Peer-to-Peer Ways to Cultural Heritage

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Abstract

As acknowledged by most scholars, practitioners and heritage institutions, the digital resources of documented Cultural Heritage form a broad corpus of diverse attributes relating to content, representation and target audiences. Until recently, Web publishing of such resources has been inconsistent in addressing these attributes, by lacking formal structure, coherence, information discovery and retrieval mechanisms, and support for custom points-of-view (individualised, thematic, spatiotemporal, multilingual, multicultural) and collaborative work. Peer-to-peer computing encourages a distributed architecture which could amend such inefficiencies.

This paper explores the emergence of peer-to-peer content networking and the ways in which it meets the requirements arising from specific aspects of the Cultural Heritage field: to encourage exploration and collaboration by identifying universal themes; to maintain contextual information; to provide the interpretation necessary to tell a story; to authenticate knowledge; to seamlessly document and record in a variety of media; to police intellectual property rights.

The Digital Data of Cultural Heritage Dialogue

Scholars, practitioners and heritage institutions are continuously adapting their tools and methods to fit current needs and address emerging problems in the creation, publishing, management and use of the digital data of Cultural Heritage. Not only are the carrying media new, but the content and distribution methods have also changed completely and new stakeholders have emerged among both users and creators of information (Abid and Radoykov 2002:65). The growing use of Internet applications in the Cultural Heritage field favours and encourages the identification of common themes and issues of global scale and interdisciplinary nature. In some cases, standards have already been set on the basis of collective, collaborative work (one such recent achievement being the CIDOC CRM). Furthermore, many heritage projects are community-based or are making attempts to include new, non-expert audiences in their production and sharing of knowledge. However, widespread collaborative work and research still rise as key future challenges rather than everyday realities, as more appropriate communication channels of direct dialogue and real-time collaborative work have yet to be explored. Users and information providers are still unaware of the potential use of the Internet not only as a communication medium, but also as a tool to share and interchange processed and raw data (D'Andrea 2000:318). This paper introduces peer-to-peer computing as one such catalyst of communication and collaboration in the Digital Age of Cultural Heritage.

About Peer-to-Peer

The notion of peer-to-peer in computer science is hardly new: sharing computing resources, integrating disparate networks, and freely cooperating in an academic research environment were the driving forces behind the original Internet of the late Sixties, which followed host-to-host communication, resource and bandwidth equality concepts. These concepts gave way to asymmetric, unequal server/client concepts with the commercialisation of the Internet and the consequent trend to fit activities on this bustling new mass medium into communication patterns used by television, radio and newspapers.

The "renaissance" of peer-to-peer computing can be attributed to a growing need to overcome current barriers to the formation of ad hoc communities, whether of people, of programs, of devices, or of distributed resources (O'Reilly 2001:58) that were put in place during the shaping of the Internet, since the inception of the World-Wide Web. Barriers both technological (Network Address Translation, dynamic IP addressing, firewalls, asymmetric bandwidth connections) and social (unsolicited mail, virus spreading, copytheft, plagiarism) in nature. The return to the original Internet is embodied by the creation of a class of applications that takes advantage of resources -storage, cycles, content, human presence- available at the edges of the Internet (...), tolerating and even working with variable connectivity (Shirky 2001:22). These applications address file sharing and licensed media distribution, messaging, web publishing, ad hoc collaboration (pervasive computing), groupware and distributed computation (grid computing).

Cultural Heritage Shared Spaces

Peer-to-peer computing represents an important social promise to the Cultural Heritage field. The creation of self-operated peer-to-peer communities organised around Cultural Heritage shared spaces will pool the efforts of individual professionals and enhance existing communication and collaboration patterns. It will integrate resources, disseminate knowledge and democratise information.

A Cultural Heritage shared space represents a collection of content and peer-to-peer applications. Shared spaces support applications that:

- fluidly integrate rich text, equations, vectors and raster images, voice and video
- are made of and use standard components (e.g. peer-to-peer integration of ESRI ArcView, Adobe Acrobat Reader, Extensis Portfolio, etc.)
- represent Web data in standard formats (e.g. HTML, XML/RDF, MPEG, SVG, etc.) and communicate using standard protocols (e.g. HTTP, TCP/IP, Bluetooth, IEEE 802.3/802.11b, SOAP, etc.)
- encapsulate collaborative tools (e.g. discussion, document review, event scheduling, project planning, etc.)

