



EMERGING DEGREES AND COLLABORATION: THE CONTEXT OF ENGINEERING SCIENCES IN COMPUTING & IT—AN ANALYSIS FOR ENHANCED POLICY FORMULATION IN INDIA

P. K. Paul¹, P. S. Aithal², A. Bhuimali³, & K.Kumar⁴

¹Raiganj University (RGU), West Bengal, India, pkpaul.infotech@gmail.com

²Vice Chancellor, Srinivas University, Karnataka, India

³Vice Chancellor, Raiganj University (RGU), West Bengal, India

⁴Vice Chancellor, KK University, Nalanda, Bihar

Corresponding Author: pkpaul.infotech@gmail.com

Abstract

Collaboration is most important and valuable term as well as a concept use these days for each and every kind of activities, organizations and even personal affairs. Academically the popular collaborated branches are humanities and social sciences, basic and applied sciences, commerce and business sciences, and engineering and technological sciences. Among these applied sciences, engineering, and technological sciences need better collaboration; and also for the sake of better manpower generation, management and output, Universities and Higher Educational Institutions (HEIs) apart from interested in the affairs of completion of training, education, and research, they focus today on skills and hands-on training. Moreover, organizations are seeking human resources which are multidisciplinary and interdisciplinary in nature to cope up organizational demand. India is developing as a superpower in the economy, education and democracy and trying to reach the status of developed countries as early as possible. Manpower development and industrial development are different issues and to realize these issues and concerns, many universities in India have started industrial affairs in different ways into their academics. Universities (apart from INIs, and few colleges) especially private are moving towards industrial components in their feather. This is a *conceptual-theoretical-review cum policy* based research paper emphasizing interdisciplinary affairs in the Indian context. With the work of Techno-Educational in nature, it has provided recent trends and future potentialities in skills in academia especially collaboration emergence in Indian private universities.

Keywords

Indian Education, Technical Education, AICTE, Universities, Skill, Digital India, Collaborative Universities, Interdisciplinary Research, Development, Knowledge Economy.

Introduction

Indian higher education is changing rapidly. India holds the highest number of educational institutions in the world comprising of different kind of establishments, viz. universities of different kinds, colleges of general and professional education, and engineering & technical colleges. When compared to affiliated colleges and other educational institutions, universities are moving towards better real-life education, training, and research. Corporate Training is a method for knowledge

dissemination and here corporate education wing and facilities play a great role in educational delivery [1], [5], [7]. Corporate training may be offered as in-house or off-house wings. In this kind of training and related affairs, *universities (or HEIs)* and *corporate houses* keep better ties. Corporate Training is kind of industrial training but may be categorized differently and today many concepts emerged in this context viz. industry integrated learning programs, industry integrated academic degrees, corporate universities etc. As the leader of higher educational institutions in the globe, India offers educational programs in different formats such as regular-on-campus, distance, correspondences etc. In recent years, private universities, educational institutions have increased rapidly in terms of various facilities and programs. The concept of vocational education based on skills training started in recent past by some of these kinds of institutions (including a few government institutions & universities, INIs). Also, emerging subjects and courses in recent past were started by many universities with 'private' tag. Most of these have significant contributions in terms of global market, job market, and emerging education context [3], [4], [7].

Objective

This paper is interdisciplinary in nature and also conceptual and theoretical. It is mainly prepared and presented with following objectives and agendas (but not limited to)—

- To provide a basic overview of emerging Indian Higher Education scenario with various types of Higher Educational Institutions (HEIs).
- To learn about a number of higher educational institutions with focus on types of educational programs and nature.
- To gain knowledge of private universities established in India in recent past with their emerging programs.
- To learn about the emerging specializations in Computing and Information Technology domains.
- To derive the nature of computing - related degrees, programs in India with special reference to private universities.
- To learn the emerging collaboration model in higher education in context computing and IT related engineering degrees among the private universities in India.
- To dig out the latest education players in India to gain popularity in recent past in private segment.
- To learn about the collaborator and programs of different levels offered by the private universities in Pan India.

