

Hybrid Experience Space for Cultural Heritage Communication

Veirum, Niels Einar; Christensen, Mogens Fiil; Mayerhofer, Mikkel

Published in:
Communicating Space(s). 24th eCAADe Conference Proceedings

Publication date:
2006

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):
Veirum, N. E., Christensen, M. F., & Mayerhofer, M. (2006). Hybrid Experience Space for Cultural Heritage Communication. In *Communicating Space(s). 24th eCAADe Conference Proceedings* (pp. 22-30). <Forlag uden navn>. <http://www.arch.uth.gr/ecaade06>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Hybrid Experience Space for Cultural Heritage Communication

Niels Einar Veirum¹, Mogens Fiil Christensen¹, Mikkel Mayerhofer²

¹Aalborg University, department of Architecture and Urban Design, Denmark

²ArchaeoData, Denmark

www.chimeraresearch.org

Cultural heritage institutions like the museums are challenged in the global experience society. On the one hand it is more important than ever to offer “authentic” and geographically rooted experiences at sites of historic glory and on the other hand the audience’s expectations are biased by daily use of experience products like computer-games, IMAX cinemas and theme parks featuring virtual reality installations. “It’s a question of stone-age displays versus Disney-power installations” as one of the involved museum professionals point it, “but we don’t want any of these possibilities”. The paper presents an actual experience design case in Zea Harbour, Greece dealing with these challenges using hybrid experience space communicating cultural heritage material. Archaeological findings, physical reconstructions and digital models are mixed to effectively stage the interactive experience space. The Zea Case is a design scenario for the Museum of the Future showing how Cultural Heritage institutions can reinvent the relation to the visitor and the neighbourhood. While Hybrid Experience Space can be used for Cultural Heritage Communication in traditional exhibitions we have reached for the full potential of on-site deployment as a hybrid experience layer using Google Earth and mobile technology.

Keywords: Hybrid Experience Space; Cultural Heritage Communication.

Introduction: Cultural Heritage Communication

There is a growing concern that the rapid changes to societies around the world due to the expanding globalized market economy will seriously damage or even destroy not only the recognized cultural heritage sites but also the sites, rituals and artefacts that until recently made up the pattern of life in all its diversity.

So the questions of how to preserve and commu-

nicate the ancient past is gradually being extended into a question of there being anything at all to preserve from our most recent past as stated at the New Heritage Conference in Hong Kong, March 2006

Another question concerns the institutions, settings and procedures involved in preserving and communicating our heritage. Part of the background for our research is based on the hypothesis that several of the modern heritage institutions that we have grown accustomed to, are facing changes on a wide

range of scales. Amongst these are not at least the museums. We are going to unfold this hypothesis in the following chapter.

If we summarize our point of view the cultural heritage and its preservation seems to be under pressure from the global economy as well as from a cultural development towards entertainment and consumer attitudes in relation to heritage.

In this paper we will start by outlining a scenario, introducing our vision for turning preservation of heritage into a shared community of practice (Wenger 2006), by means of 'Hybrid Experience Spaces' as a mediating platform. Based on a specific case study in Piraeus, Greece, we are going to unfold the theoretical framework as well as the methods and technologies involved.

The authoring team

Veirum and Christensen are associate professors at the Department of Architecture and Design, Aalborg University, Denmark. Veirum is also the director of Newmedia Productions ApS and former consultant on GIS systems development. Christensen is the founder of Architects office Modelspace undertaking architectural, multimedia and design related tasks. Mayerhofer is the founder of ArchaeoData and conduct IT management for a number of archaeological excavation sites, including the combined land and underwater archaeological Zea Harbour Project, under the Greek Ministry of Culture and the Danish Institute at Athens. The authors work together within the research project "Cultural Heritage Interactive Media Environment for Reality Augmentation"¹ (CHIMERA) with the ambition is to present an overall concept for a museum based on hybrid experience space situated learning at the historical site.

