# ISAAC

**Integrated e-Services for Advanced Access to Heritage in Cultural Tourist Destinations**

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ISAAC Project Deliverable 1.5

# D1.5 - Defining an EU indexing system to standardise retrieval in the CH domain

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SIXTH FRAMEWORK PROGRAMME

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## GUIDELINES FOR DELIVERABLE WRITING

We suggest the following model to allocate the responsibilities for the preparation of D1.5:

- Each Level 1 chapter (1 – 8, numbered X) has an **"Executive Editor" (EE)**, responsible for the writing of the summary, the integration and homogenisation of the whole chapter. Each EE is also responsible to chase contributions from Local Editors and to send the final version to Dr Stephen Platt.
- Each chapter has several Level 2 "sub-chapters" (numbered X.X) and each of them has a **"Local Editor" (LE)**, responsible for writing the specific part, gathering contributions from the contributing partners and sending it to the corresponding "Executive Editor" and to UNOTT (by E-mail). LEs should observe the **wording** applicable to the sub-chapters of this document. The minimum number of words is set at 1500 words and the maximum is 4000 words.
- **Contributing Partner (CP)** involved should contribute with precise data (i.e. list of technologies, experiences…) and ideas.

## DEFINITION OF INTERNAL DEADLINES

- Deadlines for each chapter: please see the tables for details
- Deadlines for sub-chapters: please see the tables for details
- Final delivery date by UNOTT: 31st May 2007

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| POLITO | 3 | 3.1, 3.2 | 3.3, 4, 4.1, 4.2, 6.2, 7 |
| VU-SPINLAB | | 6.1 | 2.3, 6.2, 7 |
| TXT | | 3.3, 6.2 | 2.1, 2.2, 2.3, 5.1, 6, 6.1, 7, 8 |
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# Abstract

This document presents the results from the research work undertaken for Task 1.5. This consists mainly of the two sub tasks. Subtask 1.5.1 provides the definition of a glossary following taxonomy of cultural goods from a consumer perspective. This has been developed through literature search and application of models on cultural consumption and expert behavior. Subtask 1.5.2 consists of building the prototype framework for storing and retrieving categories of cultural goods of varying types for the three cities).

The objective is to devise an agreed indexing system that might inform the technological issues related to the retrieval of information about cultural goods from the ISAAC platform. Formally it aims to *define a European reference model to standardize representation, annotation and retrieval of cultural heritage content in the selected 3 European cities of Amsterdam, Leipzig and Genoa.*

Overall, this document is divided into 10 chapters. Chapter 1 provides an executive summary. Chapter 2 presents the state of the art and describes digital access to cultural heritage. Chapter 3 defines the ISAAC taxonomy or urban cultural heritage. Chapter 4 specifies the glossary for content retrieval. Chapter 5 provides the selection criteria and the selection of cultural sites in the 3 cities. Chapter 6 describes the critical assessment of representation media and sets up the standards of developing a new content retrieval system in cultural domain. Chapter 7 provides a framework for systematic representation hierarchy. Chapter 8 draws the main conclusions for the task 1.5. Finally, chapter 9 and 10 provide acknowledgements and the list of the main references.

# 1   Executive summary

*Author: UNOTT*

The work conducted in Task 1.5 represents an important step towards the development of the ISAAC ICT architecture. The task directly addresses ISAAC operational objective of *defining a European reference model to standardize representation, annotation and retrieval of cultural heritage content in the selected three European cities of Amsterdam, Leipzig and Genoa.*

The work involves two major steps:

  i)      development of taxonomy for the cultural domain, with the specification of a relevant glossary; and

  ii)     development of a representation hierarchy that could reflect the achievements of the identified taxonomy.

The proposed framework is an important step in the development of the appropriate web ontologies within the cultural heritage domain for the purposes of the ISAAC project. Such semantic relations are dependent on the knowledge organization system  (KOS) developed within the domain.

The semantic developed in the task is based on "ontologies", that need to be defined in order to help agent technology to perform at its best. In an intelligent agent system, the ontology is a *declarative formalism*, the vocabulary for the appropriate representation of knowledge within a specific domain.

The taxonomy identified during Task 1.5 can be considered as the basis of the way ontologies will be built in the ISAAC architecture. It provides a hierarchical view of concepts/goods within the cultural heritage domain relevant to the e-services identified in the

previous stages of the ISAAC project. The user centred approach, representing what we have defined as a *bottom-up approach*, has been combined with an expert perception *(top-down approach)* of how cultural goods should be categorized to form the ISAAC framework.

