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Digital Humanities in the Context of Library and Information Science

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ABSTRACT

This paper is an attempt to explore the scope and origin of the new domain 'Digital Humanities (DH)' in the context of library and information science. Besides, author also mentioned other two modes of origin of the subject DH. It also stated the role of librarians for the development of DH. It was basically theoretical research where author used desk research technique through analysing published literature on the domain. The main gap in literature review which author identified was 'mode of formation of the subject DH from LIS point of view'. Author here tried to match between the librarians' acquired knowledge base with need of DH scholars and pointed out the areas where LIS professionals can contribute toward developing DH. Finally, author theoretically developed a model to explain the origin of the subject DH from in the context of LIS domain and also presented other two existing concepts in a very simple, graphical ways.

Keywords: Digital humanities; Humanities computing; Methodological commons; Mode of formation of DH; Relational architecture of DH; Library centric DH

1. INTRODUCTION AND BACKDROP OF THE CONCEPT

As we know that any subject is basically an open system. Its development and ramification depend on the change in the environment. Change with time is only constant. Humanities as a subject is not the exception. At the end of 20th century, we have entered the digital networked environment. At the beginning, digital technologies acted as a tool for social science and humanities. However, with time this tool is slowly and steadily becoming an integral part of the subject and new subject domain has evolved as Digital Humanities (DH). Digital humanities is also called "humanities computing". Digital humanities is an interdisciplinary field that combines computational methods with the study of humanities and social sciences. It involves the use of digital tools and techniques to analyse, store and share cultural objects and data. Digital humanities as a subject includes many activities, including data mining, text analysis, web publishing, and digital archives. Various sub-domains of humanities are experiencing the impact of ICT in the context of education and research.

Received : 26 February 2023, Revised : 10 May 2023 Accepted : 06 July 2023, Online published : 04 September 2023 After the invention of digital computers, all the knowledge domains are experiencing its effects and their connotation and denotation have changed. The ICT is now not at all a tool but the integral part of virtually all the domains, humanities and social science are not the exception. As a result, new domain has evolved - Digital Humanities (DH).¹

Digital Humanities is an interdisciplinary subject which welcomes researchers from a variety of subject backgrounds, including computer science, history, literature, anthropology, and linguistics. It promotes cooperation and exchange, encouraging researchers to work together on complex problems that require different expertise.

Before going to main concern. We should know the background of the development of the concept 'Digital Humanities. The term "digital humanities" was first coined in the 1940s by Father Roberto Busa, an Italian Jesuit priest and scholar. He used the term to describe his work in using computers to make a tune to the works of St. Thomas Aquinas. Busa's pioneering work laid the foundation for the use of digital tools in humanities research and paved the way for the development of the field of digital humanities. In 1946, we found first publication of a journal 'Computers and Humanities' and later in 1986, to supplant this journal, new journal

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Figure 2. Use of terms 'Digital Humanities' and 'Humanities Computing' during 1934.



Figure 3. Use of terms 'Digital Humanities' and 'Humanities Computing' during 2000.

named 'Literary and Linguistic Computing' was started to publish. Another term "humanities computing" was first coined in the 1960s by a group of scholars at the University of Illinois, led by the literary critic and scholar Joseph Raben. Raben and his colleagues used the term to describe their efforts to use computers to analyse and study literature. The term "humanities computing" was later replaced by "digital humanities," which came into wider use in the 1990s and 2000s. However, the two terms are often used interchangeably to refer to the use of digital tools and methods in humanities research.²



Figure 4. Use of terms 'Digital Humanities' and 'Humanities Computing' during 2015.



Figure 5. Use of terms 'Digital Humanities' and 'Humanities Computing' during 2017 and thereafter.

If we see the use of these two terms in published English literature, we can understand the literary warranty of the concepts calculated through Google N-Gram tool. Around 1921, some literature shows the use of the term 'Digital Humanities' but no trace of the term 'Humanities Computing' (Fig. 1). However, during 1934, the scenario is exactly reverse (Fig. 2). Up to 2000, the term 'Humanities Computing' superseded the term 'Digital Humanities' so far the literature is concerned (Fig. 3). Thereafter, up to 2015 huge development of 'Digital Humanities' is noticed than 'Humanities Computing' (Fig. 4). From 2015-2017 we noticed some sort of less use of both the term and thereafter the trends for both the terms are in upward direction, however with due time most of the researchers are using the term 'Digital Humanities' than 'Humanities Computing' (Fig. 5).

