

# Bachelor of Computer Applications (BCA): An Applied Science Program into a New Direction?

P.K. Paul<sup>1\*</sup> and P.S. Aithal<sup>2</sup>

<sup>1</sup>Raiganj University (RGU), West Bengal, India

<sup>2</sup>Vice Chancellor, Srinivas University, Mangalore, Karnataka, India

\*Corresponding author: pkpaul.infotech@gmail.com

## ABSTRACT

Computing and Information Technology become an important source and tool of development. It is responsible for the designing of IT and Computing infrastructure of different areas viz. Business, Healthcare, Transportation, Education and Training, Governance, and Administration etc hence the skilled manpower in this field (computing) is important and urgent. Computer Application is a study and research areas of applied nature. Before the development of domain *Computer Application*, the main popular and available subjects was Computer Science as far as Indian context is concerned. Although internationally as an applied branch Information Technology has emerged. In education and training segment during the eighties (1980's) some of the Indian universities moved to offer 'Computer Application' as an applied computing related branch as an alternative of substitute Computer Science (which was traditional, theoretical and mathematical) and initially Masters program has been started for diverse graduate with some logical/ quantitative skills. Gradually the same branch has been started in Bachelors level as well. Hence this paper is conceptual in nature and deals with the educational affairs of computing and information technology related field as far as India is concerned. This paper is highlights various emerging changes of Computer Application in this regard with reference to job potentialities and attempts to showcase the current situation in private universities in India with reference to Computer Applications (Bachelors) programs. Traditionally it is a common myth among a percentage of stakeholders that Computer Application is a program with Application concentration rather scientific and theoretical base. However, this paper tries to explore the future concept and dealing of Computer Application and allied fields in future.

**Keywords:** Computer application, BCA, MCA, India, computing, applied science, jobs and training, universities, higher education

Computer Application is a study and practice area in the field of computing and information technology. It is purely deals with the application of computing and software systems as a concentration. During the late of 1980's computers became available worldwide and many universities worldwide were move to start offering of Information Technology program as a branch of study. Gradually many universities around the world started other concentrated (business/ corporate etc) programs viz. Information Systems, Information Technology Management, Information Systems and Management, Knowledge Engineering etc.<sup>[1],[5],[8]</sup>. Though, it is worthy to note that these fields have been started in major western

and developed countries. However in India as an applied branch of study and field major universities introduced 'Computer Application' other than 'Computer Science'. A majority of universities have been started programming and software technology focused Masters of Computer Application (MCA) first. Later on some of the Universities have been started Computer Application for the 10+2 holders with Bachelors degree. Though in early 2000 few of the universities in India have been started Computer Application with BSc/ MSc degree but this study is concentrated only on BCA programs with past, present, and future potentialities.

### Objective & Methodology

The core aim of this paper is include the following (and off course not limited in):

- ❑ To learn about the basics of Computing, Computer Science, Computer Application and some other related branches viz. Information Technology, and Information Science.
- ❑ To dig out the nature of Computing and Information related fields with reference to Indian and International context.
- ❑ To learn about the aim, objective, and application of Computer Application in detail with reference to its offering in Private Universities.
- ❑ To learn the present strategies of Private Universities in India with reference to the Computing and Information related programs.

The current study is conceptual in nature and thus deals with analysis of computing and information related programs, degrees available, nature of the programs etc. Hence to learn about the basics and fundamentals *initially* literature review methods have been adopted gradually web review also been undertaken to learn about the latest of programs offered in private universities. The official URL: www.ugc.ac.in has been studied to get deeper information on private universities in India.

### Computing, IT, Allied Field and India

*Computing* is initially treated as a set of tools and technologies but gradually it (Computing) has been treated as a branch and domain of Computing and Information Technologies. There is no universally

accepted definition in respect of Computing but in generally this may be defined as a branch and areas of study concentrated on computing related affairs, tools, and technologies. It focuses on computing application in diverse areas rather study, evaluation of computer architecture, designing and development of computer systems<sup>[2],[3],[5]</sup>.

*Computer Science* is a theoretical branch of study concentrated on mathematical and statistical sciences. It is mainly concentrated on deeper and internal affairs of computing, the evaluation, and structure of computer systems. Some of the areas of Computer Sciences are Computer Architecture, Operating Systems, Microprocessor, Artificial Intelligence & Expert Systems, Software Engineering, Probability and Statistics, Image Processing, and Computer Graphics. Within the branch of Computer Science it is the oldest and well established<sup>[4],[6],[10]</sup>.

