

Industry 4.0: Readiness of Undergraduate Students

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ABSTRACT

Industry 4.0 which is the fourth stage of industrial revolution related with the development of industries in addition to the high-tech strategies in Germany in the year 2011. Many technologies are considered within it such as artificial intelligence, big data, robotics, 3D printing, cloud computing, biotechnology, linked data and amalgamation of technology with human body in operations of industry. The attainment of innovative technologies for Industrial revolution 4.0 does not put forth challenges to the financial investments only but also in the field of various levels of organization for the competent personnel who are proficient in dealing with the escalating complexities of the production system in future. Consequently, organization ought to identify the potential candidates that bear competitive advantage for the company in future. Previous studies have focused on the readiness among college students required to beat the new technology. Additionally, no significant statistical result affirmed on the factors that influence the readiness of students towards Industry 4.0. The present research work is designed to identify the factors that influence the readiness of the students of DAVV University for Industry 4.0. This study practiced the quantitative research method using the statistical tool SPSS 20. The primary data is collected through self structured questionnaire using 5 point Likert scale. The Industry 4.0 readiness factors studied in the research are the technical skills and employability skills (non-technical skills) of the students. The results of the study showed that out of the two types of skills focused on, technical skills contribute majorly towards the students' readiness for Industry 4.0. Moreover, recommendations for proactive implementation by future researchers are also presented.

Keywords: Industrial Revolution, Industry 4.0, readiness, Technical skill, Employability skill.

INTRODUCTION

We're chock-a-block gear into the Fourth Industrial Revolution. While companies and company leaders are busy adjusting their sails to the winds, is that the education sector doing enough to organize students to step into a replacement world where robotics, automation and large data analytics are transforming how we live and work?

The Organisation for Economic Co-operation and Development (OECD) estimates that over subsequent 10 to twenty years, "14 percent of jobs are at high risk of being fully automated, while another 32 percent at risk of significant change." Today, employers expect graduates to be prepared with common skills and abilities such as problem solving, communication skills, interpersonal skills, lifelong learning and becoming a capable player. Team capable of solving difficult problems. Solving and dealing with difficult work situations (David, 2014). In this way, a skilled generation must be created. Most countries focus on student education, especially higher education. Higher education is undergoing a generational development today as universities adapt to the labor needs of the 21st century (Rayner, 2015). But the economy chooses to employ graduates with more or less knowledge-oriented habits, leading to neglect of outcome skills (Willison, 2015). To assess graduate outcomes, the level of readiness of the student should be determined by this study. Readiness is a condition that can be identified to the extent of which representatives are considered behaviors and characteristics that are prepared or prepared in the workplace to adapt to new business shocks. Training and industry skills 4.0 (Caballero & Walker, 2010).

Due to the changing nature of the job, the extent to which graduates are seen as "readiness" reflects potential in terms of job performance and career development (Caballero & Walker, 2010). As such, this study identifies the factors influencing the willingness of DAVV undergraduate students to pursue industry 4.0. Willing of students is the inclination of students for Industry 4.0 on the basis of their eligibility. Thus the willingness of students is studied as readiness with the help of the readiness theory. Furthermore, it is measured using Information Literacy Education Implementation Readiness Scale.

CONCEPTUAL DEFINITION OF READINESS FACTOR

Readiness is also defined as the cognitive predecessor to the actions of either resistance to, or holds up a change effort (Vakola, 2013). Overall, it can be disagreed that the thought up till now on the eligibility necessities put forward by Industry 4.0 are yet in their infancy stage (Pfeiffer, 2015). Most of the stated needs for social and type features, with requirements that are not specific to "most" IT skills, often include an overall stack of integration and transparency of information, enhanced self-management and decision making, developed the parameters from digital communication and interactive management capabilities. Graduates who are believed to be employed in the current market must have a combination of employability skills and technical skills. This is an important factor in preparing students for Industry 4.0.

Employability skills include graduates' Industrial Revolution cognitive and cross-cutting skills to apply Industrial Revolution knowledge and skills to the labor sector (Jackson & Chapman, 2012). Employability skills, usually known as the Non-technical skills, are basic or professional skills for students in all disciplines (Jackson & Hancock, 2010). Technical skills include special tools, techniques, and the ability to use techniques (Ejiwoy, 2018). Computer skills and internet knowledge are called technical skills. According to one study, technical skills are the most popular for new salaries (Aasheim et al, 2009).

