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RE-FRAMING HIGHER EDUCATION MANAGEMENT

INDUSTRIAL 4.0 ERA POST COVID -19

BY

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- **CONCEPT OF HIGHER EDUCATION:**

- Higher education is "an education at universities or similar educational establishments, especially to degree level."

- Higher education is "education beyond the secondary level *especially*: education provided by a college or university."

- Higher Education is "education and training at colleges, universities, polytechnics, etc

- Higher education is beyond high school, especially that provided by colleges, graduate and professional schools.

- **Higher education - education provided by a college or university didactics , education , educational activity , instruction , pedagogy , teaching - the activities of educating or instructing; activities that impart knowledge or skill; "he received no formal education"; "our instruction was carefully programmed"; "good classroom teaching is seldom rewarded"((** www.coursef.com/meaning-of-higher-education**)**

- **Higher education, any of various types of education given in postsecondary institutions of learning and usually affording, at the end of a course of study, a named degree, diploma, or certificate of higher studies**.
- Higher education | Britannica
- www.britannica.com/topic/higher-education#:~:text=Higher%20education%2C%20any%20

- **Higher education is tertiary education leading to award of an academic degree. Higher education, also called post-secondary education, third-level or tertiary education, is an optional final stage of formal learning that occurs after completion of secondary education. It represents levels 6, 7 and 8 of the 2011 version of the International Standard Classification of Education structure. Tertiary education at a non-degree level is sometimes referred to as further education or continuing education as distinct from higher education.**

The right of access to higher education is mentioned in a number of [international human rights instruments](). The [UN]() [International Covenant on Economic, Social and Cultural Rights]() of 1966 declares, in Article 13, that "higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular by the progressive introduction of free education". In [Europe](), Article 2 of the [First Protocol to the European Convention on Human Rights](), adopted in 1950, obliges all signatory parties to guarantee the [right to education]().

- **<u>Three Categories of Higher Education:</u>**

Higher education Level of education had three categories: '
up to completed high school',

'up to completed vocational education', and

'Higher education'.

From the Cambridge English Corpus Higher education levels were clearly associated with increased use of modern contraceptive methods.

- **<u>Objectives of Higher Education</u>**:
- We must develop thought for the poor and sufferings, regards and respect for women, faith in brotherhood regardless of race, colour, religion etc. One of the important aims of higher education is the training for leadership in the profession and public life. It is the function of universities to train men and women for wise leadership.
- There are several aims and objectives of higher education. Broadly we can classify into four categories:

- **(1) Wisdom and knowledge:**

- **Since education is both a training of minds and training of souls, it should give both knowledge and wisdom . No amount of factual information would take ordinarily into educated men unless something is awakened in them. Therefore, there should be inculcation of wisdom and knowledge.**

- **(2) Aims of the social order:**
- **Our education system must find its guiding principle in the aims of the social order for which it prepares. Unless we preserve the value of democracy, justice, liberty, equality and fraternity, we cannot Preserves our freedom.**
- **(3) Love for higher values of life:**
- **The greatness of a country does not depend on the extent of its territory, the length of its communication or the amount of its wealth, but on the love for higher values of life. We must develop thought for the poor and sufferings, regards and respect for women, faith in brotherhood regardless of race, colour, religion etc.**

- **(4) Training for leadership:**

One of the important aims of higher education is the training for leadership in the profession and public life. It is the function of universities to train men and women for wise leadership.