Methodology & Scope of Research

As a conceptual paper, an attempt is made to review one of the methodologies and include a review of the literature to learn about the higher education in India. A detailed study has been conducted to learn about the evolution of higher education systems in the pre-independence and post-independence period. Web review has been undertaken to highlight latest status of higher education segment and for this the official websites of UGC, AICTE, MHRD are analyzed and reported. The study focuses on emerging trends in corporate affairs in the higher education especially integrated degrees and educational programs. Study digs out the latest on private universities in India and here the main link (<https://www.ugc.ac.in/privatuniversity.aspx>) of UGC was considered important. Hence, the study is purely concentrated on private universities. The universities of other kinds have been ignored, viz. state universities, central universities. This may be treated as the limitation of the study, but still, it has huge potentialities in terms of finding latest of higher education segment and corporate culture into the universities and programs. The reason behind choosing private

universities is due to rising number of universities in this segment and increasing corporate affairs (even ranking of private universities in different government and agencies, employer's interest etc) in recent past.

Engineering Education & Computing

India is a leading educational hub in the world; it is home to a large number of educational bodies, institutions, associations etc. India itself holds about 40,000+ Higher Educational Institutions (HEIs in short) which itself includes universities, general colleges, professional colleges, engineering colleges etc [2], [6], [10]. The higher education system in India is governed by the several bodies and agencies but the major ones are New Delhi based *UGC (University Grants Commission)*, and *AICTE (All India Council for Technical Education)*. A detailed of such bodies etc are listed in Table 1. Universities in India are generally categorized into following—

Universities

1. Central Universities
2. State Universities
3. Private Universities
4. Deemed Universities

It is important to note that Universities listed in first three need to be enacted by the parliament or state legislative assembly and the fourth one i.e. Deemed Universities may be notified by Ministry of HRD, GoI, through the accreditation process and recommendation by UGC. In Central tag another set of institutions (such as IITs, NITs, IIMs, IIST) called 'Institute of National Importance' and their role is significant in many contexts.

As far as engineering colleges are concerned, it is under the control of AICTE which governs the areas of Engineering, Management, Architecture, Pharmacy, and Computer Applications. Altogether AICTE controls about 10,000 (ten thousands) institutions [6], [11], [13].

Table: 1 Governing bodies and agencies in India (Paul, P.K. et.al. 2017 [8])

Sl. No.	Bodies & Location	Abbreviations	Domain/ Field of Interest
1	All India Council for Technical Education, New Delhi	(AICTE)	Engineering and Management Education
2	Distance Education Council, New Delhi	(DEC)	Distance & Online Education
3	Indian Council of Agricultural Research, New Delhi	(ICAR)	Agriculture and Allied Sciences
4	Bar Council of India, New Delhi	(BCI)	Law and Legal Studies
5	National Council for Teacher Education, New Delhi	(NCTE)	Teachers Education and Physical Education
6	Rehabilitation Council of India,	(RCI)	Improving Disability Education

	New Delhi		etc
7	Medical Council of India, New Delhi	(MCI)	Medical Science
8	Pharmacy Council of India, New Delhi	(PCI)	Pharmaceutical Sciences
9	Indian Nursing Council, New Delhi	(INC)	Nursing and Allied Sciences
10	Dental Council of India, New Delhi	(DCI)	Dental Sciences
11	Central Council of Homoeopathy, New Delhi	(CCH)	Homoeopathy Systems
12	Central Council of Indian Medicine, New Delhi	(CCIM)	Indian Medicine Systems
13	National Council for Rural Institutes, Hyderabad	(NCRI)	Rural Development
14	Council of Architecture, New Delhi	(COA)	Architecture & Design Sciences
15	Veterinary Council of India, New Delhi	(VCI)	Veterinary Sciences
16	Indian Council of Medical Research, New Delhi	(ICMR)	Medical & Health Sciences

Though, in recent past, the concept becomes changing due to the emergence of new age institutions, private universities etc (apart from few excelled government universities/ institutions, INIs etc). In Engineering segment the common programs are—

- Bachelors Level (BTech- Bachelor of Technology/ BE-Bachelor of Engineering)
- Masters Level (MTech-Master of Technology/ME-Master of Engineering)

Though apart from Engineering and Technical Education with above degrees few other degrees are MTech (Research)/ ME (Research) which are offered due to research contribution and programs concentrated with research affairs. It is important to note that still India is facing many problems in professional education segment and organizations as well. Though the number of technical institutions is so many *but* still there are many issues in this regard due to lack of infrastructure, irrelevant curricula, availability of less skilled and edged professors, lack of industrial association etc [7], [12], [14].