LITERATURE REVIEW

This study finds out the factors of student readiness towards the economic revolution. This study focus on two skills that required for industrial revolution 4.0 which is employability skills and technical skills. Technological advancement has led to dramatic increases in industrial productivity since the beginning of the Industrial Revolution. Now, we are in the middle of the fourth wave of technological developments which is also identified as the enhancement of the new digital industrial technology known as the Industrial Revolution 4.0. It is a change dominated by nine basic technology advances (Rubamann et al., 2015). Andreas Hirschi (2017) has exemplified the industrial revolution 4.0 with crucial technologies, such as artificial intelligence, nanotechnology, genetics, 3D printing, biotechnology, and cloud computing, among others.

Nowadays, students are trying to find affordable and versatile learning routes that allow faster time to finish (Christensen, 2014). In addition, they have the facility to decide the education from a variety of institutions and branches. According to Lea Dean Folds a standard theme in various studies and policy reports for over 20 years has been a lyceum student lacked the talents required to succeed in post-employment and post-secondary education. High school students must have higher levels of skills and knowledge than the predecessors to make sure and maintain jobs that buy themselves and therefore the families (Folds, 2013). Manufacturers are struggling to find employees because of the lack of student preparations across several different features. As it turns out, professional organizations and research suggest that all of these features are important and the manufacture will benefit from a set of definitions and step-by-step measures. (Flory, 2017). It was explored that participants aren't cognizant of Industry 4.0 essentials and stay sceptical and alert for its implementation which is believed to bring more job opportunities whilst some current job titles disappear. It is apparent that alterations in education establishment equivalent to the rising Industry 4.0 technologies are unavoidable. (Hasan Tinmaz, 2019)

However, most of our graduates are unaware of this current phenomenon, which sometimes cannot see the connection to what they are doing in the classroom with the real world of work they would work on later. Due to such issues as maintaining a good grade of good grades, many students can now spend more time studying and less getting the right workforce, or creating a suitable workplace (Rayner, 2015). It is therefore the duty of university lecturers and management to ensure that these students are equipped with job skills to continue to succeed in the field of employment after graduation (Asmaak & Corresponding, 2010). The level of readiness a student needs so as to enroll and succeed -without remediation- during a credit bearing course at a post-secondary institution that gives a bachelor degree programme, or any certified course that facilitate students to cross the threshold with prospective future advancement (Bhattacharjee & Ray, 2017). The level of students' readiness in terms of knowledge, attitude and skill in facing IR 4.0 showed that the students had a relatively weak knowledge level on the Industrial Revolution 4.0 (IR 4.0). It is identified that students' knowledge is weak. This is due to the likelihood of students not being recognizable with the

use of IR 4.0 technology during the teaching and learning session and in everyday life. However, the study also found that students have high levels of enthusiasm and attitudes and willingness to face the challenges of IR 4.0. This helps in developing and directing students to learn and use this technology 4.0 in their daily activities. Since the profound interest of students make them eager to use Industry 4.0 in spite of those who don't have any interest in it. (Ismail, A., et al. 2020)

In another study by Catherine Lisette Caballero, she has used qualitative methods used to identify the characteristics and characteristics of job readiness and then develop a scale called the Work Skills Scale (WRS) to measure the readiness of work in the graduate population, identifies ten broad types that exhibits job readiness like motivation, maturity, self-growth / development, organizational awareness, interpersonal orientation, work attitude, conformity, endurance, problem solving, and technical focus. Dr. Holly Hungerford-Kresser (2016) has used different methods to live the readiness of scholars within the study. He applied qualitative research which is a amalgamation of action research methods (Hubbard & Power, 1999; Somekh, 2009, 2006) and case studies (Merriam, 1998; Stake, 1995). The action research methodology is fluid, regular, and allows me to stay critical, adapting to the acceptable way for the task at hand (Hungerford-kresser, 2016). From previous studies, can conclude that most studies have used mixed methods to study students' readiness.

