Education 4.0: A New Paradigm in Transforming the Future of Education in India

Dr Ruchi Tandon   (Amity University, Noida)

Dr Sanjeev Tandon (ITS, Mohan Nagar, Gaziabad)

Abstract

This research reviews the existing literature on education4.0. The 21st century will be requiring intellectually intensive jobs and gradually the activities with human intervention will be replaced by machines. The fourth industrial revolution (IR4.0) is changing the world around us. IR4.0 has a key role in the evolution of education system. In the era of artificial intelligence (AI), robotics, big data, autonomous vehicles, bio and nanotechnology, 3-D printing, quantum computing, material science, energy storage and internet up-gradation, the teaching-learning process in India needs a relook. Even the various degree / diploma academic qualifications require a serious thinking. Do we really need various degree programs which have lost its sheen in the contemporary industrial environment (IR4.0)? The IR4.0 wave has compelled educators to align human skills with the innovative technologies, now being termed as disruptive technologies across the globe. The workforce required by the industries (various business units) would be an opportunity being created by advanced technologies. Thus, Indian education system has to cope-up with the requirements of IR4.0. In the era of industrial revolution 4.0 (IR4.0), all the schools and colleges should have the curriculum and training matching the job requirements. Incidentally, these requirements of work force are different from industrial revolution 3.0 & 2.0. Education 4.0 is a response to the needs of IR 4.0. Ideally speaking, Indian education system has been guided to change the gear from education 3.0 to education 4.0. Are we preparing the country for education4.0 in our educational system? The present research paper investigates about the awareness and the readiness of the various stakeholders with special reference to Education4.0 at Delhi-NCR. The knowledge about education 4.0 among stakeholders has been investigated. Ministry of Human Resource Development (MHRD) needs to gear-up, developing appropriate academic programs and curriculum from school level to the higher education. Variety of skill development universities, mapping the contemporary job positions need urgent attention and planning. More concerted marketing efforts are required with a public- private partnership, to

create awareness about IR4.0 and education4.0. The requirements of IR4.0 are to be loudly and effectively communicated to the educational institutes (schools & universities). Relevance of education 4.0 in the contemporary job scenario has to be marketed rigorously.

Keywords: Education 4.0, Education System, Education 3.0, 2.0 & 1.0, Industrial Revolution4.0 (IR4.0), Artificial Intelligence (AI), Big Data Analytics, Industrial Revolution 3.0 & 2.0.

1. Introduction:

The social economy has been evolving steadily across the globe. The different phases of social economy (Economy 1.0- 4.0) in their respective era urged for a unique skill set of human capital. Digital society has transformed daily lifestyle of an individual. The lifestyle of people across the globe has been evolved irrespective of distance, time and places. The digital society has become more updated and it connects every individual globally with a wider vision. Digital revolution and technology advancements have transformed framework of the education system. Right from the start, during the journey of human civilization in the past 250 years, the four industrial revolutions have significantly affected the education system. The digital social economy has evolved with the passage of time. The society had very briskly moved from steam engine era (1780: IR1.0), to the production era (1900: IR2.0), then entering into the computer era (1970: IR3.0) and the era of internet connecting computers (2000:IR4.0). During IR1.0, the education was a luxury for the rich. The society had very little expectation that, the children would go for any education. The employment was typically with on the job apprentice training. With the onset of IR2.0, industry had requirement of skilled workers, who ought to be literate. The workforce had majorly literate people, who learn the basic skills of the trade faster. The education system was more inclined to serve the needs of the industrial requirements. The subsequent era of IR3.0 had introduced computers. Technology gradually started overpowering industries and the multifaceted uses of computers became evident. Human intervention for various job works in the industrial setup started reducing. The industrial system had become more mechanized during IR3.0. IR4.0 was first introduced in 2011, at the Hannover Fair and this term had been represented under the title of intelligent production (Mehmet Baygin, Hasan Yetis, Mehmet Karakose and Erhan Akin 2016). The time has now reached to bring education into the 21st Century. Manufacturing, during this phase of Industry 4.0 concept, is moving to the next phase of digitalization. The fourth industrial revolution (IR4.0) has changed the world around us.

Artificial intelligence (AI), robotics, big data analytics and internet revolution has impacted industrial job market. In this era of IR4.0 some of the professions will be replaced. These emerging innovations have significant effect on the education of people. Creativity is the cornerstone of IR 4.0. Only qualified, highly educated and skilled employees will be able to control the innovations of the industrial setup. The innovative technologies have brought in smart media, and thus a revolution in education system from education 3.0 to education 4.0. The industries will have efficient operations and the modus-operandi would be machine-machine, human-machine or human-human. Large data (Big Data) would be analyzed to predict possible failures. The knowledge, qualification framework and regular staff training will be an essential part of IR 4.0. Prognosis-monitoring system has started replacing human operated machines. Virtual learning environments (VLEs) will enhance efficiency of companies. Big companies would be establishing training schools for highly skilled job opportunities. Effective production will be the key as per the changing customer demand. Companies will be more into producing smart products. The IR4.0 wave has ultimately revolutionized the education system and has become more demanding and innovative with the advent of internet age. 4.0, this code had initially been used to mark the disruptive change, which takes place in the manufacturing industry through the pervasive application of Information and Communication Technology (ICT), coining the term Industry 4.0. In the era of smartphone classrooms and online exams, robotics has entered deep into our day to day working, as house help or workplace companions. Globally in the education space a trend has been developed for the young professionals to meet the requirements of various industries. The efforts were focused to drive students to become valuable members of the workforce and independent problem solvers. Thus, intellectually intensive jobs of 21st century have impacted the education system. Education 4.0 has become a buzzword among educationists across the globe. In developed countries some universities are already developing an education 4.0 experience for the students. But for shaping this new world and expectations of students, we need more planned and systematic collaboration across sectors. To take full advantage of the opportunities created by advanced technology, education system in India needs overhauling. Do educators in India keen to understand the changing dynamics? India is no exception in this ever changing world, but, to learn the dynamics and requirements of IR4.0. How far we are successful molding our education system in sync with IR4.0, is yet to be investigated?

