



## Project Summary

(November 2004)

<b>Project title:</b>	<i>Enabling Communities of Interest to Promote Heritage of European Regions</i>
<b>Project acronym:</b>	<b>Cipher</b>
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<b>Partners:</b>	The Open University, UK (Project coordinator) Dublin Institute of Technology, Ireland University of Art and Design, Helsinki, Finland The Discovery Programme, Ireland Czech Technical University, Czech Republic Internet-Loesungen und Dienstleistungen RiS GmbH, Austria
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## 1. Project Overview

The CIPHER project was aimed at encouraging public participation in heritage through the development of Cultural Heritage (CH) Forums, associated to national or supranational regions. CH Forums empower communities of interest to create, own and sustain online cultural content for themselves. The Forums have strong ties to their physical counterparts, widening access, but also promoting rather than replacing the experience of exploring regions and their heritage institutions. Individual and collaborative interpretation is supported by a methodology and tools for the construction and viewing of narratives associated to heritage content.

## 2. The Approach

The overall objective of the CIPHER project stated in the original project proposal was “to develop the methodology and technology required to realise sustainable Cultural Heritage (CH) Forums that empower communities of interest to explore, research and build content”. This objective was further described in terms of a number of more detailed goals categorised as the application, methodological and technical goals of the project.

For the purposes of the project a CH Forum was defined as an online space associated with one or more communities of interest where members can participate and learn through exploring and contributing to a range of heritage resources around a common theme. Learning through participating in the activities of the community was the key organising principle for the project. Therefore, the approach taken was to develop four CH forums that would enable the project partners to collaboratively investigate the social and technical issues influencing the participation of communities of interest. The development of these CH Forums was the application goal of the project. Researching the social and technical issues involved was expressed in the methodological and technical goals of the project.

In order to encourage communities of interest to explore their cultural heritage the approach adopted at the beginning of the project was to develop methodologies for supporting the activities related to the community’s domain of interest. Initially, we concentrated on facilitating the processes of finding, organising, composing and publishing heritage content. Although this was a necessary and significant part of the methodology developed, we also found that supporting the intra-community activities proved to be a major factor in the success of the project. Recognising the roles and responsibilities of the community members, and supporting their individual activities was found to be a crucial aspect of developing the community’s online forum. Example of this include ensuring appropriate access to information, reinforcing the behavioural norms of the community and the standards of interaction expected, and facilitating the organisational activities of community life.

Achieving the methodological goals required the development of new software solutions. The technological requirements of the communities were expressed as the technical goals of the project. In the following sections of this report we will present the goals outlined in the project proposal and the solutions produced. Since we will demonstrate our achievements on concrete, fully operational applications, we will present first the results of the application goals.

## 3. Application Goals

The **application goal** of the project was to develop four CH Forums that will serve for testing the CIPHER methodology and technology. The four CH Forums produced were organised around: Irish cultural and natural heritage, Nordic heritage through storytelling and historical artefacts, the shared heritage of central Europe, and the tradition of technology innovation in south central England.

### 3.1. Irish Cultural and Natural Heritage

This forum comprise of heritage institutions having wide ranging collections, around the overall forum theme. Content includes archaeological data relating primarily to Ireland. The forum was developed as a joint effort of DIT and the Discovery Programme. DIT provided the technological support and the Discovery Programme provided the content. The methodology was developed in collaboration of both partners.

#### *Results*

The forum has been implemented and tested in two trials. An overview of these trials is presented in the project trial reports D13 (<http://cipherweb.open.ac.uk/d13/>) and D25. The forum is supported and

operational. The users were pre-historians, medieval historians and archaeologists. An example taken from the domain used in this forum is shown in Figure 1.



Figure 1. Mooghaun Hillfort in North Munster, Ireland

### **3.2. Nordic Heritage through Storytelling and Historical Artefacts**

The forum is focused on the tradition of storytelling as a reflection of and a means for conveying Nordic culture. The heritage content drew inspiration from the Carta Marina, a historical map of Nordic regions dated to year 1539. The technology and methodology was developed by UIAH, the content was developed in collaboration with the Harkko Museum in Raisio, Finland.

