



# **Informatics: Foundation, Nature, Types and Allied areas— *An Educational & Analytical Investigation***

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

<sup>1</sup>*Executive Director, MCIS, Department of CIS, Information Scientist (Offg.), Raiganj University (RGU), West Bengal, India*

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

\*Corresponding author: [pkpaul.infotech@gmail.com](mailto:pkpaul.infotech@gmail.com)

## **ABSTRACT**

---

Informatics is an emerging subject that concern with both Information Technology and Management Science. It is very close to Information Science, Information Systems, Information Technology rather Computer Science, Computer Engineering, Computer Application, etc. The term Informatics widely used as an alternative to Information Science and IT in many countries. Apart from the IT and Computing stream, the field 'Informatics' also available in the Departments, Units, etc. viz. Management Sciences, Health Sciences, Environmental Sciences, Social Sciences, etc., based on nature of the Informatics. Informatics can be seen as a technology based or also as a domain or field specific depending upon nature and thus it is emerging as an Interdisciplinary Sciences. There are few dimensions of Informatics that can be noted viz. Bio Sciences, Pure & Mathematical Sciences, Social Sciences, Management Sciences, Legal & Educational Sciences, etc. This is a conceptual paper deals with the academic investigation in respect of the Informatics branch; both in internationally and in India.

**Keywords:** Informatics, IT, Informatics Systems, Biological Informatics, Emerging Subjects, Academics, Development

---

Informatics is a developing field that cares about both technologies and information. Initially, it was treated as a practicing nomenclature and now it becomes a field of study and growing internationally in different higher educational institutes which are offering a program on simple 'Informatics' or any domain specific viz. 'Health Informatics' or 'Bio Informatics'. There are different Information Technology components and all these important to do information activities such as—

- Collection of Information.
- Selection of Information.

- Organization of Information.
- Processing of Information.
- Management of Information.
- Dissemination of Information.

Informatics as a Science of Information also uses different Management tools, techniques, procedure, methods, etc. Moreover, as the branch is a little different from the existing Computer Science so it is also closely connected with the Social Sciences and Humanities as well.

## Objective

The current paper is conceptual, analytical in nature and deals with mainly following aim and objective—

- To learn about the basics of Informatics; including its nature and characteristics.
- To gather information on background, foundation, evolution of Informatics and allied branches.
- To find out the types, nature of Informatics as a practicing area and a field of study as well.
- To learn about the Informatics related to the Bio Sciences, Pure & Mathematical Sciences, Social Sciences, Management Sciences, Legal & Educational Sciences.
- To learn about the academic programs, degrees and nomenclature offered in Informatics.
- To gather information about the traditional and emerging areas of research in Informatics and allied branches.
- To learn about the further potentialities in respect of Informatics field of study.

