City histories revealed

These articles do not have set fonts; please set your browser to your preferred font for reading or printing.

Citation: Keene, S. (2004). Literary and Linguistics Computing 19: 351-371.
http://llc.oupjournals.org/content/vol19/issue3/

This is a preprint and may differ from the published article.

Suzanne Keene Institute of Archaeology
31-34 Gordon Square
London
WC1H 0PY
suzanne.keene@ucl.ac.uk

Abstract

e-cities is a concept for a system that would bring research knowledge of the cultural heritage, in particular the history of cities, into popular use. The idea was developed as a model of multi-lingual cultural content management and dissemination. The system could be implemented as a fully functional and reproducible system applicable to any city, anywhere. Much of the technology is being or has been developed for use in other applications. It would offer important political, economic and cultural benefits. This paper explores the technologies that would be required and identifies those that are available and developing. It puts the case that an e-cities system is not just desirable but, increasingly, necessary.The basis for the idea for e-cities is the proposal for a DEER, a Distributed European Electronic Resource, which was developed as part of the work of E-Culture Net, a project in the EC 5th Framework Programme (Keene, S. and Monti, F. 2003). The DEER would provide a mulitilingual information environment that would offer access to digital materials for the whole of European culture.

Introduction

e-cities is a concept for a system that would bring research knowledge of the cultural heritage, in particular the history of cities, into popular use. e-cities would deal specifically with historical information about European cities. Its model of cultural content management spans the entire chain of the process, from scholarly historical research to content acquisition and archiving down to its delivery to end users via a variety of desktop and mobile platforms. The concept has been developed collaboratively, with principal contributions from Nikolas Mitrou from the National Technical University in Athens, Derek Keene from the Institute of Historical Research, University of London, and Sheila Anderson, Arts & Humanities Data Service, as well as the author of this paper. Others contributed proposals for technologies and for electronic publishing. There is great enthusiasm for developing e-cities among members of the Commission Internationale pour l'Histoire des Villes (see below, Acknowledgements).
This paper will present the concept of e-cities. Potential uses and users will be reviewed, especially the uses that professional historians and other researchers might make of it. The content and the technical requirements will be discussed, and examples will be given of the technological solutions already available. The social, economic and political context will be considered.

top

Objectives of e-cities

The history of European cities is a very active area of research. Within the formal academic environment new knowledge and understanding is constantly being developed. At the same time city history is of great general interest, and there are numerous energetic and well-informed researchers outside the context of formal higher education. As a consequence of the rise in cultural tourism such information may have significant commercial value as well. However, there is a gap between scholarly knowledge and the information that is widely available to tourists and the general public: the latter is often inaccurate and out of date and hence positively misleading.

The major objective of e-cities would be to enable historical research knowledge of cities to be represented, stored and delivered in electronic form, through a distributed knowledge management system. e-cities information would be delivered via desktop computers, but special opportunities are offered by the wireless technologies and mobile computing devices that are rapidly being developed and implemented.

e-cities would aim to facilitate public access to the materials and thereby encourage wide appreciation of the depth and diversity of the history and culture of cities. It would provide new tools and facilities for tourism and heritage management. It would contribute to educational programmes both through its content and through tools it would offer. e-cities would facilitate research across disciplinary and territorial boundaries, undertaken by the public at large as well as by scholars, and encourage comparison between cities (Keene, D. pers.comm. 2002).

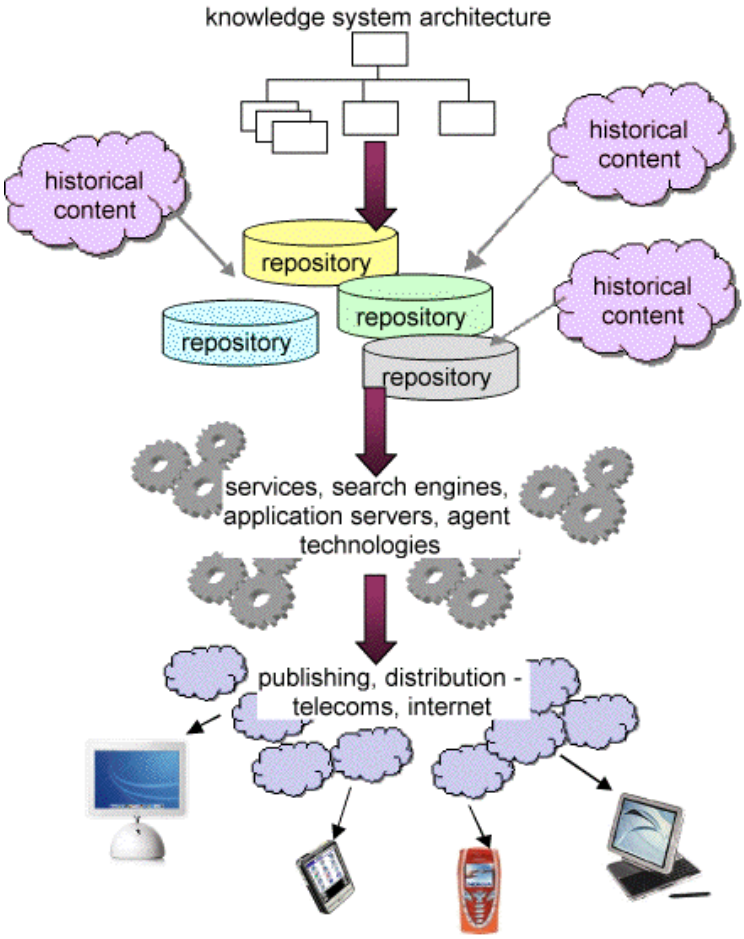

Fig. 1. Diagrammatic representation of the e-cities system.

