



# A comparative study on advanced skills of technology and entrepreneurial skills with the awareness and preparedness among the rural youths

Dipak U. Tatpuje<sup>1</sup> · Avinash Kakade<sup>2</sup> · Vaibhav Jadhav<sup>3</sup> · Avinash Ganbote<sup>4</sup>

Received: 25 February 2022 / Revised: 25 February 2022 / Accepted: 28 February 2022 /  
Published online: 25 March 2022

© The Author(s), under exclusive licence to Springer Nature Singapore Pte Ltd. 2022, corrected publication 2022

## Abstract

In the context of the fourth industrial revolution (4th IR), there is a transformation in existing and new occupations. It emerges urgent need of advanced skilled manpower. It is because of impact of advanced technology in the day-to-day life. In general, rural youths are unaware of and unprepared for this challenge. To remain pace with, competencies need to be developed among the first-generation entrepreneurs for better livelihood and also to attain UN's Sustainable Development Goals SDG-2030. Awareness and preparedness about “Technical, Vocational Education and Training” (TVET) and entrepreneurial education (EE) skills among the rural youths needs to be assessed and compared among the various groups of TVET learners. Youths under the formal academic system of education and customized training module were the population of this study. Awareness and preparedness among the different group of TVET learners is different that effects on the advanced skills. This paper gives insight into addressing this research gap by the experimental and applied research. In the context of the 4th IR, tried-out TAILOR-C model gets modified to remain pace with time with a number of required various components of the skills. This research is for the policy makers, career aspirant youths and entrepreneurship educators in the context of basics in competency mapping. The scope of this research paper is limited to the TVET and EE to the competencies with 4th IR. Life skills, applied transformational skills, soft skills, skills of digital entrepreneurship and ICT should be the inherent components of the EE curriculum. It is the major outcome of this experimental research. Importance of digital pedagogy for TVET and EE in the post-COVID era is also addressed in this study.

**Keywords** TVET · 4th IR · Digital entrepreneurship · EE · Skills · Competencies

---

The original online version of this article was revised: ethical declaration was missing.

---

✉ Dipak U. Tatpuje  
dipak.tatpuje@gmail.com

Extended author information available on the last page of the article

## Introduction

Advanced skills development and employment are the major concerns in India related to the development in the fourth Industrial Revolution (4th IR) and in the era of entrepreneurship for the better livelihoods. It is estimated that 70% of new creations in the next decade will be based on digital platforms for business models as in particular to the skills of 4th IR (WEF, 2021). In this context, awareness and preparedness among the youths plays a vital role in achieving some of the UN's Sustainable Development Goals 2030. COVID-19 pandemic gave a major revolutionary change in technology-assisted life skills. It also became a serious issue among the rural youths. Interacting with youths, it is found that most of the students even with the students of computer discipline are not sufficiently well aware of skills of technology entrepreneurship with opportunities of fourth Industrial Revolution (4th IR). The life skills are ever changing and remain pace with this context which further affects employability and self-employability. It is the main challenge faced by the youth.

Technology entrepreneurship pace with changing times is the best feasible option for the development of youths for better livelihoods of their families in all. Youths from Diploma in Computer Engineering and Bachelor of Computer Applications are the major workforce for start-ups of Information Technology (IT) sector. One of the main reasons of high unemployment in India is an increasing mismatch between required skills in industry and unavailability of such manpower. It is because of non-availability of infrastructure and essential facilities of new-age technological training and not remaining pace with time (Brizek & Khan, 2008). Few metro cities have such facilities and workforce of required competencies, but the rest of rural India needs to think and react upon. In general, various competencies of fundamental aspects have cognitive characteristics that are viewed as managerial resourcefulness (Kanungo and Sasi Misra 1992). It is useful for managing the activities of 4th IR. This study shows ground reality in this respect. An increase in self-employment and entrepreneurship sector is one of the solutions to generate employment, but it needs focused efforts in the direction of new-age technology skills of 4th IR. The various technology components of Industrial Revolution 4.0 need to be connected with the present system of TVET (Technical, Vocational Education and Training) with integration of Entrepreneurship Education (EE).

India ranks 46 in Global Innovation Index 2021 (WIPO). This rank is encouraging enough to generate new employment and thus further to address the issue of unemployment by promoting entrepreneurship with innovation. TVET efforts at diploma and graduate level of computer education are not fully to impart advanced applied skills among the students to compete with requirement of international market. Process of establishing sustainable business start-up with Internet of things (IOT) and machine learning will be considered one of the change agents to study TVET in relation with entrepreneurship education in the scenario of 4th IR. According to Saari et al., "The arrival of the 4IR needs a further action on identifying industry trends, job demands and possibilities that may arise in

parallel with this revolution specially to strengthening potential for skills development in line with 4IR. The skill sets required in both existing and new occupations will change and transform on how people work”.