In the contemporary world of fast changing technology and information overload, students need to be trained and not taught. They should learn how to access relevant information, rather than the teacher offering to them the information in a rigid structure. Educators should always bear this in mind that, students are not alike and they don't have the same starting point. Education 4.0 needs to be aligned with industry 4.0 so that; the students should be made capable to grab job opportunities in the contemporary world. As digitalization increases its effects in modern manufacturing, producing promising results, more and more companies are marching towards integrating industry 4.0 technologies in their systems. The applications are targeting all the steps of design and production, exploiting the increasing acceptance of mobile device applications and internet of things and the advanced connectivity capabilities offered by modern networks (Hermann, M., Pantek, T., & Otto, B. 2016). Mobile devices provide a digitalized input device, that integrates customers in product design (Mourtzis, D., Vlachou, E., Siganakis, S., Zogopoulos, V., Kaya, M., & Bayrak, I.T. 2017). Industry and education system should be aligned. The fast paced innovations have made the world more dynamic. The advancement in information technology has transformed the society from agricultural society to industrial society. Manufacturing process with digitalization and intelligentization is the need for today's industry. The manufacturing industries have shifted from mass production to customized production. Industry 4.0 includes internet of things, industrial internet and smart manufacturing. It focuses strictly on the integration of human in manufacturing process. The 4.0 scenario describes industrial revolution with full automation and digitalization processes. The use of electronics and information technologies (IT) in manufacturing and services in a private environment are evident in industry 4.0. The development and integration of a consumer in the mode of cyber-physical systems have led to the emergence of consumer behaviour related to 4.0 (Dominici et al., 2016). The industry 4.0 has conceptualized the developmental projects such as smart cities and communities information, strategic roles of smart cities for tackling energy and mobility challenges. The industry4.0 and the contemporary education 4.0 have to analyse the potential of this wide-scale rollout of integrated smart cities and community's solutions (European Commission, 2015). The digital revolution is more experienced by paradigm shift to artificial intelligence (AI.), big data, and connectivity. The transformation of industry is more evident and supported by the changes in the processes, like, digitalization of production, automation and linking manufacturing sites in a comprehensive supply chain (automatic data interchange). The characteristics of industry 4.0 have increased the competitiveness through smart

equipment, demographic changes, energetic efficiency and urban production. The business environment of smart factory, machine communications (M2M) and smart products are a subcomponent of the cyber-physical systems (Greengard, 2015, Kayermann, 2014). Thus, the youth has to keep pace in response to the current social changes. In the present industrial setup the production lines are highly flexible. This has given leverage to the education system to tailor made the learning path of students. The way in which industry 4.0 gives impetus to online quality control, in the similar manner education 4.0 has started formative assessment. Peers become very significant in the learning process in education 4.0. The students learn together, along with their peer group, while the teachers assume the role of facilitators in this learning process. Secondly, the learning is not classroom centric; it can be taken place anytime anywhere. The guidelines followed in education 4.0 are of a flipped classroom approach. In this approach, interactive learning is done in the class and the theoretical parts are to be learned outside the class. No time bound learning is experienced here by the learner. Even the learning is kept personalized to an individual student and the process is also carefully administered. A high level learning task is introduced to a student, when certain level of understanding is developed. Moreover, a rigorous practice to the given task is availed by the instructor for the student, till the time mastery level is attained. Primarily, positive reinforcements are used to promote positive learning experience in education 4.0. In the teaching-learning process (& curriculum designing), the learning outcomes of a course are preset by the institutions/ governing bodies, but, the students are still free to choose the learning tools or techniques that they prefer. We can observe 4.0 being administered in variety of fields like, Healthcare 4.0 or Work 4.0 etc. The essence of education 4.0 for the academic educators is to remain agile and adapt to the necessary changes. The students' are to be prepared keeping in mind the fundamental principles of education 4.0 in sync with industry requirements. Teaching factories are an important way of practicing the technical knowledge that is included in the emerging education 4.0 concept. Education 4.0 considers, on the one hand the exploitation of the developed technologies (eg advanced visualization techniques that integrate virtual reality) to facilitate the teaching process and on the other hand the methods and the workshops that will familiarize the aspiring engineers with these technologies, as will work in industry 4.0 environments (Demartini. C., Benussi 2017). Teaching factories are an important way of practicing the technical knowledge that is included in the emerging education 4.0 concept. This is a holistic approach for moving from the traditional teaching factory to teaching factory 4.0, integrating cyber- physical systems

and industry 4.0 technologies. (Demartini, C., & Benussi, L. 2017). Dunwill (2016) says that the advancement of advancement of technologies keeps on changing and transforming the teaching method and the setting of the learning process. Kozinski (2017) highlighted the following learning preferences of the Gen Z students. To perform the Industry 4.0, there are basically six different design principles. These are, respectively, interoperability, transparency of information, technical support, real-time data acquisition and processing, modularity and distributed decision (Mehmet Baygin, Hasan Yetis, Mehmet Karakose and Erhan Akin 2016). Industry 4.0 has design principles, implementing and conceptual approaches as lectures in higher education and training and / or dissemination. Industry 4.0 concept of course takes place as part of the course content. The goal of industry 4.0 is to remove physical labor by industrial robots. The dynamic use of industrial robotics requires programming and commissioning. Robot programmer performs all the activities. An important factor for industry 4.0 will be data security and data communication.

