The Increasing Trend of Domain Based Information Science Programs in India: An Investigation of Private Universities

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Abstract - **Information is an important and vital source for each and every kind of organizations, institutions and so on. Information is very much close to the data and knowledge. Previously only information related affairs viz. collection to dissemination performed by the manual tools and techniques but the development of science and technology played a vital role in respect of information affairs. Initially, Documentation Science is treated as most important and valuable but gradually other subjects viz. Information Studies played a lead role in performing the jobs. Gradually another nomenclature became popular and played a great role in the information related affairs i.e. Information Science. It is important to note that at the beginning of the domain the performance and activities are mainly governed by the manual tools and techniques but gradually technologies influenced a better role. The requirement of information and contents in other areas and sectors lead the uses of domain 'Information Science'. The domain thus combined with manual information management affairs and also technological components. The field Information Science and its applications in other subjects and sectors developed newer fields and domains viz. Health Information Science, Geo Information Science etc. Higher Educational Institutes (HEIs) in India doing well in respect of starting of new programs and new age degrees. The Private universities are suitably contributing for the development of Information Science and Technology field for other domains. This paper is a case study; and investigation of private universities in India with reference to domain centric Information Science/ IT programs.**
Keywords: **Information, Information Science, India, Private Universities, HEIs, Bio Information Science, Library Information Science, Health Information Science, IT**

I. INTRODUCTION

Information Science is an interdisciplinary Science of Science. It is a field concentrated on information and its several affairs leading to the collection, selection, organization, processing, management, and dissemination of information. Information Science is closely associated with the Computing and allied fields. Though, it is much broader than that of this, as Information Science is not only combines with the components of Information Technology but also affairs and Information Studies and Management, Social Issues, and Managerial Sciences in a different context.

Information Science is moreover in recent past an important name in different sectors viz. Business, Social Science, Health Sciences, Information Sectors etc. As a result, several fields and domains have been developed in recent past in different universities worldwide [1], [3], [7], and [8]. The nomenclatures which have developed with the application and concentration of Information Sciences are ranging from Bio Information Science/ Informatics, Health Informatics, Geo Informatics, Library Information Science etc. In India and many parts of the world still misconception exists that

Information Science is only centered on Information and IT is a related branch only; however, it is broader than IT and deals with additional components in today's age. Moreover, in international level, few interdisciplinary branches have been developed viz. Bio Informatics, Geo Informatics etc. and it is worthy to mention that still a common picture in academia and intellectuals that Information Science differs from these areas [2], [4], [6], [10]. However, in this research work, an effort has been undertaken to clear the concept of Information Science, its domain centric subjects etc. Moreover, this research work tries to develop and assemble the areas of Information Sciences available in Indian private universities in a single work.

II. OBJECTIVES AND AIM

The paper is conceptual in nature and for the fulfillment of the following aim and objectives, this research work is undertaken:

1. To learn about the basics of Information and Computing related fields with reference to the Information Science.
2. To dig out the latest nomenclature in Information Sciences with reference to India and International market.
3. To learn about the domain based Information Sciences with reference to Bio Sciences, Social Sciences, and Business Sciences etc.
4. To learn about the Indian Higher Educational Systems with reference to the Private Universities.

5. To learn about the latest subjects and fields in Information Sciences and Computing in emerging domains and sectors.
6. To find the latest of the development and promotion of interdisciplinary sciences with respect of Information Sciences in Indian Private Universities.

III. METHODS AND SOURCES

The paper deals with several context and facets. *First of all*, it is conceptual in nature with Interdisciplinary affairs. *Secondly,* it is a paper related to Techno-Educational affairs. *Thirdly*, it is more importantly a work fully dedicated to the Managerial Issues. As a whole the paper has been undertaken primarily from the review work and thus review of literature has been undertaken for the concern of Information Science, its nature, India and Worldwide view, Indian Higher Educational Systems etc. The core concentration of the work is centered on Indian Private Universities and thus for this work web-review also plays a great role and in this context the core link (https://www.ugc.ac.in/privatuniversity.aspx)of UGC (Govt. of India) has been used to reach the private universities. It is worthy to mention that the study has been conducted in between October, 2017 to December, 2017 and thus the programs and information available in the websites were used.