#### **Results**

The forum has been implemented and tested in two trials. The user group in the second trial consisted of student and teachers. The overview of these trials is presented in deliverables D13 and D25. The novelty of this application was to use soft ontologies as navigation tools. A part of Carta Marina is shown in Figure 2.



Figure 2. The Carta Marina map

### **3.3. Shared Heritage of Central Europe**

This forum explores the long common history of the regions of Southern Bohemia and Upper Austria. The forum content was planned to include collections from castles and museums, the forum supports the work of the regional heritage care organisation and regional libraries.

#### **Results**

Due to the interest from a number of heritage bodies and interest groups the forum was extended to additional areas. They include the architecture of chapels in rural Southern Bohemia, baroque palaces in Prague, the Historical Guild Schwarzenberg and Southern Bohemian Legends. An example of an annotated picture from the Prague palaces area is shown in Figure 3. As explained in section 3.5 below,

the domain of South Bohemian Legends was initially developed as a demonstrator for technology re-use (<http://cipherweb.open.ac.uk/legend/>) but grew to become a separate application used in the shared heritage of central Europe forum (<http://krizik.felk.cvut.cz/cw12/bp-explore/>).

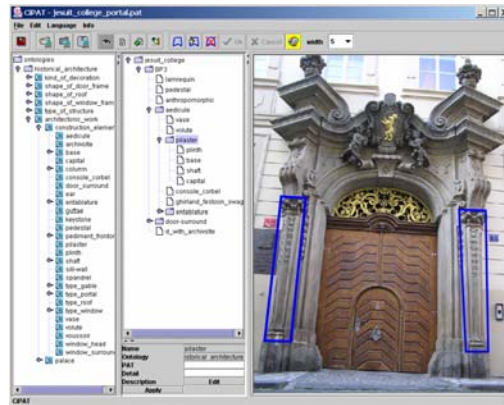


Figure 3. Annotating picture of a palace gate.

### 3.4. Tradition of technology innovation in South Central England

The south central region of England has a distinguished history in technology innovation, including the development of early computing and communication technologies, and is still a locus of innovation. This forum supports the exploration of these important events up to modern times and is also being used to support research into the nature of scientific discovery.

#### Results

The content of the forum is provided by the Bletchley Park Museum and relates to wartime code-breaking and early computing. This forum focused on supporting a group of about 35 Bletchley Park tour guides investigative and promotional work for the museum. About 80 interviews with World War II code breakers were recorded, annotated and stored in a database which can be accessed through a web-based exploration tool called Story Fountain. Early experiments with the Story Fountain system indicated that these annotated resources could be used to generate interesting dynamic narratives that supported the exploration of the existing content. As a result, the forum was extended and a further system to support visitors to the Park was developed. An example of the Story Fountain exploration tool used by the guides in Bletchley Park is shown in Figure 4 (left). An example screen view of the Bletchley Park Mobile Information Service built using the story fountain system is shown in Figure 4 (right).

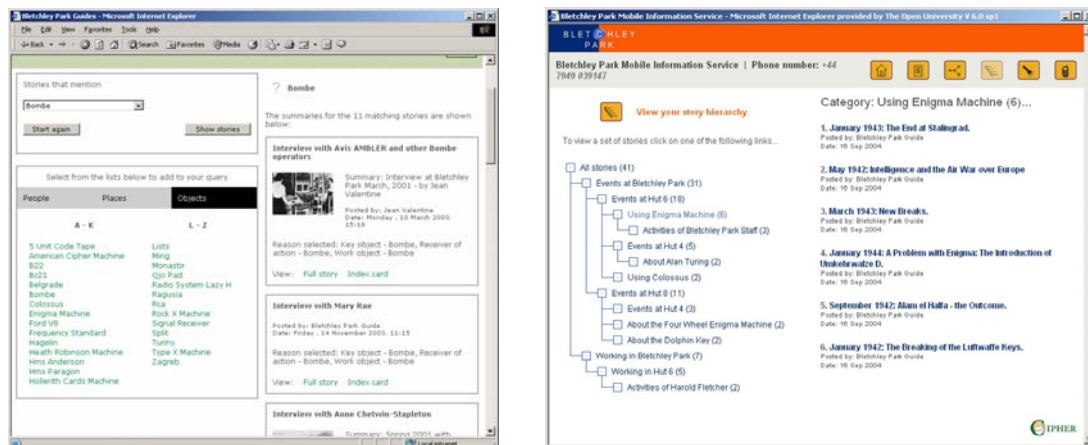


Figure 4. The story exploration tool used by guides at Bletchley Park (shown here on the left) and the Bletchley Park Mobile Information Service available for visitors (shown on the right).

