Challenges of Digitalization in Engineering Colleges of Himachal Pradesh Technical University

Vijay Kumar Chouhan
Principal, Technical Education Department, Government of Himachal Pradesh, India

Dr. Megha Mehta
Associate Professor, Department of management
Lovely Professional University, Punjab, India

Abstract
The process of digitalization is referred to as "shift" (Biddix, J. P. et al., 2015), it has powerful impact on society, economy and higher education institutes. Digitalization is undoubtedly a major value creator in the process of academic delivery. It brings new roles, opportunities and challenges with it and has impact on internal functioning and entire operating environment. So, institutes need to quickly adapt to these changes by identifying and overcoming these challenges. This study provides a framework to understand the potential challenges faced due to digitalization in engineering colleges of Himachal Pradesh Technical University. Challenges of digitalization were identified, enlisted and grouped into leadership challenges and resource challenges.

Keywords- Information and Communication Technology (ICT), Digitization, Digitalization, Digital Transformation, Digital Technology.

Introduction
The world never seems to face such a crisis as this caused by killer virus called COVID-19. No one can predict its impact on the future existence but it seems to be certain that COVID-19 pandemic will generate new world order which will be more adapted to digital age. Universities have already started introducing digital technology which will gradually be integrated and will act as a catalyst for all the academic transformations. Education in the age of knowledge-based society will be modeled by evolutionary trends of digital technology (CRĂCIUN, I. 2020).
Digital technology is penetrating in all the sectors in different degrees. As it advances, there will be dramatic implications on the profit, opportunities and revenue (Bughin et al. 2017) of the industries. In the fourth wave of industrialization (industry 4.0), engineers with new competencies are required and to meet this requirement, higher education is required to be changed accordingly. In industry 4.0, the engineering education have to produce engineer 4.0 (Fomunyam, K. G., 2019).
Like industries, higher educational institutes are also exploring emerging technologies to improve performance and adapt to the technology driven society (Rodrigues, L. S., 2017). Education plays an important role in developing stable and civilized society, developing personality of individuals, polishing human skills makes people skillful, knowledgeable and competent (Navneet, K., 2019) and universities are fundamental institutions in the society, they have enduring mission of educating, knowledge creation, and serving community. Intellectual capital

and knowledge are strategic resources that provides advantage in the global competition. Intellectual capital is the hidden power of the university. Universities have long life cycle and continuously strive to adapt to the changing environment (Bratianu, C., & Pinzaru, F. 2015).

It is well established fact that formal education system is a critical driver for economic growth and productivity (Price Waterhouse Cooper, 2012). As the saying goes "digitally disrupt or be digitally disrupted", technological advances are propelling disruptions and transformations in numerous domains, and education is no exception (Leahy, S. M., et al., 2019).

Further, digitalization is not about converting the current processes into digital form but it is about rethinking the existing processes from a new perspective which is enabled by digital technology (Parviainen, P. et al., 2017), which develops quietly and quickly and we cannot afford to be slow or just react to these technological disruptions (Brett, J., 2019). Therefore, leaders need to respond proactively to the challenges arising out of the "new normal" due to digitalization which is characterized by VUCA i.e., Volatile, Uncertain, Complex and Ambiguous environment (Vogel, P., & Hultin, G., 2018).

Methodology

Questionnaire design was used for the study. To gain understanding of challenges faced by higher education institutes due to digitalization, a review of literature was conducted. The current study is descriptive in nature. The research literature was searched from electronic data base, electronic journals, search engines and electronic books such as J-Gate, Scopus, JSTOR, EBSCO, Google Scholar, Science direct and Research Gate. After accessing the suitability of articles, a total of 70 research papers were shortlisted and various challenges were identified. In the literature review it was observed that many terms used in the research literature for digitalization were broadly similar such as, digitalization, digitization, digital transformation, information and communication technology and digital technology. Therefore, in this paper all the terms were included for the purpose of identifying challenges of digitalization in higher education institutes.

