conclusion, engineering and society are intimately intertwined. Engineering is essential to the functioning of society, but its products and systems can have both positive and negative impacts.



Engineers must consider the social implications of their designs and work to ensure that their innovations are sustainable and equitable. By recognizing the complex relationship between engineering and society, we can create a more thoughtful and responsible approach to innovation and progress.





Engineering DEFINITION

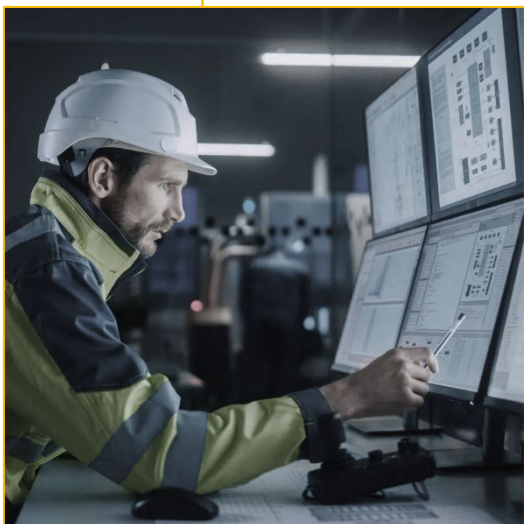
Engineering is the application of science, mathematics, and technology to design, develop, and create solutions to problems that are useful to society. It involves the use of analytical and creative thinking to solve complex problems and create new products, systems, and technologies.

Engineers use their knowledge of science and mathematics to analyze and solve problems, and their creativity to develop innovative solutions that meet the needs of society. Engineering encompasses a wide range of fields, including mechanical, electrical, civil, chemical, and biomedical engineering, among others.

“

The work of engineers has a significant impact on society, influencing the way we live, work, and interact with the world around us.

”



Engineer DEFINITION

An engineer is a professional who applies scientific, mathematical, and technical knowledge to design, develop, and maintain systems, structures, machines, devices, and processes. Engineers use their expertise to analyze and solve problems, and to develop innovative solutions to meet the needs of society.

They work in a wide range of fields, including mechanical, electrical, civil, chemical, and biomedical engineering, among others. Engineers are responsible for ensuring that their designs meet safety, quality, and regulatory standards, and for ensuring that their work is environmentally and socially responsible.

They often work in interdisciplinary teams, collaborating with other professionals such as scientists, technicians, and project managers to develop and implement complex projects. Engineers play a crucial role in shaping the world around us, and their work has a significant impact on society and the environment.



Society DEFINITION

Society refers to a group of individuals who share a common culture, beliefs, customs, and institutions, and who interact with one another in organized and structured ways.

A society can be a small group of people living in a rural community or a large group of people living in a metropolitan area. It can be characterized by various social, economic, and political factors, including social classes, cultural norms and values, institutions, and government.

Society is constantly evolving and changing, shaped by historical events, technological advancements, and other social and economic factors. It is a complex system of relationships, interactions, and structures that influence the lives of individuals and groups within it.

1.2 Relationship between Engineering & Society



Engineering and society are closely interconnected, with engineering having a significant impact on social, cultural, economic, and environmental aspects of society.

Engineering involves the application of science, mathematics, and technology to solve problems and create solutions that can benefit society. However, engineering decisions and outcomes are not made in a vacuum; they are shaped by social, cultural, and political factors that influence the design, development, and implementation of engineering projects.

One way in which engineering and society are interconnected is through the social context of engineering. The social context refers to the ways in which social, cultural, and political factors influence engineering decisions and outcomes. For example, the cultural values and beliefs of a society may influence the design of buildings or infrastructure, while political factors such as regulations and policies may impact the development of new technologies or the implementation of engineering projects.

Ethics is another important aspect of the relationship between engineering and society. Engineers have a responsibility to society and the environment and must consider the potential social and ethical implications of their work. This includes issues such as safety, environmental impact, and social justice. Ethical considerations are particularly important in fields such as biomedical engineering, where decisions made by engineers can have a significant impact on human health and wellbeing.



Sustainability is also a key area of concern in the relationship between engineering and society. Engineering plays a critical role in shaping the environment and addressing environmental challenges such as climate change, pollution, and resource depletion. Sustainable engineering practices aim to minimize the negative environmental impact of engineering while maximizing its positive contributions to society and the environment.

Technology and society are also closely interconnected, with engineering playing a key role in the development and implementation of new technologies. Technological advancements have transformed many aspects of modern society, from communication and transportation to healthcare and entertainment. However, technology can also have negative social and ethical implications, such as the potential for job displacement, privacy concerns, and the digital divide.

Innovation and entrepreneurship are also important aspects of the relationship between engineering and society. Innovation drives economic growth and social progress, and engineering plays a critical role in the development of new technologies, products, and services. However, the impact of innovation on society can be complex, and there are ethical and social implications to consider when developing new technologies or starting new ventures.

Overall, the relationship between engineering and society is multifaceted and complex. Engineers must consider the social, cultural, economic, and ethical implications of their work, and work towards creating solutions that benefit society as a whole. By exploring the relationship between engineering and society, engineers can develop a deeper understanding of the social and ethical implications of their work, and work towards creating more just and sustainable engineering solutions.



1.3 Engineering Development in Society

Engineering development plays a crucial role in shaping the progress of society. Over the years, engineering has contributed to significant advancements in various fields, including transportation, communication, medicine, and infrastructure. The following are examples of how engineering development has impacted society:



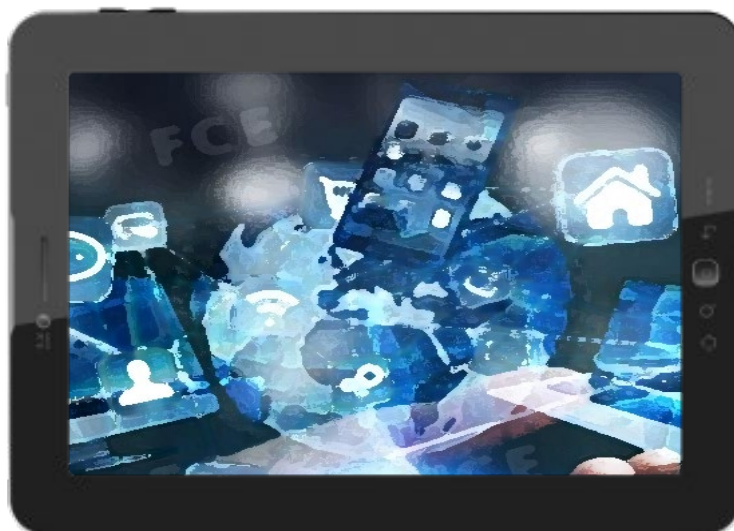
1. Transportation

The development of automobiles, airplanes, and trains has revolutionized transportation, making it faster, safer, and more efficient. Engineers have played a critical role in developing new technologies that improve transportation, such as electric and hybrid cars, high-speed trains, and autonomous vehicles.



