

Reshaping Higher Education with industry 4.0: University as a platform (UaaP) and Education as a Service (EaaS)

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Abstract:

Industrial revolution always impacts on different sectors of the society like healthcare, banking, education and many more. Industry 4.0 is the combination of many emerging technologies. The field of education is also in the race to adopt these technologies and it is called Education 4.0. In India, Education 1.0 is considered as the era of “Guru -Shishya parmpara” or “Guru Shishya method of teaching”. Education 2.0 massification in education or teacher-oriented education where teacher worked as a knowledge provider and students were passive learner. In Education 3.0, internet is used as aid (support) tool. We have entered in fourth era of education with the revolution of industry 4.0 where high-speed internet, availability and rise in mobile technology and social media play very important role. Education 4.0 is more focused in personalized and ubiquitous learning where learning is learner centric and teachers play a role of mentors and facilitators. This paper aims to explore Education 4.0 with three processes of education teaching with Teaching 4.0, Research with Research 4.0 and Service with Service 4.0 and main pillars of education System University with University 4.0 and Teacher with Teacher with Teacher 4.0. Driven by new and innovative technologies, universities and higher education have to find solutions to adapt daily in higher education. The universal role of the University comes here as University as a Platform (UaaP) and the main motive of Education comes as Education as a Service (EaaS).

1.0 Introduction:

Higher Education in fourth industrial revolution or we can say Higher Education 4.0 is complex, dialectical and exciting which has opportunities to transform the society and world for betterment. It is powered by AI and it will transform the workplace from task based characteristics to human centered characteristics. It will reduce distance between humanities and social sciences and also between science and technology so, it will require much more interdisciplinary teaching, research and innovation.

Union Commerce minister, at the 14th Edition of FICCI’s higher education summit 2018, a global conference and exhibition on the theme “Universities of the future” said that rapid changes in technology; obsolescence is the order of the day. While knowledge is becoming obsolete, it is wisdom that will prevail. Education will flourish where innovation is not stifled and respond in a way that helps society. “It is important not just to know how to learn, but more importantly how to unlearn. This will come about by keeping minds open and having an attitude towards continuous learning.”

Prof. Rupamanjari Ghosh, Co-Chair, FICCI Higher Education Committee and Vice Chancellor, Shiv Nadar University said, "Technology is a great 'enabler' but technology alone will not enable, since it functions in a social systems and social challenges are far more crucial than the technological challenges". Industry 4.0 has highly intelligent connected systems that create a fully digital value chain. It particularly is based on cyber physical production systems that integrate communications, IT, data and physical elements and wherein these systems transform the traditional plants into smart factories. Here the objective is that the machines talk to other machines and products and information is processed and distributed in real time resulting in profound changes to the entire industrial ecosystem.

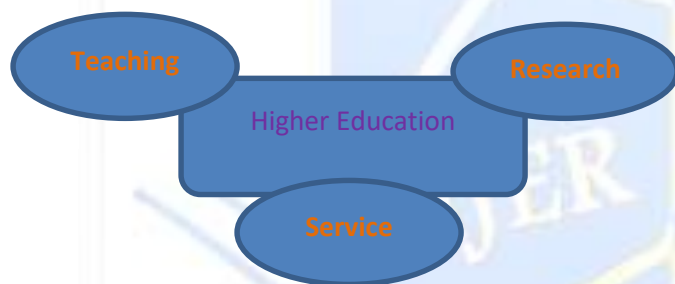
2.0 The Effect of Industrial Revolution on Education

In 1780, there was little to no expectation that children would have any education whatsoever. People learned a trade, typically with on the job apprentice training. Where it existed, education was a luxury for the rich. Later, when the second revolution occurred, industry needed skilled workers, who needed to be literate in order to be valuable in the workforce. Suddenly, an education was needed. And this education system, founded on the needs of the second industrial revolution is in many ways still in place today.

Based on earlier life learning models, school's taught knowledge. Students came in with no knowledge, the teacher fed them information in specific subjects and at the end, the student was tested to evaluate if they remembered what they were taught. This fostered a rigid framework of study disciplines, education standards and eventually standardized testing. The introduction of the computer did not change the underlying ethos behind our education system. Instead, education professionals simply took advantage of the technology and replaced teachers with computers, enabling teaching, learning and assessment to be handled by machine. While long distance learning and a vast amount of information is now accessible thanks to the Internet revolution, the structure of our education system has still been left unchallenged. Learning outcomes are still being tested by the criteria set out in the second industrial revolution. We are still treating educators and students like they are part of a production line.

