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CULTURAL HERITAGE INFORMATICS: PAST, PRESENT, AND FUTURE

Abstract
This paper briefly traces the informational history and contemporary formal establishment of *Cultural Heritage Informatics* as a distinct domain within IS/LIS, motivated by recent calls for more critical, ethical, and community-oriented interrogations of IS/LIS practices and professional identity. We unpack the conceptual history and disciplinary intellectual geography of *cultural heritage* and *informatics* to recount prior interpretations of the field. Next, we articulate a holistic domain-specific informatics model to guide the study of cultural heritage within IS/LIS. We conclude by articulating ethical imperatives and new directions for *Cultural Heritage Informatics* in research, teaching, and practice.

Introduction

Cultural Heritage Informatics holds more of an 'assumed ontological presence' than a clearly defined disciplinary identity. Turner et al. (2024) concluded how most see the "origins of cultural heritage informatics as 'cultural heritage + computers'," a dominant perspective adopted in present definitions (Modrow & Youngman, 2023, p.666). Many perceive *Cultural Heritage Informatics* as residing at "the intersection of access, preservation, and advocacy" and "refers to the creative application of information, communication, and computing technology (broadly defined) to address the needs, challenges, and content of (and in) the domain of cultural heritage" (Zeng & Gracy, 2015) and a field which can no longer afford to ignore the changing capabilities of AI tools and systems (Oh et al., 2024). For Turner et al. (2024, p. 2), "[t]he term, Cultural Heritage Informatics, is [...] being used widely [today] by Information Studies researchers and within iSchool programs. It denotes a set of assumptions about what heritage is, and how heritage is constructed as an object of study."

Nascent discourses around *Cultural Heritage Informatics* question whether the moniker "define[s] a methodology, a subject interest, or a set of technical practices" (Turner et al. 2024). We previously expressed our concerns about reducing *Cultural Heritage Informatics* to 'heritage computing', arguing a broader conceptualization would accommodate any expression of cultural

heritage as related to Information Studies. We defined *Cultural Heritage Informatics* as "the relational study of information selection, transfer, and integration during processes of heritage formation and identity maintenance, a process and product that is fundamentally shaped by acts of collective remembering" (Modrow & Youngman, 2023, p. 669). Doing so established the heritage-memory relationship and articulated its interplay as fundamentally informational.

Contemporary discussions on issues of Indigenous data sovereignty and stewardship (Belarde-Lewis et al., 2024), digitization of intangible memory practices (Hou et al., 2022), and dichotomies between technology and humanity resulting from the largely uncritical popularization of generative AI (Youngman et al., 2023)—preceded by similar calls for a commitment to ethical principles and values for digital humanities (Spiro, 2012)—underpin our concerns around the uses, application, and preservation of cultural heritage information. It seems worth it, therefore, or even urgent, to go 'back to the future' and retrace the conceptual history of *Cultural Heritage Informatics* to reorient current disciplinary discourses toward methodological and intellectual inclusivity.

To do so, we examine the two core fields of *Cultural Heritage Informatics*: *Cultural Heritage (Studies)* and *Informatics*. Next, we offer a domain-specific model for cultural heritage to conceptually merge digital technologies and Heritage/Memory Studies, illuminating the "how" and "why" of *Cultural Heritage Informatics*. Finally, we contemplate what gets left behind without holistic considerations and what may be regained through future explorations. We offer this dialogue to resolve some of the historical qualms around the functions and values of IS/LIS when studying cultural heritage, and vice versa, by charting an intellectual geography of *Cultural Heritage Informatics* grounded in criticality, community, and ethical responsibility.

Past: The Culture and Heritage of Informatics

Heritage Revisited

Unacknowledged or acknowledged, "heritage has always been with us and has always been produced by people according to their contemporary concerns and experiences" (Harvey, 2001, p.320). Drawing on Kirshenblatt-Gimblett (1995, p.369), we elsewhere defined cultural heritage as "ongoing production of identity-relevant meaning in the present through recourse to traditions and artifacts rooted in the past" (Youngman et al., 2022, p.359). But the *study* of heritage is more recent: "it is still difficult to pin down a moment, or even a *period*, when research on or in heritage began" (Waterton & Watson, 2015, p. 3). Despite a cascade of heritage protection acts since England's *Ancient Monuments Protection Act* (1882), the systematic study of heritage was not established as a research focus with regular publications before the 1960s. Before *Heritage Studies*, heritage was studied in adjacent disciplines (Waterton & Watson, 2015, pp. 3-4).