2. Communication

Advances in communication technologies, such as the internet, cell phones, and satellite communication, have changed the way people interact and do business. Engineers have been at the forefront of these developments, developing new technologies that have made communication faster, cheaper, and more accessible to people all over the world.





3. Medicine

Engineering has played a significant role in the development of medical technologies that have improved healthcare outcomes. Engineers have developed medical devices such as MRI machines, pacemakers, and prosthetics, which have helped millions of people lead better lives.



3. Infrastructure

Engineers have been instrumental in developing the infrastructure that supports modern life, such as roads, bridges, airports, and buildings. They have also been at the forefront of developing renewable energy sources such as wind turbines and solar panels, which have the potential to transform the way we generate and use energy.

Overall, engineering development has transformed society in many ways, making life easier, safer, and more productive. As society continues to evolve and face new challenges, engineers will continue to play a critical role in developing new technologies and solutions to meet these challenges



1.4 Social, Economic and Industrial Development Issues in Malaysia



Malaysia is a developing country located in Southeast Asia, and has undergone significant social, economic, and industrial development over the past few decades. Here are some examples of the key issues and challenges in each of these areas:

Social Development:

- 1. Education:** Despite making significant strides in improving access to education, Malaysia still faces challenges in terms of quality and equity in its education system. There are significant disparities in access to education based on socio-economic status and geographic location.
- 2. Healthcare:** While Malaysia has a relatively robust healthcare system, there are still significant disparities in access to healthcare, particularly in rural areas. The country also faces challenges related to non-communicable diseases such as diabetes and heart disease.
- 2. Social inequality:** There are significant income disparities in Malaysia, with the wealthiest 20% of the population earning more than 50% of the country's income. This has led to significant disparities in access to resources and opportunities.

Economic Development:

- 1. Dependence on exports:** Malaysia has traditionally relied on exports of natural resources such as oil and gas, palm oil, and rubber. This has made the country vulnerable to fluctuations in global commodity prices.
- 2. Income inequality:** As noted above, there are significant income disparities in Malaysia, which has contributed to a widening wealth gap.
- 3. Economic diversification:** The government has recognized the need to diversify the economy and has implemented policies aimed at promoting the growth of high-tech industries such as biotechnology and information technology.

Industrial Development:

- 1. Environmental concerns:** Malaysia has experienced rapid industrialization over the past few decades, which has led to environmental degradation and pollution. The country has also faced criticism for its handling of hazardous waste and its lax environmental regulations.
- 2. Labor issues:** Malaysia has been criticized for its treatment of migrant workers, who make up a significant portion of the country's workforce. Migrants often work in low-paying and dangerous jobs and are subject to exploitation and abuse.
- 3. Technological development:** Malaysia has made significant investments in technology and innovation in recent years, but there are still challenges related to the development of a skilled workforce and the adoption of new technologies by industry.





1.5 History of Engineering

The history of engineering can be traced back to ancient times, when early civilizations developed systems for agriculture, transportation, and construction. Throughout the centuries, engineering has played a crucial role in the development of human society, from the building of ancient monuments and infrastructure to the development of modern technologies and industrial processes.

The earliest forms of engineering can be seen in the construction of ancient monuments and infrastructure, such as the pyramids of Egypt, the aqueducts of Rome, and the Great Wall of China. These impressive feats of engineering required advanced knowledge of mathematics, physics, and materials science, as well as the development of tools and techniques for measuring, cutting, and shaping stone and other materials.

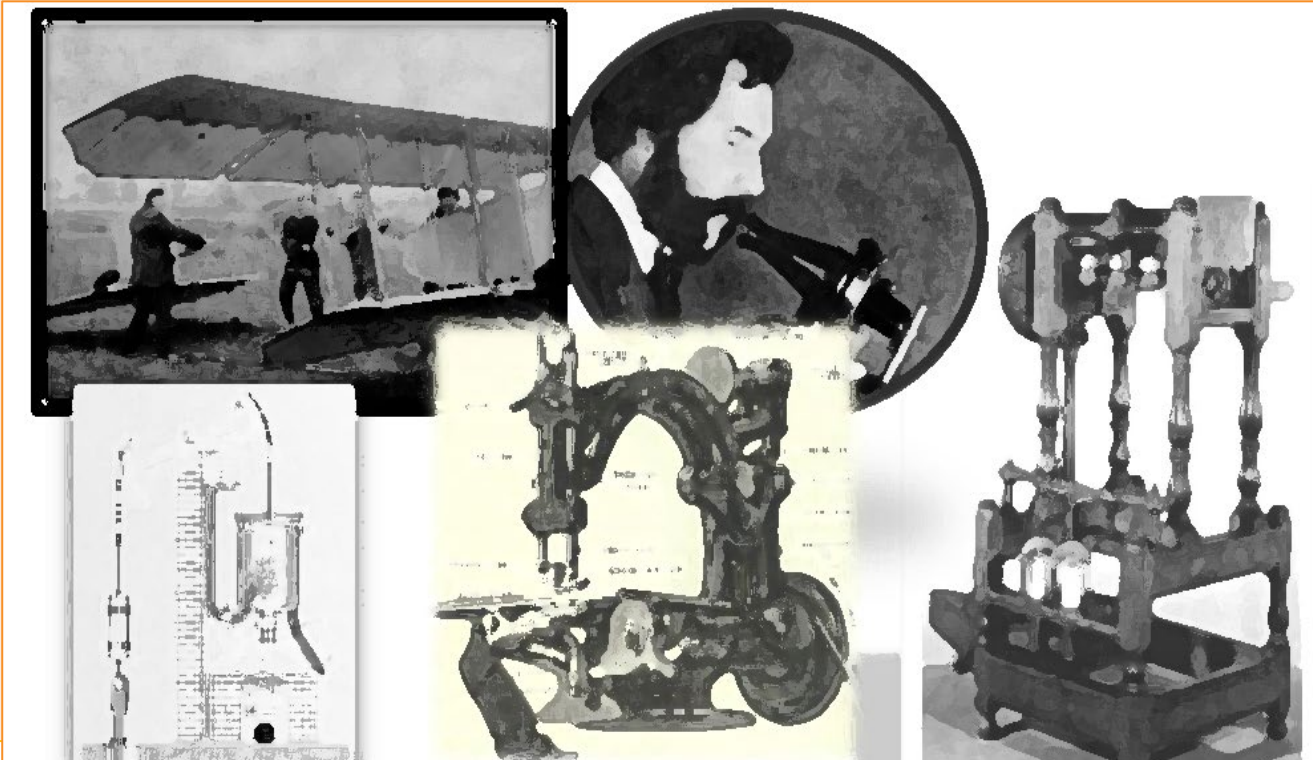
In medieval Europe, engineering played a key role in the development of agriculture, transportation, and manufacturing. Engineers developed systems for irrigation, water management, and agricultural machinery, as well as bridges, roads, and other infrastructure for trade and transportation. They also developed new techniques for manufacturing and metallurgy, paving the way for the Industrial Revolution..