The work undertaken in this task has developed an R-tree system allowing for both the expert taxonomy and the consumer oriented folksonomy, which means the system has not only informed the technological issues related to information retrieval, but also also has made the computer-based interactivity more accessible to all potential users.  We have suggested which sort of information should be retrieved and how, according to the different category of goods that are most relevant for the ISAAC project's objectives. Since the way the information is conveyed and retrieved needs to be relevant to consumers, we suggest a way of tagging the information that is both top down (experts perception) and bottom up (consumer generated tagging).

The way the information is organized needs to correspond to the key attribute of the ISAAC system identified so far, namely that the e-services it hosts are integrated. This means that the system will need to access information stored in diverse archives and domains. Moreover, such e-services relate to different categories of goods, which are accessed at different stages of a person's interaction with a city's cultural heritage. The services are also available via different media. This complexity needs to be reflected in the way the information is represented to potential users.

However, there are remain many challenges to those wanting to provide useful and enticing information for cultural heritage. Several EU projects (i.e. COLLATE, MINERVA or MICHAEL) aimed at creating a European cultural area in order to encourage practical co-operation between EU members and to ensure that European culture heritage is  promoted. The wider objective is, of course, to make European cultural tourism internationally competitive. These projects have clearly shown that, despite researchers' efforts to improve this situation at national and international level by the adoption of the new technologies, providing accessibility, usage and wide knowledge of valuable historic and cultural heritages is not straightforward.

One of the most notable issues is that service providers increasing lack of understanding of the new dynamic technologies available for information delivery.  Content providers also need to provide access to their large databases and archival holdings. According to DigiCULT report (2002), in order to narrow down these widening gaps, people need to focus on the technological issues related to three areas: (1) providing access information, (2) digitization and (3) long-term preservation. Most of the experts and service providers in the cultural tourism sector are unaware of these issues, preoccupied as they are managing customer relationships or handling copyright.

The proposed representation hierarchy combines the proposed taxonomy of cultural goods with this need to represent them appropriately to users. These goods are the cultural capital of a city, therefore an important economic asset. Each of them acts as attractor of potential tourists who will use the information at different stages of their visit. So they might use e-services before the visit, to get information on what is on offer to 'whet their appetites'; during the visit, to better enjoy the cultural resource they are visiting; and finally, after the visit, to get to know better what they have already experienced and possibly to share their personal experiences with other potential users.

The cultural offer in each city spans different kinds of tangible and intangible cultural goods. Some of these goods have more iconic status, embed the image of the city and have a high symbolic value. Such goods are generally fairly easy to represent digitally, though the relevant information is often dispersed in various archives and under various competences. The representation varies from simple texts and pictures, to more sophisticated graphical expressions.

The priority given to the process of digitizing different categories of goods in each city will depend on user demand and the marketing and cultural tourism strategy of the particular city.

The suggested Knowledge Organization System (KOS), and associate R-tree, aims to facilitate and standardize the retrieval of information in a way that is user friendly and promotes cultural tourism. A very basic index has been devised for different categories of cultural goods, but this structure is evolutionary and will grow and change with use and the addition of many more items. This implies a number of issues for the future ICT architecture that will be developed within WP2. There are two key issues that are relevant for the development of the ISAAC platform:

- There is tension in developing the KOS between, on the one hand a semantic related to the concept of "literary warrant", in which decisions to include a class of things in the index are based on scholarly literature, and on the other an index which is created in an evolutionary way based on usage. These two essentially different approaches to building an index are not necessarily incompatible. The ISAAC system will need 'seeding' with information and this might be indexed along existing scholarly lines. But usage might determine how the system develops and grows.

- The suggested KOS is expression of specific "paradigms" or "epistemologies" that respond to a specific theoretical approach about the way cultural heritage is valued. The proof of the KOS or indexing that is developed will depend on how well the system responds to an individual user's query.  To deliver relevant and useful information the system will need to cope with ambiguity, homonyms, synonyms and hypernyms.  To capture the user's interest and encourage them to sample a city's cultural heritage the system will also need to be delivered the information in a relevant and appropriate format.

Task 1.5 has provided a first indication of what is the minimum representation level to be conveyed for the major categories of cultural goods representing the cultural offer within the 3 cities of Amsterdam, Leipzig and Genoa. The choice of the best available digital material to be used is being developed in task 3.1 and will be progressively assessed during the construction of the ISAAC ICT architecture.