e-cities: an Overview

e-cities would consist of digitised content, information repositories, middleware and software for access and distribution, and end user interfaces to a variety of hardware platforms. These would range from desktop pc's to pda's (personal digital assistants) and mobile telephones. The historical content would be held in data repositories with databases modeled according to a general model of city ontologies. A range of technologies would be required to enable the content to be digitally created in suitable form, to model the information, constitute information repositories and deliver the information to the end users. Although it is to be hoped that much of the e-cities information would be available free of charge there could also be the means of commercial dissemination and exploitation.

e-cities content would be generated or selected by historians. Many historians working on the history of cities already use electronic tools to generate and store research data and information. As created, this information is mostly not suitable for delivery to the general public. There is also a wealth of material in libraries, archives and museums that could be drawn on. The essence of the e-cities concept is contextualisation, primarily through the main information axes of city geography, time, persons and the physical city itself.

A range of technologies would be required to implement the system, from an ontology to model the content of an historic city and define its basic elements to repositories that would use content databases compiled from the abstract model and metadata schemas. Associated with geographic information databases, these would form a knowledge repository of the city's history and topography.

Middleware, applications and interfaces would be required, to serve users of diverse profiles and needs via desktop and mobile access channels and devices. Translation technologies would be employed to make the content available in several European languages.
Selected e-cities content might be made available commercially. This would require authorisation technologies to be implemented as part of the repositories. Marketing studies would need to be undertaken and generic rights management agreements developed.

top

Users and Uses

The primary audience for e-cities users would be those members of the general public who are interested in the history and culture of cities. Researchers within academic institutions and also those researching for their own interest and enjoyment would also benefit from the tools and information provided by e-cities. Historians would be able to contribute to and build on e-cities information, and there would be tools for general users to actively use and possibly contribute to e-cities, or at least to store their own notes.

Uses and users would include:

• Those wishing to plan their visit, or to know more about the history of the cities
via home PCs, typically through broadband internet connections.

• Tourists and visitors during visits to the cities
Via devices that will be typically used by visitors within 3-5 years' time: the electronic equivalents of maps, guidebooks, binoculars and cameras: pda's, mobile telephones, tablet computers. Advanced telecommunications will be the primary means of delivery.

• Learning and teaching at a variety of levels
The content and the software provided for its use will allow it to be used by lecturers and teachers to develop teaching materials as well as by visitors and interested parties to compile personal portfolios.

• Historians and researchers
A new means of interpreting and disseminating the findings of research, especially via 3D modelling, eg of buildings or townscapes.

• Commercial publishers
Commercial uses could include publishers wishing to use e-cities technologies to provide information linked to the general context of city information and knowledge; tourism companies including city guide publishers; telecomms companies wishing to provide content for their delivery systems. Equally, providers of commercial services might be willing to pay for their facilities to be presented in the context of e-cities: an hotel or a restaurant convenient to a historic building, for example.

top

Evaluation

Evaluation would be required at various stages – front end, in which a sample of users is interviewed to determine what they would like to see in such a system; formative, to test prototypes, whether paper based or screen based, as the system is developed; and summative, after the system has been produced, to check whether its objectives have been met and users are satisfied.

Scenario Planning

In order to develop the formal user requirement specification for e-cities, scenario planning would be employed. In this, uses of the system are developed and the consequent requirements can then be inferred (Carroll, 2000, Ch.3).

A variety of scenarios for using e-cities information can be imagined .

• A researcher wishes to gain an overview of up-to-date knowledge of the history of a city via a desktop computer. They call up interactive maps of the city at various stages of its development and click on an area or building to discover what was known about it. For some cities (such as Bologna) research findings have been represented in virtual reality / 3D, and here the researcher is able to make a virtual walk-through of the city and thus gain a dynamic appreciation of its development over time. The researcher marks the most relevant items and attaches notes of their own to review next time they visit e-cities.

• A person is planning a visit to an historical city. They view the maps that show the development of the city and in particular those that show streets and buildings that are still visible. They save their preferred route as the start of a personal e-city, which they can call up during their walk around the city. Additionally, they ask to be shown nearby restaurants and coffee bars. The e-cities system is credited with income when they click on one of these advertisements.
While on their visit, they stand in a street and see information about the location, such as text about buildings and building uses, images of it in the past, and even historical soundscapes, via their electronic guidebook, pda or mobile telephone. e-cities receives income from the telecoms provider. They also want to find the railway or bus stations, so they click on the links to find how to get to these as well.

• A lecturer or teacher accesses e-cities on their desktop pc and compiles a portfolio of electronic e-cities information for use in classes or seminars. Through a deal with an educational publisher this information can be automatically embedded in the e-learning package that they use in their workplace.