In this study, Systematic Literature Survey and Sample Survey Analysis method are used to find awareness and preparedness of TVET and entrepreneurship in the context of fourth Industrial Revolution. Contextual and integrative literature review methods are also used in this study for research analysis.

### **Objectives of the study**

This study is carried out to achieve the following objectives by using quantitative, exploratory and action research methodology.

- To explore information on the current situation and practices of TVET to meet the requirements of 4th IR focusing on Entrepreneurship Education among students' levels of 10+3 (Polytechnic) and 12+3 (Bachelor of Computer Applications).
- To identify gaps between challenges and opportunities in TVET and 4th IR focusing on Entrepreneurship Education at this level of students.
- To explore opportunities of 4th IR for enhancing Entrepreneurship Education in TVET for this entry-level workforce.
- To provide recommendations for TVET of 4th IR and Entrepreneurship Education.

### **Literature review and hypothesis development**

With consideration of TVET skills of 4th IR with entrepreneurship, the researcher did survey of the literature through the Scopus, Scimago, Sage, Google Scholar and Emerald open-access databases. It was done to identify the research gap and also to formulate the hypothesis. Research papers and reports of only the past three years (2019, 2020 and 2021) were searched in these five databases with the terms “4th Industrial revolution”, “TVET Skills of 4th Industrial revolution and entrepreneurship”, and “TVET skills of 4th IR”. A total of 150 relevant papers and reports were reviewed in this literature survey. Awareness and readiness for the fourth Industrial Revolution (IR) has been studied and analysed with consideration of its technological nine skill components by analysing various reports including report of Grant Thornton and CII (Confederation of Indian Industries). Sample pilot survey from respondents of Diploma in Engineering (10+3) and Bachelor of Computer Applications (BCA: 12+3) students about awareness, preparedness and applied technological components of 4th IR is analysed by descriptive analysis.

In Maharashtra, Diploma students at 10+3 level are studying in different subjects, such as electronics technology, automobile engineering and computer science. MSBTE, Mumbai and few universities are the examining authority to assess the academic standards of Diploma students (10+3) levels. 12+3 (Bachelor of

Computer Applications) students are studying the curriculum set by the various universities. After successful completion and examination, this manpower becomes entry-level workforce to the IT (Information Technology) industries.

In general, the industrial companies have 27% digitization as high, and it is expected to rise to 65% within the next five years in India. In global scenario, this number is expected to grow from 33 to 72% (PwC, 2018). This needs to impart advanced level of TVET skills adoption, even at the grass root levels. Digitalization opened avenues for new industries. Nowadays, many researchers point out that mobile learning is an integral part of educational process and the best gadgets for current scenario to generate new-age manpower (Jadhav & Salunke, 2013). Digitalization of the industries includes mobile networks, telecom operators, value-added services with new business models, new spectrum of industries and broad spectrum of covered industries. These are useful for the industries such as transport and logistics, automotive, healthcare, manufacturing, agriculture and energy. Activity-based technology–entrepreneurship training materials with integration of digital contents have been supported with different reference digital tools, simulations and social media platforms for tele collaborative learning (Tatpuje & Ganbote, 2019).

Industrial Revolution 4.0 created such fields where digitization specifies the role of TVET and Entrepreneurship as a subset of ancillary industries. It will change the whole spectrum of “future-ready skills” of the youths. The few examples of digitalization of the transport industry include platooning, precise positioning, logistic tracing, connected drones, high-opportunity industry, V2V communication, autonomous vehicle and voice and gesture recognition. Automotive manufacturing industry needs robotics, smart factory and assistance to human operators. Telemedicine, remote home care, patient monitoring and remote surgery are the high-end services of healthcare industry. Digitalization level is also at railway industry, infotainment, Internet access, apps and smart maintenance. Digitalization target and opportunities, artificial intelligence (AI), are the enablers of behavioural and decisive electronics having applications in industries transport and automotive, intelligent cars healthcare industry, robotic healthcare assistance manufacturing industry and robotics. TVET and Entrepreneurial skills at such workspace are required for innovative responses (UNEVOC, 2020). The Global Innovation Index gives global ranking of economies with 81 different indicators (Global Innovation Index, 2021). This scenario shows transformational changes in the areas of skills and EE.