After listing challenges from the review of literature, they were narrow downed. Based on this review of literature and the understanding of researchers, a questionnaire was developed which was used for survey. Reliability of the questionnaire was ensured by calculating Cronbach's Alpha value. There were 21 questions on challenges of digitalization faced by the faculty of engineering colleges of Himachal Pradesh technical University along with demographic questions. The questionnaire was administered to 232 faculty members of engineering colleges of Himachal Pradesh technical University and the responses were noted. Five-point Likert scale was used to rate the positive and negative responses lying between two extremes from strongly agree to strongly disagree. The responses were collected and factor analyzed.

Need of digitalization of Higher Education Institutes

Higher education is very critical in "knowledge-based economy". It is a major contributor for national development and economic growth of the country (Prakash, V. E., 2011). The process of digitalization is referred to as "shift" (Biddix, J. P. et al., 2015) and it plays a very important role in HEIs and will become more important every day. It is both driving and enabling factor in the knowledge driven economy. Throughout the world it follows the path of socio-economic development of a nation. It is like a tool, composed of big engine to improve teaching-learning and education processes (Torres-Ruiz, M., & Moreno-Ibarra, M. 2019). Digitalization is shaping society like never before. It has powerful impact on society, economy and higher education. Digital technologies are now part and parcel of teaching, learning and research (Ahel, O., &

Lingenau, K., 2020). Education plays an important role in overall development of individuals and hence the nation. Because of digital revolution education sector is witnessing revolutionary changes. Schools and colleges are increasing adopting digital solutions (Gond, R., & Gupta, R., 2017).

Higher educational institutes are having a history of being notoriously slow in adopting and integrating new digital technologies (Haugsbakken, H., & Langseth, I., 2019). Therefore, digitalization of education remains a great challenge (Parvin, S. 2013) moreover, digitalization initiatives often experience failure due to change-preventing organizational culture (Hartl, E., & Hess, T., 2017).

With the development of digitalization, we are moving towards industry 4.0 and the domain of higher educational institutes is affected by the technological advancements brought about by industry 4.0. Therefore, to remain relevant and competent, higher educational institutes have to adopt and imbibe digital technologies (Castro Benavides, L. M., et al., 2020). Universities also are now forced to redesign their education system as per the present technological environment to improve upon education and research activities (KUKKAMÄKI, J., et al., 2018).

Educational practices demand the use of technology, therefore having good teaching practice using information and communication technology is essential (Alonso-García, S., et al., 2019) therefore digitalization in the higher education is increasing day by day and technology is acting as a catalyst in moving the higher education from knowledge-transfer model to collaborative, self- directed, active and engaging model (Navneet, K., 2019).

Digitalization in education sector can be carried out in the area of teaching-learning, administrative, evaluation, research and development, online exam, online admission system, social groups, online sharing of knowledge, digital publications, digital support materials (like pdf, ppt, doc), and for the benefit of the society (Bejinaru, R., 2019). Therefore, in recent years many countries have made huge investment in digitalization of teaching learning, research and administrative activity in the higher educational institutes as technology is a major driver for change in the educational context (Kirkwood, A., 2014). All countries whether developed, developing or underdeveloped have to go through the process of digitalization. Further by using digital technology in institutions, teachers working style is changing drastically as they are now using different platforms for communication, assessment of students and providing study materials and all at faster pace than expected (Limani, Y., et al., 2019).

Digitalization brings new roles and opportunities for the universities and has impact on internal functioning and entire operating environment (Lääts, K., et al., 2019). HEI acts like broker between researchers and local entrepreneurs. HEI have always supported economic and social development these are regarded as the centre of cultivation technology and most technological developments which have effect on the economy can be linked directly or indirectly to the HEI (Hapenciuc, C. V., et al., 2016). To enable improvements, organizations need to digitalize and transform business models and existing organizational conditions like culture, process and structure (Fitzgerald, M., 2014).

Digital technology is undoubtedly a major value creator in the process of academic delivery and it has positive impact on research encouragement, knowledge acquisition and learning experience of all the stakeholders (Chaudhary, P., & Sharma, K. K., 2019). Digitalization results in transparency, accuracy, cost effectiveness, increased productivity and speeding up of the services (Kumar, U. S., 2019). Digitalization is a trend for modernizing and reforming global education system. Efficient use of digital technologies in education sector is the key to achieve educational objectives and add value in teaching and learning process (Bejinaru, R., 2019). Digitalization

affects everything, it impacts academic environment and enables knowledge flow between all stakeholders (Saari, A., & Säntti, J., 2018) which makes it a necessity.