The Industrial Revolution, which began in the 18th century, marked a major turning point in the history of engineering. Advances in manufacturing, transportation, and communication technologies transformed society and the economy, leading to rapid urbanization and the growth of modern cities.

During this period, engineers played a central role in the development of new technologies and industrial processes. They developed steam engines, railroads, telegraph systems, and other innovations that revolutionized transportation, communication, and manufacturing. They also developed new materials and construction techniques, leading to the construction of massive steel structures such as the Eiffel Tower and the Brooklyn Bridge.

In the 20th century, engineering continued to play a key role in technological innovation and economic development. The rise of the automobile industry, aviation, and space exploration led to new engineering challenges and opportunities, as engineers worked to develop new technologies and systems for transportation and exploration.

At the same time, engineers also began to confront new challenges related to environmental and social responsibility. The development of new technologies and industrial processes led to increased pollution, environmental degradation, and social inequality, raising ethical questions about the role of engineering in society.





Today, engineering continues to play a critical role in shaping society and the economy. Engineers are involved in the development of new technologies and systems for transportation, communication, energy, and manufacturing, as well as in efforts to address social and environmental challenges such as climate change, resource depletion, and social inequality.

In recent years, there has been a growing recognition of the importance of ethical and socially responsible engineering practices. Engineers are increasingly called upon to consider the social and environmental impacts of their work, and to work collaboratively with other stakeholders to address these challenges.

Overall, the history of engineering reflects the important role that engineering has played in the development of human society, from the construction of ancient monuments and infrastructure to the development of modern technologies and industrial processes.

As society faces new challenges related to sustainability, social responsibility, and technological innovation, the role of engineering in shaping our future will only become more important

1.6 Engineering as an Indicator of Development

Engineering plays a crucial role in the development of societies and can serve as an important indicator of a country's level of development. Here are some ways in which engineering can serve as an indicator of development:

- 1. Infrastructure development:** One of the most visible signs of development is the quality and extent of a country's infrastructure, including roads, bridges, ports, airports, and other essential facilities. Engineers are responsible for designing, constructing, and maintaining this critical infrastructure, and the quality of their work can have a significant impact on a country's economic and social development
- 2. Technological innovation:** Engineering is a key driver of technological innovation, which in turn can contribute to economic growth and development. Countries with strong engineering programs and a thriving technology sector are often seen as more developed and innovative. Innovation in engineering can also lead to the creation of new products, services, and industries, which can boost a country's competitiveness and prosperity





- 3. Environmental sustainability:** As societies become more aware of the impact of human activities on the environment, engineering is playing an increasingly important role in promoting sustainability and mitigating the effects of climate change. Countries that invest in sustainable engineering practices are often seen as more environmentally responsible and forward-thinking. Sustainable engineering practices can include developing renewable energy sources, designing buildings and infrastructure with low environmental impact, and reducing waste and pollution.

- 4. Humanitarian aid and disaster relief:** Engineers play a critical role in providing aid and relief in times of crisis, such as natural disasters or humanitarian emergencies. Countries that have the capacity to provide such assistance, either through their own engineers or by collaborating with other countries, are often seen as more developed and globally engaged. Engineering can also contribute to the development of low-cost and sustainable solutions for communities facing humanitarian crises or extreme poverty.

In summary, engineering can serve as an important indicator of a country's level of development, reflecting not only its economic and technological progress but also its commitment to sustainability, social responsibility, and global engagement

1.7 Engineer Responsibility to Organization

Engineers have a crucial role to play in organizations, whether in the public or private sector, and are responsible for a wide range of activities, including design, implementation, and maintenance of technical systems, processes, and products. Here are some of the key responsibilities of engineers in organizations:

- 1. Design and development:** Engineers are often responsible for designing and developing new products or systems that meet the needs of their organization's customers or clients. This can involve working closely with other teams, such as marketing, sales, and product development, to ensure that the product meets customer needs and is aligned with the organization's goals and objectives.
- 2. Project management:** Engineers are often tasked with managing complex projects, from the initial planning stages through to implementation and delivery. This requires a strong understanding of project management principles and the ability to work effectively with cross-functional teams, suppliers, and contractors.





3. **Quality assurance:** Engineers are responsible for ensuring that their organization's products and processes meet the required quality standards. This can involve developing and implementing quality control systems, performing regular inspections and tests, and making recommendations for improvements or corrective action.
4. **Health and safety:** Engineers have a responsibility to ensure that their organization's products and processes are safe for workers and consumers. This can involve developing safety protocols, conducting risk assessments, and ensuring compliance with regulatory requirements.
5. **Innovation:** Engineers play a critical role in driving innovation within their organizations, whether by developing new products or processes, improving existing products or processes, or identifying opportunities for growth and expansion. This requires a strong understanding of market trends, customer needs, and emerging technologies.

In summary, engineers have a range of responsibilities within organizations, from design and development to project management, quality assurance, health and safety, and innovation. By fulfilling these responsibilities effectively, engineers can help their organizations achieve their goals, improve customer satisfaction, and drive growth and profitability.

