

Information Dynamics and Knowledge Management in Science & Technology

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Abstract. This paper describes the current information dynamics and its effect in higher education and research in Science & Technology. Open Access movement, Institutional Repositories, Digital Libraries, Knowledge Gateways, Blogs, Wikis and Social Bookmark Tools have rapidly emerged on the Web creating a new scenario that radically changes the knowledge production process such as the creation of information, formats & sources of information, coding & processing, accessing, managing, sharing and dissemination of information. The management of knowledge created by academia of Cochin University of Science & Technology is examined in this challenging context of information dynamics.

Keywords: Institutional Repository, Knowledge management, Information Dynamics

1. Introduction

Information is considered to be a building block of knowledge and knowledge is power. The advancement of Information and communication technology (ICT) has made a rapid growth leading to information overload or flood of information. The academic institutions and R&D institutions are producing huge volume of scientific data in different formats. The transformation of these data to useful information is known as 'Knowledge'. To leverage knowledge, institutions need a knowledge management and sharing network that can meet the demands of the rapidly changing information scenario. The knowledge sharing network is accomplished by sharing and capturing knowledge among the scientific community over the globe.

Information is not static; it is ever growing. Scientific community is always producing huge volume of scientific data from their

experiments, observations, tabulations, cognitions etc. which is transformed into information. Processed information leads to knowledge by communicating this information as scholarly publishing. Again these knowledge/information can help the cognitive processes and problem solving skill of scientific community which leads to creation of new data, information and knowledge.

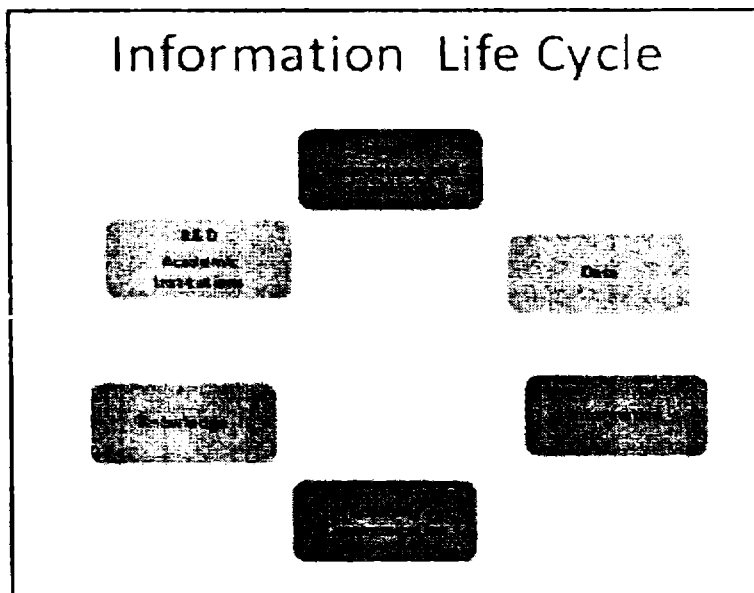


Figure 1. Information Life Cycle.

2. Information

Information in simple words may be defined as: facts provided or learned about something or someone. Information is a stimulus that has meaning in some context for its receiver. When information is entered into and stored in a computer, it is generally referred to as data. After processing (such as formatting and printing), output data can again be perceived as information.

2.1. Information Landscape of Science & technology

E-journals, e-books, e-databases, Institutional/open repositories, open archives, knowledge gateways, open courseware, open archives, blogs, reference managers, peer-to-peer communications, Web 2.0, social networks, social bookmarking, wikis etc.