IV. INFORMATION SCIENCE: BASICS

Information Science is an interdisciplinary subject and fully dedicated to the information affairs ranging from collection, selection, organization, processing, management, and dissemination of information and similar contents. Information Science is very much close to Information Studies but it is more than that; it is today deals with Computational and Information Technology tools and fields deeply [5], [8]. Information Science combines all the components of IT *(i.e. Networking Technologies, Multimedia Technologies, Database Technologies, Web Technologies etc.)* apart from Management Sciences and Social Issues.

It is closely responsible for the interaction of information-technology with people. Hence IT is about technologies only but Information Science is more than that and also Information Studies & Management, Management Science in respect of Technologies, Information and Society [6], [9], [10]. Moreover, Information Science is also available in different nomenclatures due to high concentration of technologies such as:

1. Informatics
2. Information Science and Technology
3. Information Science and Computing
4. Computer and Information Science
5. Information and Computer Science
6. Information Science and Systems etc.

A. Information Science & Domain Based Context: Worldwide and Indian Picture

As we learned that Information Science is a dedicated Science to the community, society, and people and thus it has a strong relationship with other subjects and sectors and as a result of several new areas, branches, and subjects have been created. The combination of Health Science with Information Science developed Health Information Science whereas Chemo Information Science was created with Chemical Science and Information Science. Bio Information Science is a merged field of Bio Science and Information Science. Similar to these, Geo Sciences and its integration with the Information Science results in Geo Information Science. It is important to note that in many parts of the globe the merged domain of Information Science is highly practiced and available with a different level of academic programs viz. Bachelors, Masters, Doctoral programs with the award as BS/MS/PhD-Health Information Science/ Informatics. And in many cases, such programs are available in a single School/ Academic units with the degrees of Information Sciences (non domain based) and also in many Domain Centric Information Science (viz. Health Information Science). Hence in many western countries, the programs such as MS-Information Science and MS-Bio Informatics are available in the same department whereas in India the programs are not only available in different departments but also very less interaction, communication, and collaborative dealings. Importantly Information Science programs also very limited in India.

B. Indian Higher Education and Private University Context

Higher Education systems in India composed of a different kind of HEIs viz. Colleges, Universities, Research Centers, Institutes of National Importance etc. Such institutions are established as a government body, private body, government aided body etc. It is worthy to note that India holds 800+ Universities and among these 279 are belongs to the category of private universities and such type of universities have been established in different states (except few), here a detailed list is provided in Table: I. The Number of universities is rising day by day and thus several new programs, degrees, collaboration etc. become rising rapidly.

C. Information Science and Private Universities in India

Information Science nomenclature is very limited in Indian Universities. The most common program in this regard internationally is M.Sc./MS-Information Science. In India as well the nomenclature of M.Sc. is common and available in Deemed Universities (self-financed); though as far as private universities are concerned the nomenclature not offered in a single university with M.Sc.-Information Science. Though it is important to note that few universities in this category have started (depicted in Table II) domain specific Information Science.