- **What are the main functions of Higher Education?**

- **Professor Eric Thomas, President, 'Universities UK', and Vice-Chancellor, University of Bristol:**

- **The main functions of higher education and universities are predominantly two-fold.**

- **1. One is as educational establishments and**

- **2. The second as generators of knowledge and technology.**

- **<u>Re-Framing Higher Education Management:</u>**

There are several issues that we have to consider in re-framing of higher education management:

1. Analysis of present conditions of higher education.

2. Future of higher education

3. Future Skills

4. Equity

5. Access

6. Considering economic conditions of country

7. Availability of resources

8. Structural and organisational model of higher education

9. Operating process, technology, and excellent leadership and talent models.

10. Policy framing for higher education

11. Curriculum of higher education

12. Effective knowledge transformation by various means

13. Implementation

14. Emphasis on vocational and technical education

15. Improved students- outcomes

16. Control cost of higher education

17. Recruit and retain top faculty and researchers.

- **In general we require number of excellent organisational skills for higher education such as learning literacy, self- efficacy, ethical competence, self competence, self determination, reflective competence, ambiguity competence, decision competence, initiative and performance competence, communication competence, cooperation competence, sense making, future and design competence, digital literacy, systems competence, innovations competence, design thinking competence.**

- **<u>Seven Principles for Effective Change Management</u>:**

 Universities and college must keep the following principles for effective chance management in higher education:
1. **Start with the end in mind**
2. **Understand the institution's culture**
3. **Effective Communication**
4. **Walk a mile in the shoes of those whose roles will change**
5. **Create win-wins and align incentives**
6. **Embrace relentless incrementalism to help achieve radical change**
7. **You won't get what you don't measure**

- **<u>Need of the Teachers in the World: UNESCO</u>**

  According to brand new statistics from UNESCO, "countries must recruit 68.8 million teachers" over the next 14 years in order to provide "every child with primary and secondary education." That breaks down to 24.4 million primary teachers and 44.4 million secondary teachers.

- **Higher Education: UNESCO**
- **UNESCO is the only UN agency with a mandate in higher education. As such, it contributes to developing evidence-based higher education policies. In line with Target 4.3 of Sustainable Development Goal 4 to "*by 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university,*" UNESCO provides technical support to Member States to review higher education strategies and policies in order to improve equitable access to quality higher education and enhance mobility and accountability.**

- **It employs bold and innovative actions to enhance national capacities through providing and sharing information and technical assistance and developing normative instruments. To this aim, a new [Global Convention on the Recognition of Higher Education Qualifications](#) is under development. In addition, UNESCO partners with higher education institutions through its 25-year old [UNITWIN/UNESCO Chairs Programme](#) to foster international inter-university cooperation and networking with a view to enhancing institutional capacities through knowledge-sharing and collaborative work.**

What are the Sustainable Development Goals?

- The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030.

- The 17 SDGs are **integrated**—that is, they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

- Through the pledge to Leave No One Behind, countries have committed to fast-track progress for those furthest behind first. That is why the SDGs are designed to bring the world to several life-changing 'zeros', including zero poverty, hunger, AIDS and discrimination against women and girls.

- Everyone is needed to reach these ambitious targets. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context.

Industrial 4.0 Era and Post Covid -19 Future of Industry 4.0

- **The world will become more digital. Lockdown measures have forced many businesses to change fundamentally the way they buy and sell goods and services, which is accelerating digital adoption rates. US-China trade tensions had already demonstrated the interconnectivity of global supply chains and how vulnerable they are if even small parameters change. After COVID-19, we believe companies will start to reshore (localize) some of their production. We believe the transformation of the industrials sector in the Fourth Industrial Revolution will have major implications for SME entrepreneurs, and so in this report, we discuss secular shifts in the context of the COVID-19 health crisis.**

Stages of Industrial Revolution:
The First Industrial Revolution :

The first industrial revolution was marked by a transition from hand production methods to machines through the use of steam power and water power. The period of the first industrial revolution was during between 1760 and 1820, or 1840 in Europe and the United States and had effects on textile manufacturing industry, agriculture and mining and effects on British industry at that time.

The Second Industrial Revolution

It is also known as Technological Revolution, is the period between 1871 and 1914 making extensive railroad and telegraph networks, which allowed for faster transfer of people and ideas, as well as electricity to develop modern production line increasing economic growth and productivity but many factory workers replaced by machine which created unemployment.