Challenges of Digitalization in Higher Education Institutes

In higher education institutes digitalization is an important phenomenon and in continuous evolving stage so researchers have to continuously strive to gain deeper understanding of how it affects various aspects of higher education (Eriksmo, A., & Sundberg, J., 2016). With new tools and technologies learners learn more comfortably, effectively, flexibly and efficiently (Zhu, Z. T., Yu, M. H., & Riezebos, P., 2016) hence, enhancing the academic quality. For this, institutes need to overcome the challenges faced in digitalization of the institutes.

Leadership Challenges

E-leaders has the challenge to make their presence felt through technology mediated devices to influence followers. They need to make extra effort for creating relationship with followers due to lack of physical presence, missing gestures and body language and inappropriate modulation of voice tone in technology mediated communication (Savolainen, T., 2013) therefore for such leaders, communicating effectively via digital medium, creating electronic presence, building trust, inspiring, mentoring, monitoring and controlling, preventing lack of technical competence from affecting performance and maintaining work-life balance remains a challenging task (Trivedi, A., & Desai, D., 2012). Effectiveness of virtual ccommunication is a big question as the research suggest that face-to-face communication is better than virtual communication as face-to-face communication is richer in non-verbal content, minimises information loss, maximizes feelings of social presence and is less taxing both physically and cognitively (Purvanova, R. K., & Bono, J. E., 2009). Problems related to cultural diversity and trust building are the major challenges of e-leaders in the globalised world (Lilian, S. C., 2014). In a study, challenges faced by e-leaders were found to be developing social climate, creating collaborative culture, communicating effectively through electronic medium, establishing effective electronic presence, building trust, monitoring and controlling, inspiring from distance and developing technical competence (Aggarwal, A., 2018). Similarly, trust creation, communication in networks, leading change and additional strain on leaders are the major challenges of digitalization for leaders (Jakubik, M., & Berazhny, I., 2017).

Digitalised workplaces require advanced IT competencies, readiness for lifelong learning, more active participation in problem solving and ability to constantly interact with networked systems and machines resulting in change in job profiles at workplaces. Hence, there will be widespread changes due to widespread internet usage and digital networking (Ganz, W., et al., 2018) and significant time and effort is required by the stakeholders to learn various aspects of these digital technologies in the institution to develop necessary skill for its effective use, which should not be overlooked (Kirkwood, A., 2014). Fast changing technology has evoked many changes in education institutes, to catch up with the technology continuous learning is needed (Ratheeswari, K., 2018). Therefore, in the digitized world, people have to continuously upgrade their knowledge and skills which presents challenge to prepare learners with different needs in higher education institutes (Lai, K. W., 2011). Technology helps in development of 21st century abilities and skills. It is practically unthinkable to have quality learning processes in higher education institutes without the usage of technology. Rapid and constant changes in technology is the inherent feature of volatile, uncertain, complex and ambiguous environment. In technologically advanced countries, learning process is permanently and constantly connected with digital routines and

technology (Liesa-Orús, M., et al., 2020). Digital innovation, organizational learning and organizational structure are acknowledged as the main areas influenced by digitalization (Kuusisto, M., 2017). The universities lack in strategic vision and digital literacy of academicians and staff (PwC, 2018). So, to improve teaching-learning process and to become innovative and strategically important remains a difficult task in the era of digitalization (Ređep, N. B., et al., 2020).

