

IMPACT OF ARTIFICIAL INTELLIGENCE ON STUDENTS' SUSTAINABLE EDUCATION AND CAREER DEVELOPMENT USING EXTENDED TOE FRAMEWORK

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Abstract

The goal of the education is to develop the students holistically. Ensuring the quality delivery to the students helps the Higher Educational Institutions (HEIs) to achieve the sustainable learning outcome. The current educational era is focusing on Artificial Intelligence (AI) and outcome based education predominantly. The aim of the study is to understand the attitude of the students towards artificial intelligence and its impact on sustainable learning outcome & career growth. The conceptual model developed for the present study is based on technology-organisation-environment framework (TOE). The model was evaluated through analysis of quantitative data. First hand primary data was received from students ($n=239$) from different programmes in higher education using questionnaire methods which is developed by interacting with experts in the field of artificial intelligence and sustainable learning outcome. The three main factors considered for the study are social factor, technology factor and organisation factors. It has been observed that the three factors are influencing the attitude of students and Artificial Intelligence (AI) has a positive impact on sustainable learning outcome and career growth.

Keywords: *Artificial Intelligence (AI), Sustainable Learning Outcome, Students Attitude, Career Growth, Higher Education, TOE.*

1. INTRODUCTION

The role of Artificial Intelligence in the education sector has been increasing considerably. In recent years, Computer and machine based teaching influences the learning outcome. Especially, AI based Pedagogical designing and teaching instruments are facilitating instructors and learners to reach the desired educational outcome. The present study is to identify the impact of Artificial intelligence on achieving the Sustainable education and career development among the students. Thus, the study has used a proven conceptual model of Technology-Environment-Organization (TOE) framework and the collected data from 239 respondents were analyzed through PLS SEM. AI is a technological innovation to find the solutions to the critical challenges in the Education and it provides sustainable approaches to the transformational learning. The overall education and its experience of the students are changing because of the use of technological development in the Indian Education system (Shalini & Tewari, 2020). AI facilitates the teachers to foresee students' potential and prevent the students from drop out in the studies (Sarkar, 2018). Contemporary Education lay on experiential learning and it improves the specific skills in the respective domain.

AI instruments such as gaming, simulation, 3-D technologies provide the way to practical experience to the students during the learning (Dileep Kumar,2021). The education sector needs to employ the educational technology and AI to make the effective learning process and to obtain the sustainable learning (Mudit Verma, 2018). The most determining factor in the learning process from the learner perspective is 'attitude'. There are many factors which determines the attitude of the individuals and the current study evaluates three major factors namely technological, organization and environmental. Normally, the elements of the attitudes are *cognitive, affective and behaviour*. The learning inputs are associated with TOE factors which influence the attitude of the learners directly. The learners have to imbibe the inputs given by the instructors; the given inputs are registered in the mind of the learners according to their learning style (cognitive). In the process of 'affective' the inputs are directly influence the learners either positively or negatively. The sustainable learning is depends on the inputs and the mode by which delivery has been made i.e. (approach) lecture method, simulation, gamification or any other experiential learning techniques. The so called definition for learning says "quite enduring transformation in the behaviour". The final phase of attitude is 'behaviour' the point in which transformational or sustainable learning occurs (change in the behaviour) for career development. AI learning tools and techniques are connected with learning styles (visual, auditory, kinaesthetic & auditory digital) of the individuals predominantly and it ensures the effective sustainable learning in the any domain he/she study. The present study focuses to evaluate the Impact of AI in achieving the sustainable learning and career development using TOE frame work.

Tornatzky and Fleisher (1990) development a TOE frame work; pertaining to the present study, it describes how the attitude of the students are influencing through the factors of Technology, Organization and Environment in achieving the sustainable learning.