3.0 Fundamental Functions of a Higher Education Institution

The fundamental objective and core mission of higher education never change. It remains the same whatever the era. For this, Higher Education has three fundamental functions. First and foremost task is **Teaching** - to ensure quality of learning via teaching. Second function is **Research** - to enable the students to get the latest knowledge through exploratory research. And last one and most important is to convert this teaching and research to sustain the development of societies by means of **Service**.



[Figure 1: Fundamental functions of Higher Education]

The primary task of every university is to educate the youth. It is necessary to implement appropriate teaching strategies and to organize work in a way that fosters learning. This has implications on adaptable learning programs, better learning experience, and lifelong learning attitude. The journey towards global competition in the higher education requires institutions to put a huge amount of effort into research and development (R&D). Experts believe these forces range from new technology deployment to global cooperation and collaboration. To sustain the competitive position among world higher education system, we need to radically improve educational services. In particular, we need to drive much greater innovation and competition into education. Let's redefine all these terminologies in perspective of Industry 4.0.

3.1 Education 4.0 (Higher Education 4.0)

In order for this to change, we must revisit the educational paradigms, and focus on the areas that need rethinking. In today's new world of fast changing technology and information overload, students need to be trained and not taught. Information needs to be made accessible and students need to learn how to find it rather than the teacher offering it to them in a rigid structure.

We now understand that students are not alike, do not have the same starting point, can learn and absorb different areas of focus differently and need to be guided to develop their skills rather than taught a set of predefined data points. Education 4.0 needs to align with Industry 4.0 and prepare students for the next industrial revolution which will happen in their lifetime.

3.1.1 Teaching- 4.0 - Teaching in the Fourth Industrial Revolution (Teaching 4.0)

In fourth industrial era, to educate the youth, it is necessary to implement such teaching strategies which can nurture learning activities. It can also provide adaptable learning programs, better learning experience and lifelong learning attitude. Following technologies and concepts can be adopted to fulfill this goal.

- ✚ Wearable Assisted Teaching, Learning, and Training
- ✚ Embrace massive open online courses (MOOCs)
- ✚ Cultivating Innovative Talent
- ✚ Generalize Blended Learning
- ✚ Flipped Classroom

3.1.2. Research of the Fourth Industrial Revolution (Research 4.0)

Open Innovation

Evolutionary & Revolutionary Innovations

New Technological Advancement Driven Research and Development

Shorten Innovation Cycles

3.1.3 Service of the Fourth Industrial Revolution (Service 4.0)

University-as-a-Platform (UaaP)

Education-as-a-Service (EaaS)

Internationally-linked Programs

Where all these things meet together is the University.

Teaching + Research + Service= University so,

Teaching 4.0 + Research 4.0 + Service 4.0 = University 4.0

4.0 Towards University 4.0:

❖ University 1.0:

Takshila is considered as first university in Indian education system around 2500 years ago. First formal program designed to produce well-rounded leaders, at Takshila. The best-known graduate of the program was Chanakya, the political philosopher and prime minister of the Maurya Empire who served under Emperor Chandragupta.

❖ University 2.0:

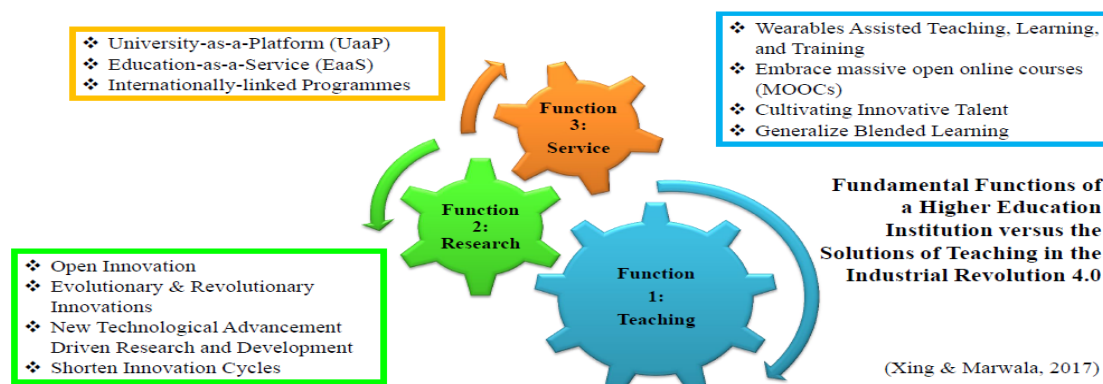
The second generations of universities where European universities came into existence which were highly structured and carefully controlled, relying almost exclusively on lectures and demonstrations to instruct their students. They trained and graduated future professors and researchers to perpetuate the academy, as well as productive business and political leaders.