The present study is an attempt to understand digital humanities as a subject and its mode of formation from different viewpoints with special reference to library and information science. Here author has tried to delineate librarian's/library's role towards development of the domain digital humanities (DH).³

2. LITERATURE REVIEW

The purpose of the literature review for review article is to thorough study and analysis of previously published literature. But for research paper, the ultimate objective of literature review is to identify the gap area of the previous works and here also need to analyse the relevant literature. Here, author firstly studied, analysed the all literature and after detail analysis he identified the gap in research.

Kamada⁴ published a paper entitled "Digital humanities: Role for libraries?" in 2010. He attended a conference on DH in 2009 and heard some terminologies about DH like metadata, digital archive, XML etc. which are very much related to the LIS domain. Here he given definition and meaning of DH and identified some role of LIS professionals to DH. However, at last he expressed his doubts that whether LIS personnel can assist DH scholars for preparing digital research projects or not. He raised a question - can LIS personnel help for collecting and representing mainly digital data in an organised way fitted for individual DH research project and help for archiving research data in a reusable format?

In 2013, Vandegrift, Micah & Varner, Stewart⁵ conducted a study and discussed about the role of libraries to provide required resources and facilities/ tools for DH research and project development. Finally, he stated that research libraries would be partner in developing DH scholarship.Posner M conducted research work and later on published a paper entitled "No Half Measures: Overcoming Common Challenges to Doing Digital Humanities" in the Library in Journal of Library Administration in 2013. Here author identified some common sources of frustration of LIS personnel engaged in DH work. The factors are lack of proper training facilities, Inflexible infrastructure, too many task in short time, lack of incentive etc. He advocated librarybased DH programs in different framework.⁶ Sula, Chris Alen⁷ wrote an article where he gave a general model comprising of libraries and DH. He conducted a survey about current location of DH working centers and told that DH should be within user-centered paradigm of LIS.

J Erway, R.S.⁸ conducted a research work and concluded that a DH center for every research library is not expected. DH center in library may not fulfill the requirements of DH researchers. Library culture needs to be developed in order to be librarians fit for DH partners. H. Green⁹ studied five case studies and discussed how LIS professionals collaborated with the DH researchers about text encoding text encoding initiative guidelines.

Zhang, Ying, Liu, Shu & Mathews, Emilee¹⁰ conducted research and published a paper entitled "Convergence of digital humanities and digital libraries" in 2015. They found that digital library (DL) components like digital contents, technology, and services should be developed for DH scholars. So, LIS professionals can play important role in DH and concluded that both DL and DH complementary to each other. Another study conducted by Robinson, Lyn, Priego, Ernesto and Bawden, David¹¹ established relationship between DH and LIS. They also focused on the common topics, issues and perspectives. Hoeve, C., Pankl, L., & Crosby, M.¹² published a paper "Digital humanities and librarians: A team-based approach to learning" in the journal "Supporting Digital Humanities for Knowledge Acquisition in Modern Libraries". Here they mentioned DH course at Kansas State University where professors and students of DH course worked together with LIS professionals. Sacco, Kathleen L and et al.13 showed in their study that DH scholars, academicians should do work along with LIS personalities.

Koltay, T.14, published a paper entitled "Library and information science and the digital humanities: Perceived and real strengths and weaknesses" in Journal of Documentation. Here he found that LIS and DH both are interested to study documented work/information and also analysed epistemology of both domains. Poole¹⁵ carried out a research work and discussed DH as a new domain of study and mentioned that DH already made an impact on both library fields and traditional humanities. In 2016, Matusiak, Krystyna K¹⁶ experienced that to cope with the new development of DH courses, LIS professional should transform themselves fit for the requirements of DH scholars. Aarsvold, Nancy, Gonnerman, Kasia and Paul, Jason N¹⁷ conducted a study where they made their expectation towards LIS personnel to conversant in the tools, techniques and resources to manage DH course and DH scholars.

A study conducted by Bell, Emilia & Kennan, Mary Anne¹⁸ in 2021 found that Australian academic library could play active role to contribute knowledge products in DH than just service. Zhang, Yin, Su, Fangli and Hubschman, Brenna¹⁹ analysed 72 job advertisements for the post of DH related works published in Job List during November 2018 to April 2018. They analysed data and found that DH related practical knowledge is required to meet the needs of the DH scholars. Díez, María Luisa Alvite and Barrionuevo, Leticia²⁰ established interrelation between LIS and DH. Zhang, Y., Xue, S., & Xue, Z.²¹ identified two basic roles of LIS professionals i.e. digital collection curation and knowledge creation towards development of DH. They also discussed the collaborative role of DH professionals, librarians and IT specialists.