# 2  Digital access to Cultural Heritage: state of the art

*Author: UNOTT*

## 2.1    Introduction

The design of information system interfaces is known as 'interaction design'. Moggridge (2005).  Interaction design covers all aspects of how people interact with digital information and interactive technologies, This Task 1.5 tackles an important aspect of how information (in our case information about cultural heritage) is organized and offered to users is the metadata or 'index' used to summaries the mass of information available.  An index is additional file structures that allow users to find the information they need quicker.

In very simple terms three distinct ways are used to organize digital information:

*Relational structure:*  is the classic form used to organize information in the commercial world to relate tables of data based on matching keys. Shopping sites and booking systems are likely to be relational databases of this kind.  They are highly pre-structured and may only be appropriate for some aspects of the information offer in the ISAAC platform.

*Object oriented structure:* where items are organized in a hierarchical structure and can be given x-y coordinates which allows them to be located on maps. Map-based information systems, likeYell.com, are likely to have an object oriented structure. Object orientation involves hierarchical inheritance of attributes from further up the taxonomy. It raises serious issues about information classification in coping with ambiguity in user search requests.

*Tagging systems:* offer the most complete range of data possible and employ a usage algorithm to determine the ordering or prioritizing of the information. Google works like this. It is simple and intuitive and allows the system to grow in an organic manner.

These three approached to designing indexes are not mutually exclusive. Each may be appropriate for different aspects of the ISAAC platform.

This area of software development is extremely topical and understanding about how best to organize information and create 'indexes' is changing rapidly. Knowledge in the area is highly specialized and this report can only give a broad overview of the issues involved in developing an index and taxonomy for the ISAAC platform.

## 2.2    The role of indexing in ISAAC project

The aim of Task 1.5 is to discuss the crucial technical and theoretical issues involved in creating an indexing system for the ISAAC ICT architecture. In particular, it addresses the operational objective of defining a European reference model to standardize representation, annotation and retrieval of cultural heritage content in the selected three European cities. The task is particularly related to the annotation phase, hence the need to develop forms of "tagging" of contents to help consumers retrieve the information they need or which inspire them to sample a city's cultural heritage.

The task aims to help the development of appropriate web ontologies within the cultural heritage domain, on which any agent technology and the ICT architecture will be partially structured. The agent technology will partially depend on the way the annotation system is developed within the ISAAC framework, and this will have consequences for the level of information that each query will deliver.

The research will propose exportable classification models or typologies, that will be related to specific identified sites within the three partner cities. To this extent a form of taxonomy (from Greek verb tassein to classify), will be developed that might be used to classify the cultural goods in the selected sites.

### *Background*

Since the middle of 1990s, the internet user population has increased dramatically and tourists have a much wider range of requirements and preferences. One of the key objectives of the 6th Framework Programme highlighted in the DigiCULT report (2002) was to increase the level of ambient intelligence in people's everyday lives. To achieve this increase the cultural tourism sector faces the challenge of moving from static information structures (databases) to dynamic, adaptive, high quality knowledge structures.

The application to cultural heritage does not traditionally drive technological innovation. It is typically a rather conservative area and many technological challenges remain to be solved. Cultural heritage experts, knowledge technologists and interaction designers need to collaborate to deliver significant invention in the cultural heritage domain.

The DigiCULT report (2002) also highlighted how future R&D projects should focus on applying research on knowledge interfaces and language technologies in cultural heritage applications. The aims of the research effort should be to improve usability, knowledge enjoyment, and support for knowledge seeking, and to combine knowledge bases, learning systems and agent communication systems under a common vision related to cultural heritage.

In order to match the needs and interests of residents, tourists (lay users) and experts (including scholars, knowledge management professionals, subject matter experts, and cultural tourism service providers) the new systems need to be able to dynamically interpret symbolic abstractions about the feature cultural heritage within a context of change.

One exciting new way of achieving this is with what is known as agent technology or the Semantic Web as it is also known.  Berners-Lee, et al (2001) state that the Semantic Web can help users to achieve sophisticated tasks by bringing structure to the meaningful content of WebPages, and creating an environment where software agents roam from page to page. An example of a semantic web application in the cultural heritage domain might be an agent /avatar system to exchange information on cultural heritage events. The DigiCULT report (2002) indicated that this kind of highly sophisticated system will be available within the next ten years. However, there are two challenges in building this semantic web – firstly that of providing a language that expresses both the data and rules for reasoning and secondly that of creating rules that can be exported to other systems.