It is a time in need to do the scientific research on the organizational and general public acceptance with regard to Artificial Intelligence, which helps to explore the possibilities of achieving the sustainable education (Mahidhar and Davenport, 2018; Dhawan, 2020; Pillai and Sivathanu, 2020) emphasize that AI is still young and difficult to predict how it will develop in the near future . In order to better understand and use AI, the world has to consider AI enforcement requirements, employment, ethics, education, tent and evolution. Many researchers believe that "the attitude of the working class is an important factor in the acceptance of new technologies and can also significantly affect the adoption of technology" (Lichtenthaler, 2020). Much research has been done on the investigation of those "intangible resources" such as social networks, virtual reality objects, artificial intelligence, etc.(Gursoy *et al.*, 2019; Sujata, Aniket and Mahasingh, 2019; Holmlund *et al.*, 2020) . At the same time, people's corporate resources and their attitude towards acceptance of new technologies should be considered as an important aspect of business competition as well as success. Only a few studies have investigated digital and technological change and the emergence of companies from the perspective of employees' attitudes towards technology changes. This study seeks to partially close this gap by examining the social situation and representatives of various industries regarding the adoption of artificial intelligence.

Therefore, this research paper will be beneficial in understanding what students think about AI and their awareness about AI. Totally 239 student respondents from various parts of India participated in this research study. The practical application of AI is still not happening on a large scale because of lack of proper information to implement it and guidance from the experts in the field of Artificial

Intelligence. This paper is designed in such a way that the first part of it is designed to explore the level of awareness of students on AI and its impact on the sustainable education. Second part is designed to understand various factors that may affect the implementation of AI in education. The third part is related to the attitude of the students towards AI and the fourth and final part of the research study is dedicated to understanding the impact of AI on the life of students.

2. THEORETICAL BACKGROUND

2.1. Artificial Intelligence for Sustainable Education

In recent days, learning environment is quite changed with innovative AI technologies. The expansion of class room teaching through virtual AI tools facilitates not only the learning methods, content designing and course delivery but also leads to sustainable education (Kashif Ahmad,2020) . Current educational context has been using the AI most effectively, educational tasks become very easy and practical learning is relevantly high. The role educational instructors are like bridge between AI and expected learning outcome (Tuomi & Ilkka, 2018). Artificial Intelligence has positive impact in academic delivery and administrative tasks. In one side AI helps the teachers to provide effective academic deliverables. In another side, AI makes the teachers to take responsibility to take decisions on unexplainable data (Van der Vorst et al, 2019).

The perceived attitude of the students towards implementation of AI is influenced by various factors. The proven TOE framework was used for the present study with different set of variables which influence the attitude of the students towards AI and their sustainable career growth. The changes in the current educational system is majorly depends on Technological, Organization and Environment social factors. A theory which has multi-face to understand the intricacies of AI implementation is TOE where in which can evaluate the presence of technological vulnerability either within on outside the organization (Tornatzky and Fleischer, 1990).

The decision of the organization to implement the innovative technology is influenced by environmental social factors and organizational factors. Advanced technology incurs cost and also quite important what sort of relative benefits technology bring back to the business (Sulaiman AlSheibani et al, 2018). The technological elements comprise sum sort of available innovative technology either inside the firm or inside the industry. An organizational factor includes strategic business investment, consent of top level management and business size and it directly influences the possibility of implementing the AI. The environment domain covers the market availability, industry size and structure and role of the internal as well as external stakeholders (Tornatzky & Fleischer 1990). The study conducted by (D Pinto Dos Santos et al, 2018) to understand the attitude of the medical students towards AI concludes “revolutionary changes were made by AI in the department of radiology and it ensures potential application through replacing the human interventions. From the study, the majority (77%) of the respondents agreed that the medical training requires AI enabled curriculum. Learning attitude of the students is quite impressive and they wanted to inculcate innovative skills & knowledge for upgrading their career growth. Moreover, AI enabled learning pedagogy are completely practical and outcome oriented which ensures the sustainable learning outcome. Few study found some negative impacts with regard to AI, (Klaudia T. Bochniarz et al, 2021) 659 school students were involved in the study and to know their attitude on AI, the results shows that many students felt distrustful on AI and also perceived it as more hostile and lack of governance by emotions.

3. RESEARCH FRAMEWORK AND HYPOTHESES DEVELOPMENT

The basic proposed conceptual framework in the research is Impact of AI in sustainable education and career development of the students using TOE framework. Perceptual attitude of students are recorded with regard to sustainable learning outcome. Students responses shows that educational outcome was highly influenced by AI positively and also the study has emphasized that the outcome of AI in the following areas such as students' progress, faculty and students interaction and class room engagement (Caroline Kairu, 2020).

