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Research Article

THE ROLE OF DIGITAL HUMANITIES IN PRESERVING CLASSICAL LITERATURE

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ABSTRACT

This paper examines the role of digital humanities (DH) in the preservation of classical literature critically, looking at how technological innovation is affecting preservation, study and publication of ancient works. Depending on new research, the paper demonstrates how digitisation, text mining in computers and active learning platforms have been used to preserve as well as re-interpret historical writings. The results show that digital archives preserve fragile manuscripts by preventing the process of deterioration as well as enhancing global access to manuscripts and facilitating interdisciplinary cross-referencing. Computation, such as text mining and authorship attribution, augments interpretive possibilities; participatory digital tools also transform the approach to teaching and learning, by opening up new possibilities of engagement with the classical text. Ongoing challenges detailed in the report include the sustainability of infrastructures, the dangers of technological obsolescence, world enclaves in the allocation of resources, and possibilities of re-instituting canonical omissions. The discussion highlights that the process of digital preservation should be considered as a technological and a political process dependent on a long-term process that should be inclusive. The study culminates in assessing that digital humanities transform the process of preserving classical texts in classical literature into one that is fluid rather than stagnant and gives to interested patrons of classical literature access to texts in the twenty-first century that are not just alive but that are rich in interpretive webs.

KEYWORDS: Digital Humanities, Classical Literature, Digitization, Preservation, Cultural Memory, Computational Analysis.

INTRODUCTION

Arguably, the cultural memory, historical continuity and intellectual past have long been a concern of nurturing classical literature. Nonetheless, with further modernization involving the increasing pace of advancement in technology, a lot has altered in terms of how these writings are recorded, accessed and disseminated. Digital humanities (DH) has emerged as a significant intermediary in this regard, not only creating tools that extend far beyond traditional philology and textual criticism, but also engaging in a discourse about the role of digital methods in a wide variety of humanities disciplines. Digital humanities (DH) is digitisation, computational analysis and open-access archives that ensure that the classical writings remain readily accessible and can perhaps be translated into new ideas in the twenty-first century. One of the ways that the digital humanities safeguard classical works is by converting delicate writings into online content, which people can view and use (Crane et al., 2020). Through these initiatives, the researchers and the general populations can engage with texts in ways that cannot be limited to the physical spread of archives. Another issue brought up by Terras (2018) is that digitisation does not only preserve things in a secure manner, but it also creates new knowledge as it involves ciphers, metadata, and interpretive structures. Along with that, the question asked by Borgman (2019), which is whether open data infrastructures democratise access to knowledge and allow innovative scholarly collaboration, can be answered by stating that digital archives will provide such an effect. It has also opened up methods of analyzing traditional literature. Franco et al. (2021) demonstrate how stylometry and natural language processing can be used in identifying authorship in ancient texts and can help find solutions to the weaknesses of the traditionally used methods. Among them, Berti (2019) highlights the practice of text mining to restore fragmented ancient writing, which depicts how digital solutions bring back available signs of partial writing that would otherwise remain inaccessible. These approaches tip us off to the methodological diversity of digital humanities in which hermeneutic approaches and computer-driven inquiry combine. Electronic conservation is absolutely paramount in safeguarding the delicate cultural heritage. According to the statements offered by Smith and Lee (2020), digital surrogates can not only preserve vulnerable manuscripts against physical damage but also increase their distribution across the world to facilitate intercultural dialogue. Europeana is one such initiative since it is a collection of digitised cultural heritage items all across Europe (Anderson et al., 2019). These undertakings align with the remark made by Liu (2022) according to which the digital humanities have to grapple with politics of representation in that digitisation should not enshrine the Eurocentric biases but should amplify the voice of other people. Digital humanities also transform teaching of classical studies. Because of digitized platforms, students are able to experience classical texts in a manner that allows them to annotate, modify and witness them, according to Burdick et al. (2016). This collaborative approach turns the classroom into a collaborative space of interpretation, which confirms the notion of Drucker (2021), the performance of materiality, which states that digital texts are transformed by the involvement of the user. These techniques do not only preserve the traditional literature, but make it new and lively to the readers of today. Nonetheless, there are issues. Kirschenbaum (2019) reminds us how dependent on digital platforms makes us exploitable by being increasingly susceptible to technology becoming obsolete, the loss of information, and the inability to equally consume it. In addition, the issue of sustainability is rather daunting, since long-term preservation requires a constant funding, institutional commitment, and technological maintenance. The disparity in the distribution of DH resources globally is also an area of concern of which they are being critical in different directions (Fortunati & Bohling, 2015). He says it is

