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ENGINEERING INFORMATION AND SUSTAINABLE DEVELOPMENT IMPACTATIONS

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ABSTRACT : *Advancement in Engineering Information and Sustainable Development resuscitatively elucidated the prowess that should be experienced in engineering impactations. This is a recent revolution that involves the use of computers, internet and software packages. Information and engineering knowledge are critical components in achieving scholarly strategies. Information offers the best avenue for easy access to huge amounts of success in engineering for sustainable development. The primary needs of man include shelter, food, clothing, water, sense of security, health and equity. The interferences created by man limits the supplies and provisions of these basic needs considering the natural challenges we encounter daily in our quest for survival. The conquest can be achieved through engineering, since the profession is here to solve all kinds of human problems in all spheres. Sustainable development being holistic due to different disciples of engineering like agriculture and bio-environmental, civil, mechanical, electrical, aeronautics, oceanieering, mechatronics etc. Engineering is a product of technology and information which leads to sustainability and developmental prosperity birthing explorations of the universe and exploiting what it has to offer for human good. This paper propagates the views on engineering information, sustainable development together with the conclusions cum recommendations. Engineers have played a key role in transforming the world through invention, innovations and the development of new technologies having significant impact on sustainability and quality of life. The United Nations Sustainable Development Goals (SDGs) seek an integrated approach to development and sustainability. Engineering is crucial for this especially in high technology, software, artificial intelligence, communications, infrastructures etc. Having focused on these, leeway can be guaranteed for better futuristic sustainable development through information in engineering and her impactations.*

KEYWORDS: *Engineering, Information, sustainable development, Impactations*

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I. INTRODUCTION

Engineer, as practitioners of engineering, are professionals who invent, design, analyze, build and test machines, complex systems, structures, gadgets and materials to fulfill functional objectives and requirements while considering the limitations imposed by practicality, regulation, safety and cost. The word “engineer” (Latin - ingeniator) is derived from the Latin words ingeniare (to create, generate, contrive, devise) and ingenium (cleverness). The foundational qualifications of an engineer typically include a four or five-year bachelor degree in an engineering discipline or in some jurisdictions, a master’s degree in an engineering discipline plus four to six years of peer-reviewed professional practice (culminating in a project report or thesis) and passage of engineering board examinations. Information is a key characteristic of engineering which constantly pushes the boundaries of what can be achieved through ingenuity and smart thinking. Technology, being a vital part of

engineering has driven social and political change, example the Arab spring protests in the middle East in 2012 (Bequmout, 2011) and the political upheaval in Malaysia in 2017 (Abdullah and Anuar, 2018) were triggered by social media (Information). In many countries, social media plays a key role in elections, engaging young people like never before, a development that would not have been possible without the extraordinary accessibility enabled by information (mobile telecommunications) (Newkirk, 2017). The significant positive effects of engineering are visible in terms of output, productivity and growth as well as the innovative capacity of sustainability (Maloney and Caicedo, 2016). Engineering plays a key role in supporting the growth and development of essential infrastructures such as roads, railways, bridges, dams, communications, waste management, water supply, sanitations, energy and digital infrastructure etc. You cannot have sustainable development without progressive information and engineering (Ifeanyichukwu, 2022). Engineering innovative information and telecommunication have been at the forefront of actions to manage the impacts and spread of the Covid-19 virus as well as using innovative technologies to detect, monitor and prevent the spread of the corona virus. Sensors and Artificial Intelligence are being used to check peoples' temperatures when they enter important facilities as fever is an important indicator of the virus. Artificial Intelligence is being applied for rapid analysis of the performance of possible new vaccines and therapeutic approaches, 3 – D manufacturing is being used to produce face-shields and other personal protective equipments. For cities exposed to natural disasters and rising sea levels, engineers must develop sustainable approaches to mitigate these risks and build resilience, being the enormous economic and social benefits of engineering. The United Nations Global Sustainable Development report (UN, 2019) recognized the importance of engineering information in advancing sustainable development in achieving the 2030 agenda. Engineering information and telecommunication gave rise to new breed of entrepreneurs. Countries having sufficient number of engineers experience a significant positive impact in terms of GDP growth (CEBR, 2015).

II. MATERIALS AND METHODS

The materials used in this study include literature sources from Journals, books, online sources etc. The methods include open-ended review of how engineering profession can impact the society using engineering information.

A. Sustainable Development

This is defined in many forms. Literally, sustainability implies a continuous and a renewable ability to perform something (Oxford Dic, 2010).

Sustainable Development is therefore a type of development that is characterized by self perpetuation. It has an inherent generator or a dynamo that keeps it recharged and on-going. This type of development is characterized by the ability to provide the needs of the present generations without compromising the well being of the future generations. The understudy is concerned with inter-temporal economic, human (social) development and environmental protection. The current global environment can be described as a knowledge-based environment. Technology is becoming more and more embedded in the well being, development and competitiveness of any society. Globalization has effectively rendered country boarders irrelevant in terms of business ventures, marketing and trade between nations.