1.8 Engineer's Challenges in an Organization



Engineers face a number of challenges in an organization, including technical, organizational, and interpersonal challenges. Here are some of the key challenges that engineers may encounter:

- 1. Technical challenges:** Engineers are often responsible for designing, implementing, and maintaining complex technical systems, processes, and products. This can involve dealing with technical challenges such as inadequate or outdated infrastructure, a lack of technical resources or expertise, or difficulty integrating different technologies or systems.
- 2. Organizational challenges:** Engineers must work effectively within their organization's structure, culture, and processes, which can sometimes be challenging. This may involve dealing with bureaucratic procedures, conflicting priorities or goals, limited budgets, or a lack of support from senior management.
- 3. Interpersonal challenges:** Engineers must also be able to work effectively with other people within their organization, including colleagues, managers, and clients or customers. This requires strong communication, collaboration, and interpersonal skills, as well as the ability to manage conflict and negotiate effectively.

- 4. Keeping up with new technologies:** Engineers must stay up-to-date with the latest technological advancements in their field, which can be challenging in a rapidly changing technological landscape. This requires ongoing learning and professional development, as well as the ability to adapt to new technologies and methods.
- 5. Balancing competing demands:** Engineers often have to balance competing demands, such as meeting deadlines, maintaining quality, and staying within budget. This can be challenging and requires effective time management, prioritization, and problem-solving skills.

In summary, engineers face a range of challenges in organizations, including technical, organizational, interpersonal, and strategic challenges. By developing the necessary skills and competencies, however, engineers can overcome these challenges and contribute to their organization's success.



Cases Examples

Some examples of case studies related to Engineering and Society:

1 The Deepwater Horizon oil spill

In 2010, an explosion on the Deepwater Horizon oil rig in the Gulf of Mexico caused the largest marine oil spill in history. This case study highlights the impact of engineering decisions and practices on the environment and society, and the importance of balancing economic and environmental considerations in engineering design and operations.

2 Flint water crisis

In 2014, the city of Flint, Michigan switched its water source from Lake Huron to the Flint River, leading to widespread lead contamination in the water supply. This case study highlights the ethical and social responsibility of engineers to ensure the safety and well-being of the communities they serve.

3 Design of the Boeing 737 MAX

The design of the Boeing 737 MAX has come under scrutiny following two fatal crashes in 2018 and 2019. This case study highlights the ethical and social responsibility of engineers to prioritize safety over economic and commercial considerations.

4 Development of renewable energy technologies

The development and implementation of renewable energy technologies such as wind, solar, and geothermal power have significant social, economic, and environmental implications. This case study highlights the role of engineering in advancing sustainable development and reducing the impact of climate change.

Tutorial

Tutorial questions can serve as starting points for discussions and further exploration of key concepts and issues related to engineering and society.

1. What is the role of engineers in addressing social and environmental challenges?
2. How have engineering practices and technologies contributed to economic development and industrialization?
3. What are the ethical considerations involved in engineering design and decision-making?
4. How can engineers ensure the safety and well-being of the communities they serve?
5. What are the social, economic, and environmental implications of emerging technologies such as artificial intelligence and biotechnology?
6. How have engineering practices and technologies impacted the natural environment and contributed to climate change?
7. How can engineers balance economic considerations with social and environmental responsibility in their work?
8. What role can engineers play in advancing sustainable development and reducing the impact of climate change?
9. How can engineers work effectively with other stakeholders, such as policymakers, community groups, and environmental advocates, to address social and environmental challenges?
10. What are some examples of successful engineering projects that have had positive impacts on society, and what can we learn from them?

02

ENGINEERING CHALLENGE IN GLOBALIZATION



CONTENTS CHAPTER 2

This chapter consist two main topic :

01

Demonstrate engineer's roles in Industrial Revolution 4.0

1.1 Expose to Industrial Revolution 4.0

1.2 Demonstrate Pillars of Industry 4.0

02

Solve engineering challenge in globalization

2.1 Handle challenges of globalization and the new economy



ENGINEERS ROLES IN INDUSTRIAL REVOLUTION 4.0

CHALLENGE IN ENGINEERING

While the current COVID-19 crisis is separating us physically, it also compels us to work together to address its accompanying societal and economic challenges, ranging from arresting the contagion to relieving the health care stress to production of vaccines to reimagining life in today's remote working and learning environment.

These challenges are ideally suited for engineers, but the first step is bringing together people with great ideas. This project provides a mechanism for that to happen.

