

Grooming students for Industry 4.0 employability skills

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Abstract

Employability education is the prime requirement in today's education. With adverse unemployment looming around, the faith on education is being lost by today's youngsters. The need now is on the role of the policy makers and entrepreneurs to woe back the younger generations and instil in them the importance of education and its impact on the employment which lead the assured growth of the individual, family and society to flourish in the future. This shift indicates a fresh perception, corresponding to which demography generates a dividend only if the youth are trained properly; deprived of the proper training, would lead to enormous unemployment. The youth of today are confused on what courses that can be taken as a core study of specialisation. Interdisciplinary studies are the need of the hour, then the narrow specialisations in scientific education. Interdisciplinary will offer scope for employment in industry 4.0. The digital technological revolution is impacting the world concurrently while industrial recession and COVID-19 are impacting the lives and livelihood of the people across the world. There are many Google tools and resources that can be used to help teachers and students in creating, collaborating, and building digital skills for the future. Learning computer science helps students to thrive in a rapidly changing world, where the access to the collaborative learning leads to use creativity, and technical skills that can unlock opportunities in the classroom and beyond. Whatever pedagogical changes that can influence this preparation of students towards being employed in industry 4.0 is the objective on which the following paper is evolved.

Key words –

education, employability, digital revolution, future jobs, education 4.0, industry 4.0

Introduction

Education leads to wholesome development, only when it is capable of leading to an employment opportunity. Education is basically a social progression, life-long development which the civic ecosystem directs the role of education to perform an act of vitality. It is an appreciation of that development and adjustment remains all through life and its familiarity persists to have an influence on the individual and their relation to one another, distinguishing a dynamic period of life evidenced by sustained cognitive, social, and psychological development. Education is the highly influential tool of the change of position in society, it also brings a decline in disparities and serves as a method of increasing the importance within the family and society. Considerable disparities in the intensity of regional development and soaring joblessness rate cannot be diminished quicker and substantially by the economy that is industrially outdated, founded on low-skilful labour and with barely freshly achieved worth (Radivoje M ., 2012). To promote the learning culture at each stages of the education will eradicate poverty and enable employment opportunities. Considering applying for a job requires an objective verification on the required experience, languages, technical skills and competencies, timed to account with the professional and personal situations. Interests may not the only reason for getting into a job, it requires a thorough understanding of what the job entails.

Poverty is related with poorer health and a shorter life expectation, excluding healthcare, aggravated stress levels, employed in more perilous jobs, higher infant mortality, poorer prenatal care, greater iron deficiencies, greater difficulty in school, and many other problems (Martha Lally et al., 2019). Population that is well trained has a reduced amount of joblessness, decreased reliance on public support packages, and improved tax returns (Dana Mitra., 2011). It is gaining the correct combination of capabilities, technical experience that is needed at the workplace and abilities to use those talents and information, with right attitudes to education across our lifetime and appreciating the encouraging gains associated with it (Foresight., 2017). Technical jobs in Iraq can be generally classified as that being operational in nature, such as Refineries, Chemicals, Textiles, Construction materials, Telecom, Processed foods, and Agricultural production. Non-technical jobs are

management in nature such as Accounting, HR, Marketing, and Supply chain. Utilities and services include Education, Government authorities (Water, Sanitation, Sewerage), Transportation (Railways, highways, waterways, pipelines, ports and harbours, marines, airports), and military etc., All these jobs are awaiting a technological change. Where the human machine interface is going to be of higher order skills and quality bringing extremely high quality of work life (QWL) and safe living conditions (SLC).

Maslows Hierarchy and Safe Living Conditions

Human advancement is the means of broadening individuals' choices and prospects and enhancing their well-being. It is the genuine autonomy common folks get to choose as “who- to- be”, “what-to-do”, and “how-to-live”. Citizens with vast, well-established resources have the means to get their dream of “a good life” a realism. Those inadequate in resources are less competent to outline their personal path and to take advantage of the prospects. Deprived of fundamental resources, individual's ability persists to be discouraged.