• A commercial publisher does a deal with a conventional print publisher to make text from a standard work of architectural history available via e-cities, either on desktop pc's or through pda's on location. Once the visitor or researcher has paid the license fee, tiny chips attached to historic buildings communicate with their pda through a wireless network, so that relevant information about the building or street is displayed automatically during the visit.
It is not difficult to envisage uses and users of a facility such as e-cities. As the system was taken up other novel uses and applications of historic city information would undoubtedly be developed because it is clearly of such broad interest, underlying many of the current economic, cultural and social uses and developments of cities.

top

e-cities Content

Historical Source Content

Historians use electronic media extensively to produce organised data from primary sources and in publishing their work. The material they produce could and indeed ought to be supplemented by that in the possession of museums, libraries, and archives. These memory institutions are well aware of the need to demonstrate that their collections are relevant and useful. But to be really useful, their collections materials need to be set in context. This is not a new idea: historians and other researchers often contribute contextual material to exhibitions and exhibition catalogues. In e-cities, the context would be the main message and items from institutions would supply part of the content.

The material that could be produced or draw on could include, for example, historic maps; photographs, paintings and other visual representations of city scenes; literary descriptions; historical sources such as chronicles, diaries, letters, street directories, and taxation returns; music, voices and other sounds; the content of cultural institutions and collections in the city; archaeological discoveries; heritage databases (e.g. in Britain 'listed buildings', and 'sites and monuments records'); bibliographies. These would be accessed through the e-cities mapping framework, but also available in a form that could be interrogated thematically and chronologically (Keene, D., pers.comm., 2002).

There is the question of quality assurance. Since e-cities would claim to be authoritative, would there not need to be a review process for the content? One approach might be to think of e-cities as a medium for debate, with proposed results and commentaries being a form of discourse. This implies a permanent editorial process to moderate and agree what went on line as the authoritative e-cities statement. The historians involved would in any case have to act as editors (or perhaps a better analogy is curators) of the e-cities content for their city.

Figs. 2 a and 2 b. Views of Cheapside, St Mary le Bow church, in the 18th century and today. The line of the

properties to the left of the church today is the same as that in the 18th century.

Digitised Content

Once e-cities resources had been identified, a process of digitisation and modelling would need to take place. In this, digital representations would be made of the actual items (images, text, sounds) and of other related data (time, geographical data, databases) using recognised standards for the file formats. In some cases existing digital representations would either be used as supplied or re-formatted.

Although there are broadly agreed standards for digital formats that will be robust and easy to use and to preserve for future use and re-use these are only gradually being recognised and employed by historians (Woollard, 2003). Working with cities in several different countries would make these issues more challenging. However, this is the kind of problem that has to be solved if historical information is to be more widely accessible.

Since e-cities would be so closely based on the geography of the cities, a very important component, perhaps even the major interface for the system, would be vector digitised maps. In the case of the UK, Ordnance Survey maps that are out of copyright provide the basis for mapping the development of the city back through time. These and similar maps for other European countries are used in the ongoing research project, Atlases of Historic Towns, in which volumes of maps based on historical evidence and showing the development of a city is published with accompanying historical essays. There are historic towns atlases for a number of cities now, such as Winchester, London, Dublin, Torun in Poland, and several others (website, Atlas of Historic Towns Projects).

Virtual Realityand 3D Content

Virtual reality or 3D (3D/VR) representations, or visualisations, can be presented at a number of levels of abstraction. They range from immersive experiences in which the user enters and becomes an actor in a virtual world that surrounds them, through highly detailed models showing building massing, openings, details and full textures, to models which merely express the massing of the building perhaps simply 'extruded' upwards into 3D from a ground plan (Giannakis, 2003). Further variations on virtual reality, such as augmented reality and scientific visualisation, are well demonstrated on the Fraunhofer website (website, Fraunhofer Institut Graphische Datenverarbeitung).

A celebrated example of 3D/VR applied to city history is the NUME project of the University of Bologna, NUovo Museo Elettronico: La città in 4 dimensioni: Bologna virtuale (Bocchi, 1999; website, VISIT). This project is the result of detailed academic research in technological collaboration with CINECA, Consorzio Interuniversitario per il Calcolo Automatico dell'Italia Nord Orientale, the Italian supercomputing centre, which has also undertaken other 3D historical projects through its VISual Information Technology laboratory (website, VISIT). Two more such projects based on partnerships with academics are from CASA, the Centre for Advanced Spatial Analysis in University College London, working with the Petrie Museum to produce the relatively low technology but information rich Digital Egypt for Universities (website, Digital Egypt; Gratjetzki, 2003), and currently on the technology for visualising historical data on the City of London (Giannakis, 2003). However, there is intense interest in such representations throughout Europe and North America. Other centres working on 3D/VR representation in connection with historical and archaeological visualisations include the Fraunhofer Institute in Germany and the Foundation of the Hellenic World in Athens.

However, there are a number of issues around the widespread creation and use of 3D and VR representations, to do with their viability as long-term assets and their widespread usability.
The value of digital materials such as these models is affected by the usual digital preservation issues of technological obsolescence, physical deterioration of storage media and maintenance of authenticity:

> To access the data we need the originating software. To run the software we need the operating system it was designed to run on. To run this operating software we need the hardware it was designed to run on. (British Library Research Report, 1996).

Such models will commonly have been produced using commercial or in-house software. The AHDS (Arts & Humanities Data Service) publishes a Guide to Creating and Using Virtual Reality. It points out that the standard that is most widely used, VRML (virtual reality modelling language), has not been universally adopted and includes the following cautionary message:

> The withdrawal of VR products by manufacturers (see Section 3.10), combined with the apparent slow acceptance of VRML as a securely established medium, should perhaps provide something of a warning to all developers of VR models or applications. (Fernie and Richards, 2000, Section 2.5).