2. Literature Review:

The information and communication technology in the industrial revolution have brought in phenomenal transformations. (Pooworawan, 2005). The new pace of virtual world brings a sea change in the lifestyle of people. People have learnt to live in an environment of social media. Their knowledge and awareness have increased multifold. From Economy 1.0 era till the digital society economy, the life style of people has been evolved significantly (Luankaew, 2016). The changes in economy 1.0 have been slow but the results were highly encouraging. From an agrarian society, with less technical knowhow, the society has moved to the era of steam engines. During this era the work was shared among labors on the basis of the capability and fitness. Industrial revolution had brought in the phase of Economic 2.0. The next phase was Economy 3.0 had improved the work performance of an individual. The economy was more observing IT & ITES services. Changes have been phenomenal. The usage of solar steam engine, oil and electricity had improved the working process. The dynamic fast changing world has led to transformation from agricultural society to industrial society, with more advancement in

information technology and innovation that is named as the Economy 4.0 era (Puncreobutr.Vichian 2016).To develop youths to use new technological applications for using intelligent agents, Mobile technologies, Cloud Computing and services (Nedeva and Dineva, 2012), it is very essential to search for new approach and ways in learning management; addition to the learning management of 21st Century Skills. Many concepts of the learning management for the 21st Century Skills are still very interesting or could be used, such as the concept of Zhoa (2012), Sinlarat (2016) and Gomaratat (2015). The concept of Zhoa (2012) is to arrange the learning process such as being in the real situation of working in the plant. As of Sinlarat (2016), there are 4 ways: 1) Critical-Based Instruction, 2) Creativity-Based Instruction, 3) Productivity-Based Instruction, and 4) Responsibility-Based Instruction. From Gomaratat (2015), arranged to adapt the Constructionist Learning, that are 3R, 3I and 3P. The 3R is Regulating the understanding, which consists of Recalling, Relating, Refining; the 3I is Investigating, that consists of Inquiring, Interacting, Interpreting; and 3P is producing, creating work by Participating, Processing, Presenting. Jeschke (2014) proposed that Social & Virtual Learning must be the Learning with social media, in large groups and in virtual environment, suggested the process as: Massive Open Online Courses: MOOCs. While Teaching tools (edudemic, 2012) have stated the 10 powerful tools for future, namely, visual Learning, evolved currencies, personalization, gamification, social media, game-based learning, connectedness, crowdsourcing-it is distributed problem-solving and production model which has solved the problem through the process of Project-Based Learning, Digital and Physical Merge, which is cited and acknowledged by (Nedeva and Dineva, 2012). Industry 4.0 supported by innovative technologies such as internet of things, cloud technology, augmented and virtual reality will also play an important role in manufacturing education, supporting advanced life-long training of skilled workforce (D.

Mourtzis, E. Vlachou, G. Dimitrakopoulos, V. Zogopoulos 2018). Dunwill (2016) says that the advancement of technologies keeps on changing and transforming the teaching method the setting of the learning process. Manufacturing is an ever-growing economic sector, with the requirement of 3 million new jobs over the next decade. He also predicted how an average classroom will look like in the next 5 to 7 years. A huge change in the layout of the classroom will be witnessed. Virtual and augmented reality will change the education landscape. The students' assignments will accommodate multiple learning styles. Massive Open Online Courses (MOOC) and other online learning options will impact secondary education. The Social and Economic Learning (SEL) being shared by the World Economic Forum report 2016b, states that 16 proficiencies for education are very crucial in the 21st century. The skill set which will remain in high demand by the industries are critical thinking, creativity, complex problem solving, emotional intelligence, cognitive flexibility, negotiation, judgment and decision making Relationships, service orientation and coordinating with others. Teachers / instructors need to equip themselves with digital tools and have to relearn to meet the expectations and learning preferences of Gen Z. They are purposive and serve to bring out meaning in a person's life and the formation of their personality (Aron & Elaine, 1996; Kelley, 1986). Every relationship provides psychological, sociocultural, and relational meaning and significantly adds meaning to the life of persons who engage in them. These relationships are generally influenced by demographic factors age, life cycle, gender, social network, and culture (Dion & Dion, 1996; Levinger, 1995). Gen Z welcome challenges and enjoy group discussion and highly interactive learning environment. Kozinski (2017) highlighted the following learning preferences of the Gen Z students. These students feel that learning is without boundaries and they can learn anywhere and anytime. They are confident to have access to new information. Active collaboration with

their team members is an integral aspect of the learning process. They feel happy, when the learning is planned at places other than their classroom. Gen Z students are technology savvy and would love to use digital tools rampantly. The social learning platform has open learning (OL) platform, which is being used to host the content, tasks and assessment of the course. Data sciences, cloud computing, smart manufacturing, advanced robotics, artificial intelligence (AI) are more to be focused in the 4.0 era (Dunwill, E. 2016).