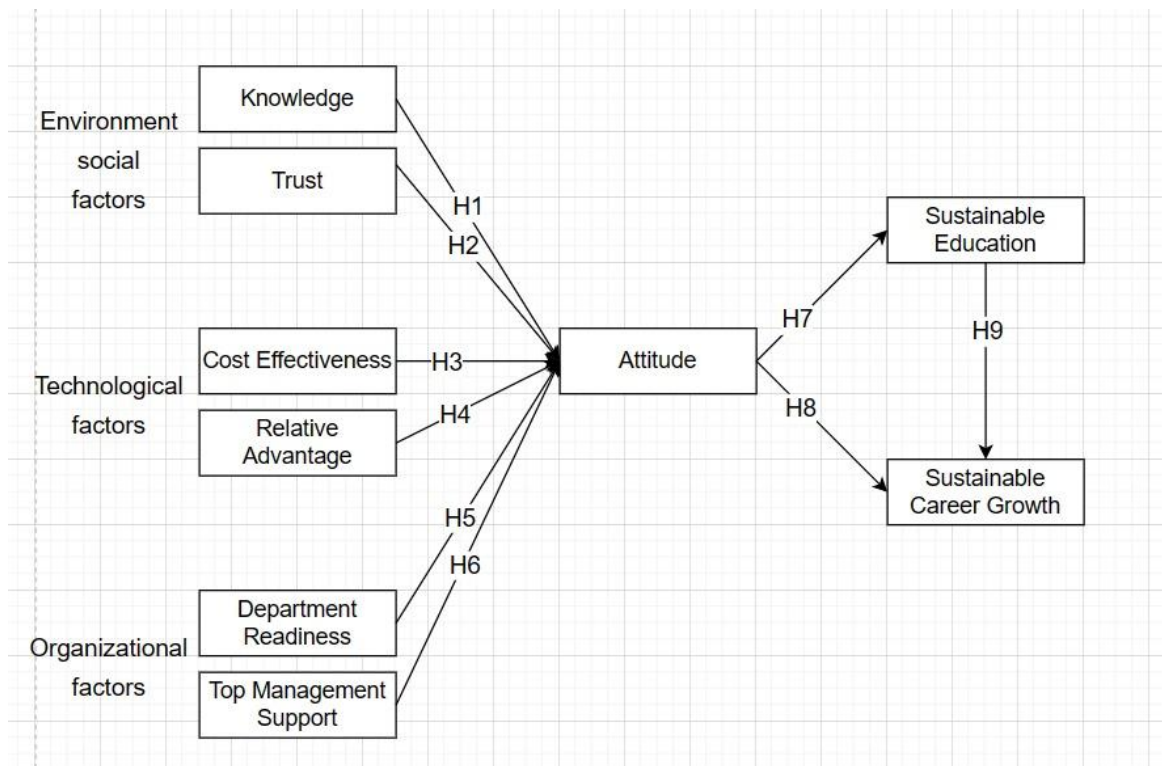


Figure 1: Research framework Impact of AI in Students' Sustainable Education

Environment Social Factors

Business organizations are activating their operations based on the industrial environment (Sulaiman AlSheibani et al, 2018). There are two factors predominantly influence while implementing any technology (AI) or changes in the organizations, they are: internal factors & external factors. Internal refers within the organizational climate where as an external factor are the environmental factors which include competitiveness, market size, suppliers and other influencing factors (Ifinedo, 2005). It explains the place where the organization exists and performs its business operations (Chau and Tam, 1997). Teachers' knowledge, skills, attitude to learn the technology and their approach towards educational delivery affects the quality of AI implementation in the educational sector. Normally, external forces such regulatory body; rivalry in the industry can stimulate the AI adoption (Kamath and Liker, 1994). In the same way, tough competition and continuous uncertainty in the market stimulates the institution to implement the innovative technology in the education (Mansfield 1968; Mansfield et al. 1977).

