EXPLORING DIGITAL HUMANITIES RESOURCES, CHALLENGES AND SOLUTIONS: IMPERATIVE FOR LIBRARIANS AND HUMANISTS

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Abstract
Digital humanities (DH), also known as 'humanities computing', uses digital methods to delve deeper into humanities subjects like history, literature or arts. It is an interdisciplinary field, suitable if you have a background in humanities and the arts, as well as if you have an interest in computing or information technology. In this paper, digital humanities has been conceptualized, the DH resources and research areas are discussed. Types of digital materials are presented. Also technological challenges affecting its implementation are identified and solutions are proffered. Programmes, and courses being offered in Digital Humanities studies as well as career perspectives of the digital humanities librarians or social scientist are explained. Ex-post facto research method was employed to this study as the independent variables were studied in retrospect for seeking possible relation and the likely effects on dependent variables. Literature-based data was analyzed qualitatively and inferences drawn from them. The paper concludes with recommendations which include that librarians and other experts in the humanities should collaborate in their digitally teaching and research activities in the humanities and social sciences and humanities fields.

Introduction

Digital humanities can be understood both as a field in its own right and as a way of identifying digital research and project development efforts in specific humanities fields. More, broadly, it also refers to any digital activity that further research in the humanities, or assists in the scholarly activities of its practitioners. Some of these activities may operate outside of any humanities field for example, digital publishing or digital libraries. The term "digital humanities" identifies, in general terms, any kind of critical engagement with digital tools and methods in humanities context. This includes the creation of digital editions and digital text or image collections, and the creation and use of digital tools for the investigation and analysis of humanities research materials. It also includes the aggregation and arrangement of digital resources and tools in order to present humanities materials to students, and other forms of broader dissemination. Again, the term can be used to refer to tools processes, and projects that expand access to the source materials of scholarship and teaching such as primary source texts, images, representations of artifacts objects of study, and secondary source materials (Flanders and Mylonas, 2018).

As a discrete field, digital humanities studies the intersection of humanities ideas and digital methods, with the goal of understanding how the use of digital technologies and approaches alters the practice of humanities scholarship. In this sense it is concerned with studying the emergence of scholarly disciplines and communicative practices at a time when those are in flux, under the influence of rapid technological, institutional, cultural change.

There is need for teachers and students in the humanities and social sciences Faculty to get acquainted with the current issues bothering on teaching and learning activities with the application of digital technologies. It is based on this premise that the authors, in this paper, attempt to explore the conceptual framework of digital humanities, its resources, challenges and solutions for development in the Academia.

Literature Review

There has been rapid change in the research pattern and knowledge creation of the academics as well as the technicians and even business people due to the emerging trend in digital technologies within the past few decades. Priego (2012) eloquently sums up what we are facing in society at large, but also specifically within higher education, in terms of the digital divide:

> "It is as if suddenly, in some section of the academic world, we were witnessing the rise of a super-humanist, who is not only an expert in Aramean manuscripts but can also develop XML schemas, tweak APIs, design WordPress templates, who is a master of custom CSS design for ebooks and blogs, tweets, curates data sets and visualises online networks; this highly-skilled born-digital creature quantifies her open access journal articles webometrics, in brief this prototype scholar is some kind of mutant 21st century super-powered being who simultaneously designs and maintains algorithmic architectures and deconstructs the history of literary theory and textual scholarship by heart."

By implication, this means that the teachers and learners alike are challenged to acquire the prerequisite skills that would enable them utilize the available tools and emerging technologies which are applicable in the course of teaching and learning and research endeavours in the academic institutions.

Research Areas in Digital Humanities

There are so many areas of research in the field of Digital Humanities. Some of them are identified as follows:

- Analysis and dissemination of knowledge through computer media, the integration of technology with humanities, and the representation of digital humanities data through the semantic web
- Computer design, creating databases, and digital sociological, philosophical, historical, and ethnographic research
- Collaborative projects, preservation and sustainability practices, institutional change, and new ways of thinking about academic work
- The use of vlogs and Instagram, application analysis, transformation of reading modes, and social transformation through teaching strategies and experiences.