*Taxonomy*

Simpson's (1961) defines taxonomy as the theoretical study of classification, which includes its bases, principles, procedures and rules. Bailey (1994) also stated that taxonomy is like a classification, and it can refer to both the process and the end results. He also stressed that taxonomies can be both hierarchical and evolutionary. Ravid (2002) defined taxonomy as the science of classification according to a predetermined system used to provide a conceptual framework for discussion, analysis or information retrieval.

This suggests that the proposed ISAAC Project taxonomy needs to combine a hierarchical classification of cultural goods that might be devised by experts, with a consumer-oriented perspective, that evolves with usage.

In order to develop the ISAAC platform and foster the sharing the cultural heritage knowledge with the users, the following steps might be envisaged: (1) Selection of contents; (2) Organization of contents; (3) Metadata or indexes, and interaction design to facilitate access for users. These steps must also tackle "semantic interoperability", and overcome potential cultural differences.

The ISAAC taxonomy developed in this Task 1.5 will therefore address the following issues: a) definition and standardization of an appropriate Glossary, b) the definition of an appropriate syntax; c) the appropriate representation of levels of (digital) contents.

*State of the art*

The aim of the Task 1.5 is to achieve an agreed indexing system that might help the technological issues related to information retrieval, which can also make the computer-based interactivity more accessible to all potential users. The DigiCULT report (2002) highlighted how most of the current online and offline environments offer various levels' interactivity, starting from the most basic functionality (e.g. linear navigation and non-linear navigation), to more complex levels of interactivity (e.g. support features or object interactivity). It points out that, to date, higher the degrees of interactivity have only been applied to the less mature systems and that interactive environments are still in a highly experimental stage and have not yet reached critical mass in terms of take-up.

Bonett (2001) has argued that personalization will empower users to become more participative in this process. By using these systems the user will actually assist in the selection and filtering of information and help provide a more relevant and useful system for the end-user. On the ISAAC platform this process this process of personalization of cultural heritage information might operate by:

(1)  Collecting and grouping favorite or most used resources and store them for future use
(2)  Customizing the content on the page, by selecting general preferences (particular subjects, resource locations, etc.)
(3)  Informing users about changes on the web site (news alerts)
(4)  Customizing the interface according to personal preferences
(5)  Allowing direct access to intermediaries or experts adding or classifying content

(6)  Receiving notifications on favorite subjects and areas of interest from cultural heritage institutions (i.e. list of recently acquired books, planned exhibitions or lectures, etc.)

(7)  Joining mailing lists in one's areas of interest and contributing to forums and blogs.

The DigiCULT report (2002) explains the aim of personalization and customization systems in terms of using technology to get a more detailed pictures of users' preferences, desires and needs, and to help identify customer segments and give better services that fits their particular needs. Current personalization and customization systems include the following technologies: fill-in profile; click-stream analysis/web usage mining systems; collaborative filtering; and Cookies. These technologies have a number of advantages: the most accurate personal profile can be gained and information is available up front; users do not spend time to create profile; system delivers rapid feedback without the necessity to build up a user's profile before; little or no intervention needed from the user. However these technologies also have a number of weaknesses which include: time consuming; users need to be motivated to persist in the early learning stages while the profile remains static; as the profile builds over time, some users may not be aware that information is being collected and so there may be issues of privacy; in order to be successful and deliver good results, very large data samples are needed; finally users are able to disable cookies.