Google Earth meets Ancient Zea Harbour, - a design scenario

We arrive at the Piraeus harbour front well ahead of time. The ferry taking us to the island will not leave

¹ www.chimeraresearch.org

until late afternoon. "- Hi, there a yellow sticker here", yields Linda, the elder of my two kids. "- I can't see any sticker", I reply. "- 'Course not, it's a Google Note", she continues, "There's an ancient site nearby". I wonder how she's able to manage all the different communities she's engaging on that tiny phone. "- Acropolis was like a sausage pan. I don't want more ruins today", argues Bob, her younger brother. "- This one is different. There's an underwater exhibition and some warships called triremes". Needless to say; before any actual agreement is reached Linda is leading the way along the water front. "They have some luggage lockers at the bus station. If we climb the streets behind we'll soon be able to overlook the next harbour. It looks like a lagoon from the sky". Bob is falling back on the steep hill. "- I want a Google Earth phone or some of those new goggles" he mumbles. I understand him. Since Linda got that phone she has turned into a knowledge typhoon and it is difficult to keep up with her pace on learning. No new concepts or technologies went into the phone, but the way they are integrated around the spinning globe from Google Earth seems to make the difference. She is the active part in our investigations and that alone is empowering her, but the most impressive is the way she is always able to find the right connections. "- One of the guys I met on the summer camp was here two weeks ago", Linda stops to wait for us, "He suggests us to start getting an overview of the site at the observation post near the Zea Marina entrance". Not a bad idea. In the binoculars I now have a great view of the marina and the line of cafes above. "- Try pushing that slider", Bob says as he hits it. Suddenly the view is blended with a busy ancient harbour life and I hear the noise from a small group of workers repairing the bronze ram of one of the warships across the water. I zoom back out as much as I can and the hammering vanishes. "- This is impressing. Come on, Bob. See how the harbour is surrounded by huge buildings and the warships are preparing to leave". Half an hour later I am relaxing in the marine archaeological museum. Bob is occupied in a virtual reality game about the Battle at Salamis and Linda is exploring more of the hints from earlier visitors she finds on Google Earth. I will ask her if anybody in