TABLE I INDIAN HIGHER EDUCATION PILLARS: PRIVATE UNIVERSITIES AT A GLANCE

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

TABLE II INDIAN PRIVATE UNIVERSITIES WITH DOMAIN BASED IS PROGRAMS

Private Universities with Information Science in different subject concentration (UG & PG)					
Sl. No.	States	IS in Library Concentration	IS in Geo Concentration	IS in Health Concentration	IS in Bio Concentration
1	Arunachal Pradesh	10	1	Nil	2
2	Assam	Nil	Nil	Nil	Nil
3	Bihar	2	Nil	Nil	Nil
4	Chhattisgarh	4	Nil	Nil	Nil
5	Gujarat	5	Nil	Nil	Nil
6	Haryana	4	Nil	Nil	1
7	Himachal Pradesh	Nil	Nil	Nil	Nil
8	Jharkhand	2	1	Nil	Nil
9	Karnataka	Nil	Nil	2	Nil
10	Meghalaya	1	Nil	Nil	Nil
11	Mizoram	Nil	Nil	Nil	Nil
12	Madhya Pradesh	8	Nil	Nil	Nil
13	Maharashtra	Nil	Nil	Nil	Nil
14	Manipur	Nil	Nil	Nil	Nil
15	Nagaland	Nil	Nil	Nil	Nil
16	Odisha	Nil	Nil	Nil	Nil

17	Punjab	12	Nil	1	Nil
18	Rajasthan	13	3	6	7
19	Sikkim	2	1	Nil	Nil
20	Tripura	1	1	Nil	Nil
21	Uttar Pradesh	14	3	Nil	5
22	Uttrakhand	Nil	Nil	1	Nil
23	West Bengal	Nil	Nil	Nil	1
	Total	78	9	10	16

Among the domain centric Information Sciences few domains are Library and Information Science *(combined with Library Science and Information Science)*. Apart from these, Geo Information Science, Bio Information Science, and Health Information Science are finding importance. Moreover, the rank of each domain specific Information Sciences have been depicted in Table: II.

TABLE III IS IN CONCENTRATION WITH LIBRARY SYSTEMS IN INDIAN PRIVATE UNIVERSITIES CONTEXT

Information Science Concentrated on Library Systems			
Sl. No.	**States**	**Bachelors Degree**	**Masters Degree**
1	Arunachal Pradesh	5	5
2	Assam	Nil	Nil
3	Bihar	1	1
4	Chhattisgarh	2	2
5	Gujarat	3	2
6	Haryana	2	2
7	Himachal Pradesh	Nil	Nil
8	Jharkhand	1	1
9	Karnataka	Nil	Nil
10	Meghalaya	Nil	1
11	Mizoram	Nil	Nil
12	Madhya Pradesh	4	4
13	Maharashtra	Nil	Nil
14	Manipur	Nil	Nil
15	Nagaland	Nil	Nil
16	Odisha	Nil	Nil
17	Punjab	6	6
18	Rajasthan	7	6
19	Sikkim	1	1
20	Tripura	Nil	1
21	Uttar Pradesh	9	5
22	Uttrakhand	Nil	Nil
23	West Bengal	Nil	Nil
	Total	41	37

TABLE IV IS IN CONCENTRATION WITH GEO SCIENCES IN INDIAN PRIVATE UNIVERSITIES CONTEXT

Information Science Concentrated on Geo Science			
Sl. No.	**States**	**Under Graduate Programs**	**Post Graduate Programs**
1	Arunachal Pradesh	Nil	1
2	Assam	Nil	Nil
3	Bihar	Nil	Nil
4	Chhattisgarh	Nil	Nil
5	Gujarat	Nil	Nil
6	Haryana	Nil	Nil
7	Himachal Pradesh	Nil	Nil
8	Jharkhand	Nil	1
9	Karnataka	Nil	Nil
10	Meghalaya	Nil	Nil
11	Mizoram	Nil	Nil
12	Madhya Pradesh	Nil	Nil
13	Maharashtra	Nil	Nil
14	Manipur	Nil	Nil
15	Nagaland	Nil	Nil
16	Odisha	Nil	Nil
17	Punjab	Nil	Nil
18	Rajasthan	Nil	3
19	Sikkim	Nil	1
20	Tripura	Nil	Nil
21	Uttar Pradesh	1	2
22	Uttrakhand	Nil	Nil
23	West Bengal	Nil	Nil
	Total	1	8