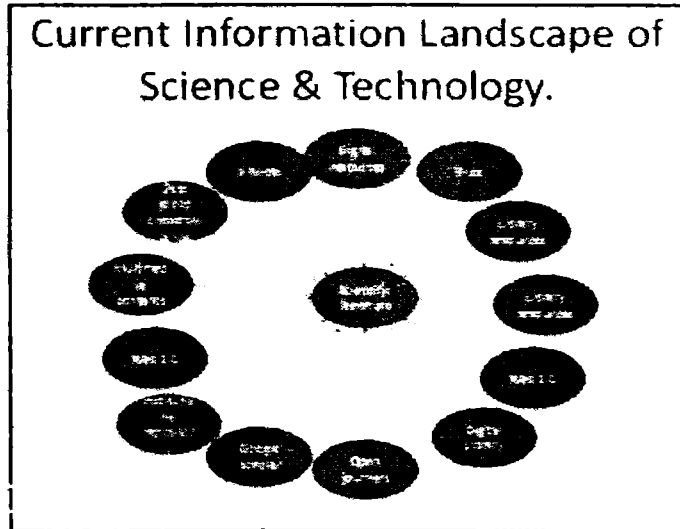


Figure 2. Information Landscape of Science and Technology

2.1.1 Information Dynamics

Information dynamics is not single entity, thus cannot be defined in simple terms. It is the overall performance or changes that happened in the creation of information, processing or coding of information, managing and sharing of information by collaboration, and dissemination or retrieval of information to the right person at right context. Depending on the understanding of information, different types of information dynamics are defined by Floridi as: "(i) the constitution and modeling of information environments, including their systemic properties, forms of interaction, internal developments, applications, etc.; (ii) information life cycles, *i.e.*, the series of various stages in form and functional activity through which information can pass, from its initial occurrence to its final utilization and possible disappearance; and (iii) computation, both in the Turing-machine sense of algorithmic processing, and in the wider sense of information processing. This is a crucial specification. Although a very old concept, information has finally acquired the nature of a primary phenomenon only thanks to the sciences and technologies of computation and ICT (Information and Communication Technologies). Computation has therefore attracted much philosophical attention in recent years."

2.2 Knowledge

Knowledge may be defined in many ways: information and skills acquired through experience or education; the theoretical or practical understanding of a subject; what is known in a particular field or in total; facts and information. When information is packaged or used for understanding or doing something, it is known as knowledge.

2.2.1 Knowledge management

Knowledge management (KM) involves data mining and some method of operation to push information to users. According to (Drucker 1999) KM is about making the right knowledge available to the right people. Another definition is presented by Davenport & Prusak (2000), which states that KM is "managing the corporation's knowledge through a systematically and organizationally specified process for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value." Advancement of computer networks, information and communication technologies (ICT) have changed the way of communications of scientific literature. Open archives and institutional repositories supported self archiving and collaborative resource sharing. Knowledge gateways or bibliographical information systems provide the facility for coupling of citations and supports to find experts in research areas and current collaborations happening within the campus and across the globe. It promotes research of a department, school, or research group and provide increased visibility of campus research and reuse of publication data. Collaborative research enables researchers to bring together different set of knowledge and cognitive approaches (Stephen 1996). The interaction between researchers from different disciplines is expected to lead to the creation of new knowledge. Blogs, wikis, social bookmarking, tagged information *etc.* adds semantically meaningful information to the web. These IR, knowledge gateways, Google scholar *etc.* will provide access to tagged and meaningful linked information which will lead to meaningful retrieval of information.

3. Knowledge Management Strategy at CUSAT

Cochin University of Science & technology (CUSAT) is a premier institution in India promoting Science & Technology education and research. CUSAT has developed cost effective strategic solutions for

managing its intellectual outcomes and sharing it for promoting collaborative research across the globe through its institutional repository, Bibliographical Information System for Science & Technology (BISSAT) and Traditional Knowledge Digital Library (TKDL) and media repository.