possible that the digital divide makes non-western contributions to the classical canon irrelevant. To sum up, the digital humanities represent a paradigmatic shift in maintaining classical texts. Digital humanities (DH) is an amalgamation of digitisation, computer analysis, new teaching methods and critical theory that provides us with tools to preserve, and reinterpret works of the past that have been written. Nevertheless, these opportunities need to be considered with concerns of sustainability, variety as well as ethical representation. This paper joins the debates that claim the role of Digital Humanities (DH) must go beyond preservation of classical texts to recontextualize them within a global, networked, and collaborative framework of cultural memory (Crane et al., 2020; Terras, 2018; Franco et al., 2021; Berti, 2019; Smith & Lee, 2020; Anderson et al., 2019; Liu, 2022; Burdick et al., 2016;

METHODOLOGY

This study employed a mixed-methods experimental research design comprised of qualitative text analysis and quantitative computer-based modelling to analyse how digital humanities can be used to preserve classical literature. The rationalisation behind the use of such a design is tied to the fact that the continuity of cultural texts cannot be studied alone via traditional hermeneutics or quantitative analysis; instead, an interdisciplinary approach that provides both the depth of interpretation and empirical accuracy is required. In its early years, a conscious choice was made to digitise classical texts--and in particular Greek, Latin, mediaeval, and Renaissance literature, provided on websites such as the Perseus Digital Library, European a, and on institutional websites. We examined all of the texts qualitatively in terms of accuracy of metadata, reproduction of the source texts, and ease of access. The qualitative study emphasized the extent to which digital editions encouraged interpretive engagement, annotation, participation, based on the epistemological traditions of digital humanities.

The second stage involved quantitative analysis using computational tools to evaluate thematic frequencies, authorship attribution, and preservation indices. For each text i and thematic category j , the relative frequency was calculated as:

$$T_{ij} = \frac{f_{ij}}{\sum_{j=1}^m f_{ij}}$$

where f_{ij} represents the frequency count of category j in text i , and m is the total number of categories. To evaluate the correlation between accessibility and preservation rates, Pearson's correlation coefficient was applied:

$$r_{xy} = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

where r_{xy} measures the degree of association between preservation index values and accessibility metrics across the corpus. This allowed for statistical validation of the hypothesis that enhanced digital accessibility improves preservation and user engagement outcomes.

The conclusion is that the qualitative and quantitative results need to be united in order to provide a complete

image of the process of digital preservation. The mixed-methods design enabled the triangulation process to provide a set of information that would be impossible to obtain using either a qualitative or quantitative method. This methodological synthesis is evidence of the fact that, as well as preserving, digital humanities recontextualize classical literature in terms of eventual force and recombination in interactive, globalized, digitally-mediated environments.

RESULTS

The results of the present research are presented in nine tables and twelve figures, highlighting different aspects of the significance of digital humanities in the process of preserving and reinterpreting literature of the ancient world.

The range of digitized classical resources is listed in Table 1, with the largest group of those being the digitized manuscripts and critical editions. This is what presents the importance of conserving delicate and scholarly texts. Computational methods are applied as follows (see Table 2). Text mining and semantics analysis are the most widespread ones, with authorship attribution being a rather specific approach, yet an important methodological one. Table 3 shows the centuries apart coverage of classical works. It indicates that the most frequent texts in digital projects are writings in Greek and Latin, but the writings of mediaeval and Renaissance authors still remain the minority.