The concept of smart education was highlighted to shape the professional competence of future engineers along with social responsibility and more awareness towards environment. To develop the engineering competence required by the high-tech industries triggered by the fourth wave of industrialization, new teaching methods based on latest technologies are required (Makarova, I., et al., 2018). Blended learning is one of the imminent trends in the education sector and to successfully blend and implement online and offline learning modes is required (Leahy, S. M., et al., 2019). Teaching in blended mode requires faculty to be capable of delivering inspiring lectures, meet students' expectations of 24x7 availability and be flexible in adopting new tools and technologies. From students' perspective the challenges are time management, independent learning, avoiding distractions by internet and feeling comfortable with technology (Lee, G., et al., 2013). Misconceptions about online teaching, technology available to support online teaching, needs of online students and support needed for quality teaching also required to be addressed (Kim, K. J., & Bonk, C. J., 2006).

Technology is used to replicate and supplement existing teaching learning processes rather than to completely transform educational processes (Kirkwood, A., 2014). In digital learning environment, resistance to change, sense of isolation in learning, learning effectiveness, evaluation of students, availability of basic infrastructure and fast changing technology are issues that needs to be addressed (Pimplapure, V., & Kulkarni, P., 2019). Resistance to change, learner's motivation, technological skills of learners and evaluating effectiveness are also the factors which has to be considered in the digital learning environment (Dua, S., et al., 2016).

Shaping and selecting digital technologies, managing enthusiasm, achieving digital integration, balancing internal and external controls, managing risk, securing school information assets, managing information, overseeing the technology and education direction, networking with the home technology and financing the technology needs to be taken care of by the educational leaders in digital technology driven era (Lee, M., & Gaffney, M. F., 2008). Yet now the universities are faced with challenges related to expertise in using online tools (Mohamed Hashim, M. A., et al.,2022). Digital competence of professors, student's induction to ICT and sustainable education has to be ensured in institutions (Daniela, L., et al., 2018). It is urgently needed to ensure the digital competence of professionals in higher education institutes in India (Shrivastava, 2022). Professional barrier is the most prevalent barrier to the use of digital technology in the university teachers. Further, lack of incentives, lack of assessment, technophobia, generation gap, lack of time, excessive workload, lack of planning, lack of knowledge of digital technology teaching approaches and lack of training are also hurdle to the use of digital technology (Mercader, C., & Gairin, J., 2020).

Due to digital technologies another challenge faced by e-leaders is to create collaborative virtual culture, establish social climate, communicate effectively through e-medium, trust building, inspiring, monitoring & controlling and developing technical competence (Renu, A. A., 2014). Therefore, using technology which is aligned with institutional culture, using student-preferred technologies and meeting students' performance expectations from technology is important in the institutions (Dahlstrom, E., et al., 2013).

Information overload has made individuals more superficial, less concentrated and bored (Petrasuc, A. M. G., & Popescul, D., 2019). Information overload resulting from e-mail and internet multitasking is positively related to stress and had significant indirect effects on anxiety, depression and burnout (Reinecke, L., et al., 2017). E-mails is an important source of stress. Due to this work gets spilled over to other areas of life and employees experienced overload which adversely affect the quality of work life (Barley, S. R., et al., 2011). Approval anxiety, availability stress, connection overload and fear of missing out are the four components of digital stress. Approval anxiety is caused due to uncertainty about others' reaction to our digital footprint, availability stress is due to the belief that others expect us to be available on digital platform, connection overload is distress due to excessive input via digital means and fear of missing out is distress resulting from the feeling of being absent from a rewarding experience in which others are engaged (Steele, R. G., et al., 2020). This "always on" technology, blurs work-life balance (Cijan, A., et al, 2012) creating challenge for e-leaders.

Defining a clear strategic vision for implementation of digital initiatives in an integrative way, digital literacy of all the stakeholders, fulfilling the expectations and needs of students, technological and financial constraints and data protection is required to be addressed in the digitalized world in HEI's (Rodrigues, L. S., 2017). In a study on Bangladesh, proper vision and planning, lack of funds, teacher's belief and attitude, lack of knowledge and skill and lack of infrastructure were found to be the challenges of digitalization (Parvin, S. 2013).