Though Computer Science is also has an applied focus with the core concentration of designing and development of Hardware and Advance Computing. This is called as Computer Engineering and the merger domain in this segment is called Computer Science and Engineering (CSE). A detail on this has been reported on Table 1.

Internationally after the development of Computer Science when universities moved upon *Information Technology* as an applied branch of study with the concentration of Network Technology, Communication Technology, Database Technology, Web Technologies (these are apart from traditional Software / Computer Technology concentration); then India gear-up with a different nomenclature

**Table 1:** Computing and related branches with their nature and characteristics<sup>[7]</sup>

Computing & Information Related Domains: The Nature				
Computer Science	Computer Science & Engineering	Information Technology	Information Science	Informatics
+ Theoretical	+ Theoretical	+ Applied	+ Applied	Applied
+Mathematical	+Mathematical	+Business Focused	+Social	+Social
+Internal & Core Affairs	+Internal & Core Affairs	+ Applications of Various Components (Viz. Network, Databases, Multimedia, Communication Technology)	+Business Focused	+Business Focused
+ Hardware study as theory	+Hardware study as practical		+ All Components of IT and their focus/ issues in Social/ Business/ Health context.	+Information Systems Designing and Development
+Less Software Study	+Development of Computer Systems	+Less Mathematical		

and field called 'Computer Application'. Universities gradually started after 1980's the Degree of MCA (Masters of Computer Applications) and then backward integrated to the Bachelor of Computer Applications (BCA) program<sup>[7],[12],[13]</sup>. The program mainly started for providing job opportunities to the students of diverse background (however with logical skills or relevant papers). It is worthy to note that while internationally started IT as an applied branch with above mentioned concentration but Computer Application concentrated in the areas of Software Technology and Computer Technology.

**Nature of Degrees in India with reference to Bachelors Degrees in IT field**

In late of 1990's some of the universities started Information Technology also as a branch of specialization. However rather concentration of following:

- Network Technology
- Communication Technology
- Database Technology
- Web Technologies

Indian Universities moved only to Software Technology concentration. Critics examined this as a reappearance of Computer Application with different name and nomenclature<sup>[8],[11],[14]</sup>. Although a very few universities have been started with the focus of all other technology concentration. As far as India is concerned as a whole common computing related subjects are Computer Application, Computer Science, and Information Technology. The Table 2 depict the details of private universities in India with reference to these subjects offering (number wise). India holds total 279 private universities and as a whole total 174 universities offering Computing/ Information related Bachelors program<sup>[9],[11],[15]</sup>. In some of the states and universities the other courses along with BCA is offered i.e. BCA, BSc-IT and BSc-CS.

It is important to note that a majority of these universities offers Computer Application program i.e. Bachelor of Computer Application (BCA in short). The states like Uttar Pradesh, Madhya Pradesh, and Rajasthan are offering the program with combination of both Information Technology and Computer Application (BSc-IT and BCA).

Though in some of the Eastern States both BCA and BSc nomenclature are not offered by the universities (for example in West Bengal). Table 3 shows the detailed list of states and universities offering both the branches.

**Table 2:** Private Universities in India with Computing related Bachelors degree (Paul *et al.*, 2017)

Sl. No.	States	No. of Universities	Universities with Computing Programs (BSc, BCA etc.)
1	Arunachal Pradesh	7	05
2	Assam	5	04
3	Bihar	2	01
4	Chhattisgarh	9	04
5	Gujarat	30	13
6	Haryana	20	13
7	Himachal Pradesh	17	10
8	Jharkhand	7	03
9	Karnataka	14	05
10	Meghalaya	8	05
11	Mizoram	1	01
12	Madhya Pradesh	24	17
13	Maharashtra	9	06
14	Manipur	1	01
15	Nagaland	3	02
16	Odisha	4	01
17	Punjab	15	12
18	Rajasthan	46	26
19	Sikkim	5	04
20	Tripura	1	01
21	Uttar Pradesh	29	25
22	Uttarakhand	13	09
23	West Bengal	9	06
<b>Grand Total</b>		<b>279</b>	<b>174</b>