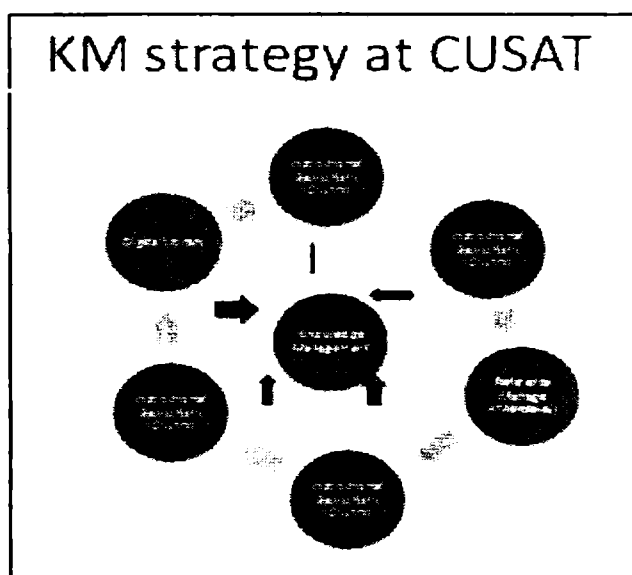


Figure 3. Knowledge Management Strategy at CUSAT.

3.1 Institutional repository (IR)

Cochin University of Science & Technology has initiated the creation of an institutional repository called "*Dyuthi*" (<http://dyuthi.cusat.ac.in>) with the financial assistance from Department of Scientific and Industrial research (DSIR), Government of India, and University Grants Commission (UGC). It is powered by open source software DSpace, developed by MIT and HP. *Dyuthi* in Sanskrit means *Spark*. *Dyuthi* is a electronic service that collects, preserves, and distributes digital material. Repositories are important tools for preserving an organization's legacy; they facilitate digital preservation and scholarly communication. *Dyuthi* archives the intellectual output of the CUSAT faculty, research scholars and scientists. This service enables the Cochin University community to archive the the intellectual outcomes such as preprints, reprints, theses, conference proceedings, teaching and learning materials and other scholarly publications. This repository is running completely on open access policy and technically compatible

with OAI-PMH which supports the metadata harvesting from other IR. Google scholar is indexing the contents from *Dyuthi*.

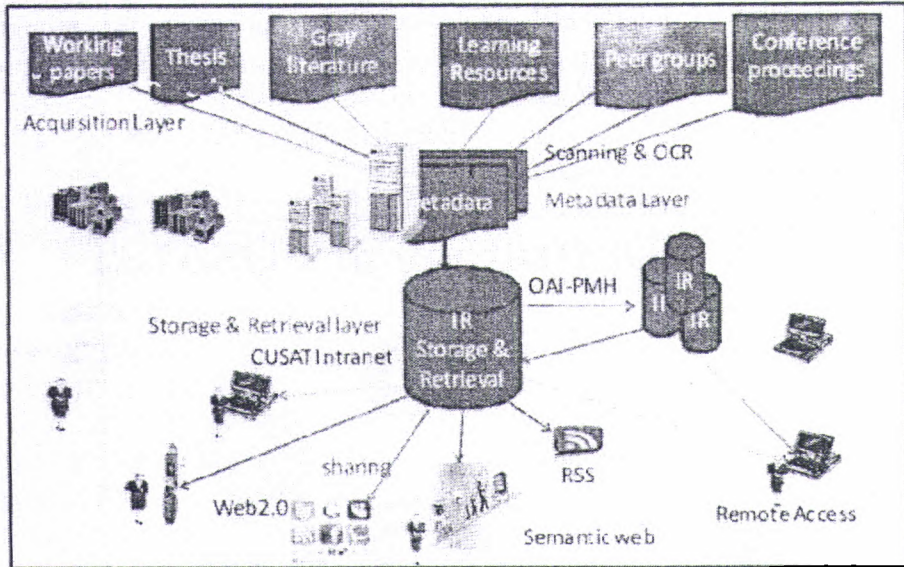


Figure 4. Institutional Repository

3.2 Knowledge Gateway (BISSAT)

Knowledge gateway of Cochin University of Science & Technology is developed under *Dyuthi* project, it is powered by open source software BibApp called Yuj. *Yuj* is a Sanskrit word meaning unite or join together/ togetherness. It aims to find experts on campus, archive their work, promote the research of a research group, department, school, promote collaborative research in the campus, increase the visibility of campus research, facilitate the reuse of publication data *etc*. Yuj covers the bibliographical information system with citation and abstracts of scientific productivity of Cochin University of Science & Technology