The problem is that VR technology is still in a state of rapid development and improvement as hardware capabilities grow. Centres of computing science and technology such as those mentioned above and many others, as well as commercial software companies, find this a very fruitful area of research and are continually producing new and improved technologies. VR/3D representations are extensively used in architecture, town planning, etc. The disadvantage is that 3D reconstructions that have been developed in partnership with careful scholarly work could become obsolete in a short space of time. On the other hand, one of the directions of VR/3D software development is to automate and therefore ease the task of creating these models from the basic data, which will be far easier to preserve through normal routes.

Another problem is that, impressive though some of these visualisations can be, they mostly lack practical usability. To avoid long download times the user will need a relatively high bandwidth connection, at least the equivalent of UK domestic ADSL at 512 kbps.; but then, the provision and takeup of broadband connections is spreading rapidly in Europe. e-cities 3D/VR content would need to be produced in 'lite' versions that did not rely on users having access to the fast academic networks such as super-JANET. But worse are the problems arising from there being a variety of proprietary 3D/VR software in use. The software is mostly highly specific to particular hardware and operating systems. It is common, and highly frustrating for the user, to find that the 3D representation cannot be displayed on their particular combination of hardware, operating system and software. The reason for this is that it is necessary for the producer of the software to constantly update their (free) plugins (ancillary software that runs with web browsers) to run with new versions of browsers and operating systems. When it is considered that there are at least two browsers in common use – Netscape and Internet Explorer - and three operating systems – Windows (several versions), Apple Macintosh (two versions) and the fast spreading Linux, each of which may be upgraded at least annually, the challenge for a commercial company or an academic institution is obvious.

e-cities would include 3D visualisations. The benefits are too great to ignore. In spite of the caveats, 3D/VR visualisation is a very powerful way to convey historical knowledge of cities. It allows the historian to vividly express to others the mental models that they develop based on their knowledge, and the user to appreciate these without the intermediate stage of reading text or studying separate maps or images. Interestingly, the National Research Council in Canada is using this technology actually to train historians in the better understanding of historical data. Students use simple architectural 3D software to model buildings for which they have historical evidence (Bonnett, 2003; website, 3D Virtual Buildings Project). One project, ARCHEOGUIDE, has developed the technology to allow users to see VR models transposed on actual archaeological remains at the same scale and perspective, using electronic 'binoculars'. This requires considerable investment in on-site infrastructure (websites, ARCHEOGUIDE).

For e-cities an objective would be to promote the development of 3D/VR models using, as far as possible, digital materials and strategies that facilitated their digital preservation for the long term. The models should be accessible through a wide range of devices, including handheld and mobile devices. Despite the marketing images of happy users of laptop computers in sunny open-air locations such as the beach, the displays on screens normally supplied are not visible out of doors, let alone in bright sunlight. However, the technology is becoming available, as this is not normally a problem with pda's (personal digital assistants). ARCHEOGUIDE claims that the handheld devices it supplies to users do have outdoor visible screens.

top

Information Management Technologies

Knowledge management, or information management, technologies would be required to store the e-cities content and make it accessible for use. Data preservation would be an important consideration.

The core of the system would be a knowledge repository organised around an ontology-based schema covering the basic elements of city (including people, social relations and physical form), plus the associations between them, and their location in space and time.
Around this core, a set of tools and interfaces would allow users (casual ones or experts, at the office or on the move) easily to interact with the information, for example by adding new content and associated metadata, by editing content in collaboration with remotely-located colleagues, by searching for information according to appropriate query templates, by retrieving geo-coded information on-site, and by displaying it on portable devices.

A salient feature of the system would be its capacity to support diverse user profiles and needs, to incorporate new content elements, and, above all, to allow its schema to evolve so as to accommodate new historical elements not anticipated when the system was set up. (Mitrou, pers.comm., 2003)

A range of different cities would provide a sample to test different aspects of the e-cities implementation, since researchers have generated different sorts of historic information about them. A sample such as Bologna, Dublin, London, Malbork, Pisa, and Torun would include capital cities, commercial and financial centres, castle towns, and intellectual centres. Historians in other cities, including New York and Edinburgh, would also be interested in the e-cities development.

Knowledge System Architecture

A major set of tasks would be to develop an ontology for city information and to implement that as a model for archival and working repositories to serve the system. An ontology is a formal expression of a shared understanding of information: a shared vocabulary in a form that allows the information to be processed by computer. This shared knowledge definition provides the conceptual information framework that is expressed and implemented as detailed database schemas and user classes. In the case of e-cities, the information should be delivered in several languages so the information architecture would need to allow for that.

A city ontology would be defined as set of elements, sufficient to describe the history of cities in general and the cities selected for the pilot project in particular. Among these elements would be: natural features (such as rivers, soils and relief) constructed elements (such as infrastructure, buildings, and the streets and other spaces defined by them), human elements (such as individuals and social or political groups), institutional elements (such as administrative units and sites of authority), activity and land-use elements (such as trades and recreation), events (such as foundation or conquest) and cultural stock (such as collections and sites of performance). These elements would be prioritized according to their significance in the life and history of the city. The ontology would be modelled using standard metadata modelling languages (website, W3 Consortium; Mitrou, pers.comm.. 2003).

For each element a set of attributes and associated content components would be determined. For a historic building these could include location, use at different times, photographs and other images, construction details and 3D models, and links to information on individuals associated with the building. In addition links would be provided to the sources of such content, particularly that available in digital format (Mitrou, pers.comm., 2002).