To summarize the shifts in heritage studies, we turn to Waterton & Watson's (2013) distinctions of theories *in* heritage, *of* heritage, and *for* heritage. Often linked to Tourism and Museum Studies, theories *in* heritage "remain influential and successful in understanding heritage as a

system of production and a method of display," while during the 1980s, theories *of* heritage emerged, maintaining "that heritage had become an 'industry', feeding on the nation's past and abjuring any concern about its future. This was a historically informed and culturally significant commentary that moved thinking about heritage away from its objects towards its social and cultural context and significance" (Waterton & Watson, 2013, pp.548-549 and 2015, p. 4 with references).

Heritage could now be perceived as "the transvaluation of the obsolete, the mistaken, the outmoded, the dead, and the defunct. Heritage is created through a process of exhibition (as knowledge, as performance, as museum display). Exhibition endows heritage thus conceived with a second life" (Kirshenblatt-Gimblett 1995, p.369). By the 1990s, this critical lens shifted to "focus upon how heritage objects come to be sanctified. [...] Heritage, as Smith (2006) put it, is characterised by a singular, dominant discourse, one that reflects concerns about identity, nationhood and the creation of social cohesion in the face of potentially conflictual readings of the past" (Waterton & Watson, 2013, p.551). In the 21st century, theories *for* heritage foreground how heritage impacts minds and bodies, in a 'biophysical' sense, encompassing our bodily and emotional reactions to heritage engagement (Waterton & Watson, 2013, p.552). This shift in heritage thinking away from *heritage as object* towards human embeddedness in *heritage practice* found its strongest expression in UNESCO's *Convention for the Safeguarding of the Intangible Cultural Heritage* (Paris, 2003) where in Article 2 *intangible cultural heritage* is defined as "the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage"; a shift which ultimately affects *Cultural Heritage Informatics* theory and practice.

Informatics Revisited

The suffix "-ics" refers to a study, knowledge, skills, or practice (Merriam-Webster, n.d.). Indeed, mathematics is the science and study of math, and linguistics the science and study of language. Surely, etymology tells us *informatics* would be the study of information, including the varieties of scientific activities dealing with the organization, storage, retrieving, sharing, analyzing, or description of information. Hans Wellisch agreed with this assessment, by opting to frame informatics as "the study of information in all its aspects" (1972, p.177). Wellisch justifies his definitory argument by claiming "the name Informatics satisfies several criteria for the designation of a new discipline", which "consists of one word [...] implies the central topic of the discipline [...] cannot be confused with any other name [...] readily understood, because the stem is familiar to everybody [...] other terms can be derived from it" (1972, p.177). Even when discussing information concepts in an attempt to provide an ontology of information science, Belkin (1978) adopted *informatics* as a shorthand synonym name.

Foskett (1970) previously presented Informatics as a viable name for the discipline of information, observing how "people are now studying the behaviour of information itself and the

properties" (p. 344) and how such a term attends to the "structure and properties" rather than "specific content" of information (p.340). More specifically, Foskett's investigation warns against the reduction of *Informatics* as solely concerned with technological development, detecting "[...] considerable dangers in the direction that most research in this field is taking, [...], the reduction of information to a commodity and the emphasis on the technology of processing information without regard to its meaning or destination" (1970, p. 342).

Ibekwe et al. (2019, pp. 10-11) observed how multiple terminological catalysts emerged since the 1950s around the term *informatics* leading to several streams of interpretation. The first is *informatics* as a computer science conceptualized in German and French thought, as Steinbuch demonstrates when describing the application of signaling and communication technology (Nachrichtentechnik) to number computing: "With this began automatic information processing. We call it 'Informatik'" (1957, p. 171, transl. by the authors). This, to the best of our knowledge, is the first attested use of the term *informatics*, which Ibekwe et al. (2019, p.5) hint at but were unable to explicitly document in their analysis of the conceptions and catalysts of *informatics*. Despite the inception of Informatik as being concerned with information transfer, *informatics* broadened under the influence of Russian thought (e.g., a science of (scientific) information) as well as American thought (e.g., the social dimension of information). The subsequent proliferation of computer-centric framings and lack of established consensus around *informatics* as an umbrella term has consequently narrowed the scope of meaning. Retreating back to a narrow definition of *informatics* as purely computational misses opportunities to engage with emergent streams of inquiry around information in all its aspects.