Suissa, O., Elmalech, A. & Zhitomirsky-Geffet, M.²² carried out a study and published a paper entitled "Text analysis using deep neural networks in digital humanities and information science". Here they found that recent

technologies like Deep Neural Network (DNN), NLP etc. are very much important for text analysis for DH researcher and here LIS persons roles are important. Another work has been carried out in 2022 where W. Yao and P. Xiao²³ mentioned DH librarians whose role would be to maintain liaison among all stakeholders of DH domain.

After analysing all literatures, finally author has identified the gap in research. There is no such study about the mode of formation of the DH domain from LIS point of view. Therefore, author later developed a model to explain origin of DH as per LIS is concerned. Author has also done research work on the overlapped area but from LIS context.

3. OBJECTIVES AND METHODOLOGY

The main objective of the present study is to overall understanding the domain 'Digital Humanities' in relation to LIS domain with special reference to develop a model to explain the mode of origin of subject DH which will be distinct from other existing models. Other objectives are – to explain other models of origin of DH in a very simple way, to identify the role of LIS professions and library towards development of DH research.

As it is basically a review research i.e. semi-review and semi-research paper, author used desk research technique. First, author collected important and recent literatures on DH from the databases - Semantic Scholar, Open Alex, Crossref, Open Citations through the inciteful.xyztool. After going through the detail analysis of the published relevant literature, author prepared the research report to fulfill the objectives. However, for developing the model for the origin of DH, author applied his LIS knowledge base. Therefore, it is semi-review, semi-research or review research article. During background study, author went through the literature review and also took help from Google and where he used the tool Google N-Gram to show the usage pattern of the term 'Digital Humanities' and related term 'Humanities Computing'.

4. MODE OF FORMATION OF THE SUBJECT DIGITAL HUMANITIES

Here I will try to explain the genesis or mode of formation of the subject DH from different viewpoints. Three viewpoints are described as follows.

4.1 Viewpoint-1: Intellectual and Disciplinary Map

In his book "Humanities Computing", McCarty presented a diagram (Fig. 6) to explain the origins of digital humanities. In the diagram, he referred to the term "Methodological Common" or "Computing Humanities" instead of DH. The octagonal shapes above the commons in Fig. 6 represent broad disciplines. On the other hand, the cloudy shapes beneath the methodological commons suggest "permeable bodies of knowledge" which develop socially, even without the presence of departmental or professional aspects. However, McCarty observed that not all disciplines have an equal standing in the field of digital humanities. He noted that history, particularly the history of science and technology, along with philosophy and sociology, are the primary disciplines, while the rest are secondary.²⁴

4.2 Viewpoint-2 Relational Architecture

Paul S. Rosenbloom's "Towards a Conceptual Framework for the Digital Humanities" is a seminal article that proposes a framework for understanding the emerging field of Digital Humanities. Rosenbloom argues



Figure 6. Representation of humanities computing (Adapted from Ref. 24).

that Digital Humanities is not just about the application of technology to traditional humanities fields, but is a distinct mode of inquiry that requires a new conceptual framework. He first identified three domains i.e. physical, life, and social sciences. Later he accepted the immerging of fourth domain-computing. He found that this fourth domain has continuously influencing over other three domains. He proposed a relational architecture to explain the origin of domain digital humanities (DH) (Fig. 7).

In the relational architecture, the four main scientific fields at the highest level of the relational architecture, namely Physical (P), Life (L), Social (S), and Computing (C). Digital humanities involves the relationship between two of these fields, namely Social Sciences and computer science. This relationship can be expressed as S+C or, to specialise it further for digital humanities, as H+C, where Humanities (H) is considered a subarea/ domain of Social Sciences (H \subset S). Additionally, the passage distinguishes between two types of cross-domain relationships: implementation (/) and interaction ($\rightarrow \leftrightarrow$), which may be unidirectional (\rightarrow) or bidirectional (\leftrightarrow).

The act of implementing two domains refers to the combination of processes from one domain with the structures and processes of another domain in a way that makes the processes of the first domain appear in the other. This is illustrated in the physical domain where and social experiences. H/C artifacts can either be digital simulations of existing non-digital objects or unique objects created for their own purposes.

The static humanities are unable to fully utilise computing (C/H). This is because, while dynamic cultural artifacts such as smart phones are capable of computing, books and pictures but books and pictures can't itself. Nonetheless, books and diagrams can offer a depiction or representation of a computer, which in turn creates a simulation. Digital humanities can go beyond merely combining computers and humanities, to also integrate the broader field of computer science and humanities, in order to incorporate the representation of general information by cultural artifacts, otherwise referred to as C/H, into digital humanities.