Repositories

e-cities would require a repository infrastructure for its content that would provide for both long-term preservation and use within the access framework. The repository infrastructure should be based on the ISO standard OAIS reference model for digital repositories, which addresses issues of data preservation. A test implementation of a distributed archive prototype has been built by the The CEDARS project (website, CEDARS project). The ontology modelling process would result in schemas that would define the databases which would hold content and metadata for content files such as digital images. Appropriate connectors to the application layer – middleware and web services - would be provided.

As well as the repository framework, tools for content editing and development would need to be supplied. The data repositories would also manage IPR, access and rights handling. Secondary data repositories would serve the tools for active distribution and delivery.
Ideally, a generic e-cities framework and associated tools would be developed that could be implemented locally, either at a local institution or by a chosen repository provider, for any city that wished to join in the e-cities programme.

Middleware

Middleware is software that connects two otherwise separate applications, distinct from import and export features of the separate the applications. For example, it is middleware software that links a database system to a web server. A user's web browser form requests data from a database, and a web page is created dynamically by the middleware for delivery (CREN, 1996).

In the case of e-cities, middleware would be needed to draw on the content stored in the respositories, process it, and deliver it to end users in the form that they required. Middleware ('griddleware') is an essential component of GRID technology, an important development of internet technology, where both information storage and processing are distributed. For example, text content in Italian might be drawn from a repository, and processed by translation software for delivery to a user who required it in Polish. Translation software is quite commonly available: for instance, it is used by companies to translate technical documents. The GIS (graphical interface system) technology in particular would require advanced middleware.

There would also be the technologies to call up the requisite content and process and deliver it in the appropriate form for the user's particular distribution medium and hardware platform, whether a desktop computer or a handheld pda or electronic guidebook, or even a mobile telephone. The latter might use voice rendering technology or it might use text messaging or simple images.

As well as this there would be location sensitive software working together with the GIS system. This is further discussed below.

top

Distribution Technology

The means of storing, representing and handling the data have been discussed above: the knowledge technologies needed to manage and process the information, and to store, retrieve and process it. The next part of the system to be discussed is the means for distributing the information via networks of various kinds

to the end user's hardware.

Hardware and Infrastructure

The technologies and infrastructure for presentation and delivery, especially via wireless connections, are rapidly developing. Alongside this, web services are already a reality. Web services deliver content to users not passively in response to searches whether simple or sophisticated, but actively, using middleware to process the user's request.

An important development in presentation is personalisation. Here, the system recognises a returning user, or a user who has been accessing the system already, and tailors what it delivers according to the users' interests and profile, or perhaps according to the information it has already presented them with. For instance the system might be able to recall what language they preferred. Good examples of personalisation can be found in e-commerce sites such as Amazon and supermarket shopping sites, where it is usual to store one's master shopping list, details of previous orders, and so on (website, Amazon).

Two European projects are developing e-cities type technologies. ARCHEOGUIDE has been mentioned above (websites, ARCHEOGUIDE). This project is developing a local information system for the classical archaeological site at Olympia. The information delivered includes that which might be found in a good guidebook – textual information, supplementary images and site plans - but using personalisation to select what is delivered according to the user's profile and what they have already accessed. It is delivered to users via a choice of hardware platforms which can be rented on site: either a small handheld pda, or a mobile unit which consists of a wearable computer and a head-mounted display similar to a pair of binoculars. Both types of platform are also location and direction sensitive using electronic compasses and gps (global positioning system) technology. The pda's can display limited text and images, but the mobile units can display a virtual reality re-creation of the site structures in the correct perspective and alignment. Events such as foot-races in the racetrack can be depicted in the appropriate venue. Reports on whether ARCHEOGUIDE will function successfully are optimistic.

This project is similar to the concept for e-cities in that it delivers information to users that is personalised to them and related to their geographical position – highly attractive and illuminating information at that. It is dissimilar in that a large amount of on-site infrastructure is required: an on-site server, three masts for wireless transmission, and specific user hardware rented on-site. e-cities would aim to use the generic wireless and wired communication systems, whether the internet, gps, or mobile telephony technology.

These generic technologies are used by a range of small handheld gps systems that is now available, as a search of the web will quickly reveal. Software and hardware can be used in normal pda's or mobile telephones to detect position down to three metres using satellite technology (it is said that only the US Defense Department prevents far more accurate positioning). Maps or other information will then be displayed according to the user's geographic location.

A project that is utilising generic technologies is IMAGE:

> As tourists, on business tours or when taking a trip to the neighbouring town we often are uncertain of where to find a specific service and how to get there. We may also want to book the service and pay in advance to avoid queuing. This could also happen in our hometown when we are in search for an unfamiliar service.

The EU co-funded Image project (IST 2000-30047) aims to help citizens and travellers in such situations. It will provide them on their move with mobile, personalised, location based information on available services, guidance how to reach them and a way to book and pay for the service and the journey there. (present author's emphasis). (website, IMAGE)

The testbed cities for IMAGE are Tampere, Finland, and Torino, Italy. Both these cities already have infrastructure services related in particular to real-time transport information. It may be that a similar service is being implemented in London: some bus stops are now equipped with screens that show the waiting time for the next bus. The Tampere system is based on national and regional personal navigation, service and intelligent transport system infrastructure. That in Torino has been developed by Torino City Council with a commercial partner.