Following Ibekwe et al.'s approach to "tracking the [multiple] origins of an idea" and synthesizing Foskett's rejection of strictly technological framings, we observe a critical imperative aligned with Wellisch's desire for a holistic attention to information issues: the necessity to understand *informatics* as human-centric and additive dimension of existing areas of inquiry which may, or may not, emphasize technological or computational deployment. Interestingly, scholars across disciplines struggle with the same reduction of *informatics* and advocate for broader interpretation, as Bernstam et al. (2010) attest in biomedicine: "Leveraging insights from the philosophy of information, we define informatics as the science of information, where information is data plus meaning. Biomedical informatics is the science of information as applied to or studied in the context of biomedicine" (p. 104). To demonstrate our argument, one need only substitute instances of "biomedical" and "biomedicine" with "cultural heritage."

Present: The Purpose of Informatics in Cultural Heritage

Converging Cultural Heritage and Informatics

Contemporary attempts to formalize *Cultural Heritage Informatics* as an area of scholarly inquiry and applied practice have intended to resolve the apparent paradigmatic discrepancies arising between the usefulness of distinct epistemologies and theories from related disciplines dealing with concepts of heritage, memory, and information. Doing so positions IS/LIS as the

meta-field and *Cultural Heritage Informatic*s as the label for the applications and scientific activities dealing with these topical intersections (Modrow & Youngman, 2023), further evidenced by *The Annual Review of Cultural Heritage Informatics* (Hastings, 2015; Arns, 2016).

Following Boticelli's (2021) case study of the *Cultural Heritage Informatics* concentration at Simmons University—a program drawing substantially on the results of a 2009 IMLS grant and situates itself at the intersection of human factors and digital curation technologies—we detect a conceptual convergence in three steps. Firstly, the Simmons team traces their intellectual lineage for cultural heritage informatics back to social informatics, an area "pioneered in the 1990s by Rob Kling (2007), among others, who argued for the value of interdisciplinary studies of how technologies influence, and are influenced by, the varying social contexts in which they are used [...]" (p. 224).

Next, the Social Informatics approach was then translated for GLAM settings and Museum Studies by Marty and others conceiving of Museum Informatics as "the study of the sociotechnical interactions that take place at the intersection of people, information, and technology in museums" (Botticelli 2021, p. 224 citing Marty 2009, p. 3717). Finally, the Simmons team acknowledged that "[w]hile Marty was concerned specifically with museums, [...] found that informatics can be just as useful in studying the impact of technology on archives and special library collections. Hence [...] we adopted 'cultural heritage informatics' as a concept that embraces convergence" (Botticelli 2021, p. 224).

One might assume programs and concentrations of the same name at other institutions with similar foci see themselves in the same intellectual tradition (for a computing-centric *informatics* framework, see Yaco & Ramaprasad, 2018). Conversely, our view of *Cultural Heritage Informatics* must strive to explain and interrogate our assumptions about the structural and attributive relationship between *culture* and *information*. Understanding our interactions with culture as an informational experience enables deeper discussions of information access (through technology), meaning (for heritage), remembering (through collective memory), functionality (for historicity), and equity (for social and epistemic justice).

Status as Domain-Specific Informatics

Zeng & Gracy's webinar offered "a starting point for discussions in an area that many of the curriculums are considering and an area that needs further collective exploration" (2015). How then can we move beyond framings of 'cultural heritage computing' to conceive of *Cultural Heritage Informatics* as a domain of informational experience? Applying Friedman's (2013) definition of domain-specific informatics, we note *Cultural Heritage Informatics* possesses applications and intellectual foundations: "informatics may be seen as the location in discipline space where (1) a particular set of relevant basic sciences meets (2) an application domain that is typically a field of professional practice" (Friedman, 2013, p.224). Much of the existing empirical work designated under the label of *Cultural Heritage Informatics* falls into the

application category, encompassing activities largely related to digital humanities, museum informatics, cultural analytics, among others.

However, the "basic sciences" (i.e. studies, fields, disciplines) underpinning the intellectual foundations of *Cultural Heritage Informatics* remain largely under-connected in IS/LIS. Understanding how these "basic sciences" manifest may reveal how memory institutions respond to cultural change, curate artifacts and experiences, and enable remembering. Applying Friedman's distinctions, *Cultural Heritage Informatics* isn't necessarily about computing cultural heritage or tinkering with "heritage" in digital settings. Rather, *Cultural Heritage Informatics* exists at the intersection of community, criticality, storage, access, and display in both digital and analog environments, whereby we must consider the acquired meanings and practical applications of cultural heritage information.