In the same vein Sorbara (2020) identified different areas of Digital Humanities is a field of study, research, and teaching, that arises from the union of humanities and digital disciplines. These include research, analysis and dissemination of knowledge through computer media. In addition to having a solid humanistic

background, the researchers of Digital Humanities must be able handle cultural content with the appropriate information technology tools. Digital Humanities is a diverse and still emerging field that encompasses the practice of humanities research through information technology, and the exploration of how the humanities may evolve through integration with technology, media, and computational methods. Lifting focus, from data publication, to data analysis, leads scientific research to face new challenges, such as the knowledge extraction, the aggregated visualization of data, machine learning and the knowledge discovery.

In his article, Brugger (2016), stated that it is argued that one of the major transformative factors of the humanities at the beginning of the 21st century is the shift from analogue to digital source material, and that this shift will affect the humanities in a variety of ways. But various kinds of digital material are not digital in the same way, which a distinction between digitized, born-digital, and reborn-digital may help us acknowledge, thereby helping us to understand how each of these types of digital material affects different phases of scholarly work in its own way. This is illustrated by a detailed comparison of the nature digitized collections and web archives.

Three Types of Digital Material within the Digital Humanities

The nexus between the humanities and the digital is related to the material to be studied in a very fundamental way, in the main because the use of digital analytical tools does not make any sense if the object of study does not somehow exist in digital form. What follows in this section are three approaches to understanding the importance of the different digitalities of digital material. First, a general typology of three types of digital material is presented, based on the assumption that although all kinds of digital material share the same digital alphabet, they are not identical in all respects just because they are digital — digital material is not just digital material. Second, a systematic approach is introduced as to where exactly we can locate "the digital" in the humanistic scholar's research process. And, third, a brief outline of the historical development of the interplay between the humanities and the digital is presented.

Digitized, Born-digital, and Reborn-digital Material

On the one hand, all kinds of digital material share the same feature, namely that they are digital. But on the other hand, this digitality is always already embedded in a set of semantic, technical and academic structures, which implies that digital material is not just digital, but that it is digital in a variety of ways (a similar argument of embeddedness in already existing structures is put forward in relation to digital tools. In the following section a general typology of digitality is suggested, based on the *provenance* of the digital material, and on a distinction between three main types of digital material: digitized, born-digital, and reborn-digital material.

Types of Digital Material

S/N	Type Digital Material	Description
1	***Digitized material***	This is analogue material that has been digitized, for instance, written documents on paper, parchment etc., or electronic media such as radio and television, and even pictures or 3D-models of artefacts. The process of digitization is any form of transformation of analogue material into digital form, be it the laborious keyboarding of written documents to punched cards, the more easily performed scanning of documents to image files, or the digital recording of sound and moving images. The main characteristic

		of digitized material is that its "becoming digital" is based on an original that was not digital — an original that can in many cases still be retrieved and thus function as a baseline (for reflections on digitized collections).
2	***Born-digital material***	This is a digital material that has never existed in any other form than digital. This includes all types of material on digital media such as CD-ROMs, DVDs, or the internet and the web. This type of digital material does not have an analogue original to go back to, we only have the digital original also use the term born-digital).
3	***Reborn-digital material***	The term that is suggested to characterize born-digital material that has been collected and preserved, and that has to a large extent been changed in the process of collecting and preserving. Examples of this are emulated computer games or material in a web archive. Each of the three general types can be subdivided, as the examples above illustrate, and as seen with (for instance) digitized documents such as newspapers that are different from digitized temporal media such as radio or television; just as born-digital material such as computer games on DVDs is very different from online web or apps on iPads.

Tabulation – authors

The Digital in the Humanities Scholar's Research Process — a Systematic Approach

The specific nature of each of the three types of digital material has an impact on how each of them can be used and approached by the scholar in the research process. But before going into more detail about how this unfolds in the digital world, let us have a look at a schematic representation of how the research process usually unfolded before the advent of the digital (Figure 1). This very general model does not necessarily fit all parts of the humanities, but it provides a good idea of where the digital can later be located within the research process of most disciplines. In addition, it has to be stressed that what are presented as two distinct worlds — an analogue and a digital — are in practice in today's digital world very often intermixed in the sense that even scholars claiming to be Digital Humanists switch between analogue and digital in various phases of their research. But for the sake of argument, they are presented as two distinct scholarly environments.