### 3.5. Additional Applications

In addition to the anticipated applications in the four CH Forums the following applications were developed. They were produced either to verify the features supported through our software, or as a response to the interest shown by some communities after public presentations.

### South Bohemian Legends

This application was used to verify the reusability of the tools and methodology produced in one of the forums, by applying it in a domain completely different to the original. The Story Fountain system was designed to support the exploration process of the Bletchley Park guides and reapplied in the shared heritage of central Europe forum to support the exploration of medieval South Bohemian legends.

### Results

The application was developed in response to a request from the Institute of Monument Care in Southern Bohemia. The necessary semantic annotations were made by the Czech Technical University, the application was developed by The Open University and the Czech Technical University (CTU) and is maintained by CTU. The annotation of the new content took a few days. Integrating the content with the existing tool was completed in about 6 hours. An example of the South Bohemian Legend forum is shown in Figure 5, access to the system is available at <http://krizik.felk.cvut.cz/cw12/bp-explore/>

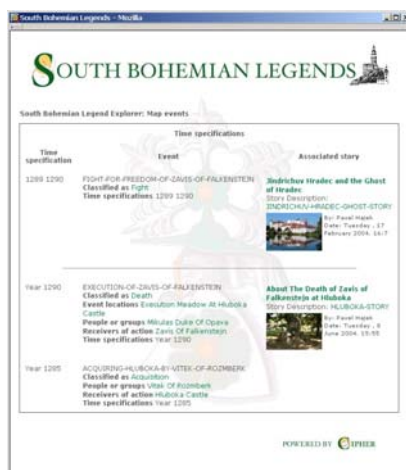


Figure 5. South Bohemian Legends – an example of tool reuse

### Community Story Exchange and Scooter.

The Community Story Exchange (CSE) is a generic tool for collecting digital heritage content.

### Results

The tool was implemented by The Open University and instantiated in Bletchley Park Forum for collecting and sharing information in the community of guides and in a new area of the south central England forum called Scooter, for communication and collaboration between schools in two different counties. The participating schools were Denbigh School in Milton Keynes (UK) and Gymnazium Jiriho Gutha-Jarkovskeho in Prague (Czech Republic).

Scooter is running on a server at The Open University. Denbigh School was supported by The Open University and Gymnazium Jiriho Gutha-Jarkovskeho by the Czech technical University. Depending on the context, the Scooter software allows users to choose from a number of communication models (described further in section 5). Two examples of pages from the Scooter site are shown in Figure 6. As a result of the dissemination carried out in the project, about a half a dozen new schools have recently shown interest in joining the Scooter project.

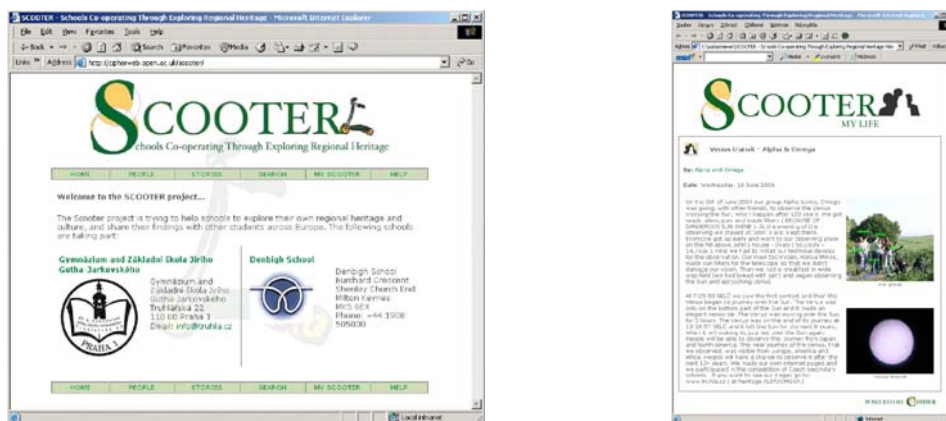


Figure 6. The Scooter home page (left) and an example of a story taken from the site (right)

#### 4. Methodological Goals

Although the set of tools produced through the above applications were a significant outcome of the project, it is the methodology governing their adoption and use that we consider to be a necessary and equally valid contribution. The manner in which the five methodological goals of the project were addressed is summarized in this section.