Table: 2 State wise universities and the universities offering collaborative programs

Serial No.	States	No. of Universities	No. universities having collaborative programs
1	Arunachal Pradesh	7	Absent
2	Assam	5	1

3	Bihar	2	Absent
4	Chhattisgarh	9	Absent
5	Gujarat	30	Absent
6	Haryana	20	3
7	Himachal Pradesh	17	1
8	Jharkhand	7	Absent
9	Karnataka	14	Absent
10	Meghalaya	8	Absent
11	Mizoram	1	Absent
12	Madhya Pradesh	24	Absent
13	Maharashtra	9	Absent
14	Manipur	1	Absent
15	Nagaland	3	Absent
16	Odisha	4	1
17	Punjab	15	2
18	Rajasthan	46	4
19	Sikkim	5	Absent
20	Tripura	1	Absent
21	Uttar Pradesh	29	1
22	Uttarakhand	13	3
23	West Bengal	9	1
Grand Total		279	17

The corporate sector is booming, the skill and knowledge are also changing and as a result, the organizations are moving to get resources from the integrated learning programs. Corporate training and its emergence lead today's organizations for best, skilled, and industry ready manpower. Initially, Universities mainly offers on-campus degrees and programs. But the lack of industrial knowledge among the students results in the birth of new generation education model. In this segment primarily universities and engineering (also professional institutions) colleges engaged in off-campus industrial training and gradually and later on universities and similar institutions switched to on-campus training etc. Although, many universities and institutions are in recent past moved and geared with flourishing Internship programs and similar initiatives. Today the most recent concept is offering corporate integrated degrees and programs.

Information Technology Domain in India: A Case of Private Universities

India holds several Higher Educational Institutions ranging from Universities, Colleges, Research Centers, Institutions of National Importance (INIs) that we already discussed. As far as private universities are concerned India holds 279 universities (as on October 2017). Among the Indian states, 23 states hold private universities. Among the states which don't have universities are Tamilnadu,

Jammu & Kashmir, Kerala etc. Most of these private universities offer Engineering Degrees and Programs including BE/BTech/ ME/MTech. Among Indian states Rajasthan holds highest rank of private universities i.e. total 46 (forty-six) while Gujarat, Uttar Pradesh, Madhya Pradesh holds 30 (thirty), 29 (twenty-nine), 24 (twenty-four) respectively.

Table: 3 State wise universities and availability of collaborative programs [9]

Serial No.	States	No. of Universities	No. universities having collaborative programs	Total Number of Collaborative Programs
1	Arunachal Pradesh	7	Absent	NA
2	Assam	5	1	1
3	Bihar	2	Absent	NA
4	Chhattisgarh	9	Absent	NA
5	Gujarat	30	Absent	NA
6	Haryana	20	3	6
7	Himachal Pradesh	17	1	1
8	Jharkhand	7	Absent	NA
9	Karnataka	14	Absent	NA
10	Meghalaya	8	Absent	NA
11	Mizoram	1	Absent	NA
12	Madhya Pradesh	24	Absent	NA
13	Maharashtra	9	Absent	NA
14	Manipur	1	Absent	NA
15	Nagaland	3	Absent	NA
16	Odisha	4	1	4
17	Punjab	15	2	15
18	Rajasthan	46	4	12
19	Sikkim	5	Absent	NA
20	Tripura	1	Absent	NA
21	Uttar Pradesh	29	1	3
22	Uttrakhand	13	3	22
23	West Bengal	9	1	2
Grand Total		279	17	66

In such Engineering universities apart from Manufacturing Engineering, Automotive Engineering, Civil Engineering, Mechanical Engineering many new and emerged programs and domains have been started, viz. Computer Engineering, Petroleum Engineering, Agricultural

Engineering, Bio-Systems Engineering Software Engineering, Corrosion Engineering, Aerospace Engineering, Biomedical Engineering, Geological Engineering, Textile Engineering, so on.