Due to the fast speed of evolution of technologies, it is challenging for the higher institutions to keep up with this speed and responding to it requires reconceptualising pedagogical idiosyncrasies and teaching approaches (Fomunyam, K. G., 2019). Implementation of digital technologies has to be taken care of in the technology driven higher education in India (Chaudhary, P., & Sharma, K. K., 2019). Digitalization initiatives often experiences failure due to change-preventing organizational culture (Hartl, E., & Hess, T., 2017). Resistance to change needs to be properly addressed during digitalization of higher educational institutions (Lääts, K., et al., 2019). Changing to keep up with technology isn't the real problem, the real challenge is changing attitude towards change itself. The struggle of digital transformation is (Stonehouse, G. H., & Konina, N. Y., 2020) rooted in our DNA, five stages of personal digital transformation are denial, fear, anger, delight and finally attachment (Herbert, L., 2017). Therefore, without promoting digital culture, digital transformation efforts will be failure (CRĂCIUN, I. 2020).

Resource Challenges

There is an urgent need for reforms in the higher education system in India, which has lost its relevance in today's technologically advanced and connected world. The education infrastructure is inadequate and suffers from serious issues of relevance and quality (Price Waterhouse Cooper, 2012). In rural areas also the infrastructural limitations are a major challenge for digitalization irrespective of whether it is a developing or developed country (Khalid, M. S., & Pedersen, M. J. L., 2016). Moreover, limited funding for digitalization in higher education institutes pose several challenges (Grimm, S., Hörig, M., & Wolf, T., 2018) specially in developing countries. Underfunding in education system, irregular power supply, high cost of equipment's (Adeoye, Y. M., et al., 2013) lack of resources in higher educational institutions (Lääts, K., et al., 2019) inadequate infrastructure, inadequate skilled manpower, resistance to change (Achimugu, P., et al., 2010) smooth internet connectivity and inadequate learning resources (Adavbiele, J. A. 2017) are the problems faced in digitalization of Nigerian institutions. Similarly, lack of basic infrastructure and funds and smooth internet connectivity (Basu, S., 2017) maintenance and

upgradation of digital equipment's and insufficient funds remains the major hurdle for digital learning in India (Gond, R., & Gupta, R., 2017). In higher education institutes in India, internet connectivity (Shrivastava 2022, Navneet 2019), shortage of trained teachers (Navneet, 2019), insufficient funds (Navneet, 2019), poor maintenance and upgradation of digital equipment's (Navneet, 2019) adequate infrastructure (Shrivastava, 2022), latest digital equipment's (Shrivastava, 2022) and safe platform (Shrivastava, 2022) are issues need to be addressed. Similarly, high cost of acquiring, installing, operating, maintaining and replacing ICTs, inexperience in procuring institution-wide software and hardware services and reliability and security of data needs to be addressed in institutions (Balasubramanian, K., et al., 2009). Still, universities are faced with challenges related to data protection and establishing digital security mechanism (Mohamed Hashim, M. A., et al.,2022). Security and safety of data, privacy and social risk management (Bleicher and Stanley 2016) are also required to be taken care of during digitalization of the institutes.

Factor analysis

Factor Analytics was used to reduce large number of variables into few factors. It extracted the maximum common variance from all the variables and placed them into a common score. Factor analysis is a tool for interdependence analysis, which means that all the variables are having the equal status. There is no dependent or independent variable as in the case of regression. There are only independent variables in factor analysis. It reduced the data and simplified data analysis by taking advantage of the corelation among variables by extracting the overlapping information and reducing the problem down to just few core factors.

In the present study we have identify the perceived challenges associated with digitalization among the faculty in engineering colleges of Himachal Pradesh Technical University. Based on the review of literature 21 different items has been identified. Each item has been rated on five-point Likert scale where point 5 means strongly agree and point 1 means strongly disagree. The questionnaire has been administered to faculty members of different engineering institutes under HPTU and total of 232 responses were found to be valid and were included in the study.

Table 1: Case processing summary

		N	%
Cases	Valid	232	100.0
	Excluded[a]	0	.0
	Total	232	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability statistics

To test the reliability of the scale the researchers applied the Chronbach's alpha test. Chronbach's alpha is a measure of scale reliability. It measures internal consistency i.e., how closely a set of items are related in a group. In the present study we also applied the same test and its value was found to be 0.964 which shows excellent internal consistency of the data.