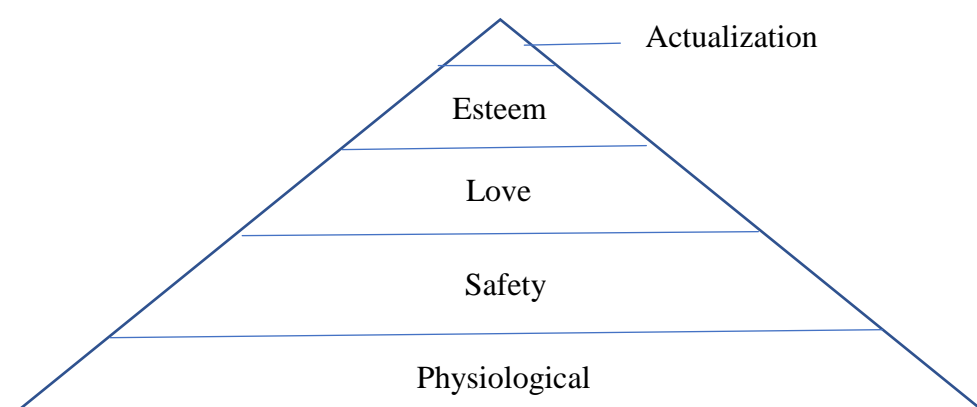


Figure 1 – Maslow's Hierarchy of needs

Maslow's Hierarchy as in Fig 1, suggests physiological needs which are necessary to the survival such as food, clothing, and shelter. Safety needs to protect against economic attack, such as the security for income, health, etc. . Socioeconomic condition is one of the methods to characterize families and households cantered on their shared levels of education, income, and employment (Martha Lally et al., 2019). Love needs such as family, friends

and being liked by others, being accepted, and belonging to a group. Esteem needs include being useful and having a value such as gain respect and influence others. Actualisation need is personal accomplishment such as the development of knowledge, unleashing creative potential. However, to capture the problem solving or being creative towards the community resources that should be aware of the rife discrimination, prejudice, homeless, lack health insurance or employment, impacts the learning facilitations. Industry 4.0 techniques can tackle the economic and social computing elements with appropriate inclusion of AI to handle potentially misaligned incentives, disturbance through self-interested intervening participants or and agents representing them (ESCAP., 2018). The educational focus may miss the needs that even more basic than safety and health which must first meet their basic survival needs first. Education portrays a vital position in the decline of delinquency, enhanced public wellbeing, and larger electoral and social commitment (Dana Mitra., 2011).

SLC depends on resilient human needs and infrastructure i.e., Food, Clothing, Shelter, Power, and information. All industries such as Civil constructions (Super structures, Connectivity's, Building and facilities), Telecom (Phone & Internet), Food (Processed & Agricultural), Power (Fuel & Electricity), Clothing & Textiles, etc., should be quick to regain its functionality in bringing back to normalcy even in the destructive incidences which are quite adversary in nature such as tsunami, storms, earthquake or manmade destruction.

Integration towards Industry 4.0

The term 'employability' implies and the characteristics, skills and experience that get to the generic competencies can be entrenched in job. To achieve high-performance using information systems considering the supremacy of computing systems is always the prime objective expected from a cyber physical system, IT is integrated with the existing human and business resources accompanied by various drastic organizational changes, which will significantly impact the organizational dynamic capabilities and appropriate strategic processes. These changes will necessarily influence firm's performance through flexible culture, strategic planning, IT integration, and supplier relationships. The focus on bolstering the organization's cultural,

structural, and systems infrastructures. The nature of industrial work is changing, with less of it is based on manual labour and more of it takes programming, data analysis, and engineering skills. Organizations can play a role in updating the image of industry too. Manageable things like presenting tours of the capacities or contributing in career courses and engaging internship or trainees by providing hands-on experience can change perceptions, in the minds of youngsters on the areas for improvement which ranges from greater consistency in practice on briefing for students with more corrective feedback and mastery strokes which enhances their skill supremacy. Work familiarity has a key position to play in formulating young individuals for the grown-up world. A Few are unhappy with formal teaching where they do not see any connect with the industries demand. Non-formal learning is organized learning activity that does not lead to a nationally recognised qualification and is either self-motivated or peer driven. Similarly, an Informal learning that entails individual or collective study to improve learning of a subject, not including those that are not tutored in classes or qualifications. All formal, non-formal and informal educational inputs affect the knowledge required for industry 4.0. Work knowledge affords a major occasion to create understanding of the contacts amongst the skills they can develop at college or university and the proficiencies that are needed at job. Educational institution should analyse the job markets and engage with the employers to understand where there is demand for entry-level employees and identify the required skills. Partnership with companies and even other educational institutions, when your institution does not possess that expertise, or unique experience in imparting such skills development to your students. Then create targeted training that can linked to the employable possibilities of the work. Superior coverage of students from relegated communal clusters by obligatory teaching, can lessen the drop-out rates in primary education and the success of it will contribute in the inclusive schooling, higher social mixing, long-term restraint of deprivation, occupation of women, etc. (Radivoje M ., 2012). Cooperation between educators, employers and licensed organization relaxes the apprehension (Kato Pant et al., 2019).