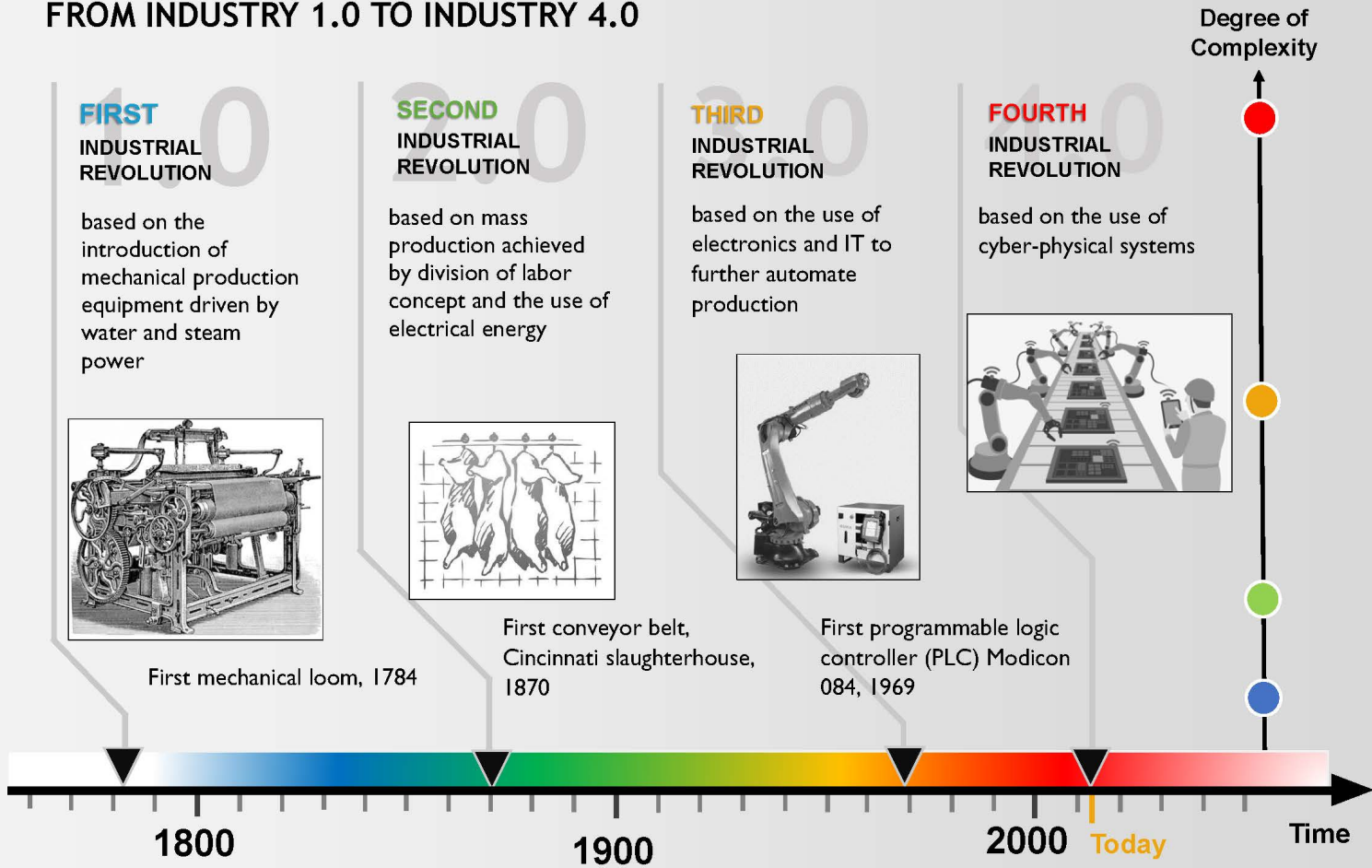


In order to tackle the engineering challenges of the 21st century, it is important to possess **teamwork, design, problem-solving, communication skills and global awareness, as well as technical knowledge.**



EXPOSE TO INDUSTRIAL REVOLUTION 4.0

FROM INDUSTRY 1.0 TO INDUSTRY 4.0



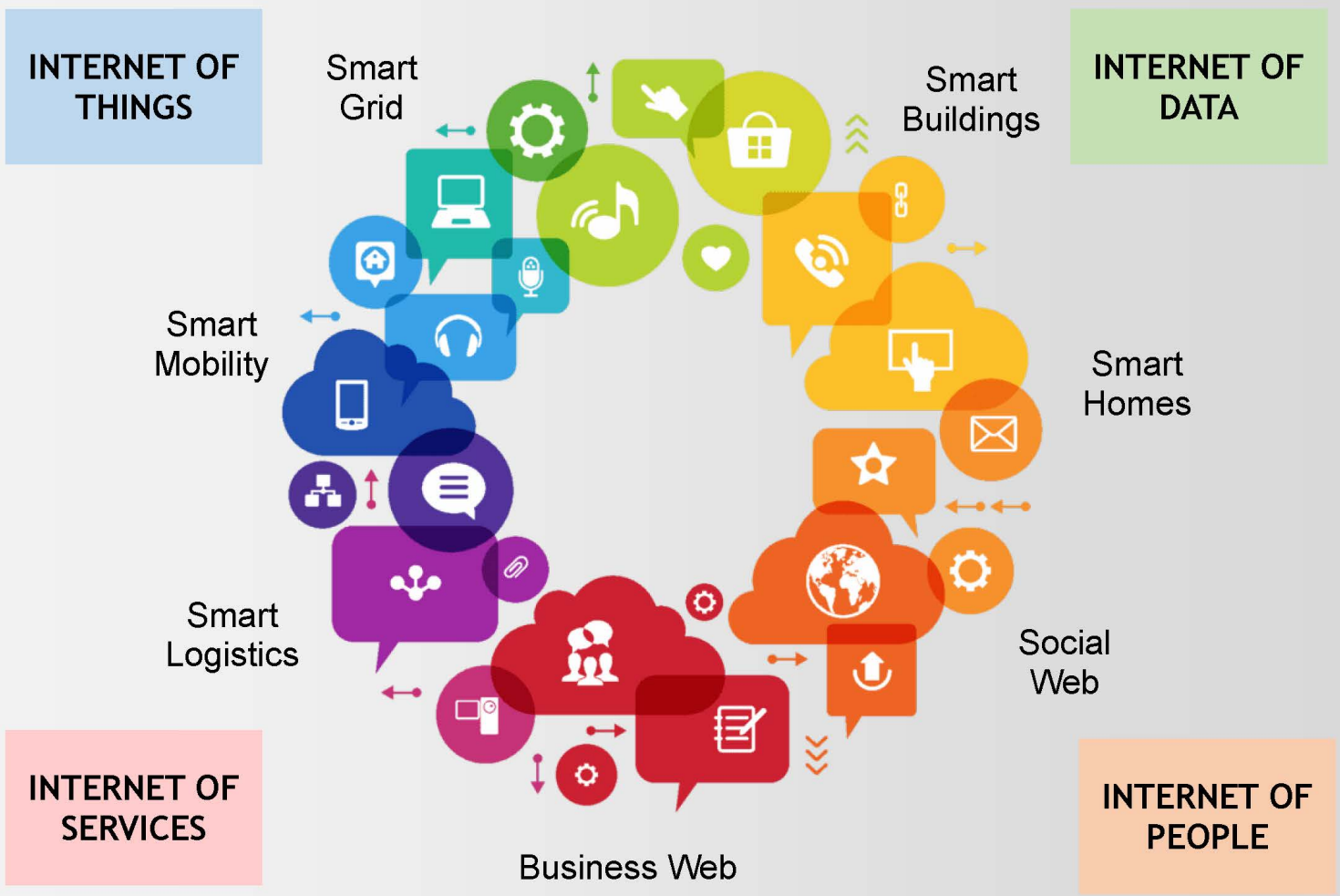
Moving to Industry 4.0 include improved productivity and efficiency, better flexibility and agility, and increased .profitability