##### 4.1. Supporting communities in the development and launch of CH Forums

Drawn from the extensive experience gathered through two sets of project trails run in the four CH forums, the key points to be considered when developing and launching a CH forum include:

- The identification of potential user groups, their goals and skills and the consequences of this for forum design
- An early analysis of the kinds of content to be developed, exchanged and archived within the forum and the consequences of this for forum design
- Supporting the full activity cycle of the communities involved, that is: the finding of resources, their organisation, the composition of new resources, and their presentation within the community
- Identifying all of stakeholders in the CH Forum, not just users but host organisations such as heritage centres, municipalities and tourist organisations. Determining the kind of return of investment the organisation requires for long-term commitment, and how this can be measured
- Technological development should be carried out according to sustainability guidelines in order to minimise maintenance and expenditure

##### 4.2. An architectural model of CH Forum construction to ensure long-term technical sustainability

It was considered vital that the approach taken in the development of CH Forums was technologically sustainable. Guidelines for the evaluation and selection of technologies according to their sustainability were developed within the project. Designing software as interoperable services was considered key to ensuring technological sustainability. As can be seen from the technological achievements in the project, many of the tools are generic standalone tools that can be used in any of our existing or future CH Forums. This includes for example ADE, PAT and Apollo (<http://apollo.open.ac.uk/>). Larger portal services such as the explorer.ie have also been designed as a set of interoperable services.

The representation of heritage knowledge expressed through the annotation of heritage artefacts and/or used to support search and exploration has also conformed to notational XML standards and domain specific standards such as the CIDOC CRM (<http://cidoc.ics.forth.gr/>). This for example allowed the story fountain software developed in the Bletchley Park forum to be applied to the domain of Bohemian Legends.

#### **4.3. An account of how communities of interest can be actively involved in CH Forum evolution to support its long-term content sustainability**

CIPHER has produced a broad range of services that allow citizens to become actively involved in cultural heritage. We classified these according to four processes: finding, organising, composing and publishing. The CIPHER toolset provides candidate tools to support each of these processes. Communities can therefore:

- Find and collect heritage resources (using e.g. SOM, Story Fountain)
- Organise their findings into personal portfolios (using e.g. Apollo, RAT)
- Compose new presentations for submission to the portal (using e.g. RAT-O)
- Present their work with the community (using e.g. explorer.ie, Community Story Exchange) and outside the community (using e.g. the SMS services in Story Fountain and explorer.ie)

#### **4.4. An articulation of concrete, viable business models of how CH Forums can be adopted by associated consortia to ensure their long-term financial sustainability**

The CIPHER toolkit and methodology have broad applicability within the tourist and municipal sectors. For each application there needs to be a clear formulation of how the CH Forum can provide benefit to the organisation (e.g. heritage centre, municipality, tourist company) that is hosting the service. For this reason the notion that any evaluation of a CH Forum should encompass multiple stakeholders (from the host institution as well as the host community) has been used to guide the development work and the two sets of project trails.