**Table 3:** BCA & BSc IT program in Indian Private Universities (Paul *et al.*, 2017)

Sl. No.	States	No. of Universities	BSc IT	BCA
1	Arunachal Pradesh	7	04	04
2	Assam	5	02	04
3	Bihar	2	01	01
4	Chhattisgarh	9	03	07
5	Gujarat	30	06	12
6	Haryana	20	03	12
7	Himachal Pradesh	17	01	10

8	Jharkhand	7	02	03
9	Karnataka	14	01	05
10	Meghalaya	8	02	05
11	Mizoram	1	00	01
12	Madhya Pradesh	24	08	17
13	Maharashtra	9	01	06
14	Manipur	1	00	01
15	Nagaland	3	00	02
16	Odisha	4	01	01
17	Punjab	15	07	12
18	Rajasthan	46	11	26
19	Sikkim	5	03	04
20	Tripura	1	00	01
21	Uttar Pradesh	29	06	22
22	Uttarakhand	13	05	09
23	West Bengal	9	00	06
<b>Grand Total</b>		<b>279</b>	<b>67</b>	<b>171</b>

12	Madhya Pradesh	24	17
13	Maharashtra	9	06
14	Manipur	1	01
15	Nagaland	3	02
16	Odisha	4	01
17	Punjab	15	12
18	Rajasthan	46	26
19	Sikkim	5	04
20	Tripura	1	01
21	Uttar Pradesh	29	22
22	Uttarakhand	13	09
23	West Bengal	9	06
<b>Grand Total</b>		<b>279</b>	<b>171</b>

### Bachelors Programs in CA Concentration

However university wise as far as Computer Application degree is concerned a total 171 number of universities offers the program BCA. Among the states Rajasthan offers highest number of BCA program (26), Uttar Pradesh ranked 2<sup>nd</sup> with total 22 universities, while Madhya Pradesh stands 3<sup>rd</sup> with 17 universities. The Table 4 depicts further information in this regard.

Interestingly, among the universities, few offer BCA Program apart from mathematics concentration i.e. they have asked other areas viz. Computer Application/ Information Technology/ Computer Science/ Informatics as a branch of study.

**Table 4:** BCA Program in Private Universities (as on Oct. 2017) (Paul *et al.*, 2017)

Sl. No.	States	No. of Universities	BCA
1	Arunachal Pradesh	7	04
2	Assam	5	04
3	Bihar	2	01
4	Chhattisgarh	9	07
5	Gujarat	30	12
6	Haryana	20	12
7	Himachal Pradesh	17	10
8	Jharkhand	7	03
9	Karnataka	14	05
10	Meghalaya	8	05
11	Mizoram	1	01

### Major & Concentration in Computer Application

Though we already learn that Computing and allied branch of study is a well-known and diverse field of study started, projected, and running in India as an alternative to Computer Science. When universities have started programs with due concentration in a specific subject (among few subjects in a program of study) called Honors or Major. The Computer Application (CA) program has been started with due concentration of full-fledged importance in Computer Application while Major/ Hons in Computer Science denotes the program also with coursework on other areas of study.

The advancement of Information Technology and its subfields viz. Network Technology, Communication Technology, Database Technology, Web Technologies leads the creation of separate focus of these areas as a study in a developed nation and in India as well.

In this connection, a special situation may be noted in Indian Educational context i.e. starting the emerging areas of IT (which already practiced in internationally) in Indian Universities in Computer Application program. More interestingly more emerged programs have been started even in Computer Application and this may lead CA as a branch. Among the areas few important are:

- Cloud Computing
- Mobile Computing
- Big Data
- Information Security
- Game Designing
- Animation and Multimedia



- Artificial Intelligence & OS
- Software Engineering etc.

It is worthy to mention that a majority of this move of BCA into a Branch led by the Private Universities in India. Table 5 depicts the details in this regard. Regarding the specification of the program, few have mention BCA (H), Few have mention BCA with direct specification viz. BCA-Cloud Computing (similar to BA (H) Economics / BA in Economics).