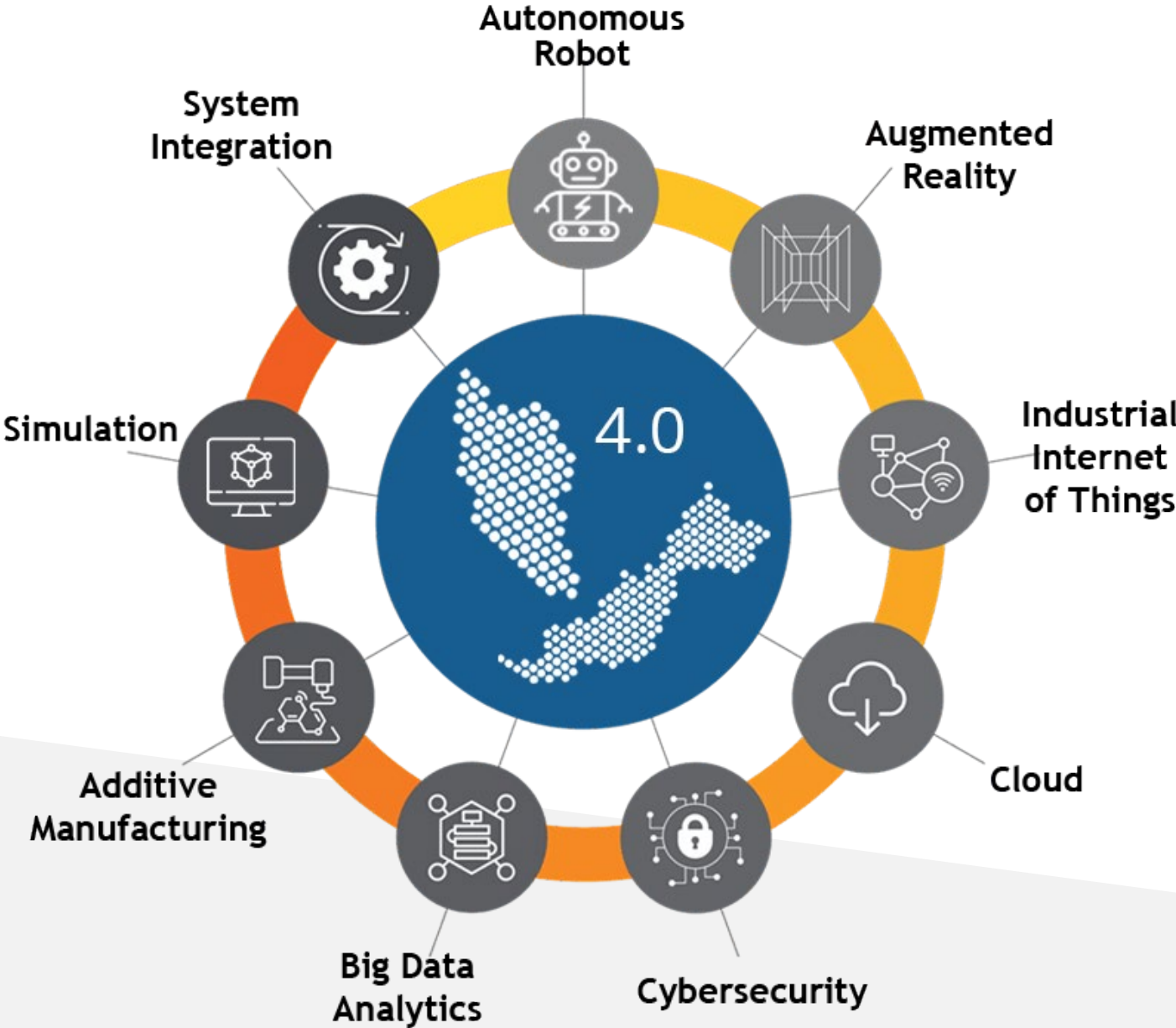
The Industry 4.0 Environment

What is Industry 4.0 environment?

Industry 4.0—also called the Fourth Industrial Revolution or 4IR—is the next phase in the digitization of the manufacturing sector, driven by disruptive trends including the rise of data and connectivity, analytics, human-machine interaction, and improvements in robotics



THE PILLARS OF INDUSTRY 4.0





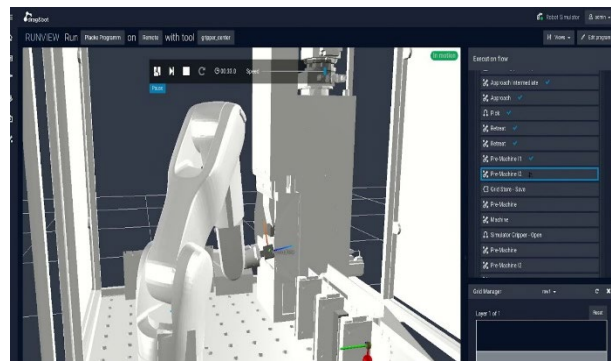
01 Big Data Analytics

Advantages in data analytics can be used in the manufacturing sector to reduce downtime and waste. If there are any problems in the factory, data will be taken, and patterns will be identified so that the time for routine maintenance needs to be made predictable.



03 System Integration

A company may have more than one facility to produce a product. In addition to robots communicating with each other in a factory, facilities can also communicate with other facilities. This can help if one facility has a problem, the other facility will increase the production rate to compensate for the loss of time experienced.



02 Simulation

Simulation is often used in the creation of a product. It can also be used in a larger scope, for example in restructuring the process in a factory. With this, possible problems can be identified in an earlier stage.

For example, if a factory wants to change an old robot to a new one, the simulation can be run with various variables such as the speed of the robot. If the robot operates too fast, it may break down. And this can be identified in the simulation process.



Autonomous Robot

Autonomous robots operate using complex algorithmic logic. They will interact with one another and work safely side by side with humans and learn from them.

For example, Kuka, a European manufacturer of robotic equipment, offers autonomous robots that interact with one another.

These robots are interconnected so that they can work together and automatically adjust their actions to fit the next unfinished product in line. High-end sensors and control units enable close collaboration with humans

Industrial Internet of things

IoT consists of an ecosystem of sensors and actuators connected to the Internet. This allows them to communicate with each other. For example, when the manufacturing material in the facility is running low, sensors can detect it and send a signal to the Inventory Department to order new material.

This happens without human involvement and will reduce the machine inactive state time if the material has run out.