D. Information Science in Library Context

Information Science with concentration in Library Systems developed Library and Information Science (LIS) branch and it is also called as a combination of 'Library Science' and 'Information Science'. In India among the domain focused IS it is widely available with 41 and 37 programs in its bag. In this category Uttar Pradesh holds first position with 14 programs and Rajasthan scored 2nd position, the

state wise details are provided in Table: 3.The branch initially available only as Library Science but in late of 1980s many universities merged the field with Information Science. It is worthy to note that still a common perception among the academia and community that Information Science means Library and Information Science. This study finds out that the reason behind this is non-availability of other Information Science program in India and largely available LIS nomenclature. As a whole total 78 programs are available in Private Universities in India according to this study.

E. Information Science in Geo Context

Similar to the Information Science concentration in Libraries etc., other branches also available in India i.e. Geo Information Science but it is popular as a distinct branch than Information Science. The Table III shows detail in this regard.

According to the study, it is noted that total 9 programs are available in the private universities and it includes Bachelors, and Masters Degrees. Total 8 PG programs are available in this segment with M.Sc. and M.Tech level [9], [11], [12]. Rajasthan holds first position with 3 (three) programs in PG whereas Uttar Pradesh also holds same rank with 3 (three) programs. Table: V in this regard offered the details of universities which are offering programs on Geo Information Science. Moreover, it is noted during this study that not a single university offers the nomenclature Geo Information Science. Majority of programs are Geo Informatics and few are Geo Information Systems, Remote Sensing etc.

TABLE V GEO INFORMATION SCIENCES PROGRAMS IN INDIAN PRIVATE UNIVERSITIES CONTEXT

Information Science in Geo Science Concentration		
Sl. No.	Universities	Programs
1	Himalayan University	M.Sc.-Geo Informatics
2	Pragyan International University	M.Sc.-Geo Informatics
3	NIIT University	M.Tech-GIS
4	Sangam University	M.Sc.-Geo Informatics
5	Shri Jagdish Prasad Jhabarmal Tibrewala University	M.Sc.-GIS
6	Sikkim Manipal University	PGD in Geo Informatics
7	Amity University, Noida	B.Sc.-Geo Informatics M.Sc.-Geo Informatics M.Tech-Geo Informatics
No. of Total Universities 7		Total Programs 9

F. Information Science in Health Context

Similar to the Geo Information Science, another Information Science field is also rising slowly it is Health Information Science. It is a combination of Health Science and Information Science and more clearly the application of IT and Computing in Healthcare Sector. As per the study, it is noted that total 6 programs are available in this category. However, it is worthy to note that including Post Graduate Certificate and Post Graduate Diploma Programs nationwide total programs are 10 (ten). Table VI depicted a detailed picture on this matter.

TABLE VI HEALTH INFORMATION SCIENCES PROGRAMS IN INDIAN PRIVATE UNIVERSITIES CONTEXT

Health Informatics Program at Private Universities in India		
Sl. No.	Universities	Programs
1	Institute of Trans-Disciplinary Health Sciences and Technology University, Karnataka	M.Sc.-CS (Health Informatics) Integrated M.Sc.-CS (Health Informatics)
2	Chitkara University, Punjab	MBA (Health IT) with Fortis
3	Mahatma Gandhi University of Medical Sciences & Technology	B.Sc.-Health Informatics M.Sc.-Health Informatics PG Certificate in Nursing Informatics PG Certificate in Health Informatics PG Diploma in Nursing Informatics PG Diploma in Health Informatics
4	University of Petroleum and Energy Studies, UK	B.Tech.-CSE(Healthcare Informatics (with IBM)

It is important to note that apart from full-fledged program on Health Information Science another important move by the private universities is starting the field as a specialization in other related domain (i.e. in this context available as M.Sc.-CS (Health Informatics)/B.Tech.-CS (Healthcare Informatics). Similar to other domain focused Information Science it also called as Health Informatics rather Health Information Science [8], [13], [14].