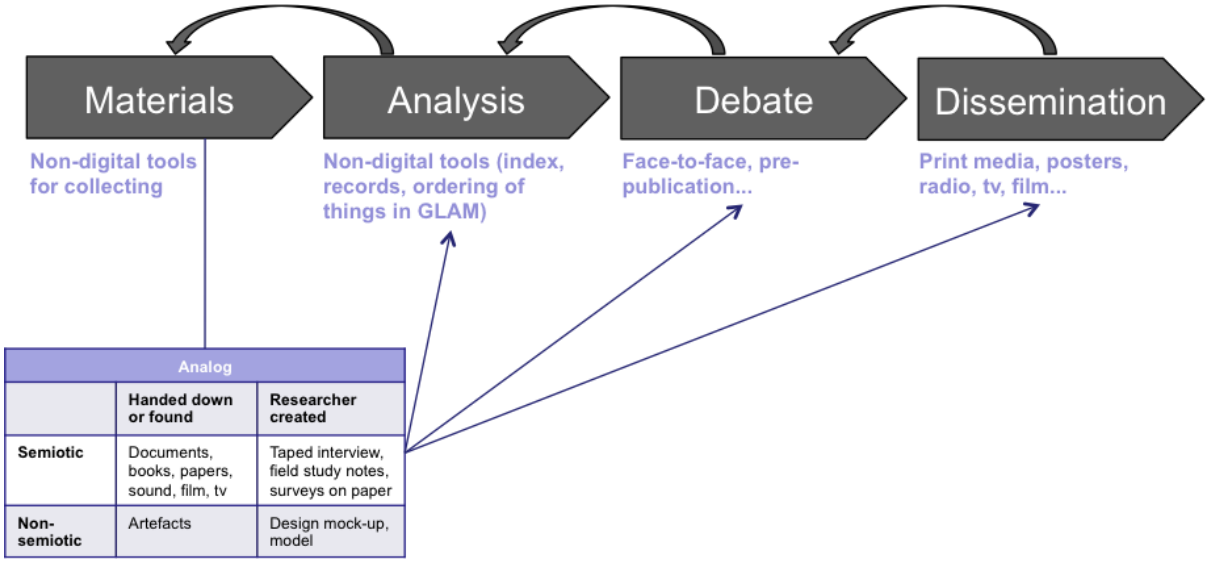

Figure 2: A schematic representation of the research process,before the advent of the digital
Source: Brugger (2016)

The research process is boiled down to four main phases: the material of study is collected, it is analyzed and the results may be debated and later disseminated. This may be an iterative process, for instance, the analysis may mean that new material has to be procured, the debate may lead to corrections of the analysis, and the dissemination may affect all the previous steps (the iterative nature is indicated by the arrows looping back).

There has been a sea of change in humanities studies in recent years. As part of the first wave, librarians and researchers have sought to harness the newfound power of digital archives to not only collect, but just as importantly, to curate, clean and analyze large sets of data. Before we dive into the three challenges — and solutions — of expanding the influence of digital humanities, let's first consider the possibilities available in this relatively new area.

Consider the case of a researcher wishing to analyze a large set of eighteenth-century gothic fiction. Thanks to mass digitalization, material related to this topic and time period are now electronically available in a wide variety of databases. Until recently, analyzing these sources at scale meant that the scholar had to explore and cross-check these various sources, extracting works in machine readable formats before writing code to configure cleaning algorithms that would correct any imperfections. Only then would the researcher have a '*clean*' set of data to act as the dataset for their analysis project. Experience has shown that the overlap in a Venn diagram of: a) students interested in eighteenth-century gothic fiction and; b) those with the coding skills to collect and standardize this disparate set of data for analysis, is quite small.