Other aspects of mobile technology that are fast developing are the portable computing platforms and the corresponding wireless networks that they are designed for. Intel's Centrino technology is used in the latest generation of laptops. This combines minimal power use through operating system and chip design with longer life batteries. Centrino machines are very lightweight (Jarret, 2003). The availability of this hardware and software is both driven by and drives the growth in wireless connection capability, which is integrated into Centrino laptops: integrated wireless access via normal wireless networks, short-range Bluetooth connections, and infrared links. These technologies will enable such equipment to use the networks in Tampere and Torino are mentioned above, and in the UK various providers, such as Starbucks coffee bar chain and BT, are planning or implementing wireless networks (Schofield, 2003).
Another relevant technology is RFid (radio frequency identification) tagging, which has been called 'the internet of things'. It is predicted that wireless and tracking technology will receive a powerful boost from these. RFid tags are said to have been first developed by the Royal Air Force in the second world war. An RFid tag can be tiny, less than a third of a millimetre wide, and it is "a microscopic antenna that can be read by a scanning device with a [current?] maximum range of 100m" (Dodson, 2003). They work in conjunction with an EPC (electronic product code) network, now launched in North America. RFids and the EPC network are predicted to be going to make barcodes obsolete.

"It is a simple concept with enormous implications," reads [the Auto ID] website. "Put a tag - a microchip with an antenna - on a can of Coke or a car axle, and suddenly a computer can 'see' it. Put tags on every can of Coke and every car axle, and suddenly the world changes. No more inventory counts. No more lost or misdirected shipments. No more guessing how much material is in the supply chain - or how much product is on the store shelves." In a sense, it is a future where pretty much everything is online. (Dodson, 2003).

RFid tags could be used in conjunction with the wireless technology outlined above to enable historic buildings or parts of cities to identify themselves to a suitably enabled electronic device, so that the relevant e-cities information or images could be presented to the user.
These technologies all bring serious issues of personal security and privacy, because they enable a person's movements to be tracked with some accuracy – but then, so does their mobile telephone, and a myriad CCTV and security cameras in almost every public place, at least in the UK.

Presentation

Interfaces

It is envisaged that the interfaces for e-cities would be highly graphic, although of course powerful search technology would also be offered. The emphasis on the city as place calls for map based interfaces, although time, events and people would also be important information axes. Although clickable maps are commonplace there are many other forms of spatial interface, discussed by Gregory (2003).

top

Funding and Exploitation

User requirements, content, knowledge management, distribution technologies for e-cities, and presentation to

users, have been reviewed. The final link in the chain is the funding and exploitation of e-cities content.

Even if capital funding is available to establish the system and to provide the initial content, information systems also require funding for maintenance and upgrading, not to mention developing new content. This would be an important consideration for e-cities, because user expectations would rise as the technology developed. There are various models for providing this funding: through central funding for public institutions such as universities; through subscriptions from or licensing to libraries or individuals; or through charging users for information on a commercial basis.

A prerequisite for the successful takeup of e-cities information would be to research the market for the information on the basis of various funding models and use the results to determine policies for charging and sustainability.

It can be argued that information generated through public funding should be available to the public free of charge. In this model, public funding is used to maintain and develop the system. Although attractive and perhaps viable in some countries this will not be a practical proposition for all. An alternative model, that of charging license fees to universities, public libraries and private users, is also commonly employed. Public funding is still the source, but market forces notionally ensure that the information is attractive and useful enough to be considered a priority for paying license fees. This route is that taken by SCRAN, the Scottish Cultural Resource Network, which received start-up funding from the lottery Millennium Fund but which now relies on licensing.

Whether cultural information, especially research-based information, can ever be entirely self-funding through commercial means is doubtful. Benefiting for its continuing operation from none of the hidden subsidies often available for public sector cultural digitisation projects, SCRAN is reported to be having financial difficulty, even though it has exclusive assignment of copyright of the content that it funded. The EU's Digicult report, Technological Landscapes for Tomorrow's Cultural Economy, includes a thorough and illuminating discussion of these issues (European Commission, 2002a). There are lessons to be learned from Fathom, an online educational project to deliver cultural information and particularly educational material such as courses to the general and interested public, in which some material was available free of charge and supplementary educational or fuller material could be purchased. With generous start-up capital supplied by Columbia University in the US, including full provision for marketing, and content from several prestigious national and academic institutions both in America and in the UK, Fathom failed to survive.

Still, the commercial market for information is developing and it may be that users are becoming accustomed to paying for this. Substantial income is generated through the purchase of ringtones for mobile telephones. WAP (wireless enabled protocol) mobile telephones enable the purchase of current information such as that on motorway traffic flow (although it is so slow to download that a substantial traffic jam is needed in order to access it). The modest charge is added to the user's mobile telephone bill. One of the collaborators in developing the e-cities concept developed the idea of digitising an existing architectural history reference source, relevant sections to be purchased via the e-cities system. Online advertising, which can be discrete and provide a useful service to users, is becoming a major source of online income – Google, in a fairly restrained way, to name but one example. e-cities could include links to information on restaurants, hotels or shops in the neighbourhood of an historic house or area of a city; there would be a charge to the advertiser based on 'click-through'.

top

Discussion

It would be a major task to develop and implement the whole knowledge management process from drawing on scholarly research data to providing information to meet researched user requirements through to geographically based contextual interfaces and diverse delivery platforms. While many of the technologies exist or are being developed in some form, they have not been implemented in an integrated manner for application in this context.