3. Objectives and Context of Research:

The vision of Industry 4.0 has introduced various new approaches and methodologies, along with innovative technologies. The challenges of this dynamic industrial environment have been magnificent. The concept seeks for elevated competencies, skills and qualifications. The job roles in the companies have also been evolved. The industrial requirements of robot programmer, process engineers, cloud system engineers, integrators, data analysts, cyber security technicians, process engineers, electronics technicians etc, cannot be satisfied with Education 3.0 system.

This study helps in developing insights about Education 4.0 and its awareness in Delhi-NCR. The research encircles the following objectives:

    i.   To study the related literature on Industry4.0 and Education4.0.

    ii.   To investigate the awareness level of Education 4.0 & the challenges posed by Industry 4.0.

4. Research Methodology:

Problem definition: To develop a deeper understanding of Education 4.0 and its understanding for the alignment with Industrial 4.0 in Delhi-NCR. The awareness level of

Education 4.0 with various stakeholders: academicians (college & school) and students (colleges) are to be investigated.

The current study is a descriptive research design (cross-sectional survey) of academicians and students of Delhi-NCR. The methodology of this study adopts a scoping review of literatures related to Education 4.0 and Industry 4.0. The descriptions and reviews are carried out by analyzing the studies related to Education 1.0- 4.0 and Industry 1.0 – 4.0. Data involves a review of secondary researches on Industry 1.0 – 4.0 and aligning concepts of Education 1.0 – 4.0. The primary data has been derived by the survey method using structured and non-disguised questionnaire. The purpose of the survey is to study the awareness level of Industry 4.0 and to develop an insight about the education system. The feedback of 213 academicians (school teachers and college faculty members) of Delhi-NCR has been derived using questionnaire, administered through Google form. Aiming to bridge the gap between Education 3.0 and Education 4.0 in India, this study investigates the awareness level of the pedagogical tools and its implementation under the umbrella of Education 4.0. The awareness levels among stakeholders and smooth integration of education 4.0 with industry 4.0 has been investigated.

5. Research Analysis & Findings Through Review of Research:

1. In the last 250 years, society has experienced four industrial revolutions, which have entirely changed the face of industry. Do you agree?
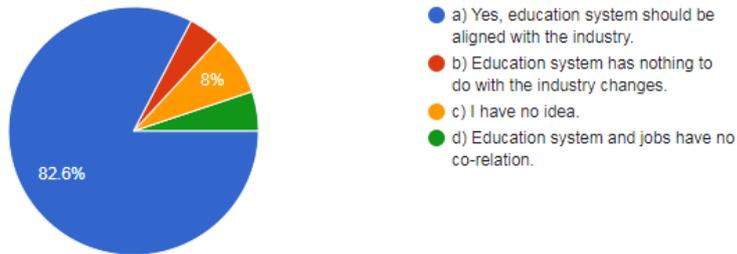
213 responses

● Yes
● No

98.1%
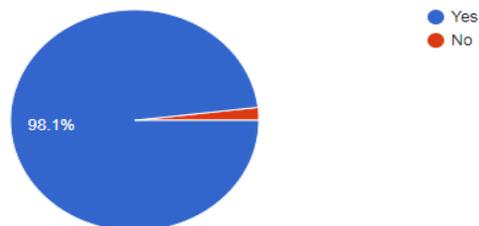
The awareness of industrial revolutions has been 98.1% of the respondents. The changes experienced in four industrial revolutions have been significant.

2. Do you feel that, education system for the students has anything to do with changes in industry?

213 responses

- a) Yes, education system should be aligned with the industry.
- b) Education system has nothing to do with the industry changes.
- c) I have no idea.
- d) Education system and jobs have no co-relation.

82.6%

8%

The changes in the education system had been in tandem with the industrial revolutions. 82.6% respondents admit that, changes in the education system should be in accordance with the industrial job requirements.

3 The ultimate goal of education system is to create student as a valuable members of the work force.

213 responses

- Yes.
- No
- Partially True
- No Idea

42.7%

50.2%
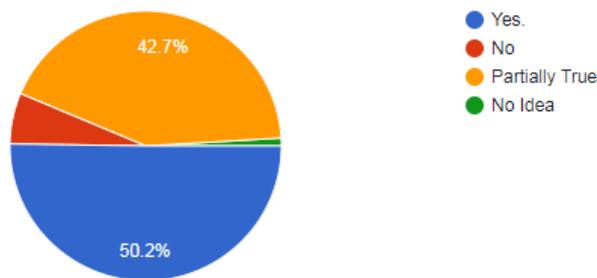
50.2 % of the respondents have this view point that students are the valuable members of the workforce in the contemporary industrial era. 42.7% of the respondents partially agree on the above statement.

4. Educational paradigms need to be rebuilding alongside each new industrial revolution in the society.

213 responses
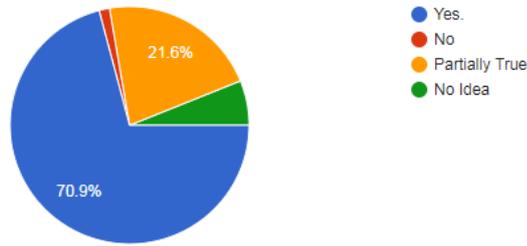
70.9 % of the respondents agree on the educational paradigms working in accordance with the industrial requirements during the phase.