#### **4.5. A description of how CH Forums can be related to their associated regions and physical world counterparts to ensure their long-term relevance**

An important objective of the CIPHER project was that our approach would encourage rather than replace visits to heritage institutions. This has been successfully realised in a number of scenarios. User groups that we have worked with include non-professional research communities, professional research communities, school groups and visitors. Our work with these user groups has served to encourage visits in the following ways:

- Our work with professional communities in all forums has allowed them to present their work to interested communities and interact with groups that have a genuine interest in the subject matter. This has helped to motivate the communities and increase their participation as demonstrated through visits to heritage sites. For example in the Irish archaeology forum explorer.ie tools have been used by professional communities to widen community access to their work. In the central Europe forum heritage professionals have supported the work of students and heritage groups in the exploration of sacred monuments, architecture and the Bohemian dynasties.
- CIPHER has built links between school children and heritage centres, thus encouraging school visits to heritage centres and the use of heritage content within the curriculum. CIPHER tools have been used to support a school visit to Bletchley Park plus a number of related collaborative web-based activities such as the exchange of code breaking puzzles between schools. In the Carta Marina forum, the CIPHER tools have been used extensively to support classroom activities, for example in the construction of a modern Carta Marina showing the pupils perceived modern day monsters and their classification.
- CIPHER technology aimed at visitors has also been carefully formulated to encourage rather than replace visits. For example the SMS services provided through explorer.ie and Story Fountain allow visitors to concentrate on the experience when visiting a heritage centre, providing them with additional resources when they get home. These can encourage return visits and promote more active involvement in a heritage domain, but in no way replace the visiting experience.

## **5. Technical Goals**

### **5.1. Collaborative discovery tools to support members of the community in the creation of personal and communal archives**

The Community Story Exchange was implemented and tested in two applications (Bletchley Park guides and Scooter, described in section 3.4). Similar support for the creation of personal and communal archives is provided in the CH-Portal, CH-Publisher and CH-Editor suite of tools from

CTU, and the Explorer Content Management Tools from DIT. Like the Community Story Exchange these tools were tested in the two trials of their respective forums.

### 5.2. Navigation and exploration facilities based on self-organizing maps

This technology was fully developed by UIAH. UIAH applied the SOM techniques both to their own content and to the content supplied by other partners. Based on the UIAH ideas and experiences, KMI have developed and tested a small experimental SOM tool.



Figure 7. A SOM similarity cluster map of the Bestiarium Construendum ontology

### 5.3. Ontology driven dynamic narratives, providing coherent, compelling stories according to visitor interests and needs

Different versions of this technology were developed and tested by a number of partners. Story Fountain was developed at the Open University and used both by the Open University and the Czech Technical University. DIT have integrated these ideas into their Irish Explorer tool, UIAH approached the problem from the viewpoint of soft ontologies. As a basis we have reused the existing ISO standard proposal called CRM ontology which was robust enough and saved us a lot of time. This ontology is still being used in CIPHER applications and we are in contact with their authors and provide feedback from our experiences.

### 5.4. Developer tools to support the construction of CH Forums.

An extensive set of tools have been developed and shared among the project partners. They include tools for developing ontologies, annotating digital heritage resources including pictures (see Figure 3 as an example), organising content and generating narratives and publishing. These tools can be divided into two groups: stand-alone tools and integrated tools supporting needs of specific community. Stand-alone tools are documented as appendices to deliverable D26 and can be easily used by third parties.

### 5.5. Maintenance tools to support CH Forum evolution, including visitor use analysis.

Some of the tools developed allow the user to download and maintain existing content. Since the second trials required the integration of a large quantity of new content this feature has been extensively tested. Feedback from the analysis of the users' behaviour is used to monitor the performance of the tools. For example, the visitors' use of the Bletchley Park mobile information service is logged and made available to the Bletchley Park tour guides (an example screen view is shown in Figure 8).