Diploma-level computer education at 10+3 level with integration of EE gives all inputs for self-employment and employment wherever specialized education is needed with skills, abilities, understandings, attitudes, work habits and appreciations. It is needed by the workforce to enter and make progress in employment or self-employment. Wood’s Despatch (1854) suggested the provision of practical education to Indian workforce which may help them to a great extent of national development.

In India, the efforts were started in the field of vocational education in 1936 by two experts Messer’s Abbot and Wood. It gave introduction new pattern of education on certain problems pertaining to vocational and technical education. They suggested a complete vertico of vocational institutions parallel with the hierarchy

of institutions imparting general and vocational education and suggested it for the establishment of new type of technical institutions called “Polytechnic: Diploma in Engineering (10+3)”. After their recommendations, different provinces started technical, commercial and agricultural institutions for imparting instruction in non-literary courses (NISTADS, 2018). The National Education Policy of Government of India aims to increase the ratio of gross enrolment in higher education including vocational education from 26.3% (2018) to 50% by 2035 (NEP, 2020). The group of students of this category is here for comparative study with the group of BCA students.

According to the UNESCO’s Hangzhou Declaration, “Strengthening regional and international cooperation and coordination in the development of entrepreneurship and its various supporting initiatives and programs provides support and mobilize resources to help member states utilize entrepreneurship to achieve the UN 2030 Sustainable Development Goals, particularly those related to quality education, poverty alleviation, decent work and economic growth”. It suggests training of manpower resource that will remain pace with time along skills of 4th IR (UNESCO Hangzhou Declaration, 2018).

Emerging issues and challenges in TVET:

- No industry linkage of courses leading to a mismatch between the labour market needs and the training skills.
- Lack of importance on emerging areas of industrial development.
- Inadequate curriculum being followed in schools and use of obsolete equipment.
- Inadequate treatment of theory to practice.
- Lack of employment opportunities and effect of social acceptance and thus overall poor enrolment in vocational stream in such schools.
- No proper interlinked skills of 4th IR.

The inclination to pursue entrepreneurship is comparatively strong in India as indicated in many researches. The educational support for its development is still a far away from the agenda (Raichaudhuri, 2005). Entrepreneurship is still at lower stage in terms of earning the status of a preferred course among management students in India. This status is a reason enough to offer entrepreneurship as an extra-curricular or co-curricular program in the majority of the colleges and universities in India (Shankar, 2012).

In India, vocational and technical education has been introduced even from standard 8th. Secondary School Certificate (SSC) with technical subject is one of the major efforts in the field of TVET for development of skills. Skill development is an increasingly important factor to change economic and environmental conditions. It can bring innovation, enhance productivity, stimulate economic competitiveness and underpin inclusive approaches to development (Brush, K, 2018). In spite of significant quantitative progress, India is still lacking effective technical, vocational education and training (TVET) strategies, is struggling with costly and traditionally training systems and has no strong culture of evaluation and knowledge-based policymaking and programme administration. Digital India initiative played a significant

role with accreditation for bench marking higher education Institutions in India. It is important towards ICT skills of 4th IR.

In Maharashtra state of India, 15.3% of children of age group 15–16 years were out of school, compared to 4.6% of 11–14-year-old children. Majority of out-of-school children in the age group 15–16 years (13.5%) were dropouts (ASER, 2016). About 95% of the world youth in an age group of 15–35 learn any type of vocation or skill or trade, with a choice of 3000 vocational streams, whereas in India the identified trades are 150 and only 2–3% of the youth of age group 15–29 years goes in for formal vocational training with technical skills. There is a lack of new and innovative trades in TVET to attract young children's and meet the Industry Revolution 4.0 requirements. In India so far, we have identified only about 170 trades with a choice of 3000 vocational streams and only 2–3% of the youth (15–29 years) goes in for formal vocational training (Bharali et al., 1995). Obviously, there is a big gap between the aspirations and the availability. OECD Education 2030 project has identified three further categories of competencies, the “Transformative Competencies”. These were useful to address the growing need for young people. It relates to creating new value. These aspects need to be addressed for the better livelihood of the youths.

The students who take the technical or vocational subjects can appear for the Secondary School Certificate (SSC Tech. or Voc.) examination. Higher Secondary School (HSC) examinations related to TVET and Entrepreneurship Education (EE) are HSC (Bi-focal vocation Course) and HSC (Minimum Competency Vocational Course). Curriculum structure of both disciplines is different. In case of HSC (bi-focal vocation course), there are only two subjects of the vocation or technical, while other subjects are the subjects of the science stream at 11th and 12th standards. These students get benefit of separate merit to the admission of the second-year Diploma in Engineering and Technology and the first-year Degree in Engineering. These students can get admission to the respective second-year Diploma in Engineering (UNIVOC, 2018). Structural support gives a positive impact on attitude towards entrepreneurship and perceived behavioural control. It gives a negative influence on subjective norms and entrepreneurial intention (Tran Van Tranga, Duong Cong Doanh, 2019).