With today's digital archives putting more primary material within reach of students, the first part of this problem has been mostly solved. It's the second part, the ability to extract the necessary information while discarding the chaff, that is rapidly advancing. Instead of running a search through one database, getting back incomplete answers, then refining the search multiple times before moving to another database, the ability to run searches through multiple databases gives today's students unprecedented research potential. With little training, they can develop a research question, create a query to test it, before refining it multiple times through multiple databases, all in a short period of time. These advances mean that our researcher no longer needs to spend half of their time acquiring information but instead can rapidly move on to the work of testing research questions and critically evaluating concepts. This is the promise of digital humanities. Digital humanities is a way to incorporate new media and new methods into the tradition of humanistic inquiry and to ask new questions. We should, however, never think of digital humanities as a replacement for traditional methods of enquiry, but instead as a way of enhancing them and uncovering new possibilities. So how can libraries and students take advantage of this evolution? By recognizing and solving three universal challenges of digital humanities:

1. Big Data Analysis Needs Data

Many digital humanities projects require a lot of data in order to generate statistically significant conclusions. The more databases and sources available to the scholar, the more power they will have to ask new questions, discover previously unknown trends, or simply strengthen an argument by adding more proof.

As we have seen, this presents a challenge to the researcher and the library they rely on. An academic who runs a large digital humanities research group explained recently, thus: *"You can spend 80 percent of your*

time curating and cleaning the data, and another 80 percent of your time creating exploratory tools to understand it." Notwithstanding the (slight) exaggeration, the struggle is real — the more data sources and data formats there are, the more complex this process becomes.

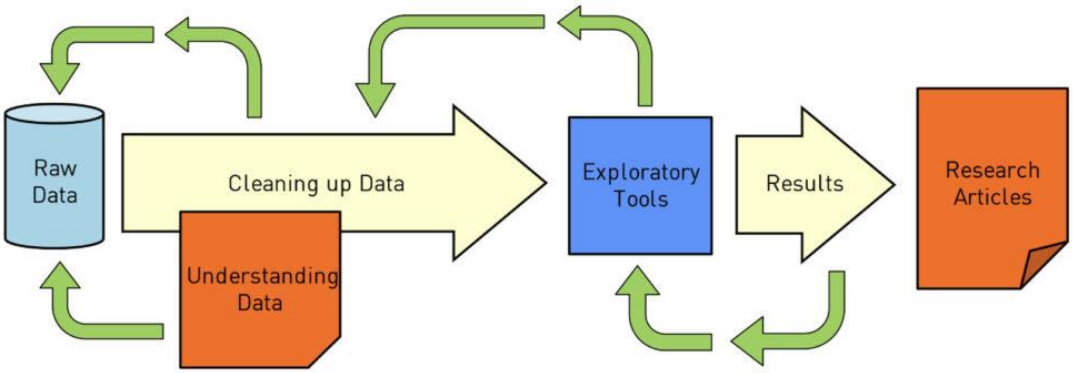

Figure 3: Data Curating and Cleasing Process

One answer for college libraries is to make sure their digital archives are up-to-date. Today's students should be able to delve not only into wide-ranging databases, but also specialized ones that focus on topics or time periods of interest, such as political extremism or the eighteenth-century. Increasing numbers of university libraries are now developing archive collections that rival the top schools around the globe and enable world-class research. Making sure your library has a robust collection of databases available for students to search is step one. Ultimately, this data availability combined with the ubiquity of increased computing power, means the possibility of digital humanities for all has never been larger.

2. Hosting and Maintaining Large Data Sets in an Institutional Setting

One aspect of having access to such large sets of data today is that libraries and colleges have to plan how to store this information. A school might subscribe to the ***Times Digital Archive,*** giving them cloud-hosted access to over 230 years of the world's newspaper of record. It may then transpire that a researcher wants to use this resource for a text mining project, requiring the material to be in a machine-readable format as opposed to in facsimile form, as it is in the digital archive. This requirement would be met by purchasing a text and data mining (TDM) drive with all of the underlying text and metadata on it, which for an archive of this size would run to several terabytes in size.