5. The rigid framework of study disciplines, education standards and eventually standardized testing has become learning models of past.
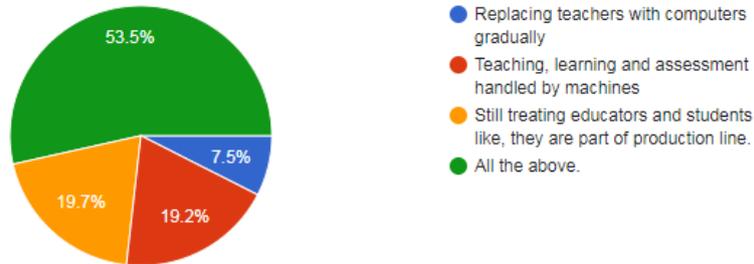
213 responses
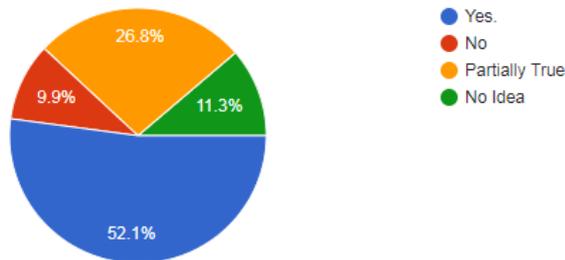
The learning models in the education system have been evolved with the changing time. 52.6% respondents agree on the fact that rigid framework of education has become learning models of the past. The flexi hour classes and flipped class rooms have become the contemporary education system. In our education system, we could witness a rigid framework of teaching-learning pedagogy. In the era 4.0, there is a need to propagate various pedagogical tools, which are relevant.

6. The introduction of the computer did change the underlying ethos behind our education system. The technology computers and internet:

213 responses

- ● Replacing teachers with computers gradually
- ● Teaching, learning and assessment handled by machines
- ● Still treating educators and students like, they are part of production line.
- ● All the above.

Technology has revolutionized the education paradigm. 53.5% respondents agree to the fact that in the times to come artificial intelligence (AI) will rule the education system. Gradually, the teaching-learning and assessment process will be machine driven (AI dominance). The computer aided smart manufacturing will involve advanced robotics and AI.

7. In today's new world of fast changing technology and information overload, students need to be:
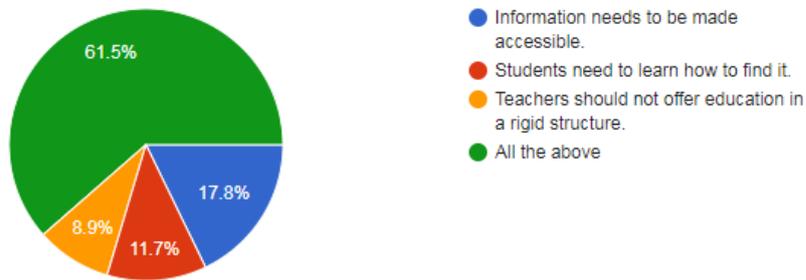
213 responses

- ● Trained
- ● Trained, but not taught
- ● Trained & taught
- ● None of the above.
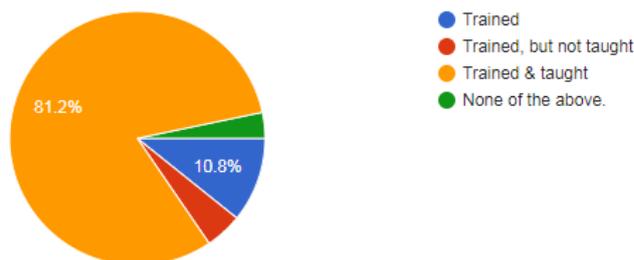
The respondents (81.2%) were of the opinion that students should be trained and taught. But, in the Education 4.0 the students need to be trained, rather than taught. Training is an integral part of education 4.0. The conventional mode of lecture has to be quickly replaced by flipped classes and interactive learning.
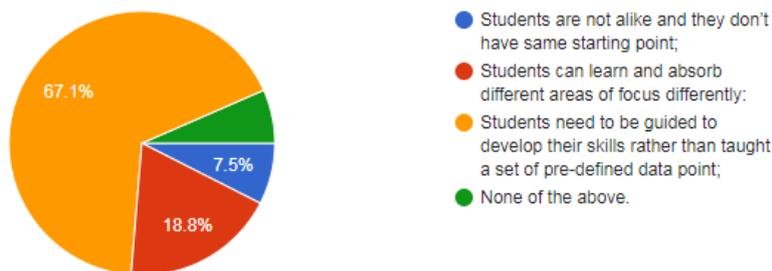
44

8. In education 4.0:

213 responses

- Information needs to be made accessible.
- Students need to learn how to find it.
- Teachers should not offer education in a rigid structure.
- All the above

Majority respondents (61.5%) highlights that the contemporary (Education4.0) education system should not be a rigid education structure. The students should be driven to find relevant information, rather than serving every bit of information to them. Thus, the contemporary education system should be more learners centric with information search to be done in-advance by the students. In this 4.0 era of spoon feeding to the student is not expected.
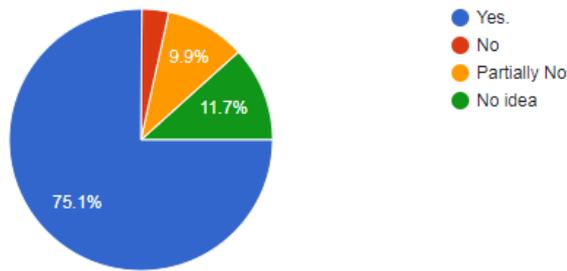
9. In Education 4.0:

213 responses

- Students are not alike and they don't have same starting point;
- Students can learn and absorb different areas of focus differently:
- Students need to be guided to develop their skills rather than taught a set of pre-defined data point;
- None of the above.