As far as Computing and Information Technology areas are concerned, the popular nomenclatures include—

- Computer Science & Engineering (*Offered highest in numbers*).
- Computer Science (*Offered limited, few are offered instead of CSE*).
- Computer Engineering (*Offered limited, few are offered instead of CSE*).
- Information Technology (*Offered highest in numbers*).
- Information Science and Engineering (*Offered limited in Karnataka only*).
- Bio Information Technology (*Offered in limited universities*).etc.

Though in **Computer Science** field BSc/MSc/MPhil- Computer Science are available in many universities and in many affiliating universities (including affiliated institutions). Around the world, **Information Technology** program has been started for the delivery of industry ready products. This is internationally focused with technologies of Software, Networking & Communication, Databases & Information Management, Multimedia etc while in India the main focus of the IT domain is still Software Technologies (mainly for software development etc.). In applied segment Computer Applications MCA-Master of Computer Applications is most popular program. This is under All India Council for Technical Education (AICTE) having around 1 Lakh seats. Though, the UG program called BCA and is not under the preview of AICTE. Apart from these, in recent past these universities are also moving towards new age and emerging subjects and degree programs such as cloud computing, virtualization, big data analytics, cyber security analysis, computer forensic, IT Infrastructure management, Information Security, Mobile Computing, Retail IT, etc. In this segment degrees viz. BTech-Cloud Computing/ Big Data Analytics are available. However, some of the universities offer MTech in CSE with a concentration of these emerging areas mentioned above. As far as this study is concerned total 66 programs are found out and out of which 22 programs offered at Uttar Khand while Punjab offers total 15 programs. The details of such offers are depicted in Fig 1.

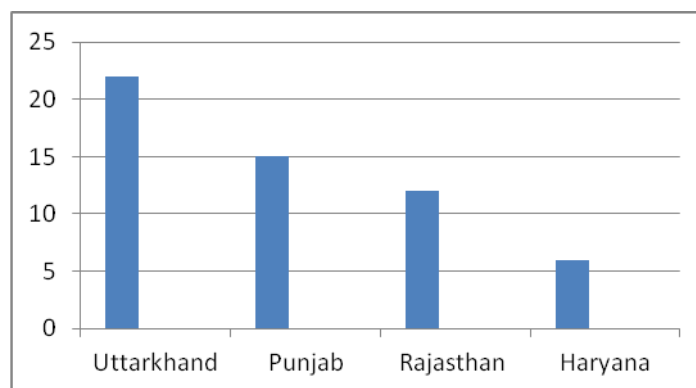


Fig. 1 : Top four states offering Skill based collaborative programs

Growing trends in Collaboration: Requirement and Trends

Initially, universities have started programs on Computing areas viz. Cloud Computing, Cyber Security, Information Assurance, and Big Data Technologies. Though gradually the growing trends in collaboration result in different nomenclatures and areas such as IoT (Internet of Things), Mobile Computing etc importantly among the programs most of them are companies having IT units.

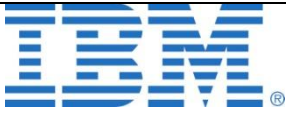






Though as per the study few others are also established as a company (*under Ministry of Corporate Affairs, Govt. of India*) and performing the role of knowledge provider and training based unit viz. iNurture (Karnataka), LE Innovate (Odisha) etc.




Table: 4-Most popular collaborating Companies

Collaborators	Rank
IBM	1
Google	2
iNurture	3

It is noted that most of the universities offered programs in collaboration with the industrial giant IBM (through its Career Education Division); i.e. total 47 programs offered while among other reputed and international brands few popular are Google Corporation, Oracle Corporation. The details on these collaborative programs are depicted in Table 5. As a whole total 66 programs are offered and most of these are computing and information technologies with BTech Degree.