With these issues, literature survey and challenges, we find the research gap. Therefore, researcher proposes the following hypothesis:

H1 BCA students are well aware of and prepared for the TVET-applied skills of 4th IR with Entrepreneurship Education than the Diploma in Computer Engineering students.

H0 Diploma in Computer Engineering students are well aware of and prepared for the TVET-applied skills of the 4th IR with Entrepreneurship Education than the students of BCA.

## Methods, data collection and analysis

This study uses survey data collected from students of Polytechnic and BCA students of Satara district. The questionnaire items of this survey were adopted from the previous literature and skill components of 4th IR. We conducted interactions and collection of survey data with two groups of students from Polytechnic and BCA colleges to check the awareness, preparedness and applications of TVET-applied skills of 4th IR and entrepreneurship with questionnaires together with a cover letter to the population of interest.

### Sample survey to analyse awareness and readiness of technology components of IR 4.0

There are nine technology components of Industrial Revolution 4.0. These are: Autonomous Robots, Big Data, Cloud Computing, Internet of Things, Simulation, Augmented Reality, Cyber Security, System Integration and Additive Manufacturing. The vision of IR 4.0 is likely to be adopted worldwide, and it might influence upon the career options of the youths. In this context, TEVT and EE need to be integrated to promote self-employments and thus creation of jobs. Today’s youths enrolled in TVET must be aware of these components. This survey is carried out on pilot sample to know and understand the onsite field situation about the awareness among the youths by action research.

In this research, questionnaire was designed to collect the data from sample pilot survey to know and analyse the awareness, preparedness and applications of the skills of the Diploma engineering students of computer engineering about these nine components of IR 4.0. This questionnaire has total 15 questions with 9 questions on the technology component of IR 4.0. Two-point scale and five-point scales are used in the questionnaire to respond.

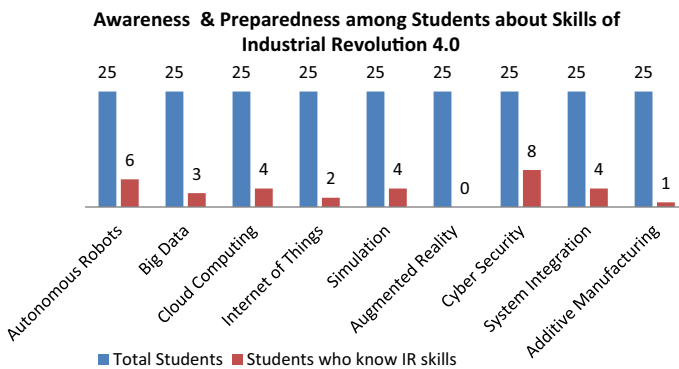
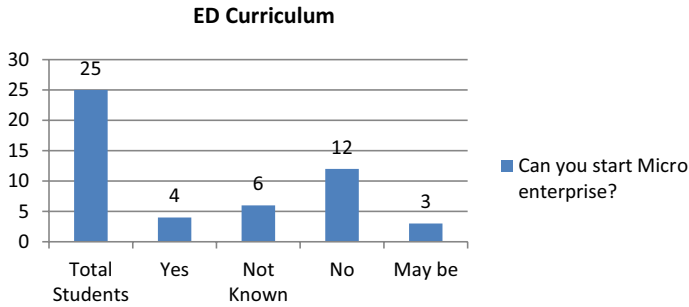
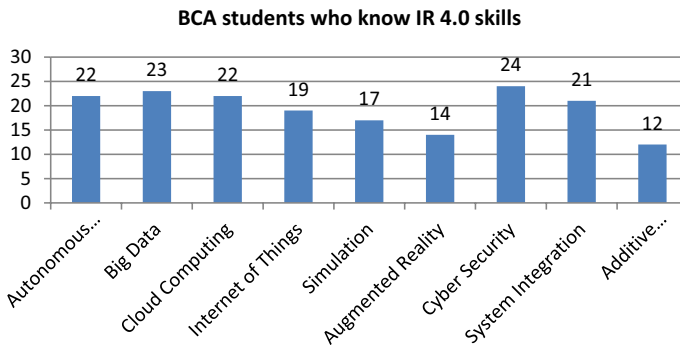


Fig. 1 Technology component awareness and preparedness



**Fig. 2** Willingness to start enterprise



**Fig. 3** Awareness among the Students of BCA course

### Sample survey: respondents of diploma in computer engineering

Figure 1 shows responses about technology component awareness and preparedness among the sample sizes of 25 respondents of Diploma in Computer Engineering.