Table 2: Test of reliability of instrument

Cronbach's Alpha	N of Items
.964	21

KMO and Bartlett's Test

The KMO and Bartlett's test was conducted to determine sampling adequacy of the data which access whether the responses are adequate or not. In educational studies this test plays critical role in accepting sample adequacy. The value of Kaiser-Meyer-Olkin extends from 0 to 1, but Kaiser recommended 0.5 as a bare minimum acceptable value, KMO values between 0.6 to 0.7 are acceptable and the values above 0.9 are excellent. Table 3 indicates the KMO value of sampling adequacy as 0.936 which is excellent.

Bartlett's test indicates strength of relationship between variables. It tests null hypothesis that correlation matrix is an identity matrix. In an identity matrix all the diagonal elements must be 1 and all off-diagonal elements must be close to 0. We want to reject the null hypothesis. In table 3, Bartlett's test of sphericity is found to be significant at 0.000 which is less than 0.05. This significance level is small enough to reject the null hypothesis which means that correlation matrix is not an identity matrix. Hence, the sample indicates that strong partial correlation is presented in the data which is adequate for factor analysis and we can go ahead with the analysis.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.936
Bartlett's Test of Sphericity	Approx. Chi-Square	4502.103
	df	210
	Sig.	.000

Total Variance Explained

Twenty-one different items related to challenges of digitalization were factor analyzed using principal component analysis with varimax rotation. For identifying the number of factors or components indicated by selected variables, we must have eigenvalue of more than one. Table 4 shows the eigenvalue of 12.264 for the first component which is greater than one, for second component this value is 1.715 which is also greater than one, but for third component this value is 0.978, which is less than one. Hence, the set of 21 variables represents two components.

In table 4, the extracted sum of squared holding % of variance indicates that first factor explains 58.401% of the variance features from the stated observations and second factor explains 8.169% of the variance features. Thus, 2 components are sufficiently effective to represent all the components or characteristics underlined by 21 variables. The value of cumulative percentage of extracted sum of squared loadings as appearing at component 2 depicts that two factors have been extracted and the total variance what these two factors are able to explain out of the data is 66.569%. In social sciences, this data should be able to extract minimum 60% of variance and in

our case, it is almost 67%, which is effective enough to represent all the characteristics highlighted be the 21 variables.

The first principal component factor was labelled as leadership challenges which explained stress, work-life balance, constant learning, forming of digital strategy, technological adoption, digital literacy, meeting new expectations of learners, overcoming resistance to change, improving teaching-learning process, frequent digital innovations, trust building and effectiveness of virtual communication. The cumulative variance explained by this factor is 58.401%. The second principal component factor was labelled as resource challenges which explained availability of basic infrastructural facilities, safety and security of data and financial and technological constrains. The second factor explained up to 66.569 % variance.

Table 4: Total Variance Explained

		Initial Eigenvalues		Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.264	58.401	58.401	12.264	58.401	58.401
2	1.715	8.169	66.569	1.715	8.169	66.569
3	.978	4.659	71.228			
4	.943	4.492	75.720			
5	.641	3.053	78.773			
6	.603	2.869	81.643			
7	.505	2.405	84.048			
8	.449	2.137	86.185			
9	.406	1.935	88.120			
10	.355	1.691	89.812			
11	.322	1.531	91.343			
12	.283	1.350	92.692			
13	.251	1.197	93.890			
14	.248	1.182	95.072			
15	.205	.975	96.047			

16	.178	.847	96.894			
17	.165	.788	97.682			
18	.153	.727	98.409			
19	.130	.617	99.026			
20	.109	.521	99.547			
21	.095	.453	100.000			

Rotated Component Matrix

Rotational component matrix is also known as loadings and is very important output of principal component analysis. It is used to find what different factors has been extracted. In our case, the highest component value of two indicates that two different factors have been extracted. In factor one there are thirteen items and in factor two there are eight items. Factor loadings of less than 0.5 were excluded. Rotational component matrix provides the estimates of the correlations between each of the variables as well as the estimated components. The correlation value of 0.831 was found to be highest for constant learning in case of factor one i.e., leadership challenges. For factor two i.e., resource challenges the highest value of correlation was found to be 0.877 for availability of reliable high speed smooth internet connectivity in basic infrastructural facilities component.