Table: 5-Most popular collaborating Companies

Collaborators	No. of Collaborative Programs	Logo of the Company/ Collaborator
IBM	47	
Google	4	
iNurture	4	
Oracle	3	
Silicon Lab	2	
Xebia	2	
PwC	1	

WnS	1	
TimesPro	1	
Le Innovate	1	
Total	66	

Among the Indian ventures, *iNurture* is most popular and important and it has started offering of more than 4 programs. Many companies and collaborative programs also been started in the areas of Management as well but with a concentration in Computing and Information Technologies. As per the study, total 9 programs in Masters level among the private universities have been noticed. The table 6 depicts a detailed account on this.

Table: 6-Most popular collaborating Companies

Programs	Available Programs
Management (Masters)	9
Engineering (Bachelors)	49
Engineering (Masters)	6

In management segment popular IT related collaborative programs include the following—

- MBA (Digital Marketing)
- MBA (Business Analytics)
- MBA (Enterprise Resource Planning)

However, Table 7 provides details on collaborative MBA programs offered by various private universities (among 279).

Table: 7-Most popular collaborating Companies

Sl. No.	Collaborative Universities and Program of Management Studies	
	Universities	Programs
1	Assam Down Town University,	MBA (Digital Marketing) with TimesPro

	Assam	
2	Jagan Nath University, Haryana	MBA (Business Analytics) with IBM
3	O.P. Jindal Global University, Haryana	MBA (Business Analytics) with IBM)
4	Chandigarh University, Punjab	MBA-(Business Analytics) with IBM
5	Rayat Bahra University, Punjab	MBA (Digital Marketing)-Google MBA (Business Analytics)-Google MBA (ERP)-Oracle
6	NIIT University, Rajasthan	MBA-(Business Analytics)-with WnS
7	Uttaranchal University, UK	MBA (Business Analytics-IBM)

Among the collaborative bodies, IBM is important with the specialization in Business Analytics. Though, Google offered both Business Analytics and Digital Marketing. The NIIT University, Rajasthan has been started MBA-Business Analytics in association and placement tied up with the corporate giant WnS.

Future Research Direction & Suggestions

The present era is of transforming education systems and providing training and degree programs to a large number of working people through different modes of education viz. distance, online by the universities. Here organizations may establish a special course/ program with the affiliation of universities and the course curricula are designed as per the requirement.

Though, employees may also join them self to many of the university programs which have collaborative approval with their organizations. This study reveals that private universities through their autonomy are changing the conventional education model rapidly in India and acting as an industry-academia interface.

The Universities around the world are moving towards industry integrated learning programs, many universities have started on-campus degree programs in collaboration with the industrial giant/ company. In many cases, corporate bodies provide training at the academic institutions and in some cases offering training at the company premises with the approval/ MoU from the universities.

Table 8 depicts a detailed overview of the 17 private universities offering Collaborative programs. As a whole total 66 programs have been noticed with the degrees of BTech, MTech, and MBA.

Table: 8-The total number of universities and programs under collaborative platform in the industries

Sl. No.	Collaborative Universities and Program at a Glance	
	Universities	Programs
1	Assam Down Town University, Assam	MBA (Digital Marketing) with TimesPrO