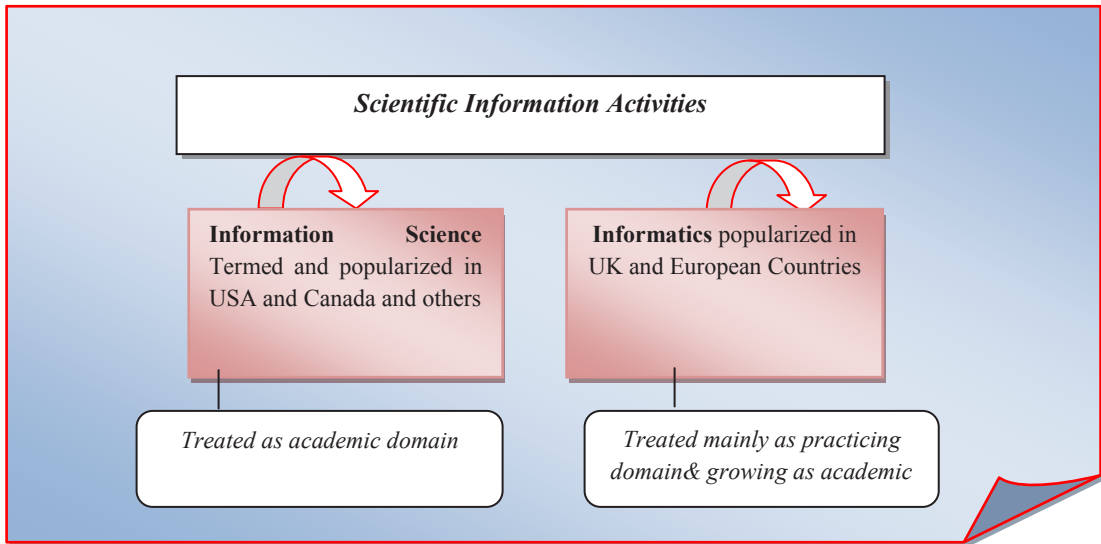
## Informatics and Background

As far as historical background is concerned in the year 1956, Karl Steinbach, a German computer scientist first coined the word *Informatik* in a paper called *Informatik: Automatische Informations verarbeitung*. However, in the year 1962, the term *informatique* was coined by Philippe together with various translations. If we search then it can be noted that Mikhailov was advocated the Russian term *informatika* in the year 1966 and later on in 1967 the English term *informatics* was coined and become popular. Then it was appeared as a *theory of scientific information* and argued for a broader meaning. Further, it is a field of study and also uses of information technology in different kinds of sectors or various communities<sup>[1],[9]</sup>. Further, it can be deemed as the interaction of technology with information with the human organizational structures (Refer Fig. 1 & 2).

Initially, the domain specific Health Informatics term got popularized and also many universities and educational institutes introduced and termed ‘Applied Informatics’. From the study, it has been noted that in European countries it is a kind of information centric field whereas in the United States it is more concentrated on Computing or used as an alternative to Applied Computing or to show the applications from the Computer Science.

Informatics is an applied science and treated as both academic and practicing subject. It is close with Information Science and Information Technology in many contexts<sup>[2],[7],[9]</sup>. The field Informatics is a concern

with collection, selection, organization, processing, management, and dissemination of information. Information processing activities are the core jobs of the Informatics and emerged during 1970-90s.



**Fig. 1:** Information Science Vs. Informatics

Informatics is treated as the alternative of the Information Technology and Computing field in many contexts. Informatics as a field can be seen with two foci, in first foci, it is the field with a concentration of information basics viz. information management, information processing, etc with a partial focus on technologies for doing these tasks; in another focus, the core concentration is on technologies<sup>[3], [13], [14]</sup>.

Informatics is applicable not only in the IT organizations but also in educational Universities, Research Centers, Governments Department, and Ministries, etc. Here, *Fig. 1- Depicted Information Science vis-à-vis Informatics- similarities and dissimilarities.*

## Informatics, Information Science and Other Allied Fields

The branch ‘Information Science’ is broad enough and evolved as a scientific study of information. Gradually it was considered as a branch of study and concentrated on other subjects and among these Library & Information Science can be treated as important<sup>[09], [23]</sup>.

However, the major difference between ‘Informatics’ and ‘Information Science’ is that, first one of practicing based (and now developed as a field as well) and the second one as an academic branch of study. We can see different types of Information Sciences similar to Informatics and among these major or important are—

- Medical Information Science
- Health Information Science
- Geo Information Science

Other subjects which have other domain concentration viz. in Chemistry (Chemo Informatics), in Bio Science (Bio Informatics) and other are not commonly available as Chemo Information Science or Bio Information Science<sup>[4],[17],[18],[19]</sup>. So, it is clear that Informatics and Information Science; both are very close as well. Apart from this, some other very close fields are—

### ***Information Systems***

Information Systems is another branch close to Informatics. This field is responsible for the evolution, designing, development of overall information infrastructure of organizations, institutions whereas Informatics is not only instituted specific but also domain/ sector specific viz. Bio Informatics, Media Informatics. Though this branch is also using the tools, technologies as mentioned in Informatics<sup>[5],[24],[25]</sup>.

### ***Information Technology***

Information Technology is another close field of Informatics. And it is related, as this uses various components and technologies such as Database Technology, Network Technology, Web Technology, Multimedia Technology, Software Technology. This is less information centric than Informatics or Information Science or Information Systems.

### ***Computing***

Computing is another branch and doing the affairs of computation and computer and similar devices use. Further, Computing is less focused on hardware design and development.

*Though, Computer Science, Computer Engineering* is far different from the Informatics. As such branch deals with mathematical and hardware designing and development related affairs mostly.

### **Informatics and Components**

As an Applied Science, Informatics deals with various Computing and Information Technological components for the task of following—

- ❑ Knowledge Management.
- ❑ Documentation.
- ❑ Information Analysis, Consolidated, and Repackaging.
- ❑ Knowledge Organization, etc.