Technological Factors

Technological factors explain the level of innovation which facilitates the business organization internally and externally. It studies the affordability and cost effectiveness of the organization to adopt the innovative technology (Tornatzky and Fleischer 1990). Quality of the educational delivery and sustainable career growth is depends on the tendency of the educational institution to investment more on the technology based educational instruments (Collins et al, 1988). External technologies and its requirements are rapidly increasing to strengthen the organizational capabilities. When organization makes incremental change, there would be least cost and risk involves in the operation. (Hage, 2008); (Tushman and Nadler, 1986). The amount of benefit perceived by the educational sector while implementing the AI is referred as 'relative advantage'. The importance of AI is based the level on which its benefits superior than the other technologies (Zahi, 2010). Machine Learning, Deep Learning, Natural Language Programming are helpful to gain the competitive advantage irrespective of any industry. Previous research is also an evident for significant relationship between acceptance of innovative technology and its relative advantages (Aboelmaged, 2014; Kumar et al. 2016; Hung, 2016; Ifinedo, 2005; Zhai, 2015; Yang, 2015).

Organizational Factors

Various organizational attributes and resources are the internal factors which induce the adaptation of innovative technology in the business operations. Success and failure of the technological adaptation is depends on the organizational perspectives (Aboelmaged, 2014). Operational elements are major influencers with regard to forming the norms of the pre and post adoption of technology in the organization (Karahanna et al,1999). Different characteristics of the organization such as size, structure and designs are the attributes which makes the business unit or departmental to get ready for the adoption of AI (Wade and Hulland, 2004). *Departmental readiness* are defined by (Iacovou et al, 1995) that 'the resources of the organization and its accessibility for adopting innovative technology'. Similarly, without the support of top management and their motivation wouldn't possible to take up the changes in the organization. The leader who engages the information system and technology and their intention to bring the innovation is also a matter in the successful adoption of innovative technology (Ifinedo, 2005). Commitment of the management has positive significant relationship with adoption of technology in the organization (Hung et al. 2014; Zahi, 2010; Yang et al, 2015).

As far as educational institution concerned, organizational factors are faculty strength, number of students; curriculum design, educational policy and attitude of the students are the real determinants of AI implementation. Environmental factors are faculty's knowledge, skills and their trust on delivering the quality education by using AI technology. Continuous investment on innovative technology and its benefits are measured through Cost effectiveness and relative advantages. The fundamental question is here, whether the AI is affordable to all the educational institutions and if it been adopted would it be possible to get the benefits. The present study explores the same and identifies the impact of AI in sustainable education and student's career growth.

The previous study shows that AI tools and techniques are encouraging the learners for innovative thinking and Institutions are able to prevent the students' dropout. Each learner is unique in terms of their learning style and the quality of the academic delivery depends on the pedagogy adopted by the faculty to reach the students. Pedagogy, innovative or traditional approach, visual aids and experiential learning are major determinants of the learner's attitude in the class room. AI in education not only makes them to sit in the class just for engagement but also make the students to think innovatively in the domain in which they are studying.

4. METHODOLOGY

The research question (RQ) addressed in this study is as follows: RQ: What is the current public attitude towards AI? What is the current attitude of industries towards AI and do social factors hinder AI adoption?

The study addressed the following research questions:

1. What is the awareness level of students towards Artificial Intelligence (AI)
2. What is the attitude of students towards Artificial Intelligence (AI)
3. Which factors contributes towards the usage of Artificial Intelligence (AI) and how it affects the students education and career growth

The main objective of this study is to evaluate the present attitude of students of various programmes towards Artificial Intelligence (AI) and investigate the most influencing factors that affect Artificial Intelligence (AI), students education and career. Through extensive literature studies from various sources, we identified that there are several factors that affect the attitude of students towards Artificial Intelligence (AI).

In earlier studies, various researchers used popular frameworks to examine the attitude and actual usage of technology which are newly introduced, such as TAM – Technology acceptance model, or technology–organization–environment framework (TOE). In this study, the authors identified and believed that the technology–organization–environment framework (TOE) model best suit for the study.

This approach justifies that an institution decision to implement new technology will be affected by technology–organization–environment (Baker, 2011). Though the proposed model is more relevant, the authors extended the model by adding social factors that influence the students' acceptance of Artificial Intelligence (AI), education factors and career related factors.

The study is descriptive in nature. Non probability-judgmental sampling method used for identifying the samples. The sample size for the study is 250 and after data cleaning, the final sample size taken for data analysis is 239. Structured questionnaire is used and data collection is carried out using google form and hard copy distributions. Data analysis is performed using IBM SPSS 23.0 and Smart PLS.