TABLE VII IS IN CONCENTRATION WITH BIO SCIENCES IN INDIAN PRIVATE UNIVERSITIES CONTEXT

Information Science Concentrated on Bio Science			
Sl. No.	States	Under Graduate Programs	Post Graduate Programs
1	Arunachal Pradesh	1	1
2	Assam	Nil	Nil
3	Bihar	Nil	Nil
4	Chhattisgarh	Nil	Nil
5	Gujarat	Nil	Nil
6	Haryana	1	Nil
7	Himachal Pradesh	Nil	Nil
8	Jharkhand	Nil	Nil
9	Karnataka	Nil	Nil
10	Meghalaya	Nil	Nil
11	Mizoram	Nil	Nil
12	Madhya Pradesh	Nil	Nil
13	Maharashtra	Nil	Nil
14	Manipur	Nil	Nil
15	Nagaland	Nil	Nil
16	Odisha	Nil	Nil
17	Punjab	Nil	Nil
18	Rajasthan	3	4
19	Sikkim	Nil	Nil
20	Tripura	Nil	Nil
21	Uttar Pradesh	1	4
22	Uttrakhand	Nil	Nil
23	West Bengal	Nil	1
	Total	**06**	**10**

TABLE VIII BIO INFORMATICS/ INFORMATION SCIENCES PROGRAMS IN INDIAN PRIVATE UNIVERSITIES CONTEXT

Information Science in Bio Science Concentration			
Sl. No.	Universities	UG Programs	PG Programs
1	Himalayan University	B.Sc.-Bio Informatics	M.Sc.-Bio Informatics
2	Amity University, Haryana	B.Tech.-Bio Informatics	Nil
3	Jaipur National University	B.Sc.-Bio Informatics	M.Sc.-Bio Informatics
4	Mahatma Jyoti Rao Phoole University	B.Tech.-Bio Informatics	Nil
5	Mody University of Science and Technology	Nil	PGD in Bio Informatics
6	Shridhar University	Nil	M.Sc.-Bio Informatics
7	Singhania University	B.Sc.-Bio Informatics	M.Tech- Bio Informatics
8	Amity University, Noida	B.Tech.-Bio Informatics	Nil
9	Galgotias University	Nil	M.Sc.-Bio Informatics
10	IFTM University	Nil	M.Sc.-Bio Informatics M.Tech-Bio Informatics
11	Maharishi University of Information Technology	Nil	M.Sc.-Bio Informatics
12	The Neotia University	Nil	M.Sc.-Bio Technology & Bio Informatics
No. of Total Universities		Total UG Programs 06	Total PG Programs 10

G. Information Science in Bio Context

After Library Information Science the next popular and available nomenclature of Information Science into the different domain is Bio Information Science. Though, it is called as Bio Informatics in India. Including Bachelors and Master's program total 16 programs are available in this segment. In these programs the award of B.Sc., B.Tech, M.Sc., M.Tech are available. Nationwide list is depicted in Table: 7, where it is noted that Rajasthan stands first with 7 programs. For a complete list please refer Table VII.It is worthy to note that Mody University of Science and Technology offers a different program level i.e. Post Graduate Diploma in Bio Informatics. In India many Science and Technology branches are available in two track; the first one is Science and second one is Engineering. As far as Bio Informatics is concerned the programs are available in both track the M.Tech is offered by two universities namely IFTM University & Singhania University. Table VIII in this regard offered a detailed picture. Similar to M.Tech program 3 (three) B.Tech. programs are also offered in the Private Universities and in this regard universities are Amity University; Noida Amity University; Haryana and Mahatma Jyoti Rao Phoole University.