❖ University 3.0:

Today's leading universities combine research and teaching in a resource-rich campus. Through lectures, laboratory experiments and field work, they gain both theoretical knowledge and practical experience in any of a myriad of disciplines and specializations.

❖ University 4.0:

A revolution has begun in higher education. With the advent of new technologies to record, store and disseminate knowledge, and with the challenge of educating unprecedented multitudes of aspiring young people around the globe, the roles of instructors, students and even college campuses are in flux. University 4.0 enables schools and institutions to manage the changes so they can succeed today and for decades to come.



4.1 Features of University 4.0:

4.1.1 University as a Platform (UaaP)

In this technological edge, Higher education institutions need to reconceive their education systems, re-identify their competitive boundaries, reorganize and reshuffle their customer pools, reshape themselves and rebuild service architecture. University-as-a-Platform gives the current higher education system an opportunity to move towards platform system for a better service performance.

Platform oriented methodology is the main technology in industry 4.0. In higher education and university 4.0, main focus is ubiquitous computing and Internet of things both within and outside campus and the demanding students in terms of customized learning. That which served institutions well in scientific disciplines and speciality based markets can become their impediments in platform-based environments. The massive production of affordable mobile devices, Internet broadband connectivity and rich education content start a trend of transforming how education is delivered. Cloud computing with other techniques, creates a new way of educating people that might ultimately change the existing higher education systems.

University as a Platform includes: Inter-Disciplinary, Multi- Disciplinary, Cross-Disciplinary Degrees, Blended learning & MOOCs, Internet of Everything, Integration of routine education activities into software across a plethora of institution system (LMS & Education Cloud), Up-to-date digital infrastructure, Enhanced connectivity among all parties residing in higher education value chain.

Education Cloud can support decision makers deliver education in the quickest, most efficient and best affordability form. It can develop 21st century students' skills and prepare students for the new job market in the most appropriate way & encourage native innovation with the strongest incentives. It can also share resources across institutions, districts, regions, or the entire country in the smoothest fashion.

4.1.2 Education as a Service (EaaS)

Once every couple of decades, a disruptive new technology evolves which fundamentally changes and affects many sectors. In higher education, the huge production of affordable mobile/smart and portable devices, Rich internet broadband connectivity and rich education content are transforming how education is delivered. Cloud based technologies, amongst other techniques, creates a new way of educating people that ultimately changing existing higher education systems. By using education cloud, education practitioners can deliver education in the quickest, most efficient and best affordability form. It can also help to develop 21st century students' skills and prepare students for the new job market in the most appropriate way.

Education cloud encourage innovations and share resources across institutions, districts, regions, or the entire country in the smoothest fashion. When universities of whole country or state think to implement Education as a Service (EaaS) or having or sharing Education cloud, they can have huge amount of infrastructure investment. Fortunately, EaaS is better for the students than academicians as they can have standard material and content resources. The best part of EaaS is the belief that students' needs should be met effectively. Therefore, when a higher education institution sets out to attract a potential student as a customer, it needs to create an all-round education experience that is genuinely capable of satisfying the student's needs. In Education Service 4.0 (Education 4.0), Education as a Service is a guideline as well as newer and more advanced strategies to cope with ever-increasing societal complexity of today's world.

4.1.3 Internationally-linked Programs

National and international collaboration as well as national and international recognition is the important feature of the 4th industrial revolution. Various kinds of institutional linkages, both domestically and internationally can offer more versatile degree programs and professional qualifications becomes a must in this competitive edge. In this, first is twinning programs where a local education provider collaborates with a foreign education provider to develop a connected system allowing course credits to be taken in different locations. On completion of the twinning programs, foreign education provider awards a qualification. Second, franchise programs is a scenario where foreign education provider authorizes a local education provider to deliver their courses / programs, and the qualification is awarded by the foreign education provider. Third, double or joint degree is an arrangement where local and foreign education providers cooperate to offer a programme for a qualification that is awarded jointly or from each of them. Fourth, blended learning where local and foreign education providers deliver programs to enroll students in various mixed forms, like, e-learning, online learning or on-site learning. These kind of linkages can improve the quality of service in higher education can bring about a significant change in the society.

4.1.4 Teacher 4.0

Today's teachers are not only knowledge transferor. As machines can store and even transfer various knowledge sophisticatedly and today's students can easily get the knowledge they want quickly. The new mindset must challenge the teacher to keep looking for new approaches to learning and rewrite the focus of learning in the classroom. Today's teacher can focus on developing student's soft skills and characters such as empathic communication skills, developing tolerant attitudes, being responsible, thinking openly, being able to cooperate. So, today's teachers are expected to come up with some novelty and innovation in their teaching.

