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Editors

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Springer

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Preface

The 4th International Conference on Research in Intelligent and Computing in Engineering, popularly known as RICE 2019, was held on August 08–09, 2019 in Hanoi University of Industry (HaUI), Hanoi, Vietnam.

The Fourth edition of RICE 2019, organized by the Electronic Engineering Faculty of the HaUI, provides an international forum which brings together the researchers as well as the industry practitioners, who are actively involved in the research in fields of intelligent computing, data science, or any other emerging trends related to the theme covered by this conference. RICE 2019 provided an opportunity to account state-of-the-art works, to exchange ideas with other researchers, and to gather knowledge on advancements in informatics and intelligent systems, technologies, and applications.

This conference has technical paper sessions, invited talks, and panels organized around the relevant theme. RICE 2019 was the event where the author had the opportunity to meet some leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science and Technology.

RICE 2019 received a huge response in terms of submission of papers across the countries. RICE 2019 received papers from various countries outside Vietnam such as India, China, Russia, Australia, New Zealand, and many more. The Organizing Committee of RICE 2019 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and 118 papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published as one volume in *Advances in Intelligent Systems and Computing*, Springer, indexed by ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar, and Springerlink.

We convey our sincere gratitude to the authority of Springer for providing the opportunity to publish the proceedings of RICE 2019.

To realize this conference in 2019, we really appreciate Hanoi University of Industry to host the conference and to be continuously supporting the organization team during the preparation as well as 2 days of the conference. In addition, we

would like to give a special thanks to Vintech City, a member of Vingroup, that has supported the conference as a diamond sponsor. We would also like to thank the financial support of ASIC Technologies to RICE 2019. Without their support, this conference would have not been successful as the first time being held in Vietnam.

Our sincere gratitude to all keynote address presenters, invited speakers, session chairs, and high officials in India and Vietnam for their gracious presence in the campus on the occasion.

We would like to thank the keynote speaker as Prof. Vijender Kumar Solanki, CMR Institute of Technology, Hyderabad, TS, India; Dr. Le Hoang Son, VNU, Hanoi Vietnam; Dr. Kumbesan, Australia; Dr. P K Pttanaik, KIIT Bhubaneswar, Odisha, India; Dr. Rashmi Agarwal, MRIIS, Haryana, India for giving their excellent knowledge in the conference.

We would like to thank the reviewers for completing a big reviewing task in a short span of time.

We would also like submit our sincere thanks to the program committee members such as Dr. Le Van Thai, Dr. Hoang Manh Kha, Dr. Nguyen Thi Dieu Linh, Dr. Phan Thi Thu Hang, Dr. Tong Van Luyen—Electronic Engineering Faculty of the HaUI; Prof. Tran Duc Tan—Phenikaa University, Vietnam; and Dr. Raghvendra Kumar, GIET University, Gunupur, Odisha, India for their efforts to make congress success.

Moreover, we would like to thank all the authors who submitted papers to RICE 2019 and made a high-quality technical program possible. Finally, we acknowledge the support received from the faculty members, scholars of Electronic Engineering Faculty of the HaUI, officers, staffs, and the authority of Hanoi University of Industry.

We hope that the articles will be useful for the researchers who are pursuing research in the field of computer science, information technology, and related areas. Practicing technologists would also find this volume to be a good source of reference.

Hyderabad, India
Ha Noi, Vietnam
Huddersfield, UK
Bhubaneswar, India

Vijender Kumar Solanki
Manh Kha Hoang
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Intervention of Smart Ecosystem in Indian Higher Education System: Inclusiveness, Quality and Accountability



Arindam Chakrabarty, Mudang Tagiya and Shyamalee Sinha

Abstract In the knowledge age, the human society largely depends on both inclusive growth and superior quality of higher education system. The world is transforming very fast and it tends to celebrate the fourth industrial revolution that extends from the information processing and automation to the extent of replication of human intelligence. The emerging protocol of artificial intelligence, RFID, cloud computing, block chain and machine learning are the gamut of resources which essentially would embody the teaching–learning process more effective and result-oriented. In India, the use of e-resources like MOOC, e-learning, Swyam have been experimented and they enjoy popularity and success among the users. However, the higher education system of the country is severely compromised by regular flow of information and databases. It is affecting the quality of teaching–learning process and research. It is high time to have a centralized database reservoir which would contribute to every learning organization, irrespective of government, private or NGO. The database would be collected and preserved by a national e-resource portal which could be accessed by any individual or institution with or without any processing fees; otherwise the direction and continuum of academia and research would have to be severely affected. The present study has attempted to showcase how the various e-resources are integrated into Indian education system. The paper would also approach and present a prototype model on how a comprehensive e-resource portal can be developed and optimized to ensure collection, preservation and access of data set.