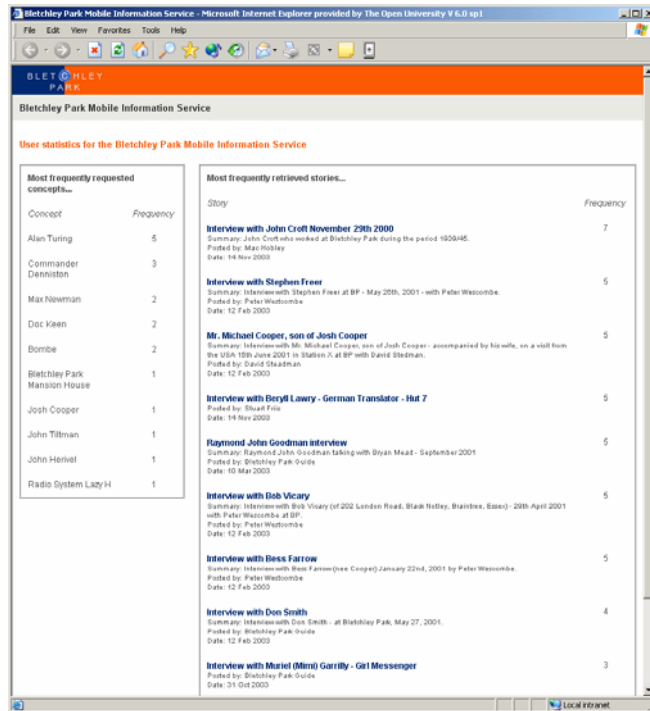


Figure 8. Evaluating visitors' activity in Bletchley Park

**5.6. Interface templates employing technologies to combine, position and present media elements in contextually appropriate ways to a range of hardware clients, including mobile devices**

This goal has been addressed in a different ways according to the needs of each application. For example, in the Community Story Exchange tool a number of templates have been developed to support different models of communication. For example, a “fan model” with a single problem setting, many independent and for limited time hidden answers and final plenary has been implemented, see Figure 9. This model is appropriated for supporting communication which needs independent action on a single question, e.g. a puzzle. Other supported models include “stand-alone” where the contributions are independent and “chain where the contributions follow a sequential ordering.

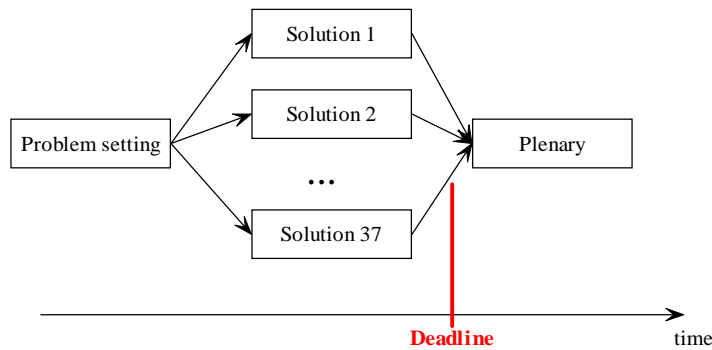


Figure 9. Communication and presentation model “fan”.

The presentation templates allow integration of a wide spectrum of different media and digital resources. For example, the Irish Explorer 3D presentation tool makes it possible to integrate web accessible 3D presentations and linking them to the Explorer knowledge base. An example of an interactive 3D presentation of Fourknocks passage tomb in Co. Meath, Ireland is shown in Figure 10.

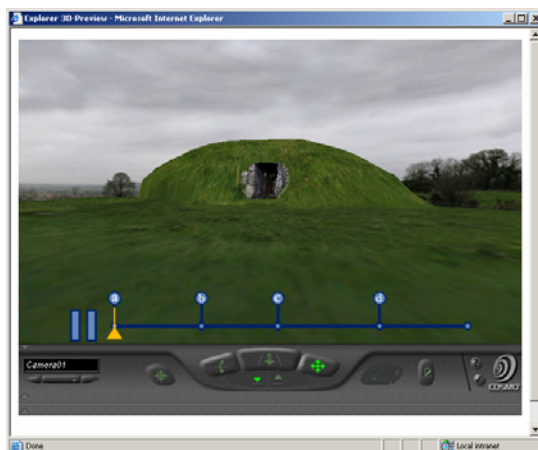


Figure 10. An example of an integrated 3D presentation available in the Irish Forum

Mobile interactive technologies were developed and integrated with the Bletchley Park Forum exploration tools (as described in section 3.4). The idea is illustrated in Figure 11. During or after the visit the visitor sends an SMS message to a mobile telephone number associated with the server. The message contains keywords relating to the content the visitor would like to explore in depth. When returning home, the visitor connects to the web server and provides the phone number from which the message was sent. All of the relevant information is then made available and organised in a format to facilitate further exploration.