RESEARCH OBJECTIVE

Majority of the studies associated to industry 4.0 have laid emphasis on the skill scarcity. The scarcity of skills amidst students is accounted as a base for employers' indifference to employ them (Ahmad & Suhail, 2015). Accordingly, the key rationale of this study is to investigate the factors that influence the readiness of the undergraduate students towards industry 4.0. The research objectives of the study are:

1. To study the influence of technical skills factor on the readiness of students towards Industry 4.0
2. To study the influence of employability skills (non-technical skills) factor on the readiness of student towards Industry 4.0

RESEARCH METHODOLOGY

Major studies discussed above had given a background to understand that, the most contributing aspect for the readiness of students towards Industry 4.0 are technical skills and employability skills which can be termed as non-technical skills. This provided us the direction to prepare the conceptual framework of this research work as shown in Figure 1. The skills that are required under employability skills are decision-making skills, communication skills and leadership skills. While technical skills include digital literacy and digital infrastructure.

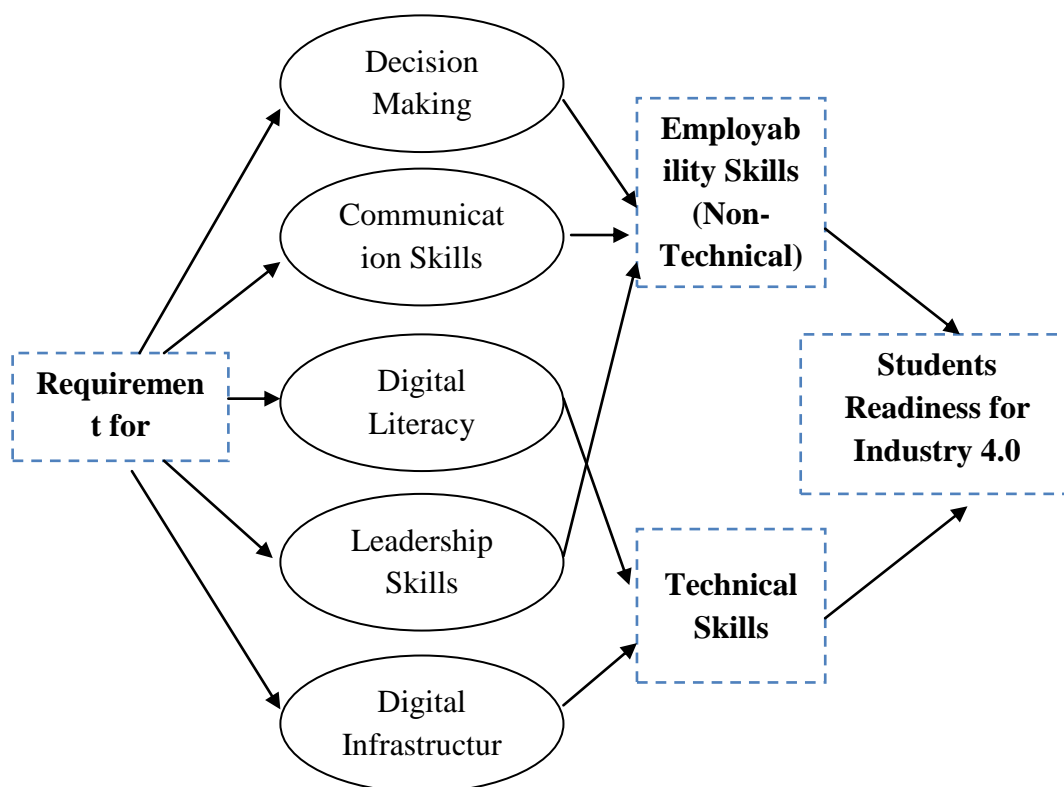
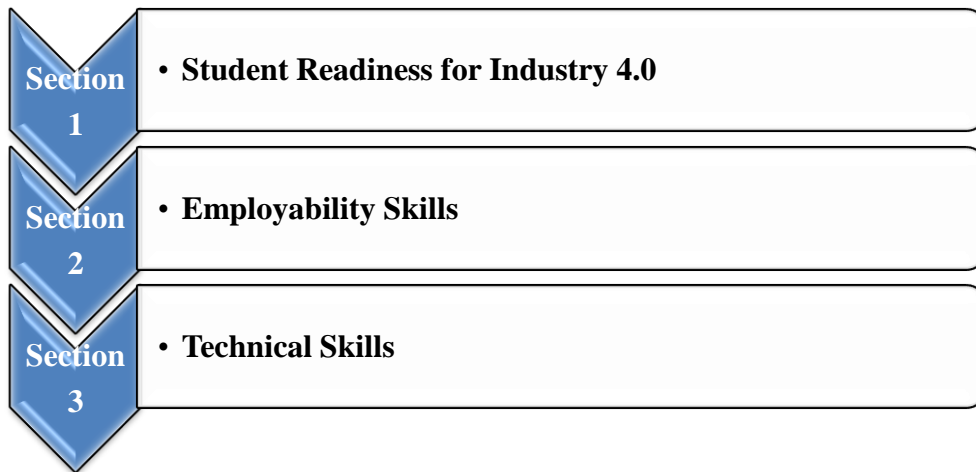