Analysis of data shows that maximum 32 percent respondents were well aware of and prepared about Cyber Security, whereas no respondent knows anything about Augmented Reality. Autonomous Robots are somehow known to the 24 percent respondents. Sixteen percent respondents know about cloud computing, simulation and system integration. Only 12 percent respondents were aware of Big Data, whereas 8 percent respondents know the IoT. Additive manufacturing is known to only 4 percent respondents. The overall analysis shows that there is no awareness and preparedness up to the mark among the students of Diploma about IR 4.0. It may reflect upon the choosing the career options with changing scenario of the industry. Lack of awareness and preparedness about recent trends may result in an increase in a number of unemployment.

We collected data from 25 respondents of Diploma in Computer Engineering about their willingness to start enterprise after completion of the Diploma. Figure 2 shows only 24 percent respondents are interested, whereas 48 percent are not willing to start the enterprise.



### Sample survey: respondents of BCA course

Figure 3 shows responses about technology component awareness and preparedness among the sample size of 25 respondents of BCA students.

Analysis of data shows that maximum 96 percent respondents were well aware of and prepared about Cyber Security and 92% know about Big Data. Autonomous Robots and Cloud computing is known to the 88 percent respondents. Eighty-four percent respondents know about system integration. Seventy-six percent respondents were aware of and also understand about IoT, whereas 72 percent respondents know the Simulation. Additive manufacturing is known to only 54 percent respondents. The overall analysis shows that there is awareness and preparedness among the students of BCA course about components of IR 4.0. It may be useful for choosing the new-age career options with changing scenario of the industry.

### Comparative analysis of two groups of TVET

Figure 4 shows responses about technology component awareness and preparedness among the sample sizes of total 50 respondents of two groups (25 each) of Diploma in Computer Engineering students and students of BCA.

In sample survey of two groups of TVET, it is found that there is a considerable difference in awareness and preparedness between two groups of each of the 25 respondents of polytechnic students of Diploma in Computer Engineering (10+3 pattern of TVET) and students of BCA. Data show that BCA students are well aware of and prepared about the nine technology components of IR 4.0 than that of the Diploma students. There is a considerable difference in preparedness, awareness and applied knowledge by knowing the trends in industries. This analysis concludes that if BCA students get additional training of advanced technology components of IR 4.0, they can fill up the gap of vacancies at entry-level requirements of the industry.

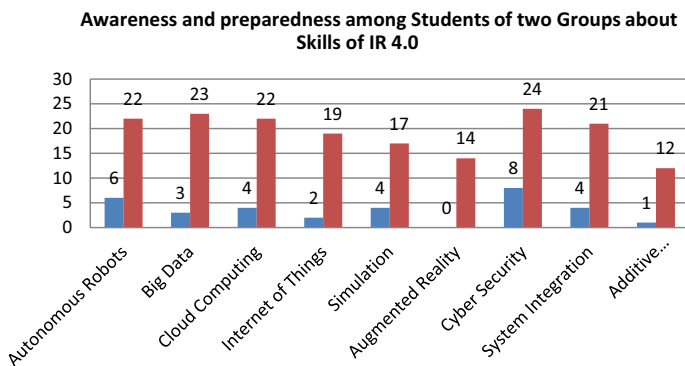


Fig. 4 Awareness and Preparedness among Students of Two Independent Groups

### Statistical procedure

To test hypothesis, researcher used method of group statistics and independent “t” test using SPSS. Technology components of the 4th IR are the defined variables. The 95% confidence interval was taken for statistical analysis. A 5% is a significance level for the rejection of the null hypothesis. It means sampling result has less than 0.05 probabilities. A 5% level of significance means there are five chances out of hundred that a null hypothesis will get rejected. When null hypothesis is rejected at any level of significance, the test result is said to be significant.

As there are two independent samples of BCA group and Polytechnic Diploma group, researcher decided to use independent samples t test to develop statistical evidence that the two-population means are significantly different. The scenario involved an investigation meant to determine as two differently exposed groups obtain significantly different effects on development of TVET skills of 4th IR and Entrepreneurship.

The assumptions made for independent sample test are as follows:

- a. Dependent variable is measured in ratio or interval scale.
- b. Sample mean is normally distributed.
- c. Respondents are selected randomly.
- d. Respondents of both groups are not related as exposed to different trainings as with ICT and without ICT.
- e. Variances of both the groups are equal.