The interaction between two domains can be either one-way or two-way. When it comes to humancomputer interaction $(S \leftrightarrow C)$, information flows back and forth between the social and computing domains. However, in the field of digital humanities, there are two types of interaction: humanities to computing, which is represented by the computational analysis of cultural artifacts or computational understanding of humanities $(H \rightarrow C)$; and computing to humanities, which is represented by the computational composition or computational shaping of humanities $(C \rightarrow H)$. The



Figure 7. Relational architecture of DH.

the living domain (L/P) is implemented when molecules and their forces combine to give cells their processes. Similarly, in the life domain, social planning (S/L) is implemented when neurons connect in the brain to create thoughts in the mind and coordinate with other parts of the body to generate human behavior. The implementation relationship gives rise to various forms of digital humanities. For example, when computing is used to implement humanities (H/C), we can create digital cultural artifacts such as digital paintings, sculptures, immersive experiences, and digital books. With the nature of computing, a significant portion of the future of H/C is expected to involve activities beyond the visible, such as digital games, video games, computing domain plays an essential role in this interaction because of the relatively unchanging nature of humanities. Researchers who study humanities are referred to as H/S. The analysis of computing artifacts by humanities scholars, as seen in critical code studies, can be represented as $C \rightarrow H/S$. However, if the researcher is a specialist in both humanities and computing, denoted as $(C \leftrightarrow H)/S$, such studies should be represented as $C \rightarrow (C \leftrightarrow H)/S$ instead.

The complicated characteristics of humanities can be illustrated by more elaborate interactions, such as the collaboration of humans and computers for comprehending humanities, which can be denoted as $H\rightarrow H/(C\leftrightarrow S)$. In this scenario, a human-computer entity with proficiency in humanities (C \leftrightarrow S) conducts the analysis of humanities (H \rightarrow), which is expressed as H/(C \leftrightarrow S). If the computer is used as a tool by the researcher, rather than a research associate the expression becomes H \rightarrow (C \leftrightarrow H/S).²⁵

4.3 Viewpoint-3: Library and Information Science

From the LIS point of view the mode of formation of the subject "Digital Humanities" is shown in the Fig. 8. In first order, researchers of multiple disciplines of humanities used to apply the computational techniques as a tool for conducting research in their respective fields and computer science researchers used to apply humanities data in their fields. These have given rise the new areas through the phase relations. Again, in the second order, the computational aspects of these new areas are distilled enough to crystallize as "Digital Humanities" as new subject through the process of distillation.²⁶

5. DIGITAL HUMANITIES AND LIS

As I mentioned that computation and IT have tremendous effect on virtually all the subject areas including most

static humanities, this is the right time for us to start DH study in all levels to cope with the changing ICT environment. We may consider library centric model to implement the development of DH.

5.1 Library Centric DH Course and Projects

Library and information professionals are very much aware of various computational tools and techniques for collecting, organising, preserving and disseminating digital information in the present electronic environment. Many of these computational tools have to cover the domain of DH. Therefore, library professionals along with subject experts of humanities and computer science may conduct DH courses and projects.

Digital humanities research differs from traditional humanities research in that it requires collaboration between scholars, technologists, and librarians. This is because any individual cannot have all the necessary skills, materials, and knowledge to conduct a digital humanities project. Subject librarians, in particular, are valuable members of the team due to their advanced knowledge and degree in their area of expertise, as



Figure 8. Mode of formation the subject "Digital Humanities" from LIS point of view.

well as their ability to build working relationships with departments and understand the research interests and instructional needs of faculty, staff, and students. Subject librarians have evolved with the changing landscape of libraries and must have an active role in each stage of a digital humanities project's life cycle, acting as a translator between technical personnel and scholars. The recent OCLC report emphasises the involvement of libraries in DH and offers various models of DH where librarians can have supporting role, such as specialised DH centers with DH librarians, and subject librarians who can supplement existing support provided to faculty members through proper training and knowledge.²⁷

5.2 Existing LIS Tools Related to DH

Libraries along with LIS department can arrange lectures, workshops, seminars etc on DH in association with departments of humanities and computer science. The areas where librarians may guide the faculties, scholars and students of DH are²⁸:

- A. Webpage designing for digital artifacts using HTML, XML, RWD (Responsive Web Designing), PHP, MYSQL, CSS, Dreamweaver, Photoshop / Core Draw /GIMP and Content Management System (CMS) designing using Wordpress, Joomla, Drupal etc.
- B. Digital library/ IDR/ Archiving for digital objects/ artifacts using DSPACE, Eprints, GSDL, Omeka etc. by using and harvesting metadata standard like MARC 21, Encoded Archival Description (EAD), Text Encoding Initiatives (TEI), Dublin Core (DC),

Categories for the Description of Works of Art (CDWA), Visual Resource Association Core (VRAC), Learning Object Metadata (LOM), E-Government Metadata Standard (e-GMS), Metadata Encoding and Transmission Standard (METS), Metadata Object Description Scheme (MODS) GEMS: Metadata Harvester etc.