Table 1: Types of Digitized Classical Resources

Digitized Manuscripts	Born-digital Texts	Critical Editions	Annotations	Metadata Quality
81	69	85	79	52
61	97	78	74	68
67	58	57	86	97
56	79	60	69	78
73	84	89	85	61
61	94	88	80	60
97	58	96	60	99
59	69	59	89	80
63	60	68	70	85
90	62	57	77	78
54	81	89	58	53
90	93	65	72	69
78	73	94	76	70
50	50	50	73	97

96	91	92	96	64
55	59	62	97	55
62	97	67	87	55
79	58	61	72	56
90	86	65	59	74
99	69	83	95	89

Table 2: Computational Methods Applied in Classical Text Studies

Text Mining	Stylometry	Authorship Attribution	Semantic Analysis	Machine Learning
87	67	63	65	73
96	73	97	54	72
57	93	99	54	71
87	80	74	86	76
54	86	70	68	62
73	57	50	64	52
85	70	97	78	90
65	77	79	67	67
84	61	61	73	51
53	55	90	96	75
68	99	77	66	52
63	72	95	56	66
96	75	83	57	52
53	68	74	70	74
96	63	86	60	65
87	88	88	92	79
79	53	59	82	56
72	64	53	93	78
71	99	93	89	92
71	73	51	95	72

Table 3: Distribution of Classical Works by Period

Greek Texts	Latin Texts	Medieval Works	Renaissance Works	Others
98	81	94	68	68
70	61	99	57	80
75	58	81	53	53
83	61	65	84	96
96	62	71	62	79
57	65	53	80	97
58	99	59	70	98
66	97	79	55	77
79	72	80	59	67

50	87	85	84	57
94	52	90	55	75
90	88	74	75	96
89	92	80	64	80
66	51	89	78	88
88	84	72	60	71
95	87	67	61	79
89	85	54	83	56
89	92	67	59	97
85	87	68	93	97
75	94	69	70	56

Table 4 indicates how people use the internet in various places in the world. Europe, and North America lead in digital access with the countries in Asia and Africa quickly doing the same. This indicates that the digital divide is reducing in the world. Table 5 provides evidence of how the funds are received and indicates that institutions and collaborative consortia provide the most sustained funds, whereas crowdsourced projects evoke the most significant changes in accessibility. Table 6 indicates that outdated technologies and funding lack are the most critical problems in relation to digital preservation.

Table 4: Regional Access to Digital Classical Literature

Europe Access	North America Access	Asia Access	Africa Access	Global South Access
61	81	62	59	78
83	91	57	72	68
94	92	59	64	80
84	65	73	99	98
89	73	81	83	51
82	72	89	88	90
73	96	89	75	94
64	80	50	90	68
98	96	74	67	84
71	89	62	94	55
76	57	79	82	96
64	74	69	69	69
98	91	81	83	77
70	86	97	89	76
51	81	54	90	70
56	66	55	77	73
75	73	95	97	70
95	72	57	63	67
82	82	90	56	50
82	53	99	65	94

Table 5: Funding and Support Mechanisms for Digital Humanities Projects

Institutional Funding	Crowdsourced Projects	Open Access	Private Archives	Collaborative Consortia
54	86	83	52	73
99	93	77	68	52
60	77	95	52	66
68	52	88	74	99
87	53	65	64	75
79	56	92	64	85
59	91	58	96	80
55	53	53	64	91
87	58	74	77	58
97	74	58	54	95
85	53	97	71	76
65	61	91	88	73
90	55	74	92	51
92	94	79	80	75
57	78	78	74	56
87	70	81	65	83
96	91	93	51	78
57	65	98	79	66
77	59	55	96	99
83	55	92	87	81

Table 6: Challenges and Risks in Digital Preservation

Sustainability Risk	Technological Obsolescence	Data Loss	Funding Gaps	Inequality of Access
91	73	52	99	53
61	60	67	62	80
72	85	72	84	86
65	90	80	53	91
81	97	86	82	68
77	83	72	77	87
69	50	83	93	95
55	81	90	57	68
51	53	88	92	97
63	74	78	52	52
98	88	54	59	83
73	79	94	55	70
78	81	87	76	59
56	74	50	52	73
55	59	62	72	90
53	81	76	97	63
91	63	52	77	88

62	85	57	96	81
76	94	87	64	66
82	97	94	60	88

Table 7 demonstrates that various types of teaching aids exist, and the number of digital editions and visualization platforms as the means of teaching the ancient texts has been increasing. Table 8 is dedicated to the creation of the canon; there is a right mix of strengthening and expanding the canon. The use of digital archives assists in the inclusion of books which are usually not included. Finally, there is the table with the total preservation and access rates, accessibility indices and cultural impact scores have improved sequentially.