Figure 4: An illustration of Data Mining Tech /Access

The school would need servers to store this information, and someone to manage the information on them. The data should be protected so that it is only available to those who have access, while also making sure that a single errant keystroke doesn't erase an entire database. Servers need shielding from floods, power outages, fires, and other natural disasters, and regular maintenance to keep them compatible with the latest software. None of this should be a surprise to a librarian or a university, but this relatively costly and time-consuming process can often act as a barrier to contemplating digital humanities research.

3. **Developing the Technical Skills to Perform Analysis**

The technical skills necessary for a digital humanities project can be sophisticated, and often provide an obstacle for the humanities researcher looking to leverage the power of these methods. Consider again a researcher with access to the *Times Digital Archive*, but this time with access to the underlying data through a TDM drive. The first pre-processing step would be to eliminate material in which they have no interest, perhaps advertisements, sports news or weather stories – these might be considered unwelcome 'noise' when constructing their dataset. Identifying and excluding these newspaper sections leaves the researcher with news and editorials, both of which could be valuable to their project. There is still a lot of work left to refine the dataset. Our scholar would need to critically evaluate the remaining material for data quality and relevance to their project, excluding or correcting material that might skew their research. As well as being time consuming, these processes require technical skill alongside existing subject knowledge.

Gale and a number of other providers, including ***HathiTrust Digital Library***, ***Google Books*** and ***ProQuest*** are now providing environments that enable this work to be done quickly and at scale. Previously, where researchers might have needed coding skills to complete these tasks, they now have the option of user-friendly interfaces, accessible to all.

Tools like these can seriously streamline the workflow of collecting, curating, cleaning, and analyzing huge sets of data. Instead of researchers spending 80 percent of their time on pre-processing tasks, using these tools radically reduces the time spent on them, bringing it down from months to days, if not hours. The

excitement around these tools is that they also open up this type of research to a much wider range of students and professors. If it doesn't take months to create a clean data set from which to start, many more students, including undergraduates, will be able to do this work in the future – just as many are starting to do it now. Digital humanities has enormous potential to not only uncover new research pathways, but also to encourage the development of transferable technical skills at universities. New solutions are making this exciting area more accessible than it has ever been, giving every institution the opportunity to generate better humanities research and teaching.

Theron, & Wandl-Vogt, (2016) assert that the field of research in digital humanities is undergoing a rapid transformation in recent years. A deep reflection on the current needs of the agents involved that takes into account key issues such as the inclusion of citizens in the creation and consumption of the cultural resources offered, the volume and complexity of datasets, available infrastructures, etcetera, is necessary. Present technologies make it possible to achieve projects that were impossible until recently, but the field is currently facing the challenge of proposing frameworks and systems to generalize and reproduce these proposals in other knowledge domains with similar but heterogeneous data sets. The TEEM Conference tries to set the basis of good practice in digital humanities by reflecting on models, technologies and methods to carry the transformation out. As many digital humanists have posited, Digital Humanities and intersectionality have a unique and complicated relationship. The representation of these issues as they relate to Digital Humanities are briefly described in the table below.

Issues Related to Digital Humanities

Accessibility	Accessibility is a priority with all digital content, including digital humanities work. Digital humanities projects tend to be interactive and dynamic digital objects so it is imperative to follow accessibility guidelines.
Culture	Diversity in cultural heritage digital humanities projects has long been discussed in the community. As more of these projects develop it has been discovered that digital platforms, copyright laws, and open access concepts often cannot encompass how cultural heritage is communicated and recorded.
Digital Preservation	Digital humanities projects tend to be a collection of complex digital objects. Comprehensively digitally preserving such projects is challenging because there are many moving parts, and no two projects are the same so developing effective workflows is contextual.
Environmental Impact	All technology and media practices have an environmental impact.
Gender & Sexuality	Gender and sexuality has a complicated role in digital projects.
Labour	Digital labor often goes unacknowledged. Digital humanities projects are labor-intensive and require the work of project teams, collaborators, and sometimes even the public in crowdsourced projects. All labor contributions need to be acknowledged and compensated.
Privacy	Data security and privacy is important even in a field prioritizing open content. Personally identifiable information of students, contributors, and included in any data used in a project needs to be secure

Sustainability	Digital humanities projects often have significant support during project creation, but suffer from a lack of sustainability. The issue of who takes responsibility for maintaining projects is an ongoing issue in the community.