- C. Programming and Scripting language like C, Java, Access, PHP, Perl, Java Script, Python etc.
- D. Web 2.0 technologies like RSS feed (QuiteRSS in WINDOWS and Liferea in LINUX), Social Bookmarking (Google bookmarks), Mashup, WIKI (Wikimedia) etc.
- E. Semantic Web tools like RDF, XML, Ontology (Protégé)
- F. E-Learning software like Moodles, Google Classroom etc.
- G. Plagiarism checker like Turnitin, iThenticate, Plagscan, Duplichecker, Urkund etc.
- H. Statistical tools like SPSS, PSPP, R etc.
- I. Analytic tool like VOYANT, OpenRefine, RSTUDIO etc.
- J. Altmetric tools like Altmetric, PlumX, Academia. edu, Research Gate, Google Scholar, PoP
- K. Reference Manager like Zotero, Mendeley
- L. Knowledge organisation tool like SKOS, XKOS, Tematres

5.3 Role of Library and Information Professionals in Developing DH

Library's role towards development of DH is summarised in the table 1.

Table 1. Suggestions for subject librarians to help to develop and promote successful digital humanities research at their institutions

Level of commitment	Possible activities
Low commitment	 Make contact with humanities graduate students, particularly those who have yet to commence their thesis or dissertation. Get familiar with the technical setup and environment of your institution. Gain knowledge about preservation standards and formats. Acquire knowledge about alt-metrics and unconventional methods to evaluate the influence of digital scholarship. Investigate successful digital humanities initiatives.
Moderate commitment	 Conduct a digital humanities symposium and invite external participants, including campus faculty, scholars already involved in digital humanities research, technologists, and library experts. Collaborate with faculty members and undergraduate courses to create an assignment using a digital humanities tool. Deliver workshops for faculty on digital humanities tools or new advances in the field. Provide subject matter training for technologists working on projects. Look for free training on digital humanities tools that developers may offer. Partner with technologists or online tools to grasp the fundamentals of coding languages such as PHP, MySQL, and Apache.
Intensive commitment	 Launch a fresh digital humanities project that utilizes the library's distinct subject collections Initiate Certificate, Diploma course on DH with the help of Humanities and IT experts Library professionals may act as teachers for DH course conducted by other humanity or computer science departments.

5.4 Present DH Courses and Project: Some Examples

Digital Humanities (DH) has become an increasingly important field in library science, as libraries and other cultural institutions work to digitise their collections and make them more accessible to the public. Here are some examples of DH courses and projects in library science:

- 1. Digital Humanities in Libraries: This course is offered by the University of Illinois at Urbana-Champaign's School of Information Sciences and focuses on the ways in which libraries can use digital humanities methods and tools to improve access to their collections.
- 2. The Digital Public Library of America: This project brings together digital collections from libraries, archives, and museums across the United States to create a single, searchable portal for users to access these materials.
- 3. The Library of Congress Digital Collections: The Library of Congress has made many of its collections available online, including digitised manuscripts, photographs, maps, and music.
- 4. Trust Digital Library: This project is a partnership between major research libraries and provides access to digitised books and other materials.
- 5. Creating Digital Collections: This course is offered by the University of Maryland's College of Information Studies and teaches students how to digitise and organise collections using metadata and other tools.
- 6. Text Analysis in Digital Humanities: This course is offered by the University of North Carolina at Chapel Hill's School of Information and Library Science and teaches students how to use computational methods to analyse text data.
- 7. The Digital Scholarship Lab: This project is based at the University of Richmond's Boatwright Memorial Library and focuses on creating digital humanities projects that use geospatial data, text analysis, and other methods to explore historical and cultural topics.

These are just a few examples of the many DH courses and projects in library science. As the field continues to grow, it's likely that we will see even more innovative approaches to digitising and preserving our cultural heritage

5. CONCLUSION

Apart from the above-mentioned computational tools and techniques used by library professionals for a long time, library professionals may acquire knowledge about installation, customization, and use of different basic DH tools in consultation with humanities and computer science experts. As library professionals have potentials to use different computational tools regarding acquisition, organisation, preservation and dissemination of digital information, they will easily be well acquainted with other DH tools. Therefore, I conclude that in India, library centric DH course may be started where library professionals will take the major role for educating humanity and social science people about digital technologies along with computer science and other experts.

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