Continuity of current education

The educational requirement of industry 4.0 is bringing in an education excellence model, where the components to its existence are the Knowledge excellence, Analytical excellence, and Executional excellence. Today's learners will participate in a technologically different, multi-cultural realm and need to be able to flourish in this futuristic ecosystem (Umachandran, K., et al., 2019)

Knowledge requires identifying the ways of obtaining knowledge, clarifying the characteristics, comprehending the various approaches, describing the landscape and range of the program, distinguish all approaches right from basics, applied and advanced requirement in its curriculum. In short knowledge excellence is a sum of basics, applied and advanced levels of acquired input suited to industry 4.0.

Analytical skills instruction will encourage to enhance their efficacy, and thus boost the long-term influence of their employment and their organisational sustainability. Thus, analytical includes numerical, arithmetic skills, Logical reasoning, use of Graphs, Maps, and Charts to eloquent the theory, select methods and methods for examining precise situations or subjects of investigation, empathetic replication on the material and information collected for reflection study (Mia Sorgenfrei., et al., 2006)

Judgmental knowledge is earned through experiences, where the natural capability to realize ideas that is correct and sufficient to make a decent feel of the decision. It refers to the executional skill of use, by an individual's knowledge, analytical and familiarity to make choices and conclusions towards getting realistically proven. Therefore, execution has a process of planning, articulation, group discussion, creativity, modelling, and finally presentation as the component for its excellence.

Technical Competence

Investing in education scores in billions leading to social and economic benefits for society (Dana Mitra., 2011). Best Possible industrial practices in conjunction with the blend of smart sensors with AI is the crucial characteristic of Industry 4.0. The sensors will increase the agile responses in the value chain through self-test, self-monitoring and self-improve their own functioning, and decrease the occurrences of distorted data. Example of Cyber Physical system and its evolution through the architectures, akin to the mobile phone acceptance across the world. The architectures can be classified as Connection,

Conversion, Cyber, Cognition, Configuration. The Table 1, CPS Architecture referenced with Mobile Phone evolution, through more illustration on the ‘to-be’ industry 4.0.

1. Connection – Charging and use, these activities as simple on operational sense like that we have in a mobile phone. Mobile phone is a combination of Landline usage and Pager; during its initial launch phase it was very basic with features such as Button Phone for Voice and Texting.

2. Conversion – Data to information, these were enabled by additional features such as colour display, Rear view camera, Games, Audio and Video, clipping and editing in the mobile phones.

3. Cyber – Internet, time, and Memory Space constraints; these depict evolutions in mobile phones such as the facilitation in connectivity through 2G Cellular Network (G - GPRS); Phone memory increased 32/64 MB scalable with memory cards 32GB. These led to the utilisation of these gadgets for emails access, search engines and facilitating the download of music and films.

4. Cognition – Make the best use of all the resources available with the machines. The mobile phones were been used for all functions that were done through a Computer with Office tools such as Word, Excel, Power Points, This was period when the social network platforms such as Facebook, Twitter, LinkedIn came into existence resulting in getting people involved to work together.

5. Configuration – Self-control on the machine’s resilience, variations and disturbances affecting it. This period reference to introduction of Apps, cloud storage, Online LMS, Web conferencing, Advancements in SM platforms to provide video call facilities through WhatsApp, Duo, Hangouts etc., The picture sharing through Messenger and Instagram, then full load of video files through YouTube etc., Todays phones are very intelligent with features that efficiently help in

power usage such as in Battery use, memory space, Wifi availability and preference.