According to Trilling and Fadel (2009), 21st-century learning focuses on the formation of an ICT-based digital lifestyle, learning ability and innovation, and the development of life skills More specifically, the learning done by the teacher must be oriented to the development of four core skills: critical thinking and problem-solving skills, communication skills, collaboration skills, and the ability to create new things (creativity).

Furthermore, Irianto (2017) explained that the World Economic Forum warns structural changes in skills in the 21st century. In 2015, the structure of skills needed by the workforce is as follows;

1) complex problem solving; 2) cooperation with others; 3) people management; 4) critical thinking; 5) negotiation; 6) quality control; 7) service orientation; 8) assessment and decision making; 9) active listening ; and 10); creativity. In 2020 the work structure changes to; 1) complex problem solving; 2) critical thinking; 3) creativity; 4) people management; 5) cooperation with others 6) emotional intelligence; 7) assessment and decision making; 8) service

orientation; 9) negotiation; and 10) cognitive flexibility. Purnomo (2017) describes several approaches that teachers should do in the era of the era of digitalization in the RI 4.0 student centered, Contextual learning, Community integrated learning, collaborative learning, Technology based learning which is called blended learning or hybrid learning.

Future teachers or teachers in industrial revolution 4.0 “Teacher 4.0”, who are able to handle new technology and .who implement it efficiently in their classes Student-centric: In these classrooms, students play an active role in their learning and teachers serve as mere guides. They are more facilitators of learning than lecturers. They help students think critically and learn by doing and act as a resource while their students discover and master new concepts. Student-centric classroom environments put students’ interests first and are focused on each student’s needs, abilities and learning styles.

5. Conclusion:

Industry 4.0 or the fourth industrial revolution, where man and machine align to enable new possibilities, harnesses the potential of digital technologies, personalized data, open sourced content, and the new humanity of this globally-connected, technology-fuelled world, establishes a blueprint for the future of learning which is called lifelong learning which takes place from childhood schooling, to continuous learning in the workplace, to learning to play a better role in society. The transition to the concept of university of the third generation to the fourth generation is the sustainable development of the modern universities.

The introduction of use of technology in education lead in the era of Education 3.0. It was primarily categorized by digitization and automation. Education 4.0 is a phenomenon that redefines the education landscape by placing the student at the centre of the ecosystem and shifting the focus from teaching to learning. Learners are now willing to experiment with how they receive their education, where they learn from and how they assess their progress, rather than adapt to the existing system of credentialing, credit-hours and standard assessment. While Education 3.0 revolved around new and improved ways to teach students by leveraging technological developments, Education 4.0 seeks to empower the student to structure his/her individual path keeping in mind the final outcome. In the fourth industrial revolution, a new form of a university is emerging that does teaching, research and service in a different manner. This university is interdisciplinary, has virtual classrooms and laboratories, virtual libraries and virtual teachers. It does, however, not degrade educational experience but augment it. Forging various kinds of institutional linkages, both domestically and internationally, to offer more versatile degree programs and professional qualifications becomes a must. First, twinning programs where a local education provider collaborates with a foreign education provider to develop a connected system allowing course credits to be taken in different locations. Xing & Marwala, 2017)

References:

- [1] T. Marwala, I. Boulkaibet, and S. Adhikari, Probabilistic finite element model updating using Bayesian statistics: applications to aeronautical and mechanical engineering. The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom: John Wiley & Sons, Ltd, ISBN 978-1-1191-5301-6, 2017.
- [2] B. Xing, "Massive online open course assisted mechatronics learning_a hybrid approach," in Furthering Higher Education Possibilities through Massive Open Online Courses, Chapter 12, pp. 245-268, A. Mesquita and P. Peres, Eds., 701 E. Chocolate Avenue, Hershey PA, USA 17033: IGI Global, ISBN 978-1-4666-8279-5, 2015.
- [3] T. Marwala, Economic modeling using artificial intelligence methods. Springer London Heidelberg New York Dordrecht: Springer-Verlag London, ISBN 978-1-4471-5009-1, 2013