The respondents (67.1%) agree to the viewpoint that students should be more guided to develop their skills rather than being taught in a predefined rigid form. Moreover, in Education 4.0, this is an expected fact that students are not alike and have to be dealt in tutorial classes with smaller groups. The awareness about the shift in the teaching-learning pedagogy in 4.0 era is an urgent requirement.

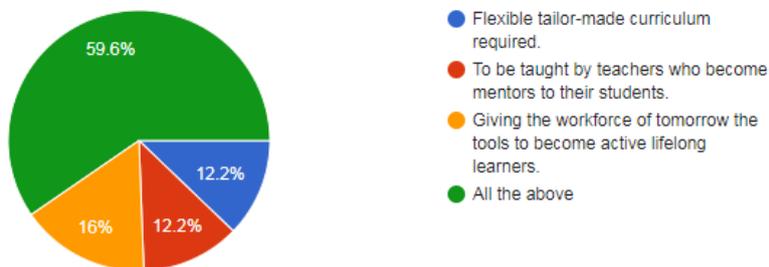## 10. Education 4.0 needs to be aligned with industry 4.0

213 responses

- ● Yes.
- ● No
- ● Partially No
- ● No idea

9.9%
11.7%
75.1%

The respondents (75.1%) are of the view that Education 4.0 has to be aligned with industry 4.0. Although, much of the awareness is required to be created decimating information pertaining to the core features of education 4.0. The education institutions miss on the implementation part, regarding the guidelines of 4.0 era.

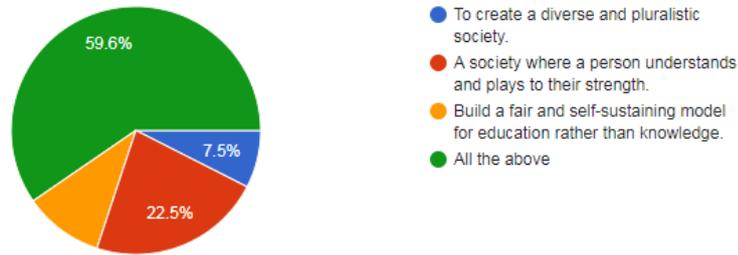## 11. In the education system of 21st century

213 responses

59.6%
12.2%
16%
12.2%

- ● Flexible tailor-made curriculum required.
- ● To be taught by teachers who become mentors to their students.
- ● Giving the workforce of tomorrow the tools to become active lifelong learners.
- ● All the above

The respondents (59.6%) endorses on this fact that flexible tailor-made curriculum is the need of the hour. Teachers have a major role as a mentor, rather than providing lectures in a rigid pattern of delivery. The necessary requirement for a teacher is to guide the student to be an active lifelong learner. With the changing times, the new skills need to be acquired. We still lag on the awareness part. The requirements of 4.0 era are to be followed in-letter and spirit.
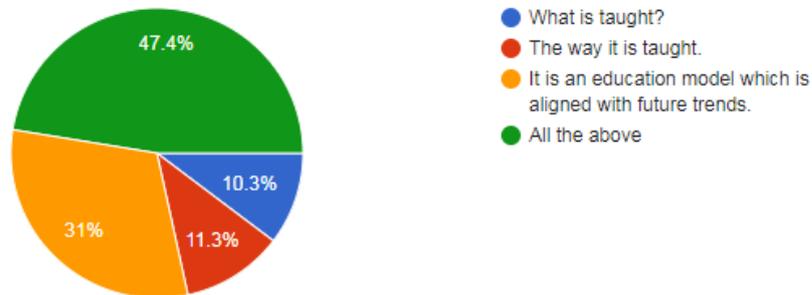
12. The goal of education 4.0 is:

213 responses

- To create a diverse and pluralistic society.
- A society where a person understands and plays to their strength.
- Build a fair and self-sustaining model for education rather than knowledge.
- All the above

The respondents (59.6%) agree to the point that contemporary education has to build a fair and self-sustaining model for education rather than knowledge transfer in a rigid form. The education system develops a society which is pluralistic and diverse at large. During this 4.0 era, (40%) respondents do not know the essence of education4.0.

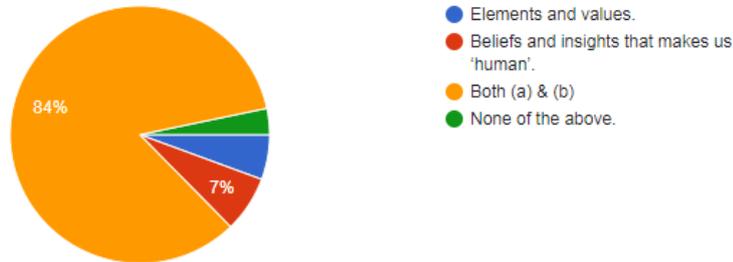## 13. A disruptive system, education 4.0 not only focuses on:

213 responses

- What is taught?
- The way it is taught.
- It is an education model which is aligned with future trends.
- All the above

The respondents (47.4%) were of the opinion that education system should ultimately align with the future trends in the society to make it more conducive and productive. Till the time the education system is not aligned with the industry 4.0, we will find a mismatch in the demand & supply of the job seekers.