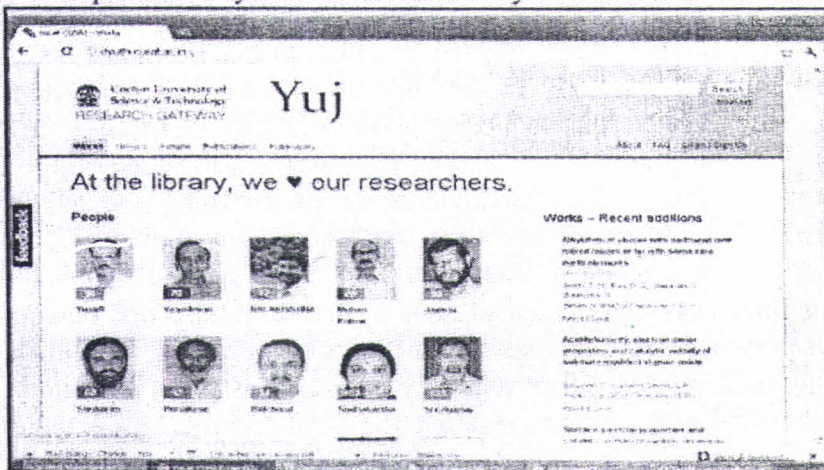


Figure 5. Scientific Productivity of CUSAT

3.3 Media repository (Media@cusat.ac.in)

MediaCore provides unparalleled organization, statistics, accessibility, and scalability. Well-designed and well-engineered, it can bring a powerful online video experience. *MediaCore* provides an exceptional experience to any site delivering media to its users. *MediaCore* can be used to organize video and podcasts, engage users and deliver content to both desktop and mobile devices. For organizations with video located on the social web and on its own servers, it can centralize everything onto one common brand-ready platform.