The Third Industrial Revolution:

It is also known as the **Digital Revolution**, occurred in the late 20th century, after the end of the two world wars, resulting from a slowdown of industrialization and technological advancement compared to previous periods. The **global financial crisis in 1929** followed by the **Great Depression** affected many industrialized countries. The production of the **Z1 computer**, which used binary **floating-point numbers** and **Boolean logic**, a decade later, was the beginning of more advanced digital developments. The next significant development in communication technologies was the **supercomputer**, with extensive use of computer and communication technologies in the production process; machinery began to abrogate the need for human power.

German Strategy:

- The term "Industries 4.0", shortened to I4.0 or simply I4, originated in 2011 from a project in the high-tech strategy of the German government, which promotes the computerization of manufacturing.

- The term "Industries 4.0" was publicly introduced in the same year at the Hannover Fair. In October 2012, the Working Group on Industry 4.0 presented a set of Industry 4.0 implementation recommendations to the German federal government.

- The workgroup members and partners are recognized as the founding fathers and driving force behind Industry 4.0. On 8 April 2013 at the Hannover Fair, the final report of the Working Group Industry 4.0 was presented. This working group was headed by Siegfried Dais, of Robert Bosch GmbH, and Henning Kagermann, of the German Academy of Science and Engineering.

- As Industry 4.0 principles have been applied by companies they have sometimes been rebranded, for example the aerospace parts manufacturer **Meggitt PLC** has branded its own Industry 4.0 research project M4.

- The characteristics given for the German government's Industry 4.0 strategy are: the strong customization of products under the conditions of highly flexible (mass-) production. The required automation technology is improved by the introduction of methods of self-optimization, self-configuration, self-diagnosis, cognition and intelligent support of workers in their increasingly complex work. The largest project in Industry 4.0 as of July 2013 is the German **Federal Ministry of Education and Research** (BMBF) leading-edge cluster "Intelligent Technical Systems Ostwestfalen-Lippe (its OWL)".

- **Another major project is the BMBF project RES-COM, as well as the Cluster of Excellence "Integrative Production Technology for High-Wage Countries". In 2015, the [European Commission](#) started the international [Horizon 2020](#) research project CREMA (Providing Cloud-based Rapid Elastic Manufacturing based on the [XaaS](#) and Cloud model) as a major initiative to foster the Industry 4.0 topic.**

Main characteristics of Industry 4.0

- Industry 4.0 is characterised by 4 foundational technologies applied along the value chain
- Connectivity, data, computational power
- Sensors
- Internet of things
- Cloud technology
- Block chain
- Analytics and intelligence
- Advance Analytics
- Machine Learning
- Artificial Intelligence
- Human Machine Interaction
- Virtual and augmented reality
- Robotics and automation (collaborative robots, AGV's –autonomous guided vehicles, RPA's -Robotic Process Automation, Chatbots
- Advanced Engineering
- Additive Manufacturing (eg. 3D and Printing)
- Renewable Energy
- Nano-particles

Design Principles and Goals of Industry 4.0 Era

- **Four design principles identified as integral to industry 4.0**

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- **1. Interconnection**
- **The ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of things, or the internet of people (IoP)**

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- **2. Information transparency**
- **The transparency afforded by Industry 4.0 technology provides operators with comprehensive information to inform decisions for improvement in functionality of machines and people.**
- **3. Technical assistance**
- **The technical facilities to assist people in decision-making and problem-solving, and the ability to help humans with difficult or unsafe tasks**
- **4. Decentralized decisions**
- **The ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible but in exceptional cases a higher level interference can take place .**

Components of Four Industrial 4.0 Eara

- The Fourth Industrial Revolution consists of many components when looking closely into our society and current digital trends. Some important digital technologies as examples:
- A. Mobile devices
- B. Internet of things (IoT) platforms
- C. Location detection technologies
- D. Advanced human-machine interfaces
- E. Authentication and fraud detection
- F. 3D printing
- G. Smart sensors
- H. Big analytics and advanced processes
- I. Multilevel customer interaction and customer profiling
- J. Augmented reality/ wearable
- k. On-demand availability of computer system resources
- L. Data visualization and triggered "live" training