The Cloud

Cloud is a remote-control system that can be accessed anywhere using the Internet. This uses a network of remote servers to store, manage and process data

For an example, the e-commerce sector. Buyers can track where the items ordered online are. This is aided by data sent by sensors in warehouses and delivery vans to a database in the Cloud system.

With this facility, customers will trust the company more because of the transparency regarding the whereabouts of their goods.

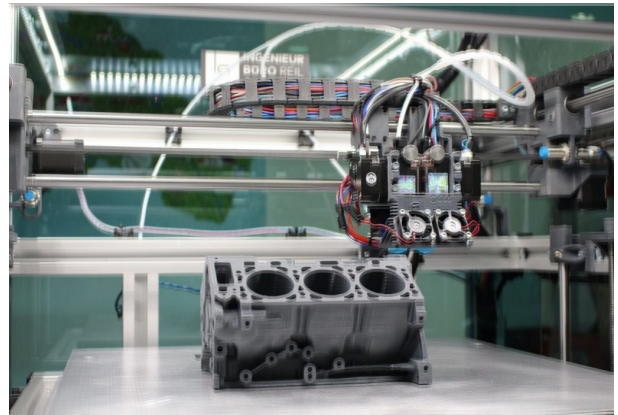


Cybersecurity

With the increased connectivity and use of standard communications protocols that come with Industry 4.0, the need to protect critical industrial systems from cybersecurity threats increases drastically.

Most manufacturers will want to protect their most valuable data including intellectual property, data on customers and their products. When a lot of data is stored and can be easily accessed, it tends to be hacked and data stolen by irresponsible parties.

This does not mean that all data in the Cloud system can be hacked. With strict cyber security, this can be avoided by joined forces with cybersecurity companies through partnerships or acquisitions.

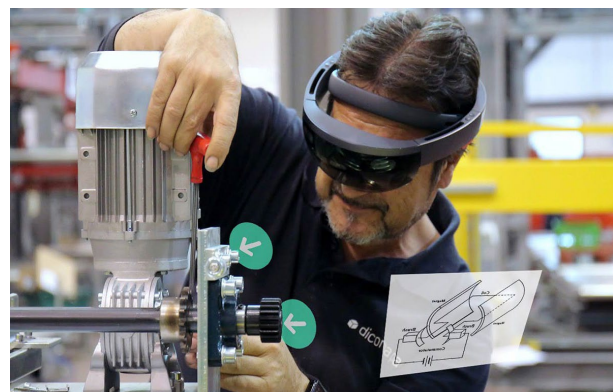


Additive Manufacturing (3D)

A better and less wasteful process in manufacturing is called Additive Manufacturing.

There are companies that have already used Additive Manufacturing such as the use of 3D printing machines to make prototypes.

For example, the German automotive company BMW uses 3D printing technology to produce prototypes of car metal parts. This technology is also able to provide opportunities for complex designs, which are impossible to do with conventional manufacturing processes.



Augmented Reality





Augmented reality allows for augmented imagery to be placed in front of the real-world.

For example, workers may receive repair instructions on how to replace a particular part as they are looking at the actual system needing repair. This information may be displayed directly in workers' field of sight using devices such as augmented-reality glasses.

INDUSTRY 4.0

WHY DO WE NEED IT?

Industrial revolution 4.0 covered an entire lifecycle of a product as well as its supply chain. It involves designs, inventory, sales, quality, scheduling, engineering, field service, and customer service. Everyone wants up-to-date, informed, and relevant views of their business processes and production.

	<h3>Cost</h3> <ul style="list-style-type: none"> • Eliminate waste and losses • Eliminate hidden cost • Cost reduction
	<h3>Complexity</h3> <ul style="list-style-type: none"> • Sub-Nano technology • Cyber Physical System • Exponential technologies
	<h3>Customer</h3> <ul style="list-style-type: none"> • Personalize • Fast, Cheap, Quality • Total Customer Satisfaction
	<h3>Competition</h3> <ul style="list-style-type: none"> • Digitalization • Increase competitiveness • Globalization

INDUSTRY 4.0 FRAMEWORK



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.

”

- Daniel Burrus, Bestselling author and tech innovator.

Engineering Challenge In Globalization

Challenges Of Globalization



GOVERNMENT

- New emerging technologies (Augmented reality, Cyber Security, IoT, Big Data Analytics, etc.)
- Multi discipline role and responsibilities to support the new revolution.
- Lack on local expertise to create and provide new training program.
- Developed 'I LOVE TECHNOLOGY' attitude and mid-set.
- Lack on local content for system hardware and software.



- Policy on Industry 4.0 related research and development, security of integrated system, legal framework conditions, work, training and further education.
- New Industry 4.0 technology and skill transfer from overseas as part of pioneer status application. Localize hardware assembly.
- High level nationwide Industry 4.0 framework and review panel/board.
- Digitalization in manufacturing technologies will require new incentive.

Challenges Of Globalization

INDUSTRY



**Fragmented
Layout**

- Merging the old and new system, techniques, machinery, protocols with complex protocols can be complicated.
- Traditional IT infrastructure merging with new IIOT system integration will require massive reorg and reskill of the workforce.



**Data Security &
Privacy**

- Data Ransom at the rise of the focus by hackers and system attackers.
- Manufacturing sector are more vulnerable to attack with interconnectivity through cyber physical system.
- Require more white hacker to developed full security system as attacker continue to look for loophole.



Big Data

- More data scientist needed means more satisfaction with operational background.
- More complex bid data analytics from industrial data source. Not typical consumer-based data anymore and transforming into well structured data format.