**Table 1** Independent samples test

	Levene's test for equality of variances		t-test for Equality of Means						
	s	Sig.	t	df	Sig. (2-tailed)	Man difference	SE difference	95% confidence interval of the difference	
								Lower	Upper
<b>Independent samples test</b>									
Score									
Equal variances assumed	.63	.432	-11.54	48.00	.000	-5.72	.50	-6.72	-4.72
Equal variances not assumed			-11.54	42.25	.000	-5.72	.50	-6.72	-4.72

Researcher did empirical analysis of the two compared groups of the students of BCA and Polytechnic. The group statistics shows that mean of Polytechnic group and BCA is 1.24 and 6.96, respectively. Standard deviations are 1.39 and 2.05, whereas standard error means are 0.28 and 0.41, respectively. It shows significant difference and thus awareness and preparedness between two group respondents.

The independent “t” test analysis of the two groups is shown in Table 1.

This table gives the results of the independent samples test. There are two main parts as:

1. Levene’s test for equality of variances.
2. t-test for equality of means.

In this test,

1. Levene’s test for equality of variances: This section gives the test results for Levene’s test with two aspects as:
  - a.  $F$  is the test statistic of Levene’s test
  - b.  $Sig.$  is the p-value corresponding to this test statistic.

The  $p$ -value of Levene’s test is printed as “0.000” (as  $p < 0.001$ , i.e.  $p$  very small), so it rejects the null of Levene’s test, and it is concluded that the variance in scores of Polytechnic Diploma group is significantly different than that of BCA group. It means further to look at the “equal variances not assumed” row for the  $t$ -test results.

2. t-test for equality of means provides the results for the actual Independent Samples  $t$  test with:
  - a. Computed test statistic is  $t$ .
  - b. Degree of freedom is  $df$ .
  - c.  $P$  value corresponding to the given test statistic and degrees of freedom is  $Sig$  (2-tailed).
  - d. Mean difference between the sample means corresponds to the numerator of the test.
  - e. Std. error difference corresponds to the denominator of the test statistic.

The mean difference is calculated by subtracting the mean of the two groups. In this example, the mean of Polytechnic Diploma group is subtracted from the mean of BCA group (6.96 minus 1.24 = 5.72). The sign of the mean difference corresponds to the sign of the  $t$  value. The positive  $t$  value in this example indicates that the mean of BCA group is significantly greater than the mean of the Polytechnic Diploma group. The associated  $p$  value is printed as “0.000”.

P-values are never actually equal to 0; SPSS prints “0.000” when the  $p$  value is so small that it is hidden by rounding error.

### 3. Confidence Interval (CI) of the Difference:

This part of the  $t$ -test output gives the significance test results. Typically, if the CI for the mean difference contains 0, the results are not significant at the chosen significance level. In this example, the CI is  $(-4.72, -6.72)$ , which does not contain zero, and this agrees with the small  $p$ -value of the significance test.

## Findings and concluding remarks and recommendations

Conclusions from independent sample  $t$  test:

As  $p < 0.0001$  is less than our chosen significant level  $\alpha = 0.05$ . It rejected the null hypothesis ( $H_0$ ), and it is concluded that the mean for Polytechnic Diploma and BCA group is significantly different. Based on these results, conclusions are:

1. There was a significant difference in mean between Polytechnic Diploma and BCA group ( $t = -11.54, p < 0.001$ ).
2. The average mean difference score for BCA group respondents was 5.72 greater than the average score for Polytechnic Diploma respondents.

In general, we find that the students of Diploma are less aware of and prepared with the technological components and skills of the Industry Revolution 4.0 as compared to BCA group of students. The result of survey of BCA students shows that these students are well aware of and prepared about the nine technology components and applied skills of IR 4.0. This analysis concludes that if BCA students get additional training of advanced technology components of IR 4.0, they can fill up the gap of vacancies at entry-level requirements of the industry.

Empirical research on the case of sample in independent sample is recommended further to understand the effect of pedagogy of TVET with EE to meet the components of Industrial Revolution 4.0. It will be useful to derive the model for replication and also to set a policy to address the challenges of unemployment problem of any country. It is necessary to include the specific applied 4th IR skill-based modules in the curriculum of the Diploma in Computer Engineering, whereas practicum aspects should be included in the curriculum of the BCA course.