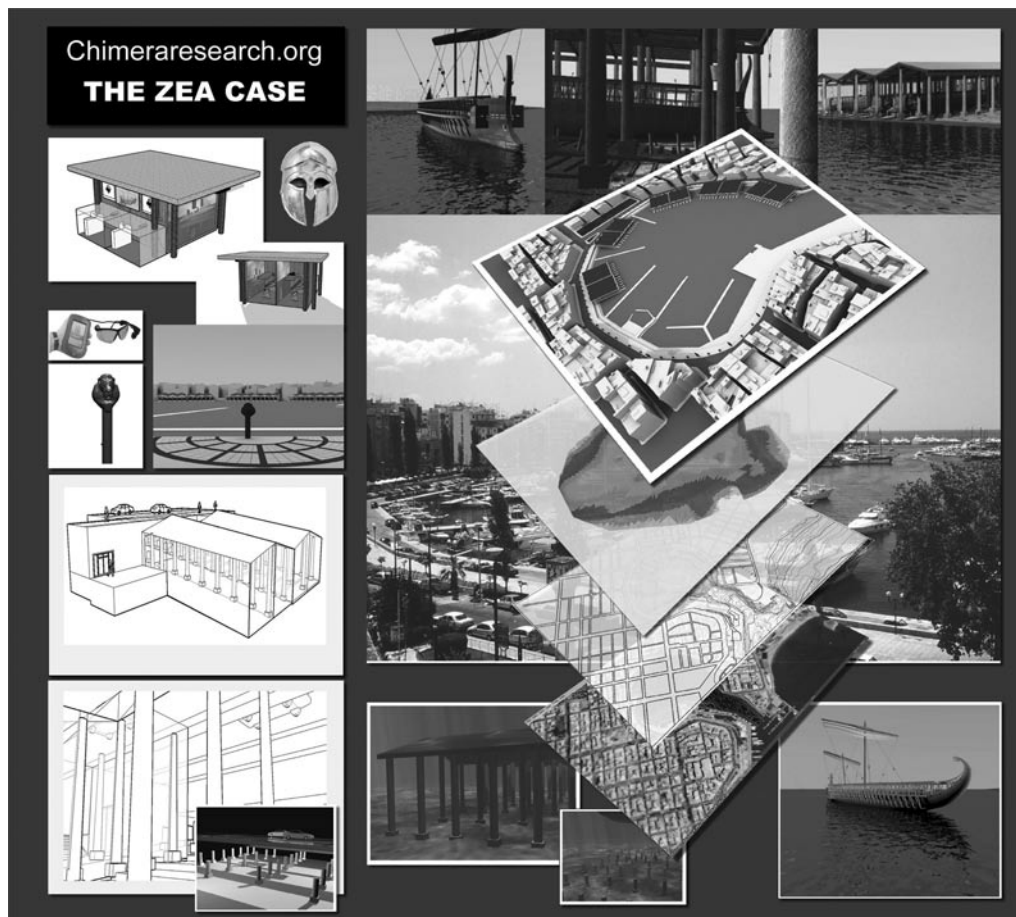


Figure 1
The Zea Case. Illustrations from a design scenario workshop “The museum of the future” in march 2006. Scenery binoculars by Thomas Bildsøe, virtual reality trireme kiosk by Allan Ranch and marine archaeological museum by Dina Brændstrup. 3D reconstruction by Brian Klejn-Christensen, Allan Bjerre and Thomas Bildsøe (view at chimeraresearch.org).

the community has commented on the tiled roof of this part of the museum. It is a reconstruction of an ancient ship shed and I am not sure the archaeologists have got that moulding right.

The scenario above outlines a situation similar to what most people experience on a holiday except for the new ways of handling information about cultural heritage sites and the element of passing on information enabling learning and building of knowledge.

The museums, the archaeological as well as art

museums, have traditionally been handling this information and the knowledge linked to it, centred on their collections of artefacts. In our research we find this role of gate keeping to be threatened by current trends in society.

In the following we are going to unfold our view upon the museum institution and some of the challenges forced upon them from the global economy and the resulting changes to the society in general.

Museums and the cultural heritage

If we look at the museum as an institution, the first Museums of Natural Science were inspired by the Renaissance Wunderkammer and brought to life during the era of industrialization and the constitution of the Modern Society. Soon after the museums were spread throughout the world and the collections covered Natural Science, History, Anthropology, Archaeology, Art etc. In these Museums the growing number of 'citizens' could learn about the wonders of the world, all put together by professionally trained experts, unfolding the orderly taxonomy of the world of objects. The exhibitions of objects and artefacts were built on a display of 'facts' in accordance with a linear and logic progression of events, enhancing a certain reading of history and a certain understanding of learning (Miles et. al., 1982)

In the 1960ies and 70ies the world witnessed the beginning of a new relationship between the formal institutions and the public, based on necessary adjustments to the needs of the modern society. (Nesbitt, 1996)

Hierarchical systems and authoritarian rules of government were abandoned and more emphasis was placed on the individual. The user appeared in guidelines for design and communication. (Bell, 1973)

In schools, high schools and universities the same thing influenced teaching and formation, but at a slower rate and heterogeneous in nature. (Jameson, 1991)

A diversified global market economy equally enforced 'new ways of working' (Bertin and Denbigh, 1998; Sproull and Kiesler, 1993) and the individualized modern consumer was born, expecting to be able to choose from a range of products, services and entertainment at a time convenient for him or her.

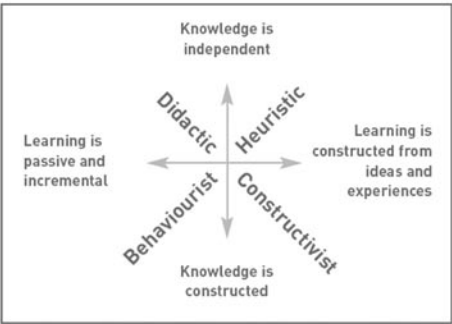
So we are facing a situation where the heritage institutions as well as cultural institutions in general are forced to compete with common marketplace entertainment venues at the same time as the global

economy has eradicated a fair share of the cultural traditions and sites that used to be representing "the other", as Nezar Alsayyad (2006) has pointed out. A research question central to the problems indicated above is: can the digital technologies of New Media, born out of the same development, be turned in to a platform for a new and forward oriented approach to our cultural heritage and its communication?

The consumer of today is not satisfied by pre-defined choices. The consumer is becoming a co-producer. In a commercial perspective this trend is recognized as Customer Made (Innovationlab, 2006), a revolution from below where the customer takes the lead and marketing is replaced by facilitation. In a broader perspective we all are co-producers of knowledge and social meaning. The cultural heritage communication challenge can be reframed as a learning challenge within communities of practice (Wenger, 1987). Following Wenger (2005, p. 4) the learning in the world today requires more emphasis on multi-scale social learning systems and on individual identity. Museums and other cultural heritage institutions can play a key role by providing a systematic account of data and telling their learning stories for and with learners in ways that are useful to them (p. 5). As an exemplary best practice on that path we see the Australian "Digital Songlines" project (Leavy, 2006) empowering the aboriginal people by collecting their cultural heritage and feed it back into the community as a social resource.