**Table 5:** BCA Program with concentration/ Major

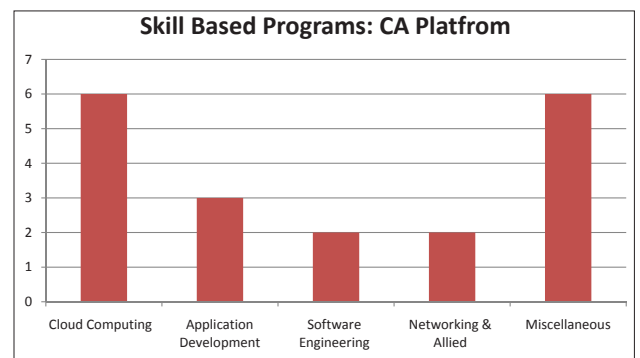
Sl. No.	Universities	Programs
1	Assam Down Town University	BCA Cloud Technology & Information Security (Science)
2	CMR University	BCA (Game & Mobile App Development)-10+2 with Math & Physics
3	Srinivas University	BCA (Software Application) BCA (Aviation Management) BCA (Data Analytics & Cloud Computing) BCA (Cloud Technology and Information Security) BCA (Information Security and Mobile Applications)
4	Mandsaur University	BCA (Mobile Programming) BCA (Cloud Computing)
5	Sandip University	BCA- Cloud Technology & Information Security (10+2 with Math)
6	Chandigarh University	BCA (Information Security & Cloud Computing)
7	C.T University	BCA (H) Cyber Security (Any 10+2)
8	Rayat Bahra University	BCA (Algorithm) (10+2 Any)- Dual Specialization BCA (OS) (10+2 Any)- Dual Specialization BCA (Application Development) (10+2 Any)- Dual Specialization BCA (H&N) (10+2 Any)- Dual Specialization
9	Poornima University	BCA (Mobile Application & Information Security)-10+2 with Science/
10	Sikkim Manipal University	BCA (Cloud Technology & Information Security)
11	Galgotias University	BCA (Animation & Multimedia)
12	Sharda University	BCA (Software Engineering)

It is important that while many universities have opened the door for other background holders (with mathematics/ logical subject as a paper) as eligible for the program a striking move have been taken by few universities even with 10+2 any stream. According to these universities, the reason behind this is offering job opportunities to all who are interested in IT career.

As far as concentration is concerned it is noted that most popular and started specialization in this regard in Cloud Computing and similar branch (Refer Table: 6 for more clarification). It includes the branches of Information Security, Network Security, Cyber security etc. Among these universities Karnataka based Srinivas University, Karnataka stands first with the highest number of BCA Specialization/ Honors/ Major. While Rayat Bahra University stands the second position with the following nomenclature:

- BCA (Data Analytics & Cloud Computing)
- BCA (Software Engineering)
- BCA (Aviation Management)
- BCA (Information Security and Mobile Applications)
- BCA (Cloud Technology and Information Security)

Computer Application program with Specialization/ Honors/ Major according to this study has been analyzed and reported in Fig. 1.



**Fig. 1:** BCA Program with concentration/ Major in all the private universities

Cloud Computing is the core and emerging area these days worldwide and thus among the emerging areas of Information Technology it has been offered highest in numbers (Refer Table 7 for other areas of specialization/ major). Among the other subjects/ areas few important are:

- Animation
- Multimedia
- Algorithm
- Hardware and Networking
- Mobile Programming
- Information Security/ Software Engineering/ Cyber Security etc.

**Table 6:** BCA (Cloud Computing/ Similar Concentration)

Sl. No.	Universities	Programs
1	Assam Down Town University	BCA Cloud Technology & Information Security (Science)
2	Srinivas University	BCA (Data Analytics & Cloud Computing) BCA (Cloud Technology and Information Security)
3	Mandsaur University	BCA (Cloud Computing)
4	Sandip University	BCA- Cloud Technology & Information Security (10+2 with Math)
5	Chandigarh University	BCA (Information Security & Cloud Computing)
6	Poornima University	BCA (Mobile Application & Information Security-10+2 with Science/
7	Sikkim Manipal University	BCA (Cloud Technology & Information Security)

**Table 7:** BCA (with Miscellaneous Concentration)

Sl. No.	Universities	Programs
1	CMR University	BCA (Game & Mobile App Development)-10+2 with Math & Physics
2	Srinivas University	BCA (Software Application) BCA (Aviation Management)
3	Mandsaur University	BCA (Mobile Programming)
4	Chandigarh University	BCA (Information Security & Cloud Computing)
5	Rayat Baha University	BCA (Algorithm) (10+2 Any)- Dual Specialization BCA (OS) (10+2 Any)- Dual Specialization BCA (Application Development) (10+2 Any)- Dual Specialization BCA H&N) (10+2 Any)- Dual Specialization

6	Poornima University	BCA (Mobile Application & Information Security)-10+2 with Science
7	Galgotias University	BCA (Animation & Multimedia)
8	Sharda University	BCA (Software Engineering)

All these programs are offered by the North Indian Universities which are self-financed among the reputed brand few important and popular are Sharda University, Galgotias University, Chandigarh University, Sikkim Manipal University, Srinivas University. There are many similarities in some of the program though there nomenclature is different viz. Cloud Computing, Virtualization & Cloud, Cloud Technologies etc. In privacy domain available programs are Information Security, Cyber Security.