A project-based learning module needs to be introduced about the IT industrial processes that are further taught with the digital pedagogy. Virtual Reality and Augmented Reality would be taken on the top priority curricula for better understanding the applied skills. Field try-out of the curriculum after assessment of the competency among the students of the particular skill development would be effective for better self-employability. Based upon these findings, researcher modified his “TAILOR-C Model of EE” as “Technology Action In Learning Of enterprise Creation Model of Entrepreneurship Education (2016)” for its implementation further in teaching and

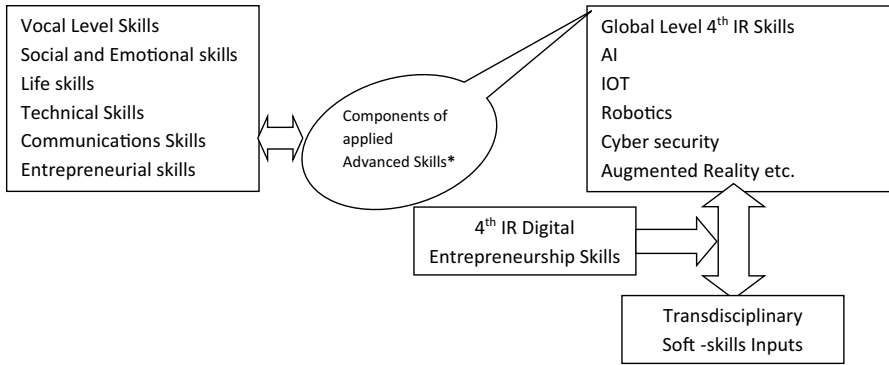


Fig. 5 Module of “Vocal to Global”

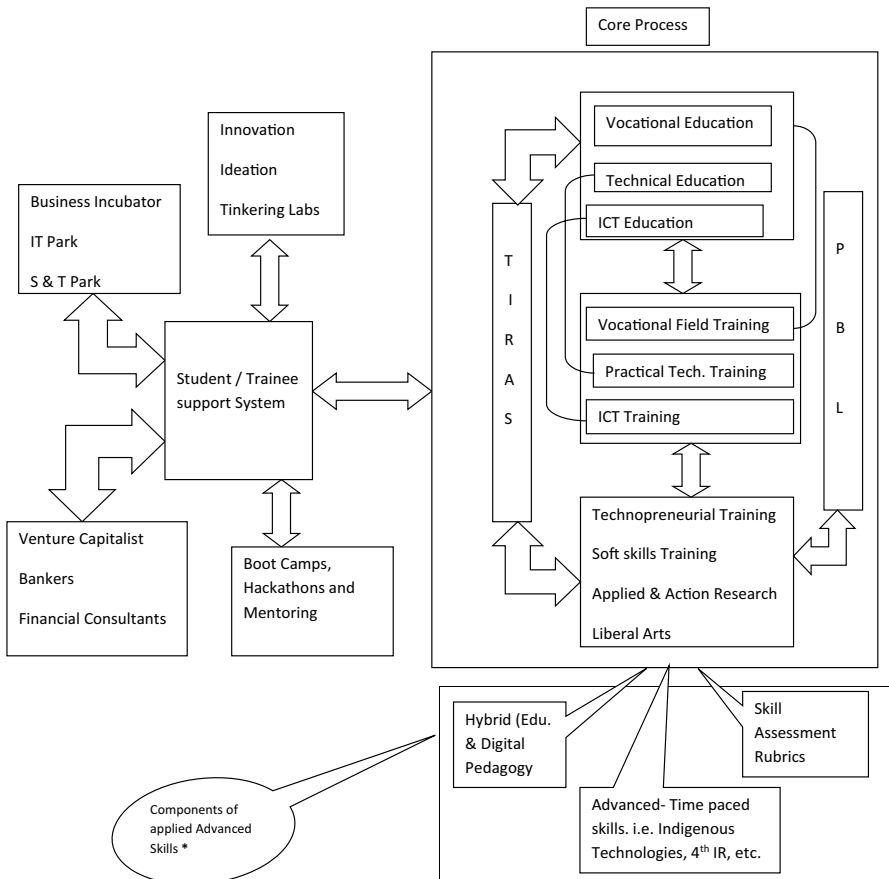


Fig. 6 Modified Version: “TAILOR-C Model of EE: 2022”

learning process (Tatpuje D.U., 2016). It was done with the number of process flow components that suit in the scenario for imparting skills and further development of competencies among the youths.

Figure 5 shows sample additional module of “Vocal (Vocation at Local Level) to Global: Occupation Transformation of Skills” to be further supported as a sub-module of the modified “TAILOR-C Model of EE: 2022”.

Figure 6 shows the modified version of TAILOR-C Model of EE: 2021 for “Development of self-reliant and Skilled Manpower for Sustainable Livelihoods”.