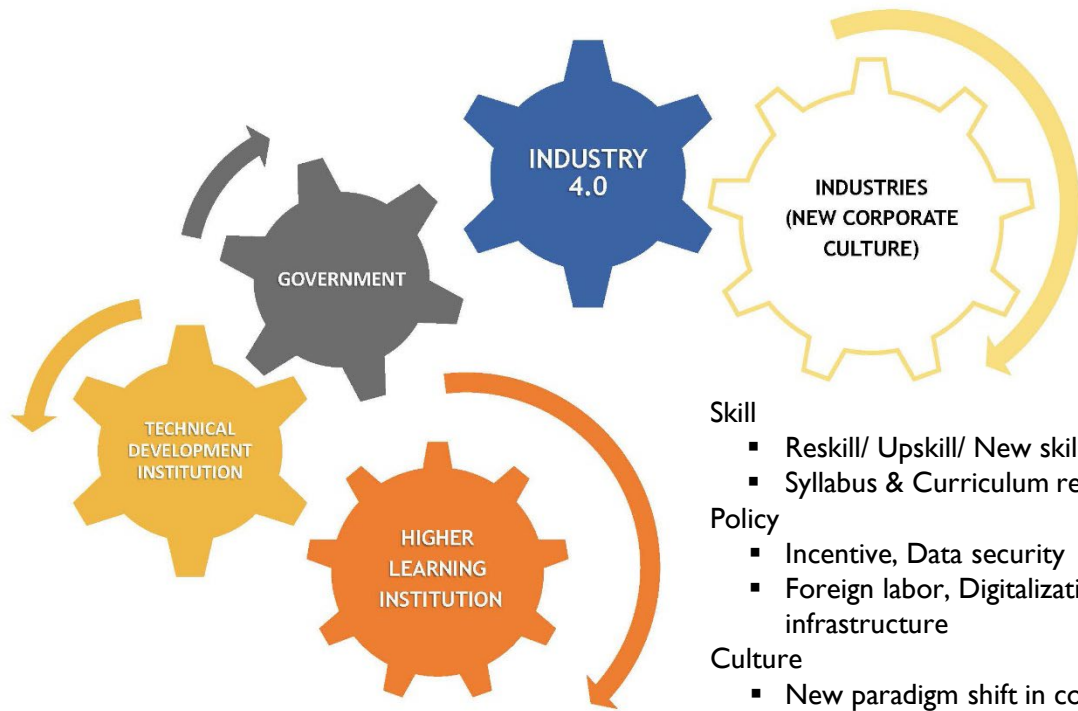


**Corporate
(Culture, Financial,
Structure)**

- Industry 4.0 is about transforming the organization into new culture and promote technology as the way to move forward. Top management must endorse on it first before the rest follow.
- Need more systematic master framework to ease the deployment plan.

INDUSTRY 4.0

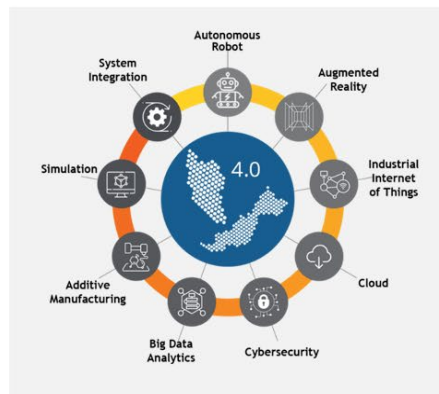
Key Driver (Skill, policy, Culture)



- Skill**
- Reskill/ Upskill/ New skill
 - Syllabus & Curriculum revision
- Policy**
- Incentive, Data security
 - Foreign labor, Digitalization, ICT infrastructure
- Culture**
- New paradigm shift in corporate culture
 - Change process

INDUSTRY 4.0

Workforce Transformation (Malaysia)



INDUSTRIES



GRADUATES

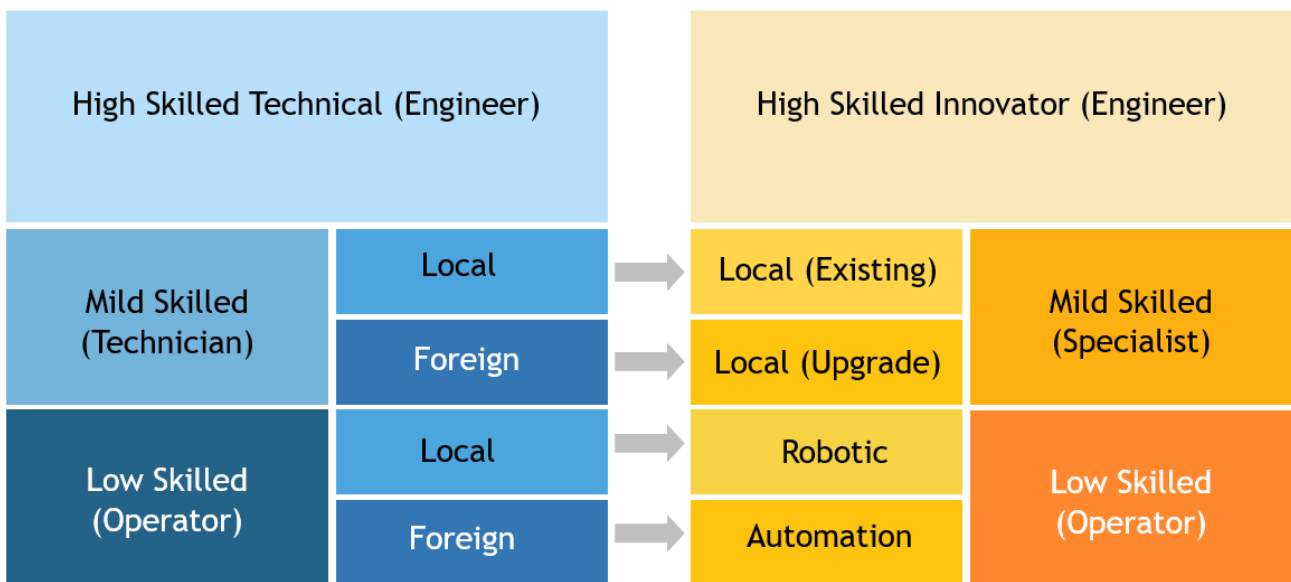


TERTIARY (TVET)

Workforce Transformation (Malaysia)

CURRENT

INDUSTRY 4.0



- Industry 4.0 will eliminate our dependency on Foreign labour workforce
- Industry 4.0 will provide platform for job upgrade on existing local workforce

IMPACT OF INDUSTRY 4.0

IoT is about to affect many areas in manufacturing and administration, most notably:

01 Services and business models

02 Reliability and continuous productivity

03 IT security

04 Machine safety

05 Product lifecycles

06 Industry value chain

07 Workers' education and skills

08 Socio-economic factors



TUTORIAL 2

ANSWER ALL QUESTION & SUBMIT BEFORE 29th MARCH 2023



Question 1



What is Industry 4.0?



Question 2



Explain about The Nine Pillars of Industry 4.0 .



Question 3



What Are the Challenges of Globalization?



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The end of one chapter is just a beginning of another.
Read on.. The best part is always yet to come.

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