It is worthy to note that for the job and objective fulfillment of the branch ‘Informatics’, among the useful technological components few important are Database Technology, Network Technology, Web Technology, Multimedia Technology, Software Technology, etc. Within these technologies, many emerging tools and sub components are also using and rapidly growing viz.—

*Network Technology* the emerging and super specialty areas are Network Security, Cyber Security, Wireless Networks, Cloud Computing, Converged Network, and so on<sup>[6],[10],[11]</sup>.

*Web Technology* is composed of different emerging areas viz. Usability Engineering, User Experience Designing, Human Computer Interaction, Web Designing and Development, Content Management, etc.

Whereas, *Multimedia Technology* deals with various areas viz. VFX, Usability Designing, Animation, Interactive Information Systems.

*Software Technology* is the most traditional area of IT and it deals with software and application development using various high level programming languages.

*Database Technology* is currently dealing with traditional Database Management, Data warehousing & mining, Advanced Information Management, Big Data Analytics, Data Science, etc.

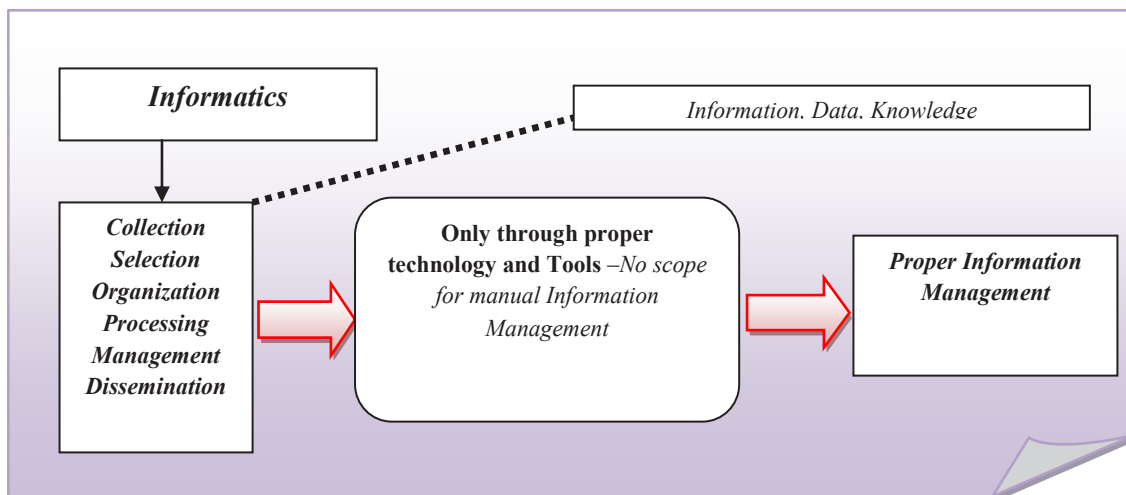
*Security Technology*, combines with Web & Database Security, Network Security, including the latest Cloud and Mobile Security, etc. The issues such as IT Security Policies, Governance, etc are also important.

## Types of Informatics

Based on the nature of the Informatics, it can be classified into differently and internationally based on academic institutions.

Informatics applications or integration with the Pure Science related areas can be considered as following—

- Computational informatics.*
- Engineering Informatics.*
- Evolutionary informatics.*
- Hydro informatics.
- Energy Informatics.
- Irrigation informatics.
- Materials informatics.



**Fig. 2:** Fundamentals of Informatics. (Paul, PK)

Informatics of Biological Sciences are also very popular and widely available<sup>[4],[12],[15]</sup>. The development of this approach is higher than that of Pure Science around the world.

- Environmental informatics.
- Disease informatics
- Forest informatics
- Bio Informatics
- Health informatics
- Laboratory informatics
- Neuro informatics
- Forest informatics.
- Geo informatics.
- Brain Informatics.
- Behavior Informatics.
- Cognitive Informatics.

Some researcher advocated and introduced different other Informatics namely—

- Cloud Informatics
- Legal informatics
- Pervasive Informatics
- Data Informatics
- Security Informatics.

## **Informatics and Academics**

The field Informatics is broad enough and internationally different organizations, institutions, universities offers educational programs on Informatics ranging from Certificate, Diploma, Bachelors, Masters, Research Degrees<sup>[8],[16],[20]</sup>.