Researcher recommends that the modified version of TAILOR-C Model of EE: 2022 for “Development of self-reliant and Skilled Manpower for Sustainable Livelihoods” can also require to be tried out further to address the variables of the problem identified. This model has two main components, i.e. Module of Core Process with Supportive components and Module of Vocal to Global Occupations.

These two modules are integrated in nature for the sustainable livelihoods to remain pace with time. In the Module of Core Process with Supportive Components, Vocational Education, Technical/occupational education and Information and Communication Technology (ICT), education module is directly integrated with Vocational Training, Practical Technical (field) training and ICT training. These two components are necessarily supported by relevant components of Technopreneurial (Technology Entrepreneurship), Training, Soft skills Training, Applied & Action Research and Liberal Arts. This integrated core process needs further design that is related to the twenty-first-century project-based learning (PBL). Training Instructor Resources for Acquiring Skills (TIRAS) need to define further training methodology and content delivery process of teaching–learning methodology.

Hybrid pedagogy (educational and digital), skill assessment rubrics and advanced time paced skills such as Indigenous Technologies and 4th IR are the main components that need to be integrated with the use of tools for instructional training and imparting skills among the stakeholders. The Core Process Module will always be supported by these advanced skills.

Core Process component is further integrated with student/trainee support system having for support components to enhance enterprise skills of first-generation entrepreneurs. Vocal to Global transformation model needs interventions in instructional design that varies from time to time.

**Conflict of interest** This research claims no conflict of interest.


## References

- Anon, (2020). *TVET and entrepreneurship skills*. Retrieved from [https://unevoc.unesco.org/fileadmin/up/2013\\_epub\\_revisiting\\_global\\_trends\\_in\\_tvset\\_chapter8.pdf](https://unevoc.unesco.org/fileadmin/up/2013_epub_revisiting_global_trends_in_tvset_chapter8.pdf).
- Brizek, M. G, Khan M. A. (2008), *Understanding corporate entrepreneurship theory: A literature review for culinary/Food service academic practitioners*. Retrieved from <https://www.scopus.com/citation/output.uri?origin=recordpage&view=&src=s&eid=2-s2.0-67650090936&outputType=exportPdf>. Accessed 2 Aug. 2021.

- National Education Policy. (2020). Retrieved from [https://www.education.gov.in/sites/upload\\_files/mhrd/files/NEP\\_Final\\_English\\_0.pdf](https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf).
- Global Innovation Index. (2021). Retrieved from [https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2021/GII\\_at\\_a\\_glance.pdf](https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2021/GII_at_a_glance.pdf).
- JADHAV, V., & Salunke, K. (2013). ICT in ODL: Mobile Learning for Inclusive Education.
- Kanungo, R. N., & Misra, S. (1992). Managerial resourcefulness: A reconceptualization of management skills. *Human Relations.*, 45(12), 1311–1332.
- Pwc.com. (2018) Retrieved from <https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>.
- Tatpuje, D. U. (2016). Title of PhD thesis: A study of effectiveness of information and communication technology as a tool for business start-ups in Western Maharashtra, 157–161. Retrieved from [http://14.139.116.20:8080/jspui/bitstream/10603/155048/12/12\\_chapter%206.pdf](http://14.139.116.20:8080/jspui/bitstream/10603/155048/12/12_chapter%206.pdf).
- Tatpuje, D. U., & Ganbote, A. (2019). Effectiveness of online tools for first generation business start-ups sustainability in Satara. *SEDME (Small Enterprises Development, Management & Extension Journal)*, 46(1), 18–23. <https://doi.org/10.1177/0970846419831132>
- UNESCO Hangzhou Declaration. (2018). Envisioning and developing entrepreneurship education: Addressing the challenges of the fourth industrial revolution: Outcome of 8th APEID Meeting on EE. Retrieved from <https://bangkok.unesco.org/sites/default/files/assets/article/Education/files/Hangzhou-Declaration.pdf>.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## Authors and Affiliations

Dipak U. Tatpuje<sup>1</sup>  · Avinash Kakade<sup>2</sup> · Vaibhav Jadhav<sup>3</sup> · Avinash Ganbote<sup>4</sup>

<sup>1</sup> SCRI, Symbiosis International Deemed University, Pune, India

<sup>2</sup> Symbiosis International Deemed University, Pune, India

<sup>3</sup> Department of Education and Extension, Savitribai Phule Pune University, Pune, India

<sup>4</sup> Shivnagar Vidya Prasarak Mandal's, Institute of Management, Baramati, Pune, Maharashtra, India