Information technology, ease of information transfer and connectivity between peoples of different backgrounds, ethnicity, culture and religion has given room for more dynamic sustainable development. The grand objective of any development is to satisfy the inter-temporal basic needs of society, promote economic and social development (on both micro and macro-scale) preserving a clean environment by minimizing adverse environmental impact. Industrial development and its derivatives (economies of scale, mechanization, division of labour, increase resource use) have effectively mass produced goods, have reduced the per unit cost of production and increased pollution. To satisfy the exponential increase in global population together with the buying power in developed and developing countries, demand for both inputs and outputs have considerably increased. The lifetime of durable and consumer goods is limited, at the end of the useful life of a product, it needs to be disposed or recycled. With this, it is obvious that there are constraints on resource availability, resource use, allocation of resources, social and environmental impact due to this development. Decision makers

that include engineers, scientists, technologists, layers, economists, politicians and all other experts in various technical and non-technical fields need to effectively pool their expertise and knowledge together; developing an optimal plan for sustainable development. Sustainable development has three components; the social, economic and environmental. Thus, proper prioritization is required to address and solve most pressing issues with the available financial and human resources (Abraham, 2006).

B. The Engineering Information and Sustainable Development

Every nation has commitments to keep that which will be met through the works of engineers. Achieving each of the seventeen (17) Sustainable Development Goals will require engineering and they are poverty alleviation, provision of basic amenities (example education, health, sanitation) gender equity, addressing the impact of climate change, depletion of worlds resources, safe drinking water etc. These global challenges demand almost unprecedented ingenuity on the part of engineers using engineering information to develop and implement the solutions needed to advance these goals. Engineers are needed to change and help create a smarter world, committed to sustainable development. These require engineering information and engineers to incorporate the values and objectives of sustainable development into their works. Government, policy-makers and the community need to understand the key role of engineering for sustainable development. Problem solving is common to all engineering work using engineering information of science, mathematics and ingenuity (highly trained skills) to transform the world. Sustainable development gave rise to new disciplines of engineering example mechatronics, medical engineering (bio-medicals), bio-chemicals etc which constantly push the boundaries of existence. In all the revolutions down to the fourth revolution, engineering information remains the tool of sustainable development especially now the Internet of Things (IOT), hinging on transforming social and political interactions through breakthroughs in information and communication technologies (ICTs) especially with the invention of smart phones in 2007 altering social behaviours.

C. The Missing Link between Engineering Information and Sustainable Development (SD)

These will dwell on challenges, threats and untapped opportunities.

Challenges:

1. A global platform where inputs are obtained, marketed and products manufactured or exported should be embarked on.
2. Competition for survival, essentially in business, self, flora, fauna etc.
3. Environmental degradation due to industrial and economic development.
4. Promotion and awareness of sustainable development practices.
5. Knowledge availability and expertise should be easily and readily available.
6. Massive and deliberate destruction of human lives and property due to wars, political and ethnic conflicts, control of resources etc.

Threats:

The current engineering information available does not fully incorporate the current realities of disadvantages. The mishaps and disasters caused and posed by engineering and here information are enormous; think of the nuclear weapons, pollutions, wrong mutations by radioactive emissions, ozone depletions by space traveling, wars, deaths, disruptions of the serene universe and the stratospheres, deforestations, land degradations etc.

Opportunities:

For sustainability to be properly and practically practiced, its benefits need to be comprehensively understood and achieved. It is absolutely crucial and necessary that we raise a generation that live by and believe in strong ethical and moral foundations. If every component of our society, starting with leaders, decision makers, engineers, scientists, lawyers, bankers, politicians and all other professionals and non-professionals alike live on

and is guided by strong and unwavering ethical and moral principles, then a major portion of sustainable development goals will be achieved. To explore these opportunities, educating young engineers on the basic ingredients of sustainable development should be a prerequisite in engineering information programme. It is vital to expose, initiate awareness and educate engineering students on issues of sustainability of mankind and its development. We have helpful topics like Industrial and Economic Development, Globalization, Population Growth and Impact on Resources/Usages, Ethical and Moral Impact of Development etc. these are contemporarily issues confronting us and our environment.

III. CONCLUSION AND RECOMMENDATION

A. CONCLUSION

Engineers have been changing the world for millennia. Advancements in science, technology and engineering have led to engineering solutions underpinning successive industrial revolutions that have powered economic growth and sustainability. In COVID-19 lockdowns, and at threshold of fourth industrial revolution, engineers are needed more than ever. There is lack of understanding among government, policy-makers, society and engineers with their information for sustainable development. There is shortage of engineers globally especially with regards to girls (women), to ensure diversity of thoughts and crucial innovations. We need to uphold professional competency of world standards. There is no time to waste as these actions are essential to advance the 2030 agenda for sustainable developments.

B. RECOMMENDATION

Values-based engineering information has to be incorporated into the engineering curriculum of most educational institution. Government, engineering educators, industries and professional engineering institutions need to collaborate to fund and increase number of engineers, promote the crucial role played by engineers in creating a more sustainable world.

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