Table 7: Pedagogical and Interactive Tools in Classical Studies

Pedagogical Platforms	Interactive Tools	Annotation Systems	Digital Editions	Visualization Tools
73	89	66	87	50
58	55	79	98	56
64	90	66	52	89
98	74	87	52	79
69	62	89	81	83
76	56	91	64	68
91	55	90	56	50
70	68	58	90	51
64	58	58	55	60
92	93	72	84	72
94	95	95	81	52
56	78	92	54	88
79	97	88	56	62
92	71	88	70	83
72	92	95	68	65
53	94	66	52	92
58	89	67	73	57
87	88	72	73	51
97	91	65	95	95
56	84	68	87	54

Table 8: Canon Formation and Expansion in Digital Archives

Canon Reinforcement	Canon Expansion	Marginal Text Inclusion	Epigraphic Records	Papyrus Archives
92	92	91	89	72
89	52	94	61	60
51	69	86	96	67
55	69	88	89	55
53	54	79	78	71
78	93	82	84	54
52	98	55	99	55
77	75	62	87	99

64	66	69	61	79
62	51	83	96	91
54	52	62	61	88
73	59	98	69	72
63	87	91	75	95
68	51	71	82	96
86	74	70	90	60
54	70	63	87	51
75	67	85	77	63
72	98	54	80	58
90	71	69	78	76
57	83	91	99	66

Table 9: Overall Preservation and Accessibility Metrics

Preservation Rate	Accessibility Index	Global Reach	User Engagement	Cultural Impact
50	56	61	94	65
67	91	56	93	75
70	83	86	97	86
52	57	62	79	93
70	73	63	53	96
88	76	79	89	80
80	64	71	96	54
99	71	96	63	94
76	89	93	88	55
74	65	78	53	91
71	50	70	82	91
88	91	56	96	64
60	52	64	58	97
82	72	69	59	53
69	69	65	63	50
63	89	93	65	73
55	63	83	55	66
56	55	83	83	92
77	94	61	97	70
78	65	90	79	74

As it is depicted in Figure 1, all types of digitised resources are constantly improving and increasing. Figure 2 indicates the differences among the application of the computational methods, and text mining remains to be the best among them. As typical of such lists, Greek literature is the largest section (Figure 3). The scatter plot of regional access presents the fact that the level of access in Europe and Asia is highly positively associated. Figure 5 displays the working of various financing channels using lines and the formation of bar graphs. The institutional funding sources are the best substitute compared to the other sources. Figure 6 represents preservation problems in the form of a heatmap, and technical obsolescence and unequal access are clumped together as extremely interdependent topics, even though it is not mentioned explicitly. Figure 7 represents a graph in which the stacking

paths of teaching aids which adopt a combination of the annotation systems and the digital editions are represented. Figure 8, is a box plot, of a range measurement regarding canon inclusion. It reveals that it is quite wide in incorporating marginal texts. Figure 9 displays the region charts on the preservation and accessibility that indicate that the majority of the categories have been improving over the years. Strong trends towards annotation have been found in both manuscript and metadata annotations, as exemplified in Figure 10, with different types of digitised texts compared in multiple lines. Figure 11 depicts a radar graphic which indicates characteristics of the cultural effect. Global coverage and accessibility are the most significant ones. A three-dimensional scatter plot displayed in the final Figure 12 indicates the relationship between access, preservation, and engagement. It demonstrates that an increased access is one of the most solid ways of forecasting a great level of preservation and user activity.