It is worthy to note that among the Post Graduate Programs most available are Post Graduate Certificate, Post Graduate Diploma, Post Graduate Degrees leading to following—

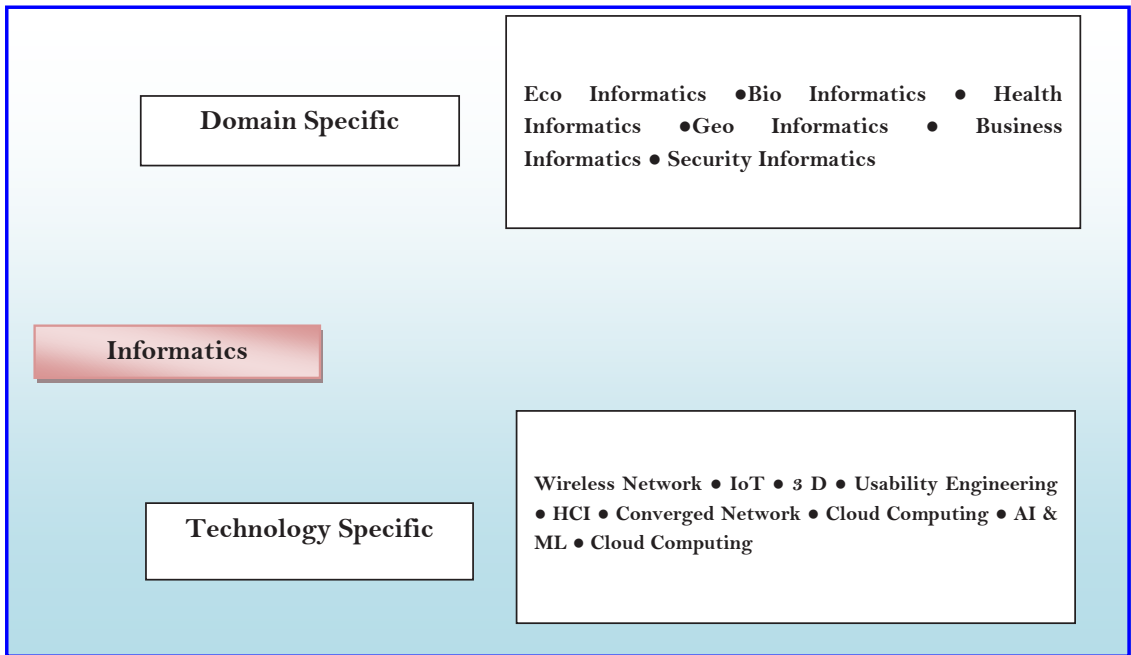
- MSc
- MS
- MTech/ ME by Coursework
- MTech/ ME by Research
- MPhil, etc.

Similarly, in Bachelors also programs are offered in the above mentioned degrees and this trend differs from country to country. In some institutes even innovative subject & informatics programs available viz. BS Biology and MS Bio Informatics.

As far as India is concerned, general Informatics is not available though, domain specific Informatics is available in many subjects viz.

- Health Informatics,
- Bio Informatics,
- Geo Informatics.

Most of the universities have started to offer the programs in the concerned nomenclature department viz. Department of Health Informatics<sup>[7],[17],[22]</sup>. There are different areas evolving as research emergences & frontiers Fig. 3.



**Fig. 3:** Emerging Research areas in Informatics.

## Findings

- The branch Informatics is broad and interdisciplinary in nature and focused on Information.
- Informatics may be in-general or domain specific.
- Informatics is very close to Information Science, Information Systems, Information Technology rather Computer Science, Computer Engineering.
- Informatics is offered in the dedicated 'Informatics' or allied departments or units or domain specific viz. Environmental Informatics in the Schools/ Units/ Departments in Environment & Ecology, etc.
- Informatics is very much related to different components and sectors viz. Physical Science, Bio Science, Social Science, Management Science, etc.
- In India, common Informatics programs are mainly Geo Informatics, Bio Informatics, Health Informatics.

## CONCLUSION

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. Informatics also started with different nomenclature viz. Informatics & Analytics, Informatics & Communication, Informatics and Information Management, Bio Medical Informatics, Informatics & Information Systems, etc. Even in domain centric Informatics, the merged title noticeable viz. Bio & Health Informatics, Geo & Environmental Informatics, etc. In India also use of the term Informatics is increasing both at Government and Private categories.