5. ANALYSIS AND RESULTS

Table 1: Mean Rank Analyses for Features Present In Your Smart Devices Are Ai Features

AWARENESS	MEAN	RANK
Social Media	4.36	1
Search Engines like Google, etc.	4.21	2
Google Maps or GPS	4.19	3
Google Keyboard	4.15	4
Online banking features	4.15	4
Chat Box	4.14	6
Online shopping app recommendations	4.14	6
Image or Text Recognition(Google Lens)	4.12	8
Search Recommendations	4.11	9
Cameras	4.1	10
Online streaming services like Netflix, Amazon Prime is recommended	4.08	11
Voice Assistant	4.06	12
Auto Correction	4.05	13
Voice Typing	4.05	13
Facial Recognition	4.05	13

The study was impact of artificial intelligence and received response from 239 people and the mean analysis of awareness of various features in smart devices with 15 features. Social media is the first rank from the table above with 4.36 mean values.

1. Model Fit Summary

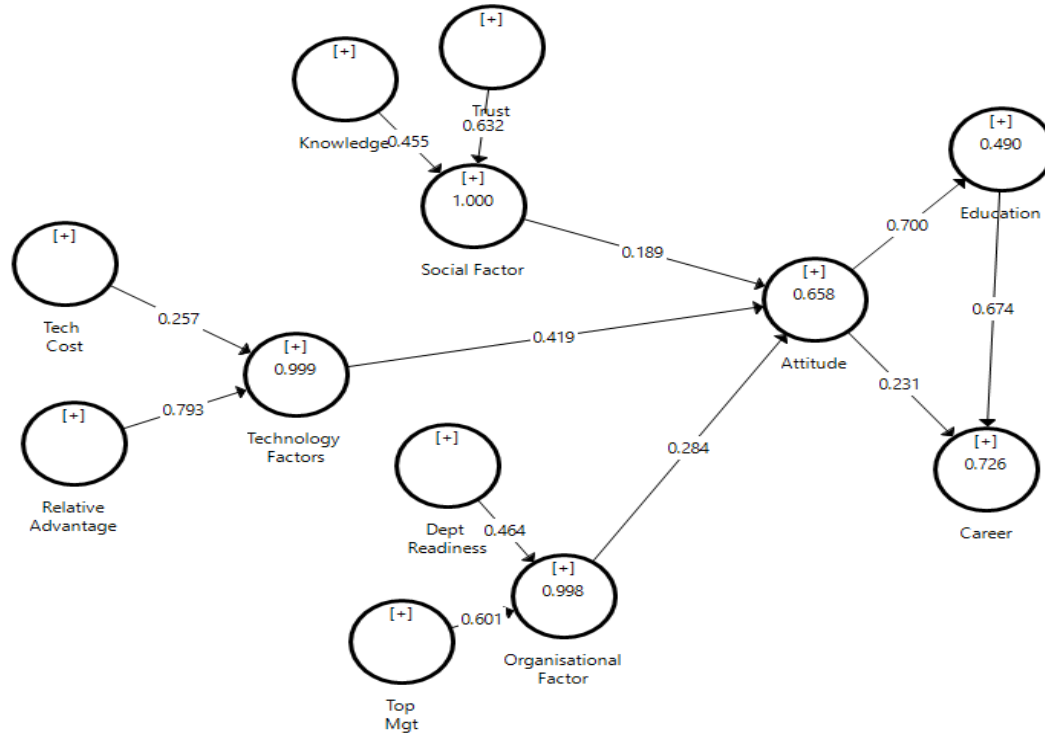


Figure 2: Extended TOE Framework

Table 2: Outer Loadings

The outer loading values must be minimum 0.708 (Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, 2017) and the present study meets the criteria requirements