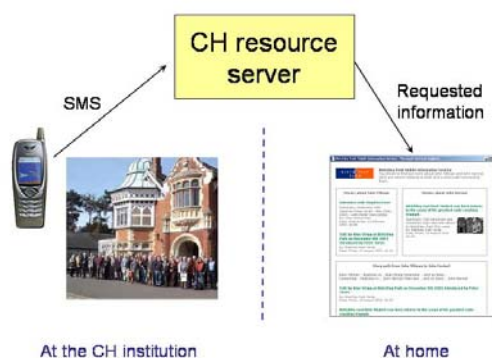


Figure 11. Mobile technology at Bletchley Park

### 5.7. Language technologies to support multilingual access to resources, through support for human translation and context sensitive cross language associations

Current language technologies do not allow us to automatically translate text with sufficient quality of translation, especially in such a language sensitive domain as cultural heritage. In many cases, language itself is a part of the heritage content. However, in order to facilitate the access to heritage objects a simplified form of multilingual support has been tested using conceptual graphs. The idea is that the user will acquire the basic grasp of the content and if interested, more expensive professional translation can be requested by the community.

Summaries of a number of documents have been represented as conceptual graphs and translated into several languages. A group of people were presented with the conceptual graph and asked to write down the summary in English. The findings indicated that a sufficient basic understanding was achieved, with only about 15% of the participants extrapolating the content and describing events that were not included in the original document (e.g. “there was a fire in a castle” was interpreted as “the castle was destroyed by fire”), and about 15% of respondents omitting one or more of the summarised facts. This technology is being studied further by the Czech Technical University.

## 6. Conclusions

The applications developed have clearly realized, and in several cases exceeded, the original goals of the CIPHER project. The needs of a community change over time and in order to meet those needs a

flexible, sustainable infrastructure is required. The broad range of tools available as a result of the CIPHER project, combined with the methodological guidelines governing their use, will enable CH Forums to be produced that meet the community's needs and evolve along with the community they support. The complementary toolkit approach taken in CIPHER is considered fundamental for ensuring the level of technical sustainability required.

Community participation in the development and deployment of a CH Forum is not only a sensible approach to design but an essential approach to ensure that the community develops a sense of ownership for their Forum. Communities that identify with and hold a sense of belonging to the CH Forum will continue to develop the Forum as long as their shared interest is held. A community's participation in the Forum development process was found to significantly influence content sustainability.

Communities of interest are formed and sustained through the members' motivation for exploring a shared topic of interest. However, the community itself does not exist in a vacuum, the stakeholders that benefit from the communities activities have a role to play in supporting and ensuring the financial sustainability of the CH Forum. A holistic approach to the community and all of the associated stakeholders fosters a sense of inclusion and can help to avoid segregation or fracturing of the community's activities.

All project goals have been fully achieved. The applications developed within the project are functional and used by the user communities. These applications will be supported also in the future. In addition a number of new potential applications have emerged. The project partners will deal with these requests according to the resources available.

## **7. Project Publications**

### ***PhD Thesis***

Matoušek K. (2004). Representation and Processing of Uncertain Historical Time Periods. PhD Thesis CTU, Prague

### ***PhD work in progress***

PhD thesis of P. Aubrecht, the Czech Technical University will be submitted before the end of 2004

### ***Conference and journal publications***

Aubrecht P., Miksovsky P., Kral L. (2003). SumatraTT: A Generic Data Pre-processing System. Paper accepted for the 2<sup>nd</sup> International Workshop on Presenting and Exploring Heritage on the Web to be held at DEXA 2003 in September.

Carswell J.D., Eustace A., Gardiner K., Kilfeather E., and Neumann M. (2002). An Environment for Mobile Context-Based Hypermedia Retrieval In *The Proceedings of the IEEE International workshop on Presenting and Exploring Heritage on the Web (PEH'02) in conjunction with the 13th International Conference and Workshop on Database and Expert Systems Applications (DEXA 2002)*. Aix-En-Provence, France. September, 2002, ISBN 0-7695-1668-8, ISSN 1529-4188.

Collao J., Diaz-Kommonen L., Kaipainen M. and Pietarila J. (2003). Soft Ontologies and Similarity Cluster Tools to Facilitate Exploration and Discovery of Cultural Heritage Resources. . In *PEH'02 Workshop*, Fourteenth International DEXA Conference, 1-5 September 2003, Prague. pp.75 - 79.

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