- **Mainly these technologies can be put into four major components, defining the term "Industry 4.0" or "Smart Factory":**
- **A. Cyber-physical systems**
- **B. IoT**
- **C. On-demand availability of computer system resources**
- **D. Cognitive computing**

Data And Analytics:

- Data and analytics are the core capabilities of each component, driven by:

- Digitization and integration of vertical and horizontal value chains

- Industry 4.0 integrates processes vertically, across the entire organization, including processes in product development, manufacturing, structuring and service; horizontally, Industry 4.0 includes internal operations from suppliers to customers as well as all key value chain partners

- B. Digitization of product and services

- Integrating new methods of data collection and analysis–such as through the expansion of existing products or creation of new digitised products–helps companies to generate data on product use in order to refine products

- C. Digital business models and customer access

- Customer satisfaction is a perpetual, multi-stage process that requires modification in real-time to adapt to the changing needs of consumers

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Biggest Trends:

- **In short, the Fourth Industrial Revolution is the trend towards automation and data exchange in manufacturing technologies and processes which include**
- **1. Cyber-physical systems (CPS),**
- **2. IoT (Industrial Internet of Things)**
- **3. <u>Cloud Computing</u>**
- **4. <u>Cognitive Computing</u>**
- **5. <u>Artificial Intelligence</u>.**

Challenges in implementation of Industry 4.0

There are several challenges in implementation of Industry 4.0 as follows:

 A. Economic

1. High economic costs

2. Business model adaptation

3. Unclear economic benefits/excessive investment

B. Social

1. Privacy concerns

2. Surveillance and distrust

3. General reluctance to change by stakeholders

   4. Threat of redundancy of the corporate IT department

5. Loss of many jobs to automatic processes and IT-controlled processes, especially for blue collar workers

- C.Political
-   1. **Lack of regulation, standards and forms of certifications**
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-     2. **Unclear legal issues and data security**
- **D.Organizational**
- **1. IT security issues, which are greatly aggravated by the inherent need to open up those previously, closed production shops**
- **2. Reliability and stability needed for critical machine-to-machine communication (M2M), including very short and stable latency times**
- **3. Need to maintain the integrity of production processes**
- **4. Need to avoid any IT snags, as those would cause expensive production outages**
- **5. Need to protect industrial know-how (contained also in the control files for the industrial automation gear)**
- **6. Lack of adequate skill-sets to expedite the transition towards a fourth industrial revolution**
- **7. Low top management commitment**
- **8. Insufficient qualification of employees**

APPLICATIONS

- **The aerospace industry has sometimes been characterized as "too low volume for extensive automation" however Industry 4.0 principles have been investigated by several aerospace companies, technologies have been developed to improve productivity where the upfront cost of automation cannot be justified, one example of this is the aerospace parts manufacturer [Meggitt PLC](#)'s project, M4.**

- **The increasing use of the [Industrial Internet of Things](#) is referred to as Industry 4.0 at Bosch, and generally in Germany. Applications include machines that can predict failures and trigger maintenance processes autonomously or self-organized coordination that react to unexpected changes in production.**

- **Industry 4.0 inspired Innovation 4.0, a move toward digitization for academia and [research and development](#).**

- **In 2017, the £81m Materials Innovation Factory (MIF) at the [University of Liverpool](#) opened as a centre for computer aided materials science, where robotic formulation, data capture and modelling are being integrated into development practices.**

Conclusion:

- At the time of re-framing management of higher education we have to consider all the aspects of industry 4.0 to make techno –informative society not only for the industrial development but also maintain social, economic, political, moral,ethical and all skills leadership of well coordination with the people of society ultimately leads to the quality of our life.

- We have to ponder about maintaining standards and improving life of the people of the whole world.

- In last but not least if we really want to make drastic change in our society in all respects we have to make start-up from the grass root level. Higher education institutions should give more emphasis on vocational, professional and technical education which make people more efficient and earn able in their life.

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