There are many existing peer-to-peer applications fulfilling the above criteria. The following are especially noteworthy: Edutella (educational resource sharing, based on the open-source JXTA development platform), Groove ("peerware", peer-to-peer enterprise groupware), Akamai EdgeAdvantage and Digital Parcel Service (content distribution system), Publius (encrypted publishing, named after the 18th century authors of The Federalist Papers), Radio Userland (weblog publishing), Meerkat (syndicated content reader), Rhymbox (integrated chat, based on the open-source Jabber instant messaging platform).

A shared space is very likely to be intermediated. Intermediaries such as a Ministry of Culture, an Archaeological Service, or a professional body can regulate access, safety and content distribution policies for shared spaces within their expertise. Control always remains at the hands of community members. Peer-to-peer community user membership can be drawn de facto from already established communities of special interest (e.g. ICOM) or on a voluntary, personal interest basis, according to the developer community model encountered on the Web (e.g. Java developer forums, JXTA community projects, SourceForge community bug report lists).

The applicability and use of Cultural Heritage shared spaces can be demonstrated in the case of archaeological content.

The Case of Archaeological Content

A peer-to-peer community organised around Cultural Heritage shared spaces provides an environment for real-time collaborative work which could be highly valued in the case of digital archaeological data. In terms of archaeological research, practice and knowledge dissemination, these shared spaces would host a wide range of activities and processes pertaining to the excavation process, academic dialogue and research collaboration, and the dissemination of archaeological knowledge to the public.

Contemporary excavation projects tend to handle a growing bulk of digital data. Field notes and diaries, pictures and drawings, geographical data, all elements of archaeological recording are turning into digital material, sometimes through direct on-site input. Excavations also incorporate a great deal of interdisciplinary work or, in some cases (e.g. rescue archaeology), demand immediate expert consultation. In large-scale national and international projects, a fine-tuned collaboration between various expert groups (e.g. geologists, conservators, architects) has to be established. Collaborative projects between different institutions or between a field research team and a "mother institution" often have to face problems of poor technical support and data exchange, which result in a time (and fund) consuming collaboration. Field archaeologists have to deal -in many cases- with a local area being technologically isolated, which burdens on-site recording and systemisation of digital data.

A community consisting of peers who practice archaeology or any other involved discipline could deal with these issues in a real-time collaborative manner. This community could set up a shared space covering different stages of an excavation project, or connecting distant excavation projects and research teams supporting defined sets of activities within the following:

- identification of common themes and problem solving strategies
- immediate expert consultation and comparative, interdisciplinary work
- collaborative authoring, cooperative interpretation and narration building
- collaboration in transforming raw data into systemised data
- arrangement of work schedules, timetables, whiteboards
- unified on-site documentation and data processing
- enhancement of existing communication and dialogue

These sets of activities would integrate and enhance existing excavation toolboxes: GIS software, portfolio management, email. The future development of advanced methods for remote operation, distributed computation and ad hoc connectivity in archaeological shared spaces would further enable the field archaeologist to use remote sophisticated hardware and software for real-time 3D modelling/rendering, and interconnect all the technical equipment available on-site (including portable 2D/3D/barcode scanners and GPS trakking devices).

Archaeological shared spaces would also enable peers beyond the excavation practice to:

- incorporate fragmented data (e.g. in excavation sites, museums, labs) through shared availability
- set and apply metadata and ontology standards to received data
- set and apply standards for authenticating archaeological knowledge
- set language annotation preferences and use multilingual tools
- co-manage work schedules and data processing
- apply selected media formats, and determine means of documentation, authoring and publishing in order to ensure compatibility and interoperability
- apply security and safeguarding policies, self-manage access and data sharing criteria
- increase the academic awareness and transparency of

archaeological research and knowledge
- e-publish without major labour requirements, sophisticated software, high costs, or time-consuming work (a motivation against the "digital dilemma" and the divide between archival data and publications)
- manage change and adapt to new technologies

In less formally structured and strictly safeguarded applications, a shared space membership could include non-expert group peers and individuals. This membership composition would enhance an expert-to-public dialogue and encourage participation in archaeological interpretation and knowledge building. Many archaeological projects have recently made attempts to allow customised, personalised points-of-view and include non-expert, local or global audiences into excavation practice, archaeological research and interpretation (e.g. Çatalhöyük, Ename 974, PAST, see Hodder 1999, Kotsakis et al. 2002, Pletincx et al. 2001). Such an approach is also justified by "community" or "community-based" archaeology which has an interest in involving local communities into archaeological research.