2	Jagan Nath University, Haryana	BTech-CSE (Cloud Computing & Virtualization)-IBM BTech-CSE (Business Analytics)-IBM MBA (Business Analytics) with IBM
3	O.P. Jindal Global University ,Haryana	MBA (Business Analytics with IBM)
4	PDM University, Haryana	BTech-CSE (Cloud Computing)-IBM BTech-CSE (Big Data Analytics)-IBM
5	Bahra University, Himachal Pradesh	BTech-CSE (Android) with Google
6	Centurion University of Technology and Management, Odisha	BTech-CS (Cloud Technology & Information Security)-iNurture BTech-CS (Data Science)-Silicon Labs MTech-(Internet Security)-Le Innovate MTech-Data Science (Silicon Lab)
7	Chandigarh University, Punjab	BE-CSE (Cloud Computing)-IBM BE- CSE (Big Data)-IBM BE- CSE (Information Security)-IBM ME (Hons) CSE (Cloud Computing)-IBM ME (Hons) CSE (Big Data)-IBM ME (Hons) CSE (Information Security)-IBM MBA-Business Analytics-IBM
8	Rayat Bahra University, Punjab	BTech (CSE)-Android Development (Google) BTech (CSE)- IoT & Java (Oracle) BTech (CSE)-Database & Analytics (Oracle) BTech (CSE)-Cyber Security & Forensic (IBM) BTech (CSE)-IT Infrastructure Management (IBM) MBA (Digital Marketing)-Google MBA (Business Analytics)-Google MBA (ERP)-Oracle
9	J.K. Lakshmipat University, Rajasthan	BTech-CSE (Big Data Analytics)-IBM BTech-CSE (Information Security)-IBM BTech-CSE (Mobile Computing)-IBM

		BTech-CSE (Cloud Computing)-IBM
10	Mody University of Science and Technology, Rajasthan	BTech-CSE (Big Data)—IBM BTech-CSE (Cloud Computing)—IBM BTech-CSE (IoT)—IBM BTech-CSE (Information Security)—IBM
11	NIIT University, Rajasthan	MTech- Cyber Security (with PwC) MBA-Business Analytics (with WnS)
12	Sir Padmapat Singhanian University, Rajasthan	BTech-CSE (IoT)-iNurture BTech-CSE (Cloud Technology & Information Security)-iNurture
13	Sharda University, Uttar Pradesh	BTech-CSE (Cloud Computing & Virtualization)-IBM BTech-CSE (Business Analytics)-IBM BTech-CSE (Information Security & Cloud Technology)-iNurture
14	DIT University, UK	BTech-CSE (Cloud Computing-IBM) BTech-CSE (Big Data Analytics-IBM) BTech-CSE (Cyber Security-IBM)
15	University of Petroleum and Energy Studies, UK	BTech-CSE (Banking & Finance) -with IBM BTech-CSE (Business Analytics) -with IBM BTech-CSE (Cloud Computing & Virtualization) -with IBM BTech-CSE (Cyber Security) -with IBM BTech-CSE (E-Commerce & Retail) -with IBM BTech-CSE (Graphics & Gaming) -with IBM BTech-CSE (Informatics) -with IBM BTech-CSE (IoT & Smart Cities) -with IBM BTech-CSE(IT Infrastructure) -with IBM BTech-CSE (Mainframe Technology) -with IBM BTech-CSE (Manufacturing

		Technology) -with IBM BTech-CSE (Mobile Computing) -with IBM BTech-CSE (Oil & Gas Informatics) -with IBM BTech-CSE (Telecom Informatics) -with IBM BTech-CSE (Health Informatics)-with IBM BTech-CSE (Big Data/Dev. Ops- all with Xebia)
16	Uttaranchal University, UK	MBA (Business Analytics-IBM) BBA (Business Analytics-IBM)
17	The Neotia University, West Bengal	BTech-CSE (Cyber Security)-IBM BTech-CSE (Data Analytics)-IBM

University of Petroleum and Energy Studies (UPES) located in the State of Uttarakhand, India and offered the highest number of collaborative programs (total 16 programs). Corporate Education as well as On Job Training (OJT) is increasing day by day with industrial cooperation and offers diverse opportunities in the arena of corporate education. Some of the emerging technologies viz. Cloud Computing and Virtualization Technologies have created a new branch of education and also created a new awareness in corporate education. The above observations lead following suggestions to manage the changes in industry collaborative engineering education in CS & IT:

- Launching industrial component in the conventional degree programmes and systems became important and vital in coming days and thus many universities have started the initiative of offering emerging programs, fields and subjects.
- In future, it is very much important to lunch such areas of specializations, degrees in other categories of universities viz. state and central. It is worthy to mention that few deemed universities already been started such collaboration or specializations at-least (*viz. VIT, Manipal, SRM etc*). It is better if we started the less initiated programs viz. BBA, BCA, MCA in these private universities with the emerging specializations.
- With due importance and value enhancement, these CSE Major or concentration may be offered into the full-fledged degrees viz. MTech-Cloud Computing, MTech-IT Systems Management.
- It is worthy to note that universities may also offer the areas of IT viz. Data Management, Networking etc within the tag IT rather CSE. For example, instead of MTech-CSE-Networking, it may be MTech-IT-Networking etc.