### Curricula Review of Computer Applications with Major Program: New Direction Sample

Based on the review of curricula it has been noticed that a majority of the universities which are adopted Specialization/ Honors/ Concentration started the focus from the beginning of the semester while few have been adopted from the mid of the semester. Table 8 shows a sample BCA Major in this regard (on Cloud Technologies).

**Table 8:** BCA (Cloud Computing Concentration) - Sample curricula

A Sample Curricula of BCA (Cloud Technology) Ajeenkya DY Patil University, Pune	
<b>Semester: I</b>	
English I	
Fundamentals of Mathematics	
Effective Speaking and Analytical Skills – I	
Computer fundamentals & organizations	
Introduction to LINUX	
Programming in C	
C Programming Lab	
LINUX Lab	
<b>Semester: II</b>	
English – II	
Effective Speaking and Analytical Skills – II	
Reasoning and Thinking – I	
Operating system	
Data structures using C	
OOPs with C++	
System Configuration and Maintenance	
Data structure Lab	
C++ Lab	

**Semester: III**

Reasoning and Thinking – II  
 Employability Skills – I  
 Computer Networks  
 Software Engineering  
 Information Security Fundamentals  
 Programming in Java  
 Introduction to DBMS  
 Lab JAVA  
 Lab DBMS

**Semester: IV**

Employability Skills – II  
 Cryptography Fundamentals  
 Server Operating System – I  
 Fundamentals of Data Centre  
 Introduction to Cloud Technology  
 Ethical Hacking Fundamentals  
 Introduction to Cloud Technology – Lab  
 Ethical Hacking Fundamentals – Lab  
 Security Threats and Trends  
 Principles of RIMS

**Semester: V**

Professional Skills  
 Fundamentals of Storage  
 Computer Forensics- an Introduction  
 Virtualization and Cloud Security  
 Principles of Virtualization  
 Cloud Web Services  
 Server Operating System – II  
 Computer Forensics and Investigation – Lab  
 Server Operating System – II – Lab  
 Security in Wireless, VoIP and Mobile Apps  
 ITIL

**Semester: VI**

IT Governance, Risk and Information  
 Security Management  
 Introduction to Windows Azure  
 Major Project / Internship

While the general concentration of Bachelor of Computer Application (BCA) has only Software Technologies (refer a sample BCA curricula of WBUT, Kolkata, West Bengal depicted in Table 9).

**Table 9: BCA- Sample curricula**

**A Sample Curricula of BCA**

**West Bengal University of Technology (MAKAUT,  
 Kolkata, WB)**

**Semester: I**

Digital Electronics  
 Business Systems & Applications  
 Introduction to Programming  
 Mathematics  
 PC Software  
 PC Software-Lab  
 Programming Lab-C/ Pascal

**Semester: II**

Computer Architecture & System Software  
 Information System Analysis & Design  
 Computer Programming  
 Mathematics  
 English Language & Communication  
 Programming Lab (VB)  
 Business Presentation & Language Lab

**Semester: III**

Operating Systems  
 Data Structure with C  
 Graphics & Internet  
 Mathematics for Computing  
 Management & Accounting  
 Internet & Computer Graphics (Lab)  
 Programming Lab (Data Structure with C)

**Semester: IV**

DBMS  
 OOP with C++  
 Software Project Management & Quality Assurance  
 Statistics, Numerical Methods & Algorithm  
 Environment & Ecology  
 Database Lab (Oracle)  
 Computing (Lab)

**Semester: V**

Data Communications & Computer Networks  
 Unix and Shell Programming  
 Windows Programming  
 Value & Ethics of Profession  
 Unix & Networking  
 Minor Project  
 Industrial Training  
 Elective 1

**Semester: VI**

Elective 2  
 Elective 3  
 Major Project  
 Viva  
 Seminar

Though it is better to introduce specialization from the 4<sup>th</sup> semester onwards or any such mutual arrangement so that university can offer additional specialization.