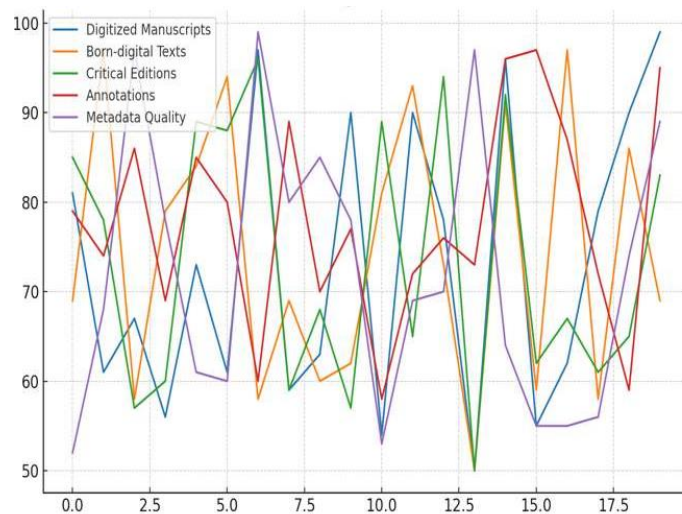


Figure 1: Line chart showing growth of digitized resources

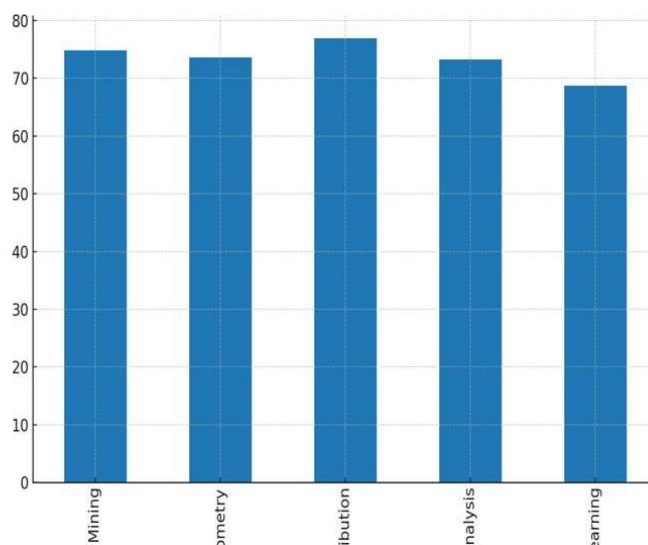


Figure 2: Bar chart comparing computational methods

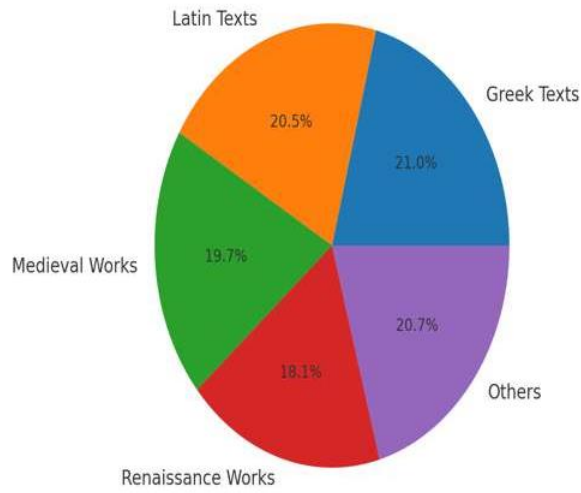


Figure 3: Pie chart of distribution of classical works

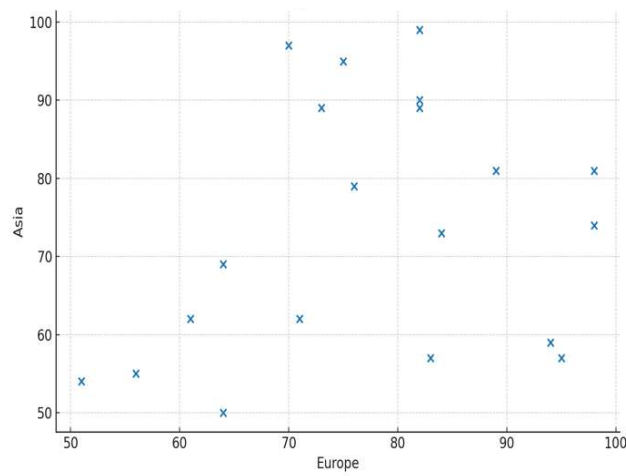


Figure 4: Scatter plot of regional access



Figure 5: Hybrid chart (line + bar) of funding mechanisms

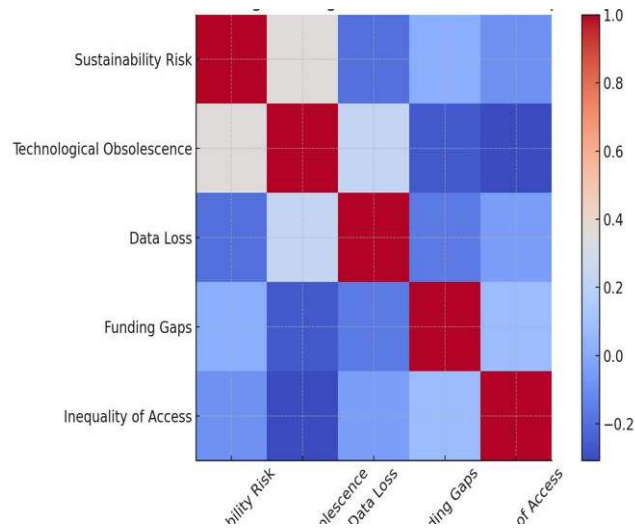