- [4] Krishnan Umachandran., (2018), Rolling mass of change, Innovation project, <https://www.researchgate.net/project/Innovation-70/update/5aa6077b4cde266d5890c3d5>
- [5] Anas Abdelrazeq , conference paper, November 2016, Teacher 4.0: requirements of the teacher of the future in context of the fourth industrial revolution
- [6] Igor Kabashkin., University 4.0: Reality and Expectations
- [7] Kelly, Frank.S. (2009) Teaching the Digital Generation. Corwin Press, 265 p.
- [8] Fayolle, Alain (Editor), Redford, Dana T. (Editor) (2014) Handbook on the Entrepreneurial University. Edward Elgar Publishing Ltd, 528 p.
- [9] David E. Goldberg. (2014) A Whole New Engineer. Three Joy Associates Inc, 288 p.
- [10] Alexandre Wipf (Editor) (2017) Professional Higher Education 4.0: A Change for Universities of Applied Sciences. EURASHE, 100 p
- [11] AbuMezied, A. (2016). What role will education play in the Fourth Industrial Revolution? Retrieved July 12, 2018, from <https://www.weforum.org/agenda/2016/01/what-role-will-education-play-in-the-fourth-industrial-revolution/>
- [12] Brown, G., & Martin. (2017). Education and the Fourth Industrial Revolution. Retrieved July 12, 2018, from [http://documents.epo.org/projects/babylon/eponet.nsf/0/17FDB5538E87B4B9C12581EF0045762F/\\$FILE/fourth_industrial_revolution_2017__en.pdf](http://documents.epo.org/projects/babylon/eponet.nsf/0/17FDB5538E87B4B9C12581EF0045762F/$FILE/fourth_industrial_revolution_2017__en.pdf)
- [13] Gerstein, J. (2014). Moving from Education 1.0 Through Education 2.0 Towards Education 3.0. Experiences in Self-Determined Learning., 83–98. Retrieved from http://scholarworks.boisestate.edu/edtech_facpubs/104
- [14] Gill, H. (2017). Is Education Keeping Up With Industry 4.0?
- [15] Groupe Media TFO. (2017). Emergency for the world of education: Adapting to the digital revolution.
- [16] Haseeb, A. S. M. A. (2018, January 10). Higher education in the era of IR 4. New Straits Times, pp. 1–8. Retrieved from <https://www.nst.com.my/education/2018/01/323591/higher-education-era-ir-40>
- [17] Lodder, J. (2016). The Fourth Industrial Revolution and the Education System, how to respond? Retrieved from <https://www.linkedin.com/pulse/fourth-industrial-revolution-education-system-how-respond-john-lodder>
- [18] Neves Marco. (2017). The (unknown) Impact of the Fourth Industrial Revolution in Education « Scientix blog. Retrieved from <http://blog.scientix.eu/2017/07/the-unknown-impact-of-the-fourth-industrial-revolution-in-education/>
- [19] Tapsir, S. H. (2017). Malaysia Higher Education 4.0, (September). Retrieved from <http://www.utar.edu.my/sieqa2017/file/Website/Seminar/Keynote1.pdf>
- [20] Thai, H. Van, Thi, L., & Anh, K. (2017). the 4.0 Industrial Revolution Affecting Higher Education Organizations' Operation in Vietnam. International Journal of Management Technology, 4(2), 1–12.
- [21] Brown, G., & Martin. (2017). Education and the Fourth Industrial Revolution. Retrieved July 12, 2018, from [http://documents.epo.org/projects/babylon/eponet.nsf/0/17FDB5538E87B4B9C12581EF0045762F/\\$FILE/fourth_industrial_revolution_2017__en.pdf](http://documents.epo.org/projects/babylon/eponet.nsf/0/17FDB5538E87B4B9C12581EF0045762F/$FILE/fourth_industrial_revolution_2017__en.pdf)
- [22] Gerstein, J. (2014). Moving from Education 1.0 Through Education 2.0 Towards Education 3.0. Experiences in Self-Determined Learning., 83–98. Retrieved from http://scholarworks.boisestate.edu/edtech_facpubs/104
- [23] Gill, H. (2017). Is Education Keeping Up With Industry 4.0?
- [24] Groupe Media TFO. (2017). Emergency for the world of education: Adapting to the digital revolution.
- [25] Haseeb, A. S. M. A. (2018, January 10). Higher education in the era of IR 4. New Straits Times, pp. 1–8. Retrieved from <https://www.nst.com.my/education/2018/01/323591/higher-education-era-ir-40>
- [26] Lodder, J. (2016). The Fourth Industrial Revolution and the Education System, how to respond? Retrieved from <https://www.linkedin.com/pulse/fourth-industrial-revolution-education-system-how-respond-john-lodder>
- [27] Tapsir, S. H. (2017). Malaysia Higher Education 4.0, (September). Retrieved from <http://www.utar.edu.my/sieqa2017/file/Website/Seminar/Keynote1.pdf>