14. The barriers between man, machine, and technology dissolve; we need to define education for the next generation by keeping intact:
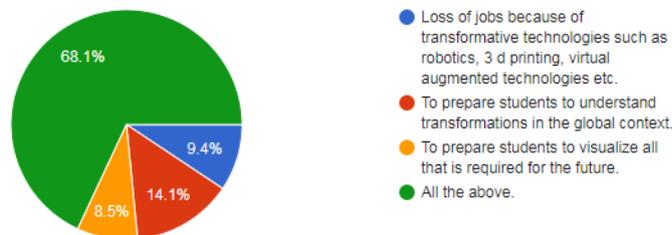
213 responses

- Elements and values.
- Beliefs and insights that makes us 'human'.
- Both (a) & (b)
- None of the above.

The education system for the next generation should dissolve the barriers between man, machine and technology. Majority respondents (84%) are of the view point that, education system should induce beliefs and insights which makes us more human. The value system is the underline force to develop any society for the larger good.

15. Industrial revolution 4.0 has brought in education 4.0 to cope- up with the challenge of:

213 responses

- Loss of jobs because of transformative technologies such as robotics, 3 d printing, virtual augmented technologies etc.
- To prepare students to understand transformations in the global context.
- To prepare students to visualize all that is required for the future.
- All the above.

Education 4.0 should prepare students to understand transformations in the global context. The respondents (68.1%) endorses on this fact that contemporary education system should prepare students to visualize all that is required for the future. These transformative technologies of Industry 4.0 require varied skill sets and major transformation in the overall approach of students towards the job positions coming their way. Artificial Intelligence (AI) will be replacing majority of the present job positions,

thus skill sets required for robotics, 3D printing and virtual augmented technologies should be an integral part of academic curriculum.

Conclusion:

The research study explored deeply into the era of industry 4.0 and the dynamics to cope-up with the visible challenges in Delhi-NCR. The future smart products and services have reduced the shelf-life of modern technologies. The world is shrinking because of new a scientific and technological breakthrough, which has enhanced the boundaries of human knowledge. This has resulted into a paradigm shift in communication, transportation, space exploration and educational technologies. In the 4.0 era, students will compete in a diverse, multi-cultural and techno-savvy futuristic environment. The governing (regulatory) bodies in the education system have to be more proactive and agile. The preparedness of the education system to ultimately provide industry (4.0) ready candidates is a matter of big concern. The curriculum and the pedagogy used in the present education system needs a serious discussion and relook. The academic bodies like, CBSE, AICTE, UGC etc need to seek students' opinion in designing and updating the curriculum. The mushrooming of higher education institutes / universities, with no quality check/ control by statutory academic bodies, is a cause of great concern. These low quality institutions / universities are providing low quality inputs for the industry in the form of human resource.

The new technologies which are evolving at an exponential pace will be requiring competent candidate. In Indian parlance the contemporary education system has to justify the challenges of these recent advancements, like artificial intelligence (AI), robotics, the internet of things, autonomous vehicles, bio and nanotechnology, 3-D printing, material science, quantum computing and energy storage. The awareness of Education 4.0 is

evident, but, positive reinforcements are required to be penetrated done the line to schools and colleges pan-India. The curriculum and contemporary industrial job positions have to be aligned. The understanding of required skills for teachers of 21st century and the pedagogy toned-up to the standards of industry4.0 is an urgent requirement. The onset of an era of learning-anytime-anywhere has to be established. The greater opportunities have to be garnered for e-learning tools. This will offer broader accessibility for the students in the form of self-paced learning. The concept of Flipped classroom has to be propagated. The flipped classroom approach would facilitate the classroom instructor to plan the learning activities to support the social emotional learning of the students. Systematic education policy and proper monitoring drive by AICTE/ UGC for higher education institutions would propagate quality industry relevant outcome. Higher education and training institutions should opt proactive measures to develop digital skills and knowledge for the students. Students should be more exposed to project-based learning and hands-on-learning through field experience such as collaborative projects, mentoring and internships. The theoretical knowledge has to be amalgamated with usage of data interpretation and reasoning skills. The education system should induce Massive Open Online Courses (MOOCs) and other online learning platforms in the teaching and learning. The system should move towards a socio-technical-digital ecosystem. To serve the 4.0 scenario, the physical-virtual dimensions should be intertwined for providing smart services. The 4.0 era should focus on three Hs: Head that is knowledge, Heart that is wisdom and Hand that is skills. More interactions between people, machines, and digital technologies would appropriately serve the emerging ecosystem. The role of higher institutions is to provide enough resources to encourage academicians to use technologies in their classrooms realizing the higher education 4.0 and the industrial revolution 4.0. The teaching pedagogy should incorporate hands-on-activities. The

continuous involvement of the student should be in the skill development activities, rather than conventional classes. The students are expected to experience or carry-out physical activities, rather than merely listening to lectures or watching demonstrations virtually. Hands-on learning would help to increase student engagement through direct practical experience. The academicians can further equp students to become a lifelong learner by using hands-on-teaching method. The era of 4.0 has the usage of certain themes of E-learning and immersive learning. E-learning has its evolvement from face-to-face teaching and the earlier generations of distance education. Immersive learning utilizes simulations, virtual learning environment and role playing. Academicians should use interactive platforms such as "Kahoot" and "Socrative" to effectively engage students while conducting assessments. Kahoot is a game-based learning program enhances the aura of the overall learning. Socrative is a cloud-based students' application. The flipped classroom approach facilitates the class instructor to plan the learning activities to support the Social Emotional Learning of students. Systematic education policy and proper monitoring of education institutions will propagate industry centric approach of education.

References :

A Dujin, C. Geissler, and D. Horstkotter (2014), "Industry 4.0 The new industrial revolution How Europe will Succeed, " Rol Berger Srateg. Consult, no. March, pp. 1-24.