Linking cultural heritage and learning

In concordance with UNESCO's (2005a) definition of cultural heritage as being two-fold, we are performing our research based on a constructivist understanding of knowledge and learning as being part of what cultural heritage involves. Some of the key elements in this understanding centres on the relationship between knowledge and learning. Hein (1998) and Hawkey (2005) have made a representation of this relationship, as illustrated in Figure 2. We understand knowledge as being primarily situated



in Constructivist quadrant of this 2-dimensional representation.

Hawkey questions whether this understanding is reflected in the way museums are conducting their business. Hawkey has analyzed a range of British museums and his findings reveal an uncertain and uneven approach to this question.

Following this understanding of knowledge and how we construct it, conservation and communication of cultural heritage has to be sensitive towards the changes in society to face the challenges outlined in the previously.

Hawkey considers the answer to these challenges to be centred on new strategies for the museums. He points out that the museums will have to:

- engage in learning as constructive dialogue rather than as a passive process of transmission
- take on the role of privileged participant rather than that of expert
- carefully evaluate the significance of the formal school curriculum (and its assessment process)
- facilitate lifelong learning by providing a free-choice learning environment that permits a plethora of pathways and possibilities.

In line with Hein and Hawkey we see learning as a central point in the relationship between the formalized institutions of learning, which involves the museums, and the reality of ‘user’ in the modern society. Lifelong learning is a reality for members of the globalized economy, which to some extent is reflected in the range of new technologies being

introduced, as illustrated in Figure 3. The illustration draws a parallel between two separate fields of study and finds some correspondence between them.

In our research we are questioning if New Media/New technology, can be used to handle the challenge of creating a new relationship between the museum and the user and how this could be done. In the following chapter we are defining the ‘space’ in which this is going to occur.

Situated learning in hybrid experience space

A change to our conceptions of space, place and time has often been linked to the New Technologies, encompassing the Internet, mobile devices and wireless connections.

Lifelong learning	New technology
individualised learner-centred situated collaborative ubiquitous lifelong	personal user-centred mobile networked ubiquitous durable

From sociology and urban planning we have several examples of research agendas on the changes that these technologies are introducing. Castells (1996) has attempted to describe this at a macro level while others (Gotved, 2006), taking an offset in Giddens (1990), are researching the micro-sociological level, where the patterns of social interaction make up everyday life. Sociologists like Latour (1987 & 1993) have tried to create a tightly knitted inter-relationship with technology in the Actor Network Theory, to enable an understanding of the creation of cultural products and artefacts.

Architects, on the other hand, have been struggling to cope with the fundamentals of space and place. Being amongst the key elements of architecture they have been challenged by new technologies. Adding to the difficulties have been the practice of

Figure 2
Hawkey (2005)

Figure 3
The design of personal mobile technologies for lifelong learning, Sharples, M (2000)

architects dealing with – at the same time – the very ‘real’ reality of the building process juxtaposed the ephemeral ‘reality’ of phenomenological sensing of place and space. Peter Anders (1999) have made an attempt to link cyber – or virtual - space with place, through the Anthropic principle. He defines it as an electronic environment designed to augment our innate (or socially constructed) use of space to think, communicate and navigate our world. He links it to traditional tools for storing information in Memory Palaces (Yates, 1966). In this he is in line with Vannevar Bush (2001) and Douglas C. Engelbart (1988).

The archaeological material at the Zea Harbour is not visually ostentatious; there are no beautiful temples with vertical pillars or striking sculpturing. Most of the archaeological material is to be found either underneath modern development or under water. It is therefore important to focus broadly on the harbour’s context, creation, and its historic significance, instead of looking at it from a purely aesthetic view point. Due to the sites great influence on history, a visit from both tourists and students is more than warranted

The ancient complex of fleets in Zea is among the great buildings of the classical era (480-323 B.C.) and accommodated the monumental war ships of the time; the triremes. These ships were among other things engaged in the famous battle of Salamis against a larger Persian fleet, and the Peloponnesian war.

These historic events have contributed to making this period central to western cultural history which is why it is significant to the promotion of culture. Precisely this cultural and historic importance makes Zea Harbour Project an obvious choice as a case study. Zea Harbour Project is an internationally acclaimed archaeological project of international standards and with an international profile attaching high importance to scientific findings (Kronsted, 2004).