Ontologies for city information would need to be developed. The difficulties of obtaining agreement on the meanings of terms and the relationships of information items are well known. Although the OAIS Open Architecture model is generally accepted as the basis for information repositories, implementing the city ontology as a generic model, with facilities for advanced middleware and web services applications, would be a challenge. Technologies for accessing information via geographic databases are still emerging. Virtual reality representations of cities exist, but it is difficult to access them from normal desktop platforms. The technologies and commercial models for information delivery via mobile platforms are under intensive development, but for different though comparable applications.

There are a number of discussions of the impact of computers on historical research, for example by Morris (2003), and in the publications of the Association for History and Computing (website). Morris argues that, broadly speaking, computer processing facilitates and encourages research that employs rule-based searching of information that consists of or can be converted into lists and databases, at the expense of more subtle, intricate investigations into texts, especially handwritten ones, such as diaries, letters, manuscripts, and so on. Historians are having to come to terms with the arrival of source material that is 'born digital' – and also the vast quantity of material thus available. Given this scene, e-cities seems to offer new perspectives through its focus on geographic, spatial and visual information and interfaces.

top

Conclusions

The emerging technologies present the opportunity to disseminate the new cultural knowledge that is constantly generated by humanities research into European history and culture, at present largely hidden in academic publications and institutions. In turn, these technologies present possibilities for undertaking historical and cultural research in new ways.

European research Framework Programmes alone have resulted in a wealth of innovative technical capabilities and applications. Marshall McLuhan crystallized the recognition that "the medium is the message": technology is not neutral. Far from simply 'supporting' what people do (the technologists' favoured term), discourse on technological determinism argues that it shapes and determines activities in fundamental ways (e.g. de Miranda and Kristiansen, 2000). However, the knowledge created by historians and humanities researchers might, if it were more accessible, also shape society and inform actions and responses. We need not look far for examples of current situations where better knowledge of history, cultures and societies could have had important political benefits. The e-cities concept is an example of how new technologies could help to achieve this end.

Fig. 3. Starbucks café in Cheapside. Starbucks offers wireless connections for customers.

Historical research and knowledge is not a minority concern for a few academics. On the contrary, it is a major popular interest, as attested by television programmes, historical novels and accessible books, and millions of cultural toursists. Information and communication technology is now the EU's second most important economic sector (European Commission, 2002b, para. 1.1.2) - and it is said that tourism is the first. To avoid politicians such as David Blunkett, the UK's current Minister for Education and Employment, consigning historical research to a dusty (and underfunded) cupboard, historical knowledge must be made interesting, economically relevant, and accessible to its many adherents. The e-cities concept shows how information technologies could deliver this desirable result.

top

ACKNOWLEDGEMENTS

The principal contributors to the e-cities concept are Nikolas Mitrou (National Technical University in Athens), Derek Keene (Institute of Historical Research, University of London), and Sheila Anderson (Arts & Humanities Data Service), as well as the author of this paper. Historians interested in using e-cities are those in London, Dublin, Bologna, Pisa, and Torun in Poland, all members of the Commission Internationale pour l'Histoire des Villes. Manolis Koutlis of Talent SA in Athens and Michael Schnaider of the ZDGV in Darmstadt contributed proposals for technology. Adam Hodgkin of Xrefer represented electronic publishing aspects. Kim Veltman and Lou Burnard contributed greatly to the development of the wider DEER concept, and Francesca Monti researched and jointly authored the DEER report.

References

Bocchi, F. (1999). New Methodologies for the History of Cities: The City in Four Dimensions (Nuove metodologie per la storia delle città: La città in quattro dimensioni), in: Bocchi, F. (ed.), Medieval Metropolises, Proceedings of the Congress of Atlas Working Group, Bologna, 1999, pp. 11-28. English translation, J. Maloney, URL: http://www.storiaeinformatica.it/nume/english/ntitolo_eng.html. Accessed: 26.10.03.

Bonnett, J. (2003). Following in Rabelais' Footsteps: Immersive History and the 3D Virtual Buildings Project, Journal of the Association for History and Computing, VI:2, September 2003. URL: http://mcel.pacificu.edu/JAHC/JAHCVI2/ARTICLES/bonnett/bonnett.HTML. Accessed: 10.11.03.

British Library Research Report (1996). Cited in: Web, C. (1997).
Carroll, J.M. (2000). Making Use: Scenario-Based Design of Human-Computer Interactions. MIT Press, London.

CREN (1996 and later). Core technical glossary. Corporation for Research and Technical Networking. http://www.cren.net/crenca/glossary/crenglossary.html. Accessed: 3.11.03.

Dodson, S. (2003). The internet of things. In: Guardian Online supplement, 9.10.03. Also online: URL: http://www.guardian.co.uk/online/story/0,3605,1058506,00.html. Accessed 4.11.03.

European Commission (2002a). The Digicult Report: Technological Landscapes for Tomorrow's Cultural Economy. Full report. Luxembourg: Office for Official Publications of the European Communities, Ch.VIII. Also online: http://digicult.salzburgresearch.at//. Accessed 7.11.03.

European Commission (2002b). Decision No 1513/2002/EC of the European Parliament and of the Council of 27 June 2002 concerning the sixth framework programme of the European Community for research, technological development and demonstration activities, contributing to the creation of the European Research Area and to innovation (2002 to 2006). Official Journal L 232, 29/08/2002 P. 0001 – 0033, Luxembourg, European Commission.