Figure 1: Conceptual Framework

Based on the conceptual framework, the research is carried out to determine the factors that influence the readiness of university students towards Industry 4.0 with the help of the questionnaire. The questionnaire is divided into three sections comprising of the questions based on the above factors.



The data was collected from the undergraduate students of DAVV University using non-probability sampling method. Approximately 220 respondents were approached for the questionnaire out of which 200 complete and valid responses are considered for further analysis using SPSS 20.

All the items of the questionnaire are measured on five point likert scale; “5” as strongly agree and “1” as strongly disagrees. The researcher made use of the Information Literacy Education Implementation Readiness Scale to determine the students’ readiness towards Industry 4.0. The readiness scale mentioned below in table no. 1 works as a benchmark with the mean score between the ranges of 4.00 – 5.00 is considered as “Ready”; mean ranging from 3.00 - 3.99 as “Approaching readiness” while ranging of mean score from 1.00-2.99 is inferred as “Developing readiness”.

Table 1: Readiness Scale

Likert Scale	Mean Score	Readiness
Strongly Agree	5.00	Ready
Agree	4.00 – 4.99	
Neutral	3.00 – 3.99	Approaching Readiness
Disagree	2.00 2.99	Developing Readiness
Strongly Disagree	1.00-1.99	

Source: Lucy M. Guglielmino

RESULT AND DISCUSSION

The Cronbach's alpha test is used to measure the internal consistency of the items. The value of Cronbach's alpha as 0.72 demonstrates that the questions used in the questionnaire are reliable and can be established as a tool to assess the proposed concept.

DEMOGRAPHIC ANALYSIS

The result of the demographic analysis of the data obtained from 200 students is given in the table 2.

Table 2: Demographic Profile

	Items	Frequency	Percent (%)
Gender	Male	34	17
	Female	166	83
	Total	200	100.0
Age	19-20 years	4	2
	21-22 years	150	75
	23-24 years	44	22
	25-26 years	2	1
	Total	200	100.0
How much are you aware of Industry 4.0?	Nothing	37	18.5
	Little	95	47.5
	Something	63	31.5
	A lot	5	2.5
	Total	200	100

Source: Author's Compilation

The above data reveals that only 47.5% students are little bit aware about the Fourth Industrial revolution while, only 2.5 % gives the confidence of being aware of this Industrial wave. This diminutive knowledge for Industry 4.0 provokes them to be a part of this revolution. The same has been found from the outcome of the first section of the questionnaire discussed below.

Section 1: Student Readiness for Industry 4.0

The responses collected from undergraduate student's gives the highest mean of 4.52, which depicts that the students are willing to become accustomed to the prerequisites of Industry 4.0. Despite the fact that students are ready to learn the innovative methods for Industry 4.0 with a mean value of 4.44 but are reluctant for the application part of the same.

Table 3: Student readiness for Industry 4.0

Questions	Mean	Std. Deviation	Readiness scale
Prepared to get used to changes during Industry 4.0.	4.52	.459	Ready
Prepared to incorporate technical skills in job assignment throughout Industry 4.0.	4.44	.427	Ready
Prepared to gain innovative knowledge offered by organization for Industry 4.0.	4.44	.427	Ready
Prepared to carry out my work in a creative manner in the direction of Industry 4.0.	4.03	.380	Ready
Prepared to alter my operational approach throughout Industry 4.0.	4.42	.495	Ready
Prepared to be present at the training program given by the organization for Industry 4.0.	4.19	.389	Ready

Source: Author's Compilation

SECTION 2: EMPLOYABILITY SKILLS

The results justified that all the students of undergraduate are towards approaching readiness as per the readiness scale in all the three aspects of the employability skills namely decision making skills, communication skills and leadership skills. Although, the contribution of the decision making skill and leadership skills are same with the mean of 3.69 which shows that the students are ready to adopt the forthcoming Industrial revolution.