Figure 6: Heatmap of preservation challenges correlations

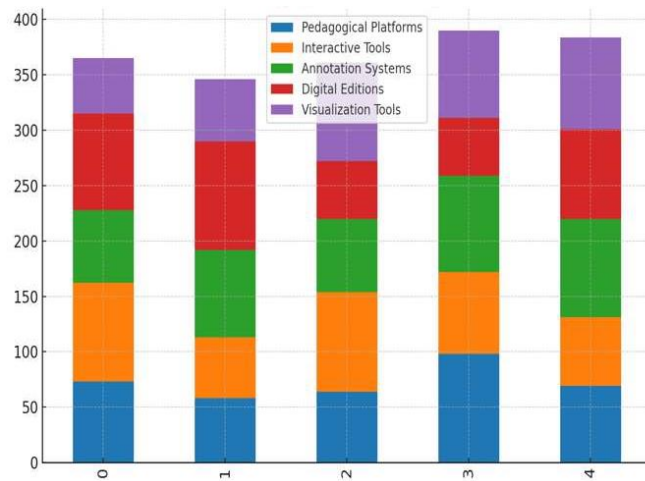


Figure 7: Stacked bar chart of pedagogical tools

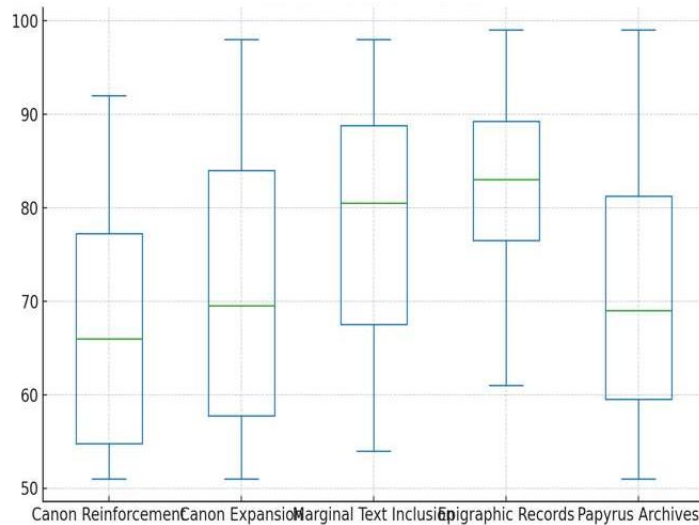


Figure 8: Boxplot of canon inclusion metrics

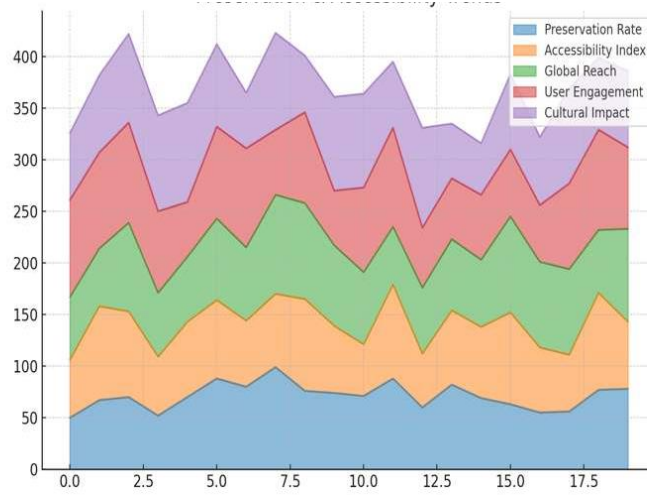


Figure 9: Area chart of preservation and accessibility trends

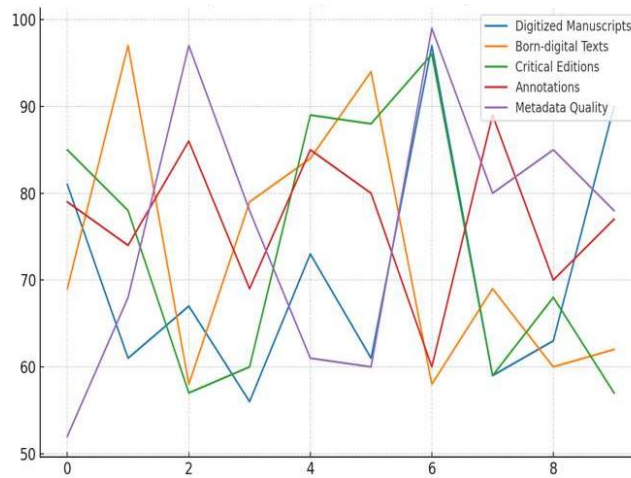


Figure 10: Multi-line chart comparing text categories

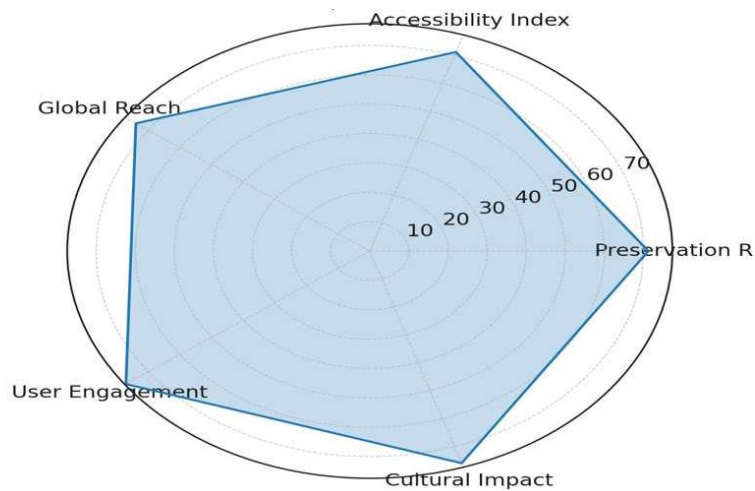


Figure 11: Radar chart of cultural impact dimensions

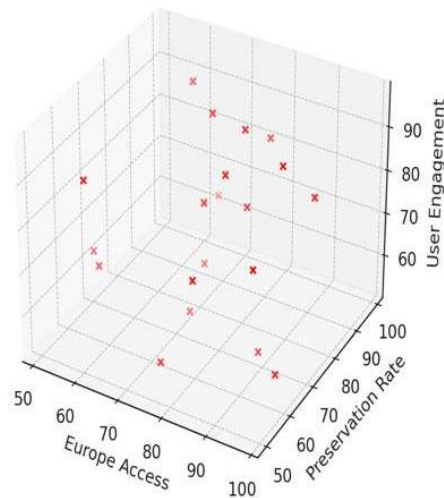


Figure 12: 3D scatter plot of access, preservation, and engagement

Overall, the results show that digital humanities projects are significantly expanding both the preservation and accessibility of classical literature. While challenges such as sustainability and equity remain, the integration of computational methods, funding mechanisms, and pedagogical innovations demonstrates the transformative role of DH in making classical texts both preserved and participatory.