It is the aforementioned physical conditions of the excavation site that makes it difficult for visitors to get a sense of size and room. A digital reconstruction of buildings and ships would be ideal for the understanding of the antique harbours architecture

and town space. The potential in the new mobile digital forms of promotion makes it possible to combine digital reconstruction with the actual archaeological location.

In the Zea Case we have set up a model for handling these challenges. Built on the notion that The Cultural Heritage is to be seen as an active part of Piraeus city, we have put forward a strategy for linking the existing collections with on-site localized hybrid experience space ‘layers’, operated in a variety of ways.

We integrate the advantages of new digital media to allow for new and unforeseen linkage of previously separate information. Based on a reference system and Google Earth the user can subscribe to relevant information, contextualized and in accordance with his or her preference profile.

Google Earth is a globe that sits inside your PC. You point and zoom to anyplace on the planet that you want to explore. Satellite images and local facts zoom into view and you tap into Google search to show local points of interest and facts.

Google Earth can accommodate cross referencing between separate layers, thereby activating e.g. archaeological information dispersed in the city. Using overlay techniques, e.g. spectacles with variable transparent overlay of 3D information, the user can get a personal and exciting impression of the cultural heritage (Vlahakis et al., 2004).

Hybrid experience space at the current state-of-the-art is a possible way for Cultural Heritage institutions like museums to meet the challenges from the global experience society.

Archaeological findings, physical reconstructions and digital models can be mixed to effectively stage interactive experience spaces at sites of historical importance.

Hybrid experience space for cultural heritage communication links past and present in the actual land or cityscape and let tourists and citizens alike take part in the geographically rooted “authentic experience” which is the main attraction of the local setting.

Such a truly unique hybrid experience space

strongly bound to the actual site does not need to be invented from scratch each time. On the contrary; - a global infrastructure for linking and distribution of digital models is necessary to provide the local institutions with the tools they need to focus on the cultural heritage content.

We are pointing to known technologies and practices that can support the realization of the design scenario and make it possible to develop generic design concepts spanning a wide variety of cultural heritage institutions. In the spirit of open source² and creative commons³ it can be used as a mutual platform for hybrid experience designs around the globe.

After a long unnoticed period as a research communication tool the Internet took off in early 1990ies when a group of dedicated users defined HTML as a simple set of rules that limited the theoretical possibilities of the internet but expanded the practical use tremendously by introducing the web-browser.

Google Earth can become the web-browser of hybrid experience space, the common interface and infrastructure that make hybrid experience space for cultural heritage communication a breeze and not a battle.

Google Earth has the potential to lift the geographical information systems (GIS) out of the research labs and governmental agencies and throw the power of spatial databases into the hands of archaeologists and cultural heritage communicators. And it is happening already; you find the UNESCO Official World Heritage List in Google Earth at <http://whc.unesco.org/en/map>.

As pointed out by Addison (2006) the initial work done in data organizing and classification by the UNESCO should be taken as a guideline for further development. An important next step is to provide a registration procedure for a cultural heritage site to obtain a unique identification number, a *Heritage-ID* building on an extended notion of the existing *WorldHeritageID*. An official free accessible cross-reference web service with an open metadata querying

² <http://www.opensource.org>

³ <http://creativecommons.org>

interface providing Google Earth anchor points and links to further resources would be a very good start on a global cultural heritage infrastructure. Hopefully Google or another wealthy organization will partner up with UNESCO on that.

Besides the well known classification layers in the Google Earth interface we need now to integrate a historical time-line continuing the concept of TimeMap from the Archaeological Computing Laboratory, University of Sydney. The *Heritage Time Period* metadata entity from the cross-reference web service will provide the needed data for that. We acknowledge with Silberman (2006, p.73) that the linear representation of time has produced chronological narratives in which the course of history seems almost predetermined and we will encourage experiments representing e.g. the mythic cycles of time, but we find this must be done locally in a carefully designed contextual set-up.

We also need integration to mobile devices such as phones and PDAs and to advanced delivery systems such as the upcoming Framework for Mixed Reality Experiences suggested from the Media Convergence Laboratory, University of Central Florida (Stapleton & Hughes 2006a) This framework is an Open Source initiative aimed at shared development of common modules for rich experience installations. Cultural heritage institutions might not be in the position to lead this technological integration, but by preparing the content for open platforms they will benefit from the mass market drive. Google Maps (a "light" version of Google Earth) is now available for mobile phones and the whole game industry is preparing to target the mobile market massively in near future.