**Findings**

- ❑ Computing and Information Technology is the largest academic domain in the field of knowledge and higher education in India and abroad.
- ❑ Universally higher educational institutes have started programs on diverse areas of study viz. Computing, Computer Science, Computer Application, and Information Technology.

- ❑ Computer Application is popular as a branch of study in India only, in abroad Information Technology has been started as an applied science.
- ❑ Computer Application mainly treated/ equivalent as Science (BCA/ BSc-CA) field of study and as Technology/ Engineering branch it is still not available.
- ❑ Like other branches of study gradually in Computer Application also few universities have initiated to offer Major/ Specialization and among them, popular are Cloud Computing, Big Data Analytics, Information and Cyber Security etc.
- ❑ It is important to note that the present study is restricted towards only private universities in India and thus huge potentialities are there to offer these areas of specializations also in other type of universities.
- ❑ Most of these universities which offer BCA with Major are from North Indian Universities. However important to note that in terms of the total number of institutions the current offering is very limited.

## CONCLUSION

The development of Knowledge, Science, and Technology lead the concept of Interdisciplinary research. The modernization of computing, information technology created many new emerging areas and in India as well these are practiced in industries, organizations, institutions and importantly these are also practiced into some context in academia in research and academic segment.

However, as far as study-training is concerned the emerging areas viz. Cloud Computing, Big Data Analytics, Information and Cyber Security not yet very well started as a program or course of study in Indian universities. Initially in Humanities and Social Science also many other branches have been created and became full-fledged domain viz. Public Administration, Sociology, Psychology etc. Similarly, it is a worthy move by some of the private universities for introducing Computer Application Major. And hope a good picture is waiting for the future! For true India! And Digital India!

## REFERENCES

1. Agarwal, P. 2007. Higher education in India: Growth, concerns and change agenda. *Higher Education Quarterly*, **61**(2): 197-207.
2. Desai, S. and Kulkarni, V. 2008. Changing educational inequalities in India in the context of affirmative action. *Demography*, **45**(2): 245-270.
3. Gereffi, G., Wadhwa, V., Rissing, B. and Ong, R. 2008. Getting the numbers right: International engineering education in the United States, China, and India. *Journal of Engineering Education*, **97**(1): 13-25.
4. Gupta, D. and Gupta, N. 2012. Higher education in India: structure, statistics and challenges. *Journal of education and Practice*, **3**(2).
5. Bhattacharya, I. and Sharma, K. 2007. India in the knowledge economy—an electronic paradigm. *International Journal of Educational Management*, **21**(6): 543-568.
6. Paul, P.K. and 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*, **435**: 93-102. Springer, Singapore.
7. Paul, P.K., Bhumali, A. and Aithal, P.S. Indian Higher Education: With Slant to Information Technology— a Fundamental Overview. *International Journal on Recent Researches In Science, Engineering & Technology*, **5**(11): 31-50.
8. Paul, P.K., Aithal, P.S. and Bhumali, A. 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.
9. Paul, P.K., Aithal, P.S. and Bhumali, A. MCA (Information Science and Management): The next Generation Interdisciplinary Specialization for Better Social Informatics and Digital Humanities Practice. *International Journal of Scientific Research in Mathematical and Statistical Sciences*, **4**(5): 27-32.
10. Supe, A. and Burdick, W.P. 2006. Challenges and issues in medical education in India. *Academic Medicine*, **81**(12): 1076-1080.
11. Tate, D.S. and Schwartz, C.L. 1993. Increasing the retention of American Indian students in professional programs in higher education. *Journal of American Indian Education*, pp. 21-31.
12. Tayade, M.C. and 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.
13. Tijerina, K.H. and Biemer, P.P. 1988. The Dance of Indian Higher Education: One Step forward, Two Steps back. *Educational Record*, **68**(4): 86-91.
14. Tilak, J.B. and Varghese, N.V. 1991. Financing higher education in India. *Higher Education*, **21**(1): 83-101.



15. 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.
16. Umashankar, V. and Dutta, K. 2007. Balanced scorecards in managing higher education institutions: an Indian perspective. *International Journal of Educational Management*, **21**(1): 54-67.