Keywords Higher education • Smart ecosystem • e-resource portal • Inclusive growth • Accountability

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1 Introduction

1.1 India and Higher Education

During the ancient era, the scenario of Indian education consists of ‘*Gurukul System*’ which mainly concentrated on education to developed knowledge. The *Guru* (referred to the teacher) will train their ‘*Sishya*’ (referred to the students) through yoga, meditations and various standards. The early education system in India eventually got unnoticed due to series of invasions and dispute in the country. In the beginning of modern age, the Islamic influences improved the outdated education centers and brought in the broad domains, like geography, administration, law, arabic, mathematics and so on, into India. Colonial rulers who ruled India brought a significant transformation in the higher education system. It was the British who set up the formal system of higher education dedicated to the disciplines, like *languages, literature, history and philosophy*. In India, the higher education system started to grow rapidly after independence. The study shows that during the year 1980, there were 132 universities and 4738 colleges, enrolling around 5% of the eligible age group in higher education. The total number of educational institutions in India was four times higher than the overall number of institutions present in both United States as well as Europe. Today, India is advancing toward modernization, technology, communication, education and economic growth. It is giving a tough competition to other developed nations in the field of high-tech industries, such as agriculture, medical, information technology, energy and power, and biotechnology to drive the nation to opulence. In the present day, Indian higher education system holds an important place in the global education industry. India has one of the largest networks of higher education institutions in the world and is the third largest in the world. The UGC—an apex body established in the year 1949—essentially deals with the setting up and maintenance of standards in higher education throughout the nation on a uniform basis. The Central Government has been playing a key role in providing overall policy directions and thus acts as a vital link between the policy-making bodies of the government and institutions of higher education. With the introduction of various policies on higher education and subsequent programs undertaken to operationalize the policy has significantly impacted the growth and development of higher education in India. The important landmarks in the evolution of policy in higher education are as under:

Evaluation of Higher Education Policy in India	Year
University Education Commission	1948–49
Education Commission	1964–66
National Policy on Education	1968
Policy on Education (Draft)	1978

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Evaluation of Higher Education Policy in India	Year
National Commission on Teachers-II	1984
Challenge of Education: A Policy Perspective	1985
National Policy on Education	1986
National Policy on Education: A Program of Action	1986
National Policy on Education: A Program of Action	1992

Source IGNOU study material for PGDHE (MES-101, Block-2, Unit-6, pp. 23

1.2 *Emphasis on ICT in the Higher Education Policy*

In the year 1984–1985, the need of ‘*Information and Communication Technology*’ (ICT) in education sector has been recognized in India. It was realized when the program called *Computer Literacy and Studies in Schools* (CLASS) was introduced on experimental basis, and the project was later on adopted as a centrally sponsored scheme during the seventh Five-Year Plan (1993–1998). Eventually, the scheme was extended in eighth plan to provide financial grants to institutions covered earlier and to include new government-aided secondary and senior secondary schools. The financial assistance included annual maintenance grant and purchasing equipments for new school. During this period 2598 schools were covered. In the mid-1998, the information technology and software development (IT taskforce) came into the picture for the purpose of recommendations on introduction of IT in education sector including school. The report recommended the provision of computer system to all educational institutions up to higher secondary schools by appropriate investments (about 2–3%) of total budget during the next five years. During the year 2001–2002, a revised class scheme was introduced by making the provision of Rs. 845 million on recommendation. The applications of ICT for quality improvement were also included in Government of India flagship program on education, viz., Sarva Shiksha Abhiyaan (SSA).

2 Literature Review

[1] ICT in Indian University and colleges shows the revolution of higher education in the nation, in terms of access, equity and quality with the application of ICT in education. The various prospects and challenges posed by amalgamation of ICTs in various aspects of higher education in the present scenario are discussed and factors regarding future development in ICT in education sector are also highlighted.

Information and communication technology (ICT) plays a major role in supporting powerful, efficient management and administration in education sector. It is stated that ICT may use right from student management to various resource management in an education institution [2].

The e-learning and pedagogical innovation framework at Leicester provided a proper stage for the number of formal and informal discussions required to develop an e-learning strategy for the university [3].

ICT evolves as an instrument toward advanced knowledge. As learning tool, that is, ICT, it enhances the human intellectuals and capabilities in solving problems, helping and benefiting the students in gaining and increasing knowledge, and promoting the faculties, teachers, trainers and administrators in improving teaching and learning. This technology has also incorporated the knowledge and skills required to effectively use ICT as a tool [4].

Even though the application of ICT is not the answer for all the challenges faced by higher education systems in the region, it does leverage and extend conventional teaching and learning activities, and has the potential to positively influence on learning [5].