Source: University Libraries (2022). Digital Humanities: Concerns

Institutional Locations of Digital Humanities

Digital humanities projects find an institutional home in a variety of different contexts, it is often these contexts that determine their scale, research agenda, personnel, and practical outcomes. There is emphasis on the functional role of the various institutional centres: whether they provide teaching, research, collegiate support, or technical support, or several of these in combination. This classification leaves out some important sites of digital humanities activity and it also elides some useful distinctions. The categories of "library-based units", for example, includes both large-scale digitization efforts located within libraries, library units focused on managing electronic resources for patrons, and library projects with a more specific scholarly focus.

For the purpose of understanding the broad outlines of the field and its evolution over time, Flanders and Mylonas (2018) suggest an alternative classification that illuminates the most significant types of projects and takes into account the kind of intellectual product that motivates their design and activity. They provide the significant terms in their classifications as follows:

- Digital library projects and centers which undertake the digitization of library collections on a large scale.
- Faculty support centers in which the goal is to enable humanities faculty (typically nontechnical or at least technically not self-sufficient) to use digital humanities technologies and approaches in teaching and/or research.
- Digital humanities research units in which central questions in digital humanities and its constitutive fields (human-computer interaction, digitization standards and practice, text encoding theory, new media theory, etc) are pursued as central activity.
- Digital humanities programmes and departments in which digital humanities is the subject being taught (and where research is conducted as part of that effort).
- Digital publication project, organized around the creation of a specific digital publication (often a scholarly edition or thematic research collection).

Academic Programme and Jobs for Digital Humanities Graduates

According to Young-Powell (2023), the followings are the programmes and /or course in digital humanities:

DH 110: User Experience Design
DH 120: Social Media Data Analytics
DH 125: Data Analysis for Social and Cultural Research
DH 131: Digital Mapping and Critical Geographic Information Systems
DH 140: Programming for Humanists
DH: M145: Text Analysis
DH M150/151: Special topics
DH 187: Capstone seminar
DH 199: Capstone (independent study or small group)

Similarly, citing Young-Powell (2023), Chimah, Horsfall and Nwankwo (2023) enumerated career opportunities and the jobs for a digital humanities degree holder as follows:

- **Digital curator:** This is a sought after role in which you select, preserve, maintain, collect or archive digital assets and digital artefacts of various kinds – texts, images, recordings, video games and more. As a digital curator your employer could be a public library, museum, or university, for example.

- **Academic and research work:** All kinds of positions that also attract other humanities graduates are open to you with a Digital Humanities degree.

- **Technical writing and communication:** Technical writers are tasked with interpreting complex concepts, ideas and processes in plain English. With an interdisciplinary education, this might be a role for you – for example at large engineering or software companies.

- **Data scientist:** Data scientists are professionals who are responsible for analyzing, collecting, and interpreting significant amounts of data. As a data scientist you could work for a large tech company, such as Google or Apple.

- **Web design, game design and information architects:** In this role you could design the websites, software or mobile apps. Other areas of employment for Digital Humanities graduates include publishing and editorial work, public relations, public policy, or cultural works.

Conclusion and Recommendations

In this paper, authors have reviewed the conceptual framework of Digital Humanities, its resources, types of digital materials, technological challenges and skills and/or competences expected of librarians and other experts in the humanities and social sciences faculty. The career prospects for graduates of Digital Humanities programme are as well highlighted.

Based on the inferences drawn from literature based findings, the followings are recommended:

- Librarians and humanists should embrace the new trends in Digital Humanities and as well apply them for effective service delivery in the academia.
- The researchers of Digital Humanities must be able handle cultural content with the appropriate information technology tools.
- Educators should design/develop curriculum for Digital Humanities as a programme and present same for NUC approval for possible implementation in the near future.
- The technological related challenges faced by the Faculty should be articulated and solutions proffered by the University Management and other stakeholders.

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