Achabal.D.,Gorr. W., & Mahajan. V. (1982). "MULTILOC: a multiple store location decision model"*, Journal of Retailing*, 58(2), pp. 5-9.

Ackoff, R. L. (2005). *On Purposeful Systems: An Interdisciplinary Analysis of Individual and Social Behaviour as a System of Purposeful Events.* Aldine Transaction Publishers, Piscataway, New Jersey.

Adkin. LeHew, M.L., Burgess, B., & Wesley, S. (2002). "Expanding the loyalty concept to include preference for a shopping mall". *Review of Retail, Distribution and Consumer Research*, 12 (3), pp.225-236.

Akyuz, Serhat, and Fatih Yavuz. 2015. Digital Learning in EFL Classrooms. Procedia-Social and Behavioral Sciences 197: 766-69.

Anderson, P.M. (1985). "Association of shopping centre Anchors with performance of non-anchor specialty chain's stores", *Journal of Retailing*, 61, pp. 61-74.

Anikeeff. M. (1976). "Shopping centre tenant selection and mix: a review", Benjamin (ed.), *Research Issues in Real Estate, Megatrends in Retail Real Estate*, Vol.3, Norwell: Kluwer Academic Publishers.

Bennett N., Lemoine G.J., (2014) What VUCA Really Means for You. Harvard Business Review, January- February 2014 Issue, 5/13,2016, from: hbr.org/2014/01/what-vuca-really-means-for-you.

Biba, G., Des Rosiers, F., Theriault, M., & Villeneure, P. (2006). "Big boxes versus traditional shopping centres: looking at households' shopping trip patterns". *Journal of Real Estate Literature*, 14 (2), pp. 175-202.

Brown, G.M. (1999). "Design and value: spatial form and the economic failure of a mall", *Journal of Real Estate Research*, 17:2, pp. 189-225.

Brown, S. (1993). "Retail location theory: evolution and evaluation". *The International Review of Retail Distribution and Consumer Research*, 3(2), pp. 185-229.

Catter, C. and Haloupek, W.J. (2000), "Spatial Auto correction in a retail context", *International Real Estate Review*, 3:1, pp. 34-48.

Fisher, J.D. and A. Yezer (1993), "Spatial structure and rents in shopping centers, Indiana University", *The Nature of Economic Journal, Southen Economic Journal*, 5, pp. 71-78.

Ford, K. (2002). "Shopping as it should be: welcome to the mall", *European Retail Digest*, pp. 23-25.

Goldie, J.G.S. (2016).Connectivism: A knowledge learning theory for the digital age? Medical teacher, 38(10). 1064-1069.

http://dx.doi.org/10.3109/0142159x.2016.1173661.

Harkins.A.M.(2008, March 28). Leap frog Principles and Practices: Core Components of Education 3.0 and 4.0. Futures Research Quarterly draft VIIIO, 1-15.

H. Lasi.P. Fettke, H.H. Kemper, T. Feld and M. Hoffmann (2014), "Industry 4.0.", Business & Information Systems Engineering, vol. 2, no. 6, pp 239-242.

Hendrik, Meyer-Ohle (2009). "Two Asian malls: urban shopping centre development in Singapore and Japan", *Asia Pacific Business Review*, 15 (1), pp. 123-135.

J. Shi, J. Wan, H. Yan, and H.Suo (2011), "A Survey of Cyber-Physical Systems", *International Conference on Wireless Communications and Signal Processing (WCSP)*, pp.1-6.

Kim E. and Nam Dae-il, Stempert J.L. (2004). "Testing the applicability of Porter's generic strategies in the digital age: a study of Korean cyber malls", *Journal of Business Strategies*, 19 (1), pp. 1-17.

Konrad, S. (1982). "Location and Spatial Pricing with non-covex transportation schedules, *Bell Journal of Economics*, 13:2, pp. 575- 582.

Kuruvilla, J. Shelja and Ganguli, J. (2008). "Mall development and operations: an Indian perspective, *Journal of Retail and Leisure Property*, 7 (3), pp. 12-14.

LeHew, Melody L.A., Burgess, B and Wesley. S. (2002). "Expanding the loyalty concept to include preference for a shopping mall". *International Review of Retail, Distribution and Consumer Research*, 12 (3), pp. 47-50.

Majumdar, A. (2005). "A model for customer loyalty for retail stores inside shopping malls- an Indian perspective, *Journal of Services Research*, pp. 15-18.

Mashhadi, Vahideh Zolfaghari, and Mohammad Reza Kargozari. 2011. Influences of Digital Classrooms on Education. *Procedia Computer Science 3*: 1178-83.

Ozhan E., Vedia D., Tuba U. and Evren O. (2008). "Spatial distribution of shopping malls and analysis of their trade areas in Istanbul", *European Planning Studies*, 16 (1), pp. 40-45.

Pooworawan. Y. (2015). *Challenges of New Frontier in Learning: Education 4.0.* Document by Innovative Learning Center, Chulalongkorn University, Dusit Thani Hotel, Bangkok.

S. Jeschke (2015), "Engineering Education for Industry 4.0: Challenges, Chances, Opportunities," World Engineering Education Forum.

Shim, S. and Eastick, A. M. (2003). "The heirarchiacal influence of personal values on mall shopping attitude and behavior", *Journal of Retailing*, 74 (1), pp. 89-93.

Tripathi, P. Aditya (2008). "Emerging trends in modern retail formats and customer shopping behaviour in Indian scenario: a meta analysis and review", *Delhi Schools of Professional Studies and Research,* 17 (3), pp. 67-70.