Table 4: Employability Skills (Non-technical skill)

Questions	Mean	Std. Deviation	Readiness scale
Holds the capacity to recognize alternate methods to meet the objectives associated with Industry 4.0.	3.22	.744	Approaching readiness
Holds the capacity to view growth goals in uncertain business enterprises toward the application of advanced technology in Industry 4.0.	3.21	.796	Approaching readiness
Holds the capacity to recognize possible results to make my route easy for Industry 4.0, when dealing with uncertain business enterprises	3.13	.803	Approaching readiness
Capable of taking rational job related risks necessary for the Industry 4.0.	3.69	.696	Approaching readiness
Become accustomed to diverse situations that occur in the business with the advancement in technology 4.0.	3.64	.724	Approaching readiness
Holds the capacity to have a discussion on own view or circumstances that improve myself and my association towards Industry 4.0.	3.67	.798	Approaching readiness
Holds the capacity to guide people mainly by being updated with the modern technology application in an association.	3.49	.767	Approaching readiness
Holds the capacity as a student to hand over work to peers necessary to continue in the Industry 4.0.	3.68	.703	Approaching readiness
Holds the capacity to inspire others towards a common objective that is to be advanced enough with the recent trend of technologies.	3.66	.753	Approaching readiness
Eager as a student, to hold responsibility and ownership for the job by familiarizing oneself with the Industry 4.0.	3.69	.696	Approaching readiness

Source: Author's Compilation

SECTION 3: TECHNICAL SKILLS

In the expedition to adopt Industry 4.0, there subsist a difference between the employability skills that the students have and the expectation of the industry. This is well justified from the above analysis but looking at the challenges encountered by the current work force, the students are ready to get familiar with the upcoming technical environment. The same is observed in the table below which gives the brief picture of the students' readiness towards Industry 4.0. This means that the proportion of digital literacy and digital infrastructure is more in comparison to the employability skills. So, there exists an opportunity for the undergraduate students' to surpass the Industry 4.0 requirement with their capability of handling the technology successfully.

Table 5: Technical skills

Questions	Mean	Std. Deviation	Readiness Scale
Holds the skill to operate the Internet appliance or software requisite for records or probing information.	3.94	.778	Approaching readiness
Holds the skill of word processing imperative for Industry 4.0.	4.13	.792	Ready
Learned to acquaint oneself with the new technology 4.0 as a student, by making use of e-mail to communicate often.	4.21	.746	Ready
Skilled in handling spreadsheet that is vital for data necessary in the Industry 4.0.	3.46	.856	Approaching readiness
Holds the technical skill as a student in conducting presentations useful for Industry 4.0.	4.02	.774	Ready

Source: Author's Compilation

RECOMMENDATIONS AND CONCLUSION

In conclusion, the Educational Institution is not only the place where the students get knowledge and skills but also as a field to equip the students to complement the period of Industrial Revolution 4.0 (IR 4.0). There are a bundle of characteristic that can influence the students' readiness for the Industry 4.0. This

research study opens up new opportunities for the researchers to develop knowledge and responsiveness on current issues that reflect on student's readiness towards Industry 4.0. Thus, it can enhance the Industry 4.0 requirements of the students who will be workforce of our nation.

It is recommended that the conceptual model designed by this research along with the constructs identified that influence the students' readiness for Industry 4.0, be utilized as a common framework to better prepare students for the challenges that they might face when they enter a career. The study on students' readiness for industry 4.0 indicates that there is a need for system approach to prepare students for both, college and career ready. The system includes a variety of individuals and a curriculum that is defined by the knowledge, skills and disposition identified in the constructs that emerged from this research. Therefore, the educational institutions should devise various initiatives of exposure activity to enhance student awareness and dedication. The itinerary of the Bachelor Degree must be directed towards IR 4.0.

Finally, it is imperative to spotlight on the limitations. This study was accomplished with a explicit group of students. Hence, study results are extremely reliant on this context. Therefore, the same study should be imitated within other contexts in order to authenticate the findings. Furthermore, this restricted sample of university students is not basically representative of all other university students in India. Besides, the following limitations are relevant to the study: (a) the validity of this study is limited to the reliability of the instruments, and (b) validity is partial to the sincerity of the partakers' responses to the study instruments.

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