The application of information and communication technology (ICT) in higher education system has resulted in shifting from teacher-centered delivery and transmissive learning to student-centered learning. ICT acts as a channel of information, and intellectual tools have been supporting and serving the students to be mature enough and become responsible toward learning [6].

3 Objectives of the Study

- I. To explore the application of smart eco-system in Indian higher education system.
- II. To formulate integrated and smart strategy framework for sharing information through the man-machine interfaces across the country.

4 Research Methodologies

This study conceptual in nature is based on information collected from secondary sources like reports, journals and so on. The paper attempts to understand the present scenario of smart eco-system used in higher education system in India and attempts to

formulate a schematic model where the advance smart eco-system would be deployed the available resources to enhance quality of the higher education.

5 Analysis and Interpretation

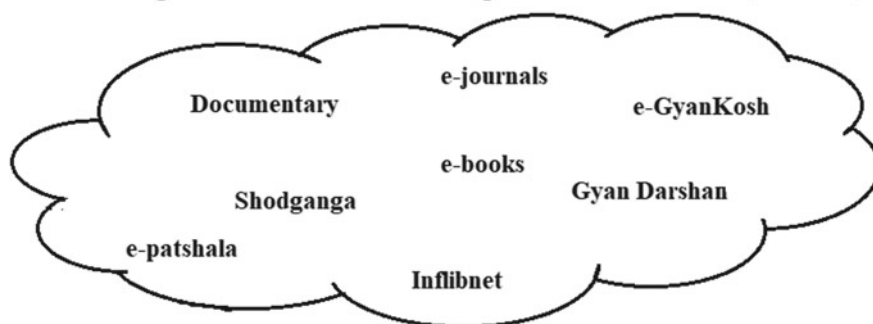
5.1 Analysis—I

Various e-resources on education	
E-resources from MHRD supported programs	Other learning resources
NPTEL (https://nptel.ac.in/)	Digital Teaching and Learning Resources for PwDs (http://www.ayjnihh.nic.in/Digital_teach_resources.asp)
Virtual Labs (http://www.vlab.co.in/)	LILA Hindi Pravah
Spoken Tutorial (https://spoken-tutorial.org/)	Physics—Mysterious Magnetism (http://www.youtube.com/watch?v=wKdqCqTzSnI&list=PLdm-2_AHi21QoOEbiVEMty8vy6yS3UWF3&index=4)
The Consortium for Educational Communication (http://cec.nic.in/Pages/Home.aspx)	Astronomy—Eclipse (http://www.youtube.com/watch?v=Q1yq2LpQ-Qc&list=PLdm-2_AHi21QoOEbiVEMty8vy6yS3UWF3&index=28)
e-Yantra (https://www.e-yantra.org/)	Astronomy—Day and Night
e-ShodhSindhu (www.inflibnet.ac.in/ess/)	Khan Academy
FOSSEE (Free and Open Software in Education) (https://fossee.in/)	CS Unplugged
	Coursera
	Udemy (http://www.youtube.com/watch?v=Q1yq2LpQ-Qc&list=PLdm-2_AHi21QoOEbiVEMty8vy6yS3UWF3&index=28)
	MITOCW (https://www.edx.org/)
	LEARNING SPACE:THE OPEN UNIVERSITY (https://www.open.edu/openlearn/)
	Vidya Online (http://www.vidyaonline.net/index.php)

Source <http://vikaspedia.in>

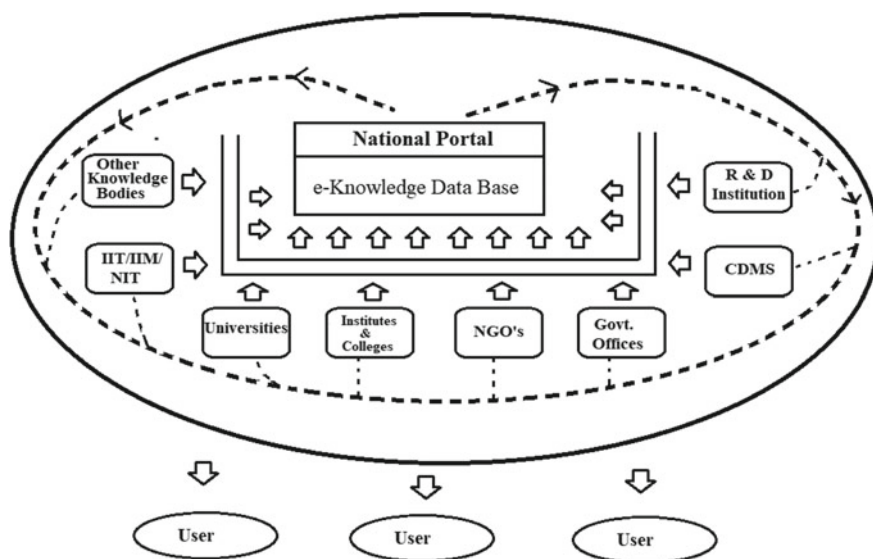
India has been using e-education resources since early twenty-first century. The application of ICT has been pioneered in a few open and distance learning program and online courses offered by both govt. and private enterprises with the pace of phenomenal growth in satellite technology, access to the internet and even high-configuration mobile usage. The importance of e-resources has been well thought and adopted. The indicative list of popular e-education resources in India is mentioned below:

Existing e - education resources in Higher Education of India (Indicative)



5.2 Analysis—II

The growth of higher education system largely depends on creation of new knowledge, development of contents, smart dissemination process and application-based research. In India, various sectors and agencies are working in their respective domains but observations, outcome and experiences are not adequately shared among all its partner, stakeholders and users. These create massive hindrance for the learners, researchers and the implementing agencies to achieve success in their respective intellectual pursuits. The lack of data support or exchange leads the society toward policy paralysis. India is in the alarming position where all the knowledge-generating, policy-making and research organization need to interact freely with their databases, sharing of experiences and critical observations. The paper has coined this urgency and has attempted to device an integrated e-resource portal which would perform the task of continuous data collection, preservation, its uninterrupted flow of processing across the entire stakeholders.



Modus Operandi of the Proposed Model

Step—I: Creation of a dedicated e-knowledge national portal/database. It can be created by appropriate enactment of law and with the consortium public–private partnership (PPP).

Step—II: All the knowledge bodies, institutes, private enterprises, non-government organization, govt.–pvt. establishments and so on compulsorily need to share their database, particularly R&D, process outcomes, achievements experiences or observations to the said national portal on regular interval. All the contributing institutional entities may be connected through appropriate network topology or modern gateway. It could also use the flowchart of electronic data interchange (EDI).

Step—III: All the data set/information would be collated, correlated and preserved so that the user's community across the nation can benefit from this system. However, access to the database may be free of cost or partially chargeable as the case may be depending on the rigor and cost implication of data procurement and its preservation. However, this national portal may exclude the information pertaining to security issues of the country, as well as the product/process secrecy, and others forms. In fact, the national portal would collate and preserve all the published information or documents in an integrated, coherent and synergic orientation.

Step—IV: The user may have to either subscribe with the portal or have to purchase the database if it is chargeable.

In the present context of Indian higher education system, it is difficult to access panel data or cross-sectional data, due to lack of integration of data across the stakeholders on a particular field of inquiry. The standard deviation and variation in data collected from different sources on a particular set of measurable attributes and entities sometimes appear to be very high. Few organizations that generate and

preserve database hardly share with the common users whether it is inaccessible, limitedly accessible or very costly for use. There are issues in generating particular set of database on regular intervals. The question of real-time data management is insignificantly exercised. In the corporate sector, the transparency and disclosure of information are limited and highly concentrated among few big players. All these catastrophic features of data generation, preservation and excess mechanism have largely affected the quality of higher education, teaching–learning and dissemination process. The research activities are severely compromised because of lack of availability or access to relevant data set. This paper has devised a comprehensive and nationwide data management ecosystem which would collate, collaborate and integrate all the relevant stakeholders for generating, preserving and sharing the platform for the users. The proposed national e-portal would ensure the authenticity, reliability of dataset and avoid data redundancy. This would ensure incremental access to such dynamic database platform which would trigger for achieving higher inclusive education. The projected model would perform the task of validating and integrating the database with higher precision and reliability which would ensure superior quality of knowledge exchange. As the system is reinforced by all the stakeholders of the country representing various segments of economy and intellectual acumen, the system is committed toward creating high-end value in the process of creating of knowledge and its dissemination, which shall reaffirm the spirit of accountability.

6 Conclusion

Information is the most decisive factor for success, particularly in the era of knowledge economy. Even in the ancient time the battle was fought among kings and the winning party did not conquer not only because of its marshal but of its strength in information search. This paper has shown the growing trend of using e-resources in the process of teaching–learning dissemination and research, particularly in the Indian context. However, there is lack of integrated approach to collate, preserve and share all the pertaining data sets among its users and stakeholders. This paper portrays a model solution by integrating all contributory institution with the national portal and in return the propagation of data flow from the portals to individual and institutional users with free access, limited access or paid access mechanism so that without compromising the sovereignty, security issues of the nation and without affecting the patent, copyright and commitments the country can foster high-end academic environment and experience the frontiers of research outcome.

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