## REFERENCES

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. Goldberg-Kahn, B. and Healy, J.C. 1997. Medical informatics training in pathology residency programs. *American Journal of Clinical Pathology*, **107**(1): 122-127.
4. Gupta, D. and Gupta, N. 2012. Higher education in India: structure, statistics and challenges. *Journal of Education and Practice*, **3**(2): 17-24.
5. Henricks, W.H., Boyer, P.J., Harrison, J.H., Tuthill, J.M. and Healy, J.C. 2003. Informatics training in pathology residency programs: proposed learning objectives and skill sets for the new millennium. *Archives of Pathology and Laboratory Medicine*, **127**(8): 1009-1018.
6. Kapur, D. and Mehta, P.B. 2004. Indian higher education reform: From half-baked socialism to half-baked capitalism. *Center for international development working paper*, 103.
7. Nambissan, G.B. and Rao, S. (Eds.). 2013. *Sociology of education in India: Changing contours and emerging concerns*. New Delhi: Oxford University Press.
8. Nikolov, R. 1987. Integrating informatics into the curriculum. *Education and Computing*, **3**(3): 269-74.
9. Paul, Prantosh Kumar and Poovammal, E. 2013. Information Service vis-a-Vis Online and Cloud Environment in 21<sup>st</sup> Century: Promoting Environmental & Bio Informatics. *Journal of Chemical and Pharmaceutical Sciences*, **9**(4): 3164-3168.
10. Paul, Prantosh Kumar. 2013. Business Informatics: Emerging Domain of Interdisciplinary Information Science with Possibilities in I-Schools. *International Journal of Marketing Theory*, **3**(2): 113-120.
11. Paul, Prantosh Kumar. 2013. MSc-Information Science [Geo Informatics]: Overview emphasizing twoproposed curriculum for sophisticated GeoSpatial development in *International Journal of Pharmaceutical and Biological Research (IJPBR)*, **4** (5): 218-227.
12. Paul, Prantosh Kumar and Dipak Chaterjee. 2013. Retail Informatics: The Wonderful Cluster of Information Science and Marketing Management. *SIT Journal of Management*, **3**(11): 89-95.



13. Paul, Prantosh Kumar, Jhuma Ganguly and Ghosh, M. 2013. Chemical Information Management powered by Chemo-Informatics: Possibilities and opportunities emphasizing need and way in Academics and Universities. *Current Trends in Biotechnology and Chemical Research*, **3**(2): 137-141.
14. Paul, Prantosh Kumar, A. Bhuimali and Dipak Chaterjee. 2016. Retail Informatics: Basics and Emerging Scenario with Special Reference to Design and Development of Proposed MSc-Information Science (Retail Informatics) in Indian Scenario. *International Journal of Information Dissemination & Technology*, pp. 140-144.
15. Paul, P.K. and Aithal, P.S. 2017. Bio Informatics in private universities in India: An Emerging Study on promotion of Biological Information Sciences in Higher Education in Proceedings of National Conference on Innovations and implications in Information Technology, Management, Social Sciences and Education, pp. 84-92.
16. Paul, P.K. and Aithal, P.S. 2017. Bio Informatics in Private Universities in India: An Emerging Study on Promotion of Biological Information Sciences. *International Journal of Bioinformatics and Biological Sciences*, **5**(1): 1-7.
17. Paul, P.K. and Aithal, P.S. 2017. Informatics as a Branch in Indian Academics with Case of Private Universities: Emphasizing Biological Information Sciences. *Current Trends in Biotechnology and Chemical Research*, **7**(1-2): 37-42.
18. Paul, P.K., Aithal, P.S. and Bhuimali, A. 2017. Business Informatics: A possible specialization of MSc-Information Science & Technology (IST): Challenges and Opportunities in Developing Countries Context. *International Journal of Recent Researches in Science, Engineering & Technology*, **5**(10): 54-63.
19. Paul, P.K., Bhuimali, A., Aithal, P.S. and Dangwal, K.L. 2017. Quantum Information Science-The Domain of Future Informatics Practice: Emphasizing Possibilities, Challenges and Academic Scenario. *International Journal of Scientific Research in Physics and Applied Sciences*, **5**(5): 22-26.
20. Paul, P.K., Bhuimali, A. and 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.
21. Paul, P.K., Aithal, P.S. and Bhuimali, A. 2018. Business Informatics: With Special Reference to Big Data as an emerging Area: A Basic Review. *International Journal of Recent Researches in Science, Engineering & Technology*, **6**(04): 21-27.
22. Sood, R. and Adkoli, B.V. 2000. Medical education in India—problems and prospects. *J Indian Acad. Clin. Med.*, **1**(3): 210-212.
23. Sohani, N. and 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.
24. Supe, A. and Burdick, W.P. 2006. Challenges and issues in medical education in India. *Academic Medicine*, **81**(12): 1076-1080.
25. 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.
26. 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.