	Attitude	Career	Dept Readi	Education	Knowl edge	Org Factor	Relative Adva	Social Factor	Tech_ Cost	Tech Factors	Top Mgt	Trust
AT1	0.838											
AT2	0.857											
AT3	0.818											
AT4	0.868											
DR1			0.867									
DR1						0.797						
DR2			0.894									
DR2						0.807						
DR3			0.888									
DR3						0.822						
DR4			0.83									
DR4						0.769						
IC1		0.842										
IC2		0.842										
IC3		0.884										
IC4		0.869										
IE1				0.853								
IE2				0.862								
IE3				0.864								
IE4				0.817								
K1					0.866							
K1								0.781				
K2					0.887							
K2								0.803				
K3					0.807							
K3								0.684				
RA1							0.778					
RA1									0.769			
RA2							0.823					
RA2									0.805			
RA3							0.841					
RA3									0.816			
RA4							0.844					
RA4									0.835			
RA5							0.823					
RA5									0.821			
T1												0.807
T1								0.735				
T2												0.886
T2								0.842				
T3												0.834
T3								0.764				
T4												0.836
T4								0.826				
TCE1									0.846			
TCE1										0.698		
TCE2									0.836			
TCE2										0.721		
TCE3									0.855			
TCE3										0.735		
TMS1											0.884	
TMS1						0.834						

TMS2												0.881
TMS2						0.854						
TMS3												0.849
TMS3						0.8						

Table 3: Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Attitude	0.867	0.868	0.909	0.715
Career	0.882	0.883	0.919	0.739
Dept_Readiness_	0.893	0.894	0.926	0.757
Education	0.871	0.871	0.912	0.721
Knowledge	0.814	0.821	0.890	0.730
Organisational_Factor		1.000		
Relative_Advantage	0.880	0.881	0.912	0.676
Social Factor	0.890	0.894	0.914	0.605
Tech_Cost	0.801	0.801	0.883	0.715
Technology_Factors		1.000		
Top_Mgt	0.842	0.843	0.905	0.760
Trust	0.862	0.865	0.906	0.708

The AVE value must be more than 0.5 and the composite reliability value must be more than 0.7 (Sarstedt, Ringle and Hair, 2017). Construct Reliability and Validity values are as per the standards and hence all the criteria to meet the requirements of AVE, Composite reliability.

Table 4: Discriminant Validity through HTMT Approach

	Attitude	Career	Dept Readiness	Education	Knowledge	Relative Adv	Social Factor	Tech	Top Mgt	Trust
Attitude										
Career	0.801									
Dept Readiness	0.74	0.599								
Education	0.803	0.852	0.613							
Knowledge	0.743	0.67	0.721	0.735						
Relative Advantage	0.859	0.712	0.7	0.786	0.743					
Social Factor	0.82	0.658	0.754	0.745	0.076	0.844				
Tech_Cost	0.776	0.66	0.588	0.76	0.799	0.889	0.858			
Top_Mgt	0.789	0.648	0.872	0.769	0.757	0.762	0.791	0.736		
Trust	0.797	0.585	0.705	0.679	0.809	0.836	0.831	0.818	0.739	

The cross loadings values show whether the items converge in the representing construct or with other constructs too. From the above table 3.3.3 it is identified that the values are below 0.9 which is the threshold limit for accepting the loading of items without multi collinearity (Kline, 2010). Also the VIF values for all items in constructs are below 3.3.

Table 5: R Square

	R Square	R Square Adjusted
Attitude	0.658	0.653
Career	0.726	0.723
Education	0.490	0.487
Organisational_Factor	0.998	0.998
Social Factor	1.000	1.000
Technology_Factors	0.999	0.999

The R-Square says the impact and relationship between the dependent and independent variables.

Hypothesis Testing

Table 6: Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Attitude -> Career	0.231	0.237	0.060	3.825	0.000
Attitude -> Education	0.700	0.703	0.042	16.580	0.000
Dept_Readiness_ -> Organisational_Factor	0.464	0.466	0.127	3.654	0.000
Education -> Career	0.674	0.670	0.055	12.259	0.000
Knowledge -> Social Factor	0.455	0.454	0.016	28.181	0.000
Organisational_Factor -> Attitude	0.284	0.293	0.077	3.694	0.000
Relative_Advantage -> Technology_Factors	0.793	0.786	0.092	8.586	0.000
Social Factor -> Attitude	0.189	0.180	0.078	2.421	0.016
Tech_Cost -> Technology_Factors	0.257	0.260	0.104	2.465	0.014
Technology_Factors -> Attitude	0.419	0.425	0.082	5.110	0.000
Top_Mgt -> Organisational_Factor	0.601	0.593	0.125	4.823	0.000
Trust -> Social Factor	0.632	0.632	0.019	32.927	0.000

The hypothesis proposed for the study is tested using Smart PLS and from the p-value it is observed that all the hypothesis framed for the study is accepted.