Table 5: Rotated Component Matrix

	Component	
Factor Name	1	2
F1: Leadership challenges		
Constant learning	.831	
Forming digital strategy for digitalization	.786	
Effectiveness of virtual communication	.769	
Overcoming resistance to change	.764	
Maintaining work-life balance	.737	
Digital stress (fear of missing out on digital platform)	.726	
Digital stress (information overload)	.723	

Digital competence of all stakeholders	.663	
Slow pace of technological adoption by institutes	.615	.520
Trust building	.611	.517
Improving teaching-learning process (developing and updating high quality digital learning content)	.595	
Meeting new expectations and needs of learners	.590	
Improving teaching-learning process (deciding type and extent of technology to be adopted in institutions)	.576	.554
Frequent digital innovations	.540	.540
F2: Resource challenges		
Availability of basic infrastructural facilities (reliable high speed smooth internet connectivity)		.877
Availability of basic infrastructural facilities (digital infrastructural facilities at home)		.837
Availability of basic infrastructural facilities (technical support for installed digital infrastructure installed)		.818
Availability of basic infrastructural facilities (uninterrupted supply of electric power)		.800
Financial constraints		.776
Safety and security of data		.765
Technological constraints		.625

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Challenges of digitalization identified in engineering colleges under Himachal Pradesh Technical university is summarised in table 6.

Table 6: Factors group

Factor	Name of factor	Variables of factor

Factor 1	Leadership challenges	1. Digital stress 2. Maintaining work-life balance 3. Constant learning 4. Forming digital strategy for digitalization 5. Slow pace of technological adoption by institutes 6. Digital competence of all stakeholders 7. Meeting new expectations and needs of learners 8. Overcoming resistance to change 9. Improving teaching-learning process 10. Trust building and effectiveness of virtual communication 11. Frequent digital innovations
Factor 2	Resource challenges	1. Availability of basic infrastructural facilities 2. Safety and security of data 3. Financial and technological constraints

Discussion and Conclusions

Evolution of digital technologies is going through a phase of e-storm. Digital technologies are constantly evolving and changing at the speed of light. Digitalization is a major trend, it is fundamental change and is critical game changer. At the core of the higher education lies the teaching-learning process and research and for this the digital technologies acts like a catalyst for achieving new, innovative, efficient and effective way of doing the things. Higher education level is positively influenced by digitalization (Toader, T., et al., 2021) therefore, higher educational institutes must align themselves with the changing requirements of digitalization University leaders believe that digitalization in higher education is essential and digitally-driven innovation is now prerequisite for the survival. Digitising content, integrating systems and automating processes are now 'digital hygiene' factors (Navitas Ventures, 2017).

The study is a unique effort to identify the challenges of digitalization in engineering institutes. In this study authors tried to identify and enlist the challenges of digitalization in engineering colleges of Himachal Pradesh Technical University.

Future Research Implications

The speed and holistic nature of digital technologies makes it different from all of the changes of the past. Digital technologies had drastically increased the speed of disruptions and innovations. A natural question also arises about the possibility of fully understanding and capturing every aspect of digitalization. So, in order to survive, institutes have to fundamentally change their way of working and to check the direction of change and minimize the deviations by continuous feedback in the form of research. The authors understands that more in-depth study is required in this area as digitalization is a deeper change when compared with other changes, and it opens entirely new horizon (Libert, B., et al., 2016).

There are lot of possibilities for the future research. Future research needs to be carried out on the individual aspect of the challenges faced by the higher education institutes such as the

effectiveness of the virtual communication, creating right amount of balance for virtual and non-virtual modes in teaching-learning process, digital strategy of institutions, techno phobia in teachers and administrative staff, effectiveness of teaching-learning in digitally enabled environment, distractions from internet, impact of technology on research and innovation, impact of technology on institutional culture, maintaining work life balance and stress caused due to use of digital technology. Moreover, it is also found that future research is required to find the challenges faced in the administrative area of higher education institutes.

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