Table 1 – CPS Architecture referenced with Mobile Phone evolution

Architecture	Explanation	Illustration
Connection	Charging & Use	Mobile phone a combination of Landline usage and Pager; Button Phone (Voice & Text)
Conversion	Data to information	Colour display, Rear view camera, Games, Audio and Video, clipping and editing
Cyber	Internet, time, and Memory Space constraints	Connectivity through 2G Cellular Network (G - GPRS); Phone memory increased 32/64 MB scalable with memory cards 32GB - emails / search engines / download films
Cognition	Make the best use of all the resources available with the machines. Design of learning algorithms, scaling existing algorithms, to work with large data sets.	Computing, Office tools, Facebook / Twitter / LinkedIn
Configuration	Resilience	Apps/ cloud storage / Online LMS / Web conferencing / SM platforms - Whatsapp, Messenger, Instagram, YouTube / Intelligent - Battery use, memory space, Wifi preference

Technological building of Industry 4.0 gadget

Cyber-Physical System connected with Artificial Intelligence, Machine learning, Data Modelling and Digital Twin. The use of artificial intelligence

and machine learning technology are poised to impact radical modifications across the world. AI is deemed be a field than a feature, and it can be fractured through into numerous classification such as ML, robotics, neural networks, vision, NLP, and speech processing interdisciplinary connected with fields other than computer science, comprising of psychology, neuroscience, cognitive science, philosophy, linguistics, probability, and logic. (Lindsey Andersen., 2018). ML and AI are often used in assistance systems and speech recognition (IDG., 2019). Imminent concerns with these technologies is that, it will essentially employ people with specific Internet of Things connected additive manufacturing skills across the value stream, comprising computer-aided design, machining process, raw material development, robotics and supply chain management; but these are only island of excellence in industry 4.0 and not the perfect obligation of the manufacturing process (Umachandran, K., et al., 2019).

Artificial Intelligence has Big data (BD) linked to an algorithm which has the cognition correction and cognition amplification. The application of which leads to adjustment such as variation, or resilience to overcome adversities and finally offer recommendation to all human deficiencies that could be overcome by this component. Human Deficiencies are normally classified as thinking, memory, and dramatic performances. AI can perform an assortment of cognitive chores such as sensing, managing oral foreign language, thinking, insight, determinations and displaying a capacity to change and influence objects appropriately. Intelligent techniques use a blend of BD analytics, cloud computing, M2M communication and IoTs to operate and learn (ESCAP., 2018). Along with customization, data mining and artificial intelligence (AI) will reap the potential benefits from new technologies.

Cognition Amplification - Implement Smart Human Tools

- Organizer – Calendar, Scheduler, Reminders
- Knowledge – Google, Wiki, Library Resources
- Visualisations – Graphs, Maps, Charts, Dashboard
- Expert Opinion - Astonishing breakthroughs resulting in New pathways and Surprising Research.

- Signs, Signals, Sounds, Symbols, Gestures

Machine learning is a linear Perceptron, with interactive, features, data mining and chat bot.

Interactive tools are graphs, charts and maps which are displayed in a machine. Features are modelling, timings and deployment. Data Mining encompasses all the algorithm, hyper parameters, classification regression, time Series and cluster analysis. Chat Bot includes the voice and text as input and output.

Deep Learning is an Artificial Neural Network function with multiple layers of networks, non-polynomial actuation and with hidden layers of unbounded width. It is comprised of responses - image or audio and numerous hidden layers of sub-models that provide as input for the subsequent tier and eventually an output of stimulation resultant action (ESCAP., 2018). Higher level features with sensory inputs include vision, voice, auditory, touch and smell, which must be recognised then probabilistically analysed and translated. The novel evolution of research is happening now in taste sensors are pH, titration, chemical and microbial in food and flavour industries.

Data Modelling is the programming that is an input to the digital automation for an expected outcome; and corrections that need to accommodate the sensors spiking signals through transducers and the computing device as a binary output into the IoT.

Digital Twin is a diagrammatic replica of a physical entity which can be evaluated for its elements and dynamics. The features can be classified as real assets, operation and environmental.