Table 7: Q-Square

	SSO	SSE	Q ² (=1-SSE/SSO)
Attitude	956.000	519.314	0.457
Career	956.000	449.362	0.530
Dept_Readiness_	956.000	956.000	
Education	956.000	622.842	0.348
Knowledge	717.000	717.000	
Organisational_Factor	1673.000	570.742	0.659
Relative_Advantage	1195.000	1195.000	
Social Factor	1673.000	669.877	0.600
Tech_Cost	717.000	717.000	
Technology_Factors	1912.000	764.716	0.600
Top_Mgt	717.000	717.000	
Trust	956.000	956.000	

The Q-Square has measured of the study. The value must be 0.35 to have a strong effect of generalizability. The study proves that the values are greater than 0.35 which shows that the study can be used in any part of the world to understand the acceptance level of students towards AI, how AI impact the students' education and career growth.

Table 8: Model fit Summary

	Saturated Model	Estimated Model
SRMR	0.070	0.081
d_ULS	7.793	10.506
d_G	n/a	n/a
Chi-Square	infinite	infinite
NFI	n/a	n/a

The model fit is assessed by SRMR value. The threshold value for SRMR must be less than 0.9. The value obtained in the study is 0.081 which is between the threshold limit. Hence the model is accepted.

6. DISCUSSIONS

The first and foremost thing that everyone should do is to recognize and understand the seriousness of the problem that may be caused due to the unconscious use of artificial intelligence features in our life in the long run. This is a new technology so most of the people are not aware of its full potential, therefore we must include a dedicated subject or program in every educational institution. The people who use smart phones must be educated about all its features and the way it can have an influence on our daily life. There are many people who don't even know that their life is impacted by AI and their decision making process is manipulated in many ways. For such people there should be proper awareness programs conducted through various platforms. From the analysis, it is observed that among 239 respondents, 60.7% are in the age of 18 – 21. 32.6% are in the age of 22 – 26, and 1.6% is in the age of above 26. Most of the respondents 47.3% education is UG and 38.5% education is PG, 6.7% education is PHD, 5% education is 12th / DIPLOMA, 2.5% education are professional course. The students are participated from diverse programmes, i.e. 65.3% are arts & science department, 27.6% are engineering department, 2.1% are medical department, 4.2% are professional department, and others are law department. Among the respondents, 44.4% are using 2 smart devices, and 30.5% are using 1 smart devices, 15.1% are using 3 smart devices and others are using above 3 smart devices. Among respondents, 76.6% are using smart device on 1 – 8 hours. 19.7% are using smart devices on 9 – 16 hours, and others are using 17 – 24 hours. Regarding the awareness level, 55.6% are got awareness on the internet and 33.1% are got awareness through social media, 6.3% are aware through the newspaper and others are aware through magazines and advertisement. Among the respondents, 94.6% are using the android, and this 5.4% are using the ios type of mobile. The awareness level of students shows that 34.3% are highly aware and 31.4% are aware, 26.4% are neutral, and 6.3% are not aware and others are highly not aware. The model developed for this study extended TOE approach is fit and the Q square values show the suitability and generalizability of study in different setups. Hence the study can be taken by other researchers those work on Artificial Intelligence. Looking at the shifting trends in the technological fields we now know that artificial intelligence plays a vital role in all the

latest technology. Many people are aware of AI and many more are not so we need to create more awareness among people about Artificial Intelligence and train them how to utilise the technology that we humans have created for our own advantage. This study will help in understanding the awareness and impact of AI on students. This study will also definitely help in understanding various aspects through which AI is influencing our life and finding out ways to overcome it through proper application of techniques to take charge of these technologies.

7. CONCLUSION

Looking at the shifting trends in the technological fields we now know that artificial intelligence plays a vital role in all the latest technology. Many people are aware of AI and many more are not so we need to create more awareness among people about Artificial Intelligence and train them how to utilise the technology that we humans have created for our own advantage. This study will help in understanding the awareness and impact of AI on students. This study will also definitely help in understanding various aspects through which AI is influencing our life and finding out ways to overcome it through proper application of techniques to take charge of these technologies.

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