Fernie, K. and Richards, J.D. (2002). ADHS Guides to Good Practice: Creating and Using Virtual Reality, London, AHDS. URL: http://www.vads.ahds.ac.uk/guides/vr_guide/sect25.html. Accessed: 26.10.03.

Giannakis, M. (2003). Work in progress. URL:
http://www.casa.ucl.ac.uk/melina/upgrade/pages/index_presentation.htm. Accessed: 11.11.03.

Gratjetzki, W. (2003). Impetus or Obstacle to Learning? 3D reconstructions on Digital Egypt for Universities, in: EVA 2003 London, conference proceedings. London: EVA Conferences International.

Gregory, I. (2003). Space - a neglected frontier? Adding the geographical component to research in the digital age. In: Examining the impact of digitization upon scholarship in the humanities, proceedings of a conference held 7 July 2003. Institute of Historical Research.
http://www.history.ac.uk/conferences/digitisation2003/gregory.html. Accessed: 4.11.03.

Jarret, D. (2003). Great electronic leaps forward, In: Guardian Online supplement, 29.5.03. Also online: http://www.guardian.co.uk/online/businesssolutions/story/0,12581,965647,00.html. Accessed 4.11.03.

Jones, M. and Beagrie, N. (2001). Preservation management of digital materials, London, Resource. URL:

http://www.dpconline.org. Accessed: 31.10.03.

Keene, S. and Monti, F. (2003). DEER: the Distributed European Electronic Resource. Deliverable 11 In: E-Culture Net: European Network of Centres of Excellence for Digital Culture Research and Education. Project IST-2001-37491. 2003. URL: http://137.120.135.183/FP5/. Accessed 2.11.03.

Keene, D. (2002). pers.comm. Contribution to project proposal, Institute of Historical Research,<cities outputs.doc>, November 2002.

de Miranda, A. and Kristiansen, M. (2000). Technological Determinism and Ideology: The European Union and the Information Society, in: Policy Agendas for Sustainable Technological Innovation, 3rd POSTI International Conference, London, United Kingdom, 1-3 December, 2000. Online only: http://www.esst.uio.no/posti/workshops/miranda.pdf. Accessed: 10.11.03.

Mitrou, N. (2002). Pers.comm.. Presentation to E-Culture Net project conference. National Technical University of Athens. December 2002.

Mitrou, N. (2003). Pers.comm. Contribution to project proposal. National Technical University of Athens. December 2002.

Morris, R. (2003). A discourse upon method, historical knowledge and information technology. In: Examining the impact of digitization upon scholarship in the humanities, proceedings of a conference held 7 July 2003. Institute of Historical Research. http://www.history.ac.uk/conferences/digitisation2003/morris.html. Accessed: 4.11.03.

Schofield, J. (2003). Radio ahead, in: Guardian Online supplement, 13.3.03. Also online: http://www.guardian.co.uk/online/story/0,3605,912599,00.html. Accessed: 4.11.03.

Web, C. (1997). Long-term management and preservation of publications on CD-ROMS and floppy disks: technical issues. In: National committee meeting on the management of Australian physical format digital publications, National Library of Australia, Oct. 27-28. National Library of Australia. Online only: URL: http://www.nla.gov.au/niac/meetings/tech.html. Accessed 31.10.03.

Woollard, M. (2003). Digital resources: challenging use or users' challenge? In: Examining the impact of digitization upon scholarship in the humanities. Proceedings of a conference, July 2003, Institute of Historical Research. London, Institute of Historical Research. URL: http://www.history.ac.uk/conferences/digitisation2003/woollard.html. Accessed: 31.10.03.

Websites

3D Virtual Buildings Project, http://3dlearning.iit.nrc.ca/3DVirtualbuildings/. Accessed 6.11.03.
Amazon: http://www.amazon.co.uk. Accessed: all too often.

ARCHEOGUIDE project. URL: http://www.aec2000.it/archeoguide/ and http://archeoguide.intranet.gr/. Accessed: 31.10.03.

Arts & Humanities Data Service, URL: http://www.ahds.ac.uk Accessed 27.10.03

Association for History and Computing, URL: http://grid.let.rug.nl/ahc/. Accessed 11.11.03.

Atlas of Historic Towns projects, URL: http://www.wien.gv.at/english/historictowns/en_leit.htm. Accessed 27.10.03

CEDARS project: URL: http://www.leeds.ac.uk/cedars/archive/archive.html. Accessed 31.10.03.

DAML DARPA Agent Markup Language, URL: www.daml.org. Accessed 10.11.03.

Digital Egypt, URL: http://www.digitalegypt.ucl.ac.uk/Welcome.html Accessed: 26.10.03.

Fraunhofer Institut Graphische Datenverarbeitung, URL: http://www.igd.fhg.de/igd-a4/index.html.en. Accessed: 4.11.03.

IMAGE, URL: http://www.image-project.com/image/. Accessed: 4.11.03.

W3 Consortium RDF Resource Description Framework, URL: www.w3.org/RDF. Accessed: 10.11.03.

W3 Consortium OWL Web Ontology Language, URL: www.w3.org/TR/owl-features. Accessed: 10.11.03.

VISIT, URL: http://www.planum.net/cineca/visit3.htm. Accessed 2.11.03.

top