For technical reasons like e.g. limited real-time rendering performance it is often necessary to compromise very strict museum standards for accurate representation in order to achieve an engaging user experience, but it is important to note, that the proposed underlying infrastructure of layered spatial databases in principle allow for a spontaneous user initiated time-out session at any point. The user can investigate the scientific evidence for a specific scenario and reflect and discuss on it in a community of

practice. According to Affleck and Kvan (2006, p.85) there is a rebirth of the 'community' online using a mix of social software, with both groups and individuals publishing journals, blogs, discussions and collaborative stories on themes ranging from specific to general. Kalay (2006) points to the diminishing power of official gatekeepers that opens the floodgates to "un-authorized" evidence and interpretations. We agree that the museums and other traditional custodian institutions will have to turn to a more facilitating mode of practice, forwarding the professionals' doubts and considerations along with the canonical views. An active community of practice around a cultural heritage topic should be seen as a success in both preservation and communication terms.

Visitors to cultural heritage sites represent different generations, cultural backgrounds and learning styles but should all have the possibility to get a memorable experience. Hybrid experience space installations can encourage shared experience by prompting questions and inspiring creativity in a mix of storytelling, game and play. The storytelling approach embedded in different installations range from passive to interactive, the former pursuing the author's intent while the latter relay on the visitor's active participation. In the Zea case (Figure 1) the scenery binoculars allows a view of the activities at the harbour front in ancient times and the virtual reality trireme kiosk involves the visitors physically in struggle for the victory at the Battle of Salamis.

It is desirable that the traditional linear canonical story telling of ancient times only serves as an introduction to a historical epoch and is supplemented by a more playful exploration of the site, the findings and their correlations.

A recent field study points to the observation that the audience is very capable of extending the imaginary experience space beyond the Hybrid experience space installations to areas that have no technology (Stappleton and Hughes 2006b). In the Zea case that means that after exposure to the cultural heritage layer the urban texture itself will feed experiential triggers to the visitor for constructing an

understanding of ancient harbour life.

Perspectives and further research

We have engaged in the challenge to actually create design proposals for hybrid experience spaces for the ancient Zea harbour, working from the professional tradition of architecture and design to create synthesis from the stakeholders' different agendas. The work with difficult spatial design decisions ignited a research interest in the underlying knowledge, learning and communication paradigms in the area of cultural heritage communication. We are now looking at the same challenge with a different view, but still we find the search for visionary but simple solutions to be the way to go.

References

- Alsayyad, N.: 2006, Consuming Heritage or the end of Tradition, The New Challenges of Globalization, in New Heritage: Beyond Verisimilitude, Conference on Cultural Heritage and New Media, Hong Kong.
- Addison, A.C.: 2006, The Vanishing Virtual, in New Heritage: Beyond Verisimilitude, Conference on Cultural Heritage and New Media, Hong Kong.
- Anders, P.: 1999, Envisioning Cyberspace, McGraw-Hill.
- Bell, D.: 1973, The Coming of Post-Industrial Society, N.Y.
- Bertin, I. and Denbigh, A.: 1998, The Teleworking Handbook: New Ways of Working in the Information Society, TCA, the Telework, Telecottage and Telecentre Association.
- Bush, V.: 2001, As we may think, in David Trend (ed) Reading Digital Culture, Blackwell.
- Cosmas, J., Itegaki, T., D. Green et. al: 2003, Providing Multimedia Tools for Recording, Reconstruction, Visualisation and Database Storage/Access of Archaeological Excavations in D. Arnold, A. Chalmers and F. Niccolucci (eds). 4th International Symposium on Virtual Reality, Archaeology and Intelligent Cultural Heritage, pp. 165-174.
- Castells, M.: 1996, The Rise of the Network Society, Blackwell Publishers, Malden, MA.