Status of the "Basic Sciences" and "Application" Domain

Early integrations of digital technologies within cultural heritage institutions sought the usefulness of the World Wide Web for heritage information – setting baseline standards of use: reduce cost of collection and housing of materials; increase public findability of and access to information and institutional use (Bearman, 2010, p. 49). Early developments mimic the "basic sciences" domain despite their call for making cultural heritage information and records more accessible. Access is one part of the puzzle. Standards for digital collecting are products of decisions made by record-keeping and information professionals, rather than by or with communities. Digital collection and organization software are riddled with similar concerns across GLAM institutions, reflecting dominant knowledge structures through description while struggling to holistically preserve Indigenous and community memory (Renshaw & Li Liew, 2021, pp. 709-710). The "basic sciences" domain demonstrates early concerns of building digital software for the organization and collection of cultural heritage information, with little dialogue on the software's theoretical implications.

Unraveling the "application" domain involves critical discussions on how cultural heritage information is cultivated across institutions, record-keepers or curators, and communities. History (and memory and heritage) as *performance* assumes the set of rituals or practices that embody the past – often associated with cultural heritage materials, objects, or ideas (Taylor, 2006, p.68, p.83). Performances are efforts of "*making* the past in the present," where cultural heritage and tradition are embodied and enacted, the "objects" of cultural heritage are applied (Dean et al., 2015, p. 6). *Cultural Heritage Informatics* must consider how digital technologies enable the performative aspects of history, memory, and heritage – shifting authority over cultural heritage to communities, rather than institutions and systems (Hauser, 2025, pp. 450-451).

Current endeavors to connect the practice and application of *Cultural Heritage Informatics* emphasize empowering community agency in the creation and maintenance of often local

history, memory, and heritage. Living digital archives aim to design and construct digital repositories *for* and *by* living communities (Almeida & Hoyer, 2020, p. 24). Digital components of living archives are not solely for preservation nor public access, but for community generation and discussions of memory and heritage. Through reparative collecting and digital tool building, libraries can support communities in combating epistemicide (Smith & Patin, 2024, pp. 453-455). Pursuing participatory design of (digital) exhibits in museums allows for community-driven representation and storytelling involvement in museum design (Cesário & Campos, 2024, pp. 71-72). Community collaboration with GLAM institutions is paramount: digital tools and mechanisms must be designed *by* and *with* the community. The "application" domain illustrates the *process* of cultural heritage preservation as opposed to the *product* – we must attend to the ways in which digital technologies are designed and utilized (Harris, 1997, p. 140; Olick and Robbins, 1998; Modrow & Youngman, 2023).

Future: The Potential of Informatics for Cultural Heritage

In homage to Waterton & Watson (2013), we've considered informatics *in* and *of* cultural heritage. We conclude by imagining informatics *for* cultural heritage to inspire future work across institutional and interpersonal settings. Performances of history and heritage rely on cultural competence, community outreach, and the impact of digital technologies: teaching and research *in Cultural Heritage Informatics* must emphasize this observation. Creating digital and computational tools for the preservation of cultural heritage, and teaching *Cultural Heritage Informatics*, requires conscious and concerted efforts to include community voices.

Our current cultural moment has placed the inherited canon front and center, prompting many to consider the legacies and inequities of cultural heritage information diffusion (Youngman et al., 2024). Futures for cultural heritage depend upon continuations of present trends proliferating ethical values and commitments to: anti-colonial initiatives (advocating against extraction and decentering Eurocentric epistemology), critiques of technological power (who benefits or suffers from use?), responsible stewardship and community ownership of cultural heritage information (a kind of speaking with—rather than speaking for—communities (Alcoff, 1999)), emphasizing sites and practices of resistance (such as reparative storytelling and intellectual freedom) in pursuit of social and epistemic justice, and, understanding the performances of the profession as reflexively embodied and critically enacted. *Process* over *product* stresses the practical and theoretical applications of *Cultural Heritage Informatics*, intersecting computational and community needs while acknowledging generative information and record-keeping occurs at the crossroads of participation, representation, and power. Thus, recognizing implicit institutional, state, and "national agendas" embedded within terminologies and concepts across fields (Ibekwe et al. 2019, p. 14).

Heritage has always needed community *and* technology. Heritage Studies has long critiqued the politics of heritage creation. Now more than ever, computation needs humanism: our digital relationship to heritage requires explicit designs, deliberation, and reflexive action rooted in

inclusive theories of history, memory, community, and participatory collaboration. This convergence is paramount to realizing the transformative interdisciplinary potential of *Cultural Heritage Informatics*.

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