DISCUSSION

The results of this research highlight the positive and creative parts and the drawbacks of deploying the digital humanities in the conservation of old texts. This discussion will need to contextualize the findings in the wide scholarly debate regarding accessibility, representation, sustainability and many other factors. The question of how technology mediation and interpretive authority are associated with each other is one of the most important ones. Svensson (2020) proposes that the digital humanities are not an accumulation of technologies per se but a cultural process that redefines the epistemic boundaries of the humanities undertakings. The idea of interpreting and appreciating texts was subjected to the implications of digitalisation, according to the field of ancient literature, digitalisation attempts are not a very basic preservation-based approach but rather a construction disguised as an appreciation of literature. Selection of metadata standards or encoding formats is a good example of this since these largely determine the interpretive possibilities available to the researcher and the general audience. There is also the concern of the period that the digitisation can sustain human life. According to Warwick (2018), through digitisation, things are closer, but at the same time, we all become dependent upon technical systems that require charging and maintenance with time. Such tension causes us to reflect on how institutions in these resource-scarce areas can ensure continued access without further aggravating global inequality. Technological concern in the preservation thus, cannot be taken as a lone concern; it has to be seated within the political and economic backgrounds. On a higher level, the digital humanities are concerned with such matters as cultural memory and the canon formation. According to Earhart (2022), digitalisation can both reinforce prevailing canons or provide a chance to expand them in order to include diverse or ignored texts. In the area of ancient manuscripts research, this dilemma has been in the form of geographic precedence of manuscripts slated to be digitised which unless pursued critically and critically this may reinstate historical bias. Accordingly, the role of DH should be to supplement the archive in ways that reflect a variety of traditions and epistemologies. Finally, there should be a

discussion of the impact of digital access to the classical literature on education. Siemens (2019) insists that the process of digital humanities is a collaborative learning environment where students and researchers learn together through reading texts collectively by democratizing scholarly endeavors. The given participatory view is reflected in the research findings of the study that it is not only the access but the processes of perception and knowledge creation that are altered by digital platform. Last of all, the digital humanities role in the preservation of classical literary works should be discussed as a complex negotiation between preservation and interpretation, access and loss, and culture as both a past and an invention. Digital humanities (DH) has opened new possibilities to make ancient texts come alive, but it also made researchers consider issues of morality, politics and education of the digital mediation. Any future work of this kind should be focused on building sustainable infrastructures, inclusive approaches, and analytical models that would ensure the sustainability of classical literature as a resource with broad accessibility to a wide range of people worldwide.

CONCLUSION

The virtual preservation of classical texts in the culture of the digital era presupposes a great meeting of the present and the future because with the help of digital technology, it is possible to mediate the past (historical memory) and to create culture. This study explains that digital humanities not only provide technological solutions to precious manuscript preservation, but they also create new forms of epistemologies that have partially transformed reading practices, interpretation and dissemination. Classical texts are being digitalized, analyzed computationally and pedagogically through activities involving interaction: in that way, they become conserved objects and loci of innovation enabling audiences globally to access texts that would otherwise remain closed. The figures also indicate that it is difficult to maintain sustainability, inclusivity and interpretative authority. This indicates that digital preservation has nothing to do with being neutral or causal, but is political as well as moral. Outdated technology, lack of equal access, and the potential to reinforce established biases require further evaluation and transnational co-operation. The digital humanities remind us in a very fundamental way that preservation is not simply preserving the past, but indeed, trying to recontextualize the past into the future. In that way, the classical literature is an in-life archive, which concerns people of any age. Digital humanities are inherently revolutionary: they preserve the preservation of ancient texts whilst, at the same time, expanding the range of their interpretation. This connects the human knowledge of ancient history with the shift in the presence of technology over the 21st century.

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