Thematic shared spaces (e.g. focused on the theme of a Neolithic settlement excavation) encompassing a broad audience ranging from the excavation team itself to high school students, PC-equipped locals and random, geographically-spread Web visitors, would result in original interpretation perspectives and establish direct dialogue between distant communities. For individuals representing "less dominant" views, being able to attend the stages of an ongoing excavation (through shared textual and audiovisual data) or taking part in the archaeological story-telling, gives a sense of belonging to a community that jointly produces knowledge and forms the body of narration. In a community of peers, "authority" (in this case: the archaeological expertise) is no longer the sole content provider since it is a receiver at the same time, allowing a greater initiative space to non-expert peers.

Peer-to-Peer Risks

Peer-to-peer communities and shared spaces demonstrate some inherent risks owing to their reliance on digital communication technologies, to their content and their peers. While the reliance on digital communications is no different than any other Internet application (access being a prerequisite to participation, this is still a highly discriminatory limitation as most of the Earth population is "offline"), content and peer risks should be examined more closely.

Shared spaces apply to that part of digital archaeological data which can be made available on a shared basis. Peers are able to determine the range of content coverage within their community. In the domain of cultural resource management -here taking the case of archaeology- access control to a peer-to-peer community and the regulation of digital rights are crucial issues. It is therefore necessary to set standards for the safeguarding of intellectual/cultural property rights and fine-tune them to national policies.

In a context of data exchange, collaborative authoring and participatory interpretation, where both communication protocol and human errors or mishandlings are involved, the risk of losing primary data is real. Ways to preserve primary data and avoid the loss of "information commonsense", such as data duplication (backup) and encryption, should be taken into consideration.

Even in a peer-to-peer, decentralised environment, the development of dominant peers and regulative authorities is still possible, as is the tendency to homogenise academic, linguistic and cultural diversity. "Elite" expert groups and western "developed" institutions may tend to marginalise non-expert groups and small, developing institutions in a community of peers. English will still tend to be the language exclusively used in international and even non-western projects.

The creation, regulation, and communication function of a peer-to-peer community and shared space depend on the peers that create it. Dominant views and schemes may still survive, but alternative views, diverse communication patterns and multivocality should always be guaranteed. Peer-to-peer communities and shared spaces can be self-managed in terms of setting regulation policies, language preferences, range of participation and dialogue. If the centralised systems are so constructed that they overflow with diversity and alternative perspectives (Hodder 1999), then decentralised systems have the true potential to answer these issues in a more fluent way.

In every case, there has to be a firm will for collaboration, data sharing and exchanging, and dialogue not only between archaeologists and other researchers but also with interest groups and non-expert audiences. Data flow within peer-to-peer communities should remain unburdened by rigid mentalities, bias and hesitation relating to the electronic publishing and exchange of data, academic and research collaboration, and the sharing of knowledge with the public.

Thinking Peer-to-Peer: A Trend Setting

Data sharing, collaborative work and research have been identified as future trends of Internet use in the field of Cultural Heritage and archaeology. As described by Hodder, *'there is a shift from hierarchy to networks and flows'* (Hodder 1999). Such a shift can also have an impact on archaeological theory and practice, since *'the potential for participation is such that it does possible to talk of the erosion of hierarchical systems of archaeological knowledge and the emergence of a different model based on networks and flows'* (Hodder 1999).

Peer-to-peer is a model based on networks, flows and collaboration between communities of peers. The main consequence of the implementation of peer-to-peer content networking is the vertical disintegration of the provider/user or server/client scheme. In the case of the digital data of archaeology, this respectively leads us to a series of transitional effects which signify a shift from authoritative, linear schemes to communities of peers creating and using data on a sha-

red basis. Being a decentralised, "democratised", participatory model of Internet use, peer-to-peer content networking provides spaces for collaboration, dialogue and multivocality.

Shared spaces can only be viable as long as trends favour a shift from central to peripheral, from dominant or "western" views to alternative or local interpretations, from "safekeeping" of academic "certainties" and archaeological knowledge to publishing, exchanging, and communicative and collaborative researching. The decentralised nature of peer-to-peer communities and shared spaces -excluding the notion of a sole content possessor- has the potential to meet modern challenges such as the discovery and quality control of resources or the survival of primary digital data (Richards 1998:347-348).

Peer-to-peer computing is still being re-introduced as the fundamental collaborative basis of the Internet. This paper has attempted to demonstrate a first link between such promising technologies and the field of archaeological theory, practice and the dissemination of knowledge, since no choice of tool should be regarded as incidental (Richards 1998:331) or detached from a discipline's body.

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