Conclusion

Universities around the world are fast moving towards introducing interdisciplinary studies. Side by side, universities are also aiming at adding industrial components into the curricula resulting in industry integrated programs. Many universities have been functioning with full-fledged departments or units or centers for dealing corporate affairs and liaison between industry and academia. Initially, universities in India categorized as 'state' and 'central'. But gradually many other universities in India have been started in the areas of Private Category. During the last ten years, the growth of private universities is eye-catching. Except for few universities, almost all are moving towards new age programs in engineering, technology and management fields. Though due to the specific requirements of industry and/or corporate groups, very recently the identification of collaborative industry and academia programs are being observed. However, the universities need to offer more value based emerging programs in different areas and subjects, viz. information systems, digital marketing and SEO, Cyber Systems Management etc.

Reference

- [1] Altbach, P. G. (1993). The dilemma of change in Indian higher education. *Higher Education*, 26(1), 3-20.
- [2] Dayal, I. (2002). Developing management education in India. *Journal of management Research*, 2(2), 98.
- [3] Gupta, D., & Gupta, N. (2012). Higher education in India: structure, statistics and challenges. *Journal of education and Practice*, 3(2).
- [4] Kapur, D., & Mehta, P. B. (2004). Indian higher education reform: From half-baked socialism to half-baked capitalism. *Center for international development working paper*, 103.
- [5] Nambissan, G. B., & Rao, S. (Eds.). (2013). *Sociology of education in India: Changing contours and emerging concerns*. New Delhi: Oxford University Press.
- [6] Paul, P. K., & Ghose, M. K. (2018). Why Green Computing and Green Information Sciences Have Potentialities in Academics and *iSchools*: Practice and Educational Perspectives. In *Advances in Smart Grid and Renewable Energy*, Vol. 435 (pp. 103-112). Springer, Singapore.
- [7] Paul, P. K., & Ghose, M. K. (2018). A Novel Educational Proposal and Strategies Toward Promoting Cloud Computing, Big Data, and Human-Computer Interaction in Engineering Colleges and Universities. In *Advances in Smart Grid and Renewable Energy*, Vol. 435 (pp. 93-102). Springer, Singapore.
- [8] Paul, P. K., Bhuimali, A., & Aithal, P. S., (2017). Indian Higher Education: *With Slant to Information Technology—A Fundamental Overview*. *International Journal on Recent Researches In Science, Engineering & Technology*, 5(11), 31-50.
- [9] Paul, P. K., Aithal, P. S., & Bhuimali, A. (2017). Computing & Allied Engineering Domain in India with reference to Private Universities: *A Case Study of Bachelors Programs*. *International Journal on Recent Researches In Science, Engineering & Technology*, 5(11), 51-63.
- [10] Sood, R., & Adkoli, B. V. (2000). Medical education in India—problems and prospects. *J Indian Acad Clin Med*, 1(3), 210-212.
- [11] Sohani, N., & Sohani, N. (2012). Developing interpretive structural model for quality framework in higher education: Indian context. *Journal of Engineering, Science & Management Education*, 5(2), 495-501.
- [12] Supe, A., & Burdick, W. P. (2006). Challenges and issues in medical education in India. *Academic Medicine*, 81(12), 1076-1080.

- [13] Tayade, M. C., & Kulkarni, N. B. (2011). The Interface of technology and medical education in india: current trends and scope. *Indian Journal of Basic & Applied Medical Research*, 1(1), 8-12.
- [14] Tilak, J. B. (2008). Transition from higher education as a public good to higher education as a private good: The saga of Indian experience. *Journal of Asian Public Policy*, 1(2), 220-234.