H. Emerging IS & Computing in Private Universities

Information Science including other related areas and fields viz. Computing and Information Technologies are very much applicable in other areas of knowledge internationally there are other areas which result in the integration of Information Science in other areas and created not only subjects but also academic programs viz. Neuro Informatics, Agricultural Informatics, Environmental Informatics etc. This study concentrated on private universities significantly and shows that in domain centric Information Science popular nomenclatures are Library and Information Science, Bio Information Science/ Informatics, Geo Informatics and Health Informatics. Though significantly in another branch of Information Science i.e. Chemo Informatics/ Information Science is offered in two different universities with M.Tech and PhD degree and the table IX in this regard provide the details. Apart from these another field also may be treated as within the Information Science i.e. combination/application of IT and Computing in Economics. Two private universities this regard started programs in this field.

TABLE IX INFORMATION SCIENCE AND COMPUTING IN OTHER DOMAIN CONTEXT IN INDIAN PRIVATE UNIVERSITIES

Information Sciences Programs lies on other subjects in Private Universities (Chemical Science & Economical Sciences)			
Sl. No.	Universities	Place	Programs
1	Reva University	Bangalore	BS- Computational Mathematics & Economics
2	Maharishi University of Information Technology	Lucknow	B.Sc.-Computational Economics & Analytics
3	Singhania University	Jhunjhunu	M.Tech-Chem Informatics
4	Shiv Nadar University	Gautam Budh Nagar, UP	PhD- Chem Informatics

V. FINDINGS

1. Information Science is an important discipline and field of fields and closely associated with Information Studies and Information Management in respect of Information affairs while it also has a relationship with IT and Computing in terms of technological affairs.
2. Initially, Information Science was mainly popular as a branch of information and gradually it became a domain of interaction of information-technology-people. The gradual developments of Information Science in other fields have resulted in other subjects and domains viz. Bio Information Science/ Informatics, Geo Informatics and Health Informatics etc.
3. It is important to note that Informatics term is also equally used in the academia internationally in place of Information Science.
4. Internationally in many universities and academic community Bio Information Science/ Informatics, Geo Informatics, and Health Informatics branches and programs are offered in same school and unit; while in India the programs are very limited and offered in different wings. Even it is common practice and conception that IS/IT is different with such domain based Information Sciences.
5. The biased free Information Science is mainly offered in Deemed Universities with very limited presence while Private Universities started a good move on offering domain centric Information Science; though isolated manner.
6. The common Domain centric Information Science programs which are available in India include Library Information Science, Bio Information Science/ Informatics, Geo Informatics, and Health Informatics (Fig: 1 depicted also in details).
7. The branch of Library and Information Science is highly offered and in this regard, it is important to note that a common perception is that LIS and Information Science is the same field and the second one is dedicated to the Information Centre and its Computation.

VI. SUGGESTIONS AND CONCLUSION

The world is changing rapidly. The knowledge world is powered by good information and knowledge systems *as well as* information technologies. And all these cases Information Science play a great role as it is more than technologies with a wonderful concentration of information fundamentals and information management. Internationally universities are doing well in the promotion of interdisciplinary research and in this context, universities are offering Information Sciences with not only simple Information Science program but also emerging concentration viz. Information Systems, Informatics, Data Science, Information Management etc. On the other hand, the domain centric Information Sciences are mainly popular with Health Informatics, Bio Informatics, Geo Informatics etc. Internationally universities have established *iSchools* in this regard and all such programs are offered under a single umbrella. While in late, but at-least many private universities have been started the programs in general, Information Science and domain centric Information Science in an isolated manner. Hence private universities need to start programs under a particular umbrella or with a good tie-up, collaboration, sharing etc. with other suitable institution or industry. It is fact, in India, science and technology subjects are mainly offered in science stream and also in technology stream and thus in many cases, programs are still available with B.Sc. and M.Sc. but due to time need, universities may start the programs in different flavor viz. B.Sc., M.Sc., B.Tech. and M.Tech. Moreover, specialization within Information Science may also be started such as M.Sc.-Information Science (Health Informatics/ Bio Informatics/ Geo Informatics) etc. hence with this traditional information management and domain centric information management.

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