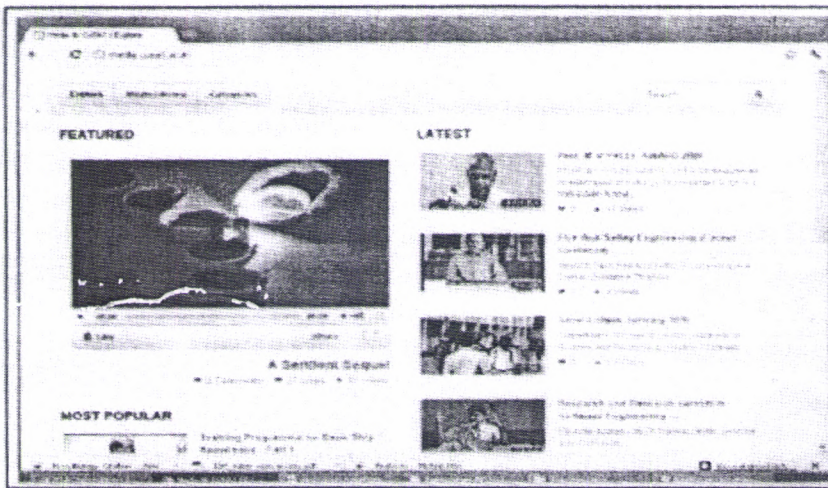


Figure 6. Media Repository

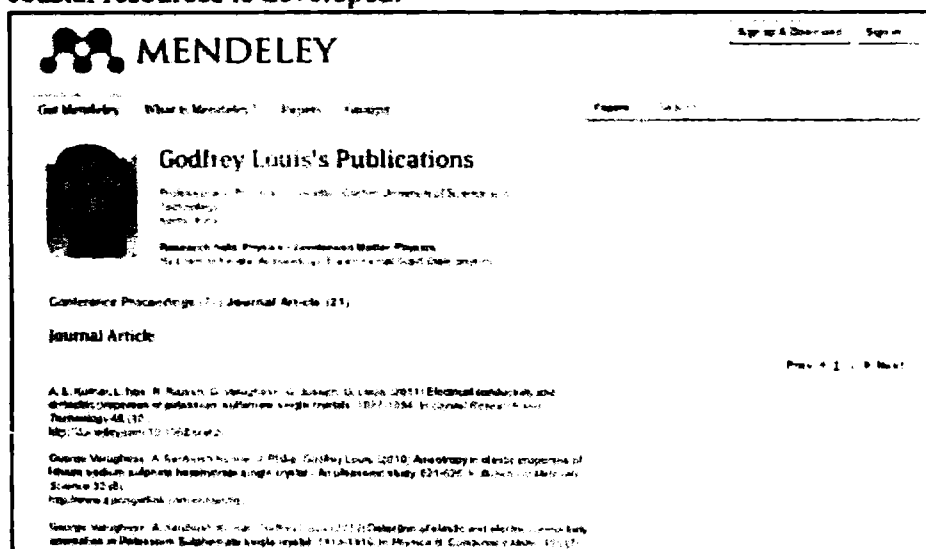
3.4 Reference Manager for Knowledge Management

This is a free tool for managing the academic research namely Mendeley. It supports the comprehensive search and navigation of a particular research library through relevant fields like Author, Title, Publisher and Journal. This open access tools supports the collaborative research in Science & Technology by supporting connectivity with other researchers: inviting colleagues to Mendeley; joining or creating new research groups. It helps to access the research statistics and make researchers profile and newsfeed to public.

3.5 Traditional Knowledge Digital Library (TKDL)

TKDL of CUSAT covers the traditional knowledge used by the fishermen community for their occupation related activities such as prediction on the availability of fish species and their migration.

weather forecasting and assessing the suitability for venturing into the sea, disaster prediction and communicating warning signals, demarcation of fish habitats and its periodic changes, scouting fish aggregating locations, fish shoal detection, use of various marine organisms for curing various diseases seen among coastal communities, the dependence on marine organisms as the rich source of wonderful drugs by the coastal community, knowledge used by the traditional community for the management and conservation of fishery resources etc. These traditional knowledge were inherited by the coastal communities from their forefathers and were used for the well being of the community as well as for managing the coastal fishery resources. These *grandmas's* knowledge will be documented and linked with the available scientific knowledge now available and a Traditional Knowledge Digital Library (TKDL) of the blended information of coastal resources is developed.



The screenshot displays the Mendeley Reference Manager web interface. At the top, the Mendeley logo and name are visible, along with navigation links for 'Sign up & Download' and 'Sign in'. Below the header, there are tabs for 'Get Mendeley', 'What's Mendeley?', 'Features', and 'Support'. The main content area is titled 'Godfrey Louis's Publications'. It features a profile picture of a man and a list of publications. The first publication is 'A. S. Kumar, L. Beena, R. Rajan, G. Venugopal, G. Anand, G. Louis (2011) Electrical conductivity and dielectric properties of potassium sulfonate single crystals. (2011-2014). In Journal Research and Technology 48, (10). <http://dx.doi.org/10.1162/rt.2011.48.10.1162>'. The second publication is 'George Marudhara, A. Anandharaman, J. Pradeep, Godfrey Louis (2010). Anomalous dielectric properties of lithium sodium sulphate hexahydrate single crystal: An advanced study. (2010-2011). In Journal Research and Technology 47, (10). <http://dx.doi.org/10.1162/rt.2010.47.10.1162>'. The third publication is 'George Marudhara, A. Anandharaman, J. Pradeep, Godfrey Louis (2010). Determination of static and electric conductivity of Potassium Sulphate hexahydrate. (2010-2011). In Physics B: Condensed Matter 400, (1-3): 1-3.

Figure 7. Reference Manager for knowledge management

4. Conclusion

Implementation of institutional repository, knowledge gateway, Reference Manager (Mendeley) and media repository using open source tools for effective management of intellectual output of the researchers of Cochin University of Science and Technology is explained. There is a tremendous scope for improving information management using open access tools and techniques. This paper covers a small initiative in this direction and real time experience of managing

the information and knowledge produced by Cochin University of Science and Sechnology. This can be implemented in many libraries to develop a national & international collaboration on the basis of own subject discipline.

Acknowledgements

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