- CustomerMade - Customers are taking over. Conference April 20, 2006 in Copenhagen organized by Innovation Lab in association with O'Reilly Media, Inc. <http://www.innovationlab.dk/sw13480.asp>
- Engelbart, D.C., William K.: "A Research Center for Augmenting Human Intellect," English, AFIPS Conference Proceedings of the 1968 Fall Joint Computer Conference, San Francisco, CA, December 1968, Vol. 33, pp. 395-410 (AUGMENT,3954.). Republished in 1982 with Items #4, #21, and #23 in *Computer Supported Cooperative Work: A Book of Readings*, Irene Greif [Editor], Morgan Kaufmann Publishers, Inc., San Mateo, CA, 1988, pp. 81-105.
- Giddens, A.: 1990, *The Consequences of Modernity*, Polity in association with Blackwell, Cambridge.
- Gotved, S.: 2006, *Time and space in cyber social reality*, University of Copenhagen, Denmark, in *New media & society*, SAGE Publications, London, Thousand Oaks, CA and New Delhi, Vol8(3), pp. 467-486.
- Hawkey, R.: 2005, *Learning with digital technologies in museums, science centres and galleries*, Nesta Futurlab Report 9, Bristol.
- Hein, G. E.: 1998, *Learning in the Museum*, Routledge, London.
- Hooper-Greenhill, E.: 2001, *Communication and Communities in the Post-Museum – from Metanarratives to Constructed Knowledge*, University of Leicester.
- Jameson, F.: 1991, *Postmodernism or, the cultural logic of late capitalism*, Verso.
- Kronsted, P.: 2004, *Dansk arkæolog opdager græsk kulturskat*. http://www.zeaharbourproject.dk/Kultur-Weekend_03-09-2004.pdf (last visited May 2006).
- Kalay, Y.: *Preserving Cultural Heritage Through Digital Media*, in *New Heritage: Beyond Verisimilitude*, Conference on Cultural Heritage and New Media, Hong Kong.
- Kvan, T., Affleck, J.: *Reconstructing Virtual Heritage: Participatory Interpretation of Cultural Heritage Through New Media*, in *New Heritage: Beyond Verisimilitude*, Conference on Cultural Heritage and New Media, Hong Kong.
- Latour, B.: 1987, *Science in Action*, Harvard University Press.
- Latour, B.: 1993, *We have never been modern*, Latour B., Harvester Wheatsheaf.
- Leavy, B.: 2006, *Digital Songlines*, CyberDreaming Pty Ltd, Australia, <http://songlines.interactiondesign.com.au/>
- Miles, R.S.: 1982, *The Design of Educational Exhibits*, in collab. with Alt, M.B., Gosling, D.C., Lewis, B.N. and Tout, A.F., Allen & Unwin, London.
- Nesbitt, K.: 1996, *Theorizing a new agenda for Architecture*, Princeton Architectural Press, pp 21.
- Owen, R., Buhalis, D. and Pletinckx, D.: 2004, *Identifying technologies used in Cultural Heritage* in Y. Chrysanthou, K. Cain, N. Silberman, F. Niccolucci (eds), *The 5th International Symposium on Virtual Reality, Archaeology and Cultural Heritage*, pp. 155-163.
- Sharples, M.: 2000, *The design of personal mobile technologies for lifelong learning*, Computers & Education.
- Sproull, L. and Kiesler, S.: 1993, *Connections: New Ways of Working in the Networked Organization*, MIT Press.
- Stapleton, C. B. and Hughes, C. E.: 2006, *The Evolution of a Framework for Mixed Reality Experiences*, *Emerging Technologies of Augmented Reality: Interfaces and Design Idea Group, Inc.*, Hershey, PA, in press.
- Stapleton, C. B. and Hughes, C. E.: 2006, *Making Memories for a Lifetime*, *Emerging Technologies of Augmented Reality: Interfaces and Design Idea Group, Inc.*, Hershey, PA, in press.
- Tsoulouvis, L.: 1998, *Planning, the Urban System and New Forms of Inequality in Greek Cities*, in *Progress in Planning*, Volume 50, Number 1, pp. 1-74.
- Vlahakis, V., Demiris, A., Bounos, E. and Ioannidis, N.: 2004, *A Novel Approach to Context-Sensitive Guided e-Tours in Cultural Sites: "Light" Augmented Reality on PDAs*, in Y. Chrysanthou, K. Cain, N. Silberman, F. Niccolucci (eds), *The 5th International Symposium on Virtual Reality, Archaeology and Cultural Heritage*, pp. 57-66.
- Yates, F.: 1966, *The Art of Memory*, University of Chicago Press.
- Wenger, E.: 1987, *Artificial Intelligence and Tutoring Systems*, Morgan Kaufmann, USA.
- Wenger, E.: 1999, *Communities of Practice*, Cambridge University Press
- Wenger, E.: 2005, *Learning for a small planet, a research agenda*. <http://www.ewenger.com/research/index.htm>