- Real Assets - All 'as-is' physical Assets in an organization, connected to the process flow.
- Operational - Age, Health and Degradation (wear and tear) of each individual asset.
- Environmental - Changes in the ecosystem, Input parameters

Teaching

Educational establishment plays a substantial purpose of delivering knowledge encounters to take the lead by their learners from the obscurity of obliviousness to the illumination of understanding. Every country needs a very careful, coordinated and high-quality advancement of teaching because it is the key conditions for the growth which can lead a culture founded on education and proficient of delivering excellent employment prospects to the people (Radivoje M ., 2012). The main people in the establishments who work towards an essential role in bringing about this renovation are teachers. Teacher education develops the teacher's competence and ability to facilitate and encourage them to connect the constraints of the profession and confront the encounters there, encompassing tutoring skills, sound pedagogical concepts and specialized skills. Industry 4.0 requires a variation in the orientation of teachers to be as facilitators of learning, then as contributors to teaching. To safeguard our educational technology and to grow at the rate ordered by the current pervasive digital learners, a constant examination of developing technologies along with conventional teaching practices and also suggest desirable changes is the pertinent need to education (Umachandran, K., et al., 2019).

- Visualisation - See learn, prototypes, working models, laboratory, videos and online
- Personalisation - Informal learning, Social Media, MOOC, and Peer learning
- Gamification – Puzzles, Riddles, Jig Saw, Experimentation, Working Circuits and Quiz
- Problem solving & Projects

Enhancement in student understanding and results through technology enabled education develops partnerships among institutional units, employers, community partners and offers the successful approach of education services and prospects to students (Amuthalakshmi., et al, 2019). Students' anticipations and Evaluation Deliverable have a mixture of inbuilt fear to handle failures and exposures and comparison phobia. Hence formative evaluation formulates students for achieving on their comprehensive

appraisals, which is the outcome of learning along with feedback eventually diminishing the negatives, such as comparison phobia (Said, M. M. T., et al., 2019).

Change in Human Beings towards acceptance of Industry 4.0

Change initiatives in Human include the engagement roles in an industry 4.0 that would offer the following, based on their engagements in different kinds of role they get positioned in the hierarchy of the organisation. Initiatives which integrate basic skills along technical bring more positive attitude to learning sandwiched between learners and enhanced fulfilment (Foresight., 2017). Therefore, it is essential that today's pedagogy deliver lifelong students to succeed in a global platform (Umachandran, K., et al., 2019). Every organization will expand its present skills support beyond the acquisition of talent pool. Employees should be adaptable in attitude, participate in active learning, groom superior cognitive skills and be well informed in digital technologies.

- Operate - Sensors, Tethering, Plug & Play
- Maintain - Understand aging, degradation, health, and performance
- Integrate - Can handle Time and Memory space constraints of the machine, do cluster analysis and data mining for optimising, minimising, or maximising the output of the machine. AI can enhance human capacity by managing and exploring substantial datasets considerably swifter (ESCAP., 2018)
- Regenerate - Simulation, Synthesis, Diagnosis, Visualization, Decision Making; Play with various machines to achieve the enterprise goals by scheduling and routing all the available machines.
- Leader - Can configure machines to become self-control on resilience, variations and disturbances.

The world is dwindling to new scientific and technological innovations that enlarge the boundaries of human intelligence, resulting in enhancements in transportation, communication, space exploration and learning technologies (Umachandran, K., et al., 2019)

Conclusion

Experience is a knowledge, understanding of insight of the industrial requirements such as the realities, data, explanations, talents, that are obtained through recognizing, realizing, and understanding. To be prepared for handling such an opportunity in the future industries, the psych parameters in those individuals should be with positive attitudes such as an inclination in affiliated liking, constructive preferences, favourable situation, oriented opinions, and benefiting beliefs. The perception which builds the employability big picture should suitably tune the inputs from sensory, stimuli, memory which is acknowledged and analysed to complete a dependable picture. It covers all the people who are engaged in productive activities that contribute to the national product of the country constitute to be a workforce for the development. The involvement of adolescent or growing to-be adults is a vulnerable group with high-risk or prohibited behaviours can have terribly affect the long-term outcomes for the society. Hence education is a vital formative tool which can be positioned to groom them to become useful citizens for the society. Progressing human development necessitates, expansion of the physical prospects, they have to evade early bereavement by ailment or injury, to relish shield from subjective rejection of existence, to live in a strong setting, to uphold a healthy existence, to obtain superiority in therapeutic care, and to accomplish the maximum thinkable standard of physical and psychological well-being. The employment should finally lure and hold the employees with rewards that which offer motivation and speeds up their contribution to the upliftment of the organization performance, which pushes the economic rewards and bonus or incentives to be a sought after effect which can linked to their involved performance.

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