The following diagram indicates how personalization can match user interests with structured content:
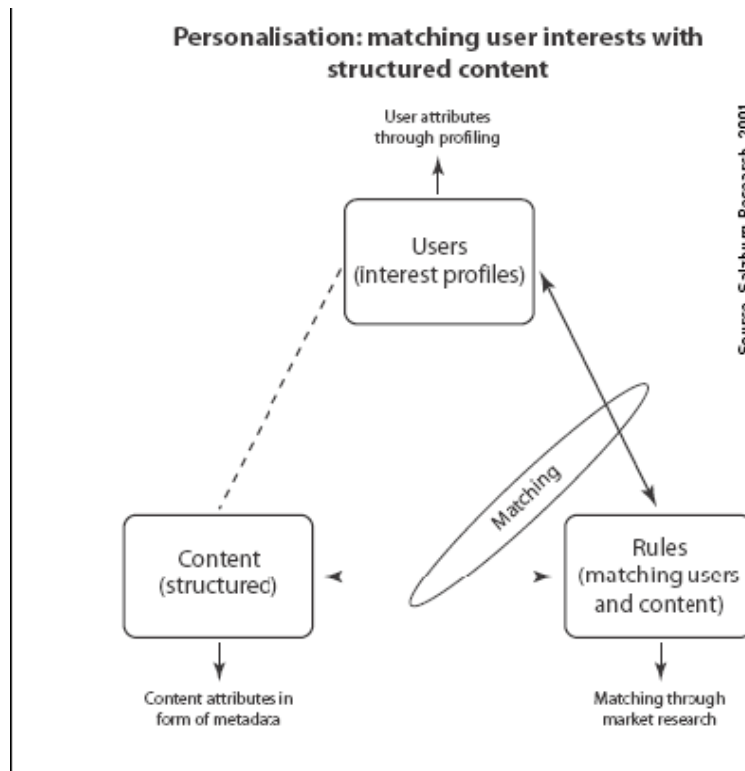


**Source:** adapted from the DigiCULT Report, 2002:239

## 2.3    Literature Overview

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*Contributions: TXT, DCCBA*

**DESCRIPTION OF CONTENT**

This sub-section presents a literature overview on indexing systems used in other contexts that might shed light on the subject of information retrieval in the cultural heritage domain.

### 2.3.1    Introduction

A good indexing system is important in relation to the technological issues related to information retrieval. This is of a particular relevance for such a complex task as defining a reference model to standardize representation, annotation and retrieval of cultural heritage content. The task is particularly related to the annotation phase, hence the need to develop forms of tagging of contents.  Any agent technology developed will depended on the way the tagging or annotation system is designed. And the usability of the information provided by each query will depend entirely on the success of this indexing system.

This section focuses on the relevant scientific literature about indexing. First, the basic concepts of indexing methods are described, with particular reference to text, document and image retrieval as the major components. Second, the use of indexing for digital cultural heritage libraries is outlined using the references to the computer languages used for information classification and retrieval. The implications for the ISAAC project are outlined and discussed. In conclusion a hierarchical system for representation, annotation and retrieval of cultural heritage is proposed.

### 2.3.2   Indexing methods

The Oxford English Dictionary defines indexing as the action or process of compiling an index. An index is in its turn defined as that which serves to direct or point to a particular fact or conclusion; a guiding principle (OED, 2007). Indexing can be also defined as extracting specific information from data and access data through it.  According to Petrakis (1993) indexing is pre-determined by attribute and attributes vectors and includes a two-step retrieval procedure:

- hypothesis: search through the index returns all qualifying documents plus some false alarms,
- verification: the answer is examined to eliminate false alarms.

According to (Bentley and Friedman, 1979) the database indexing methods include indexing based on:

- primary key: single attribute with no duplicates
- secondary key: one or more attributes (this is characterized by the fact that duplicates are allowed and indexing is done in M-dimensional feature space)

Further, indexing can be split into primary key indexing and secondary key indexing. Primary key indexing is based on dynamic indexing which is characterized by the ability of file to grow or to shrink to adapt to the volume of data. This ability largely pre-determines good space utilization and good performance. The basic methods of primary key indexing are:

- B-trees and variants (B+trees, B*-trees)
- Hashing and variants (linear hashing, spiral hashing ,etc.)

- Hashing using faster processing (in this case, B-trees preserve order of keys) (see for example, Sellis et al, 1987; Petrakis, 1993; Ciacca et al., 1997)

Secondary key indexing is of much more interest in its everyday applications. In particular, it finds a wide use in multimedia (Petrakis, 1993). In this form of indexing signals are represented by feature vectors and feature extraction computes feature vectors from signals. In secondary key indexing the index organizes the feature space so that it can answer queries on any attribute (Guttman, 1984).

Amongst the query types employed by most of the indexing methods are the following five ones:

- Exact match: all attribute values are specified
- Partial match: not all attribute values are specified
- Range queries: range of attribute values are specified
- Nearest Neighbor (NN): finding the K-best matches
- Spatial join queries: finding pairs of attributes satisfying a common constant (see Guttman, 1984; Faloutsos and Roseman, 1989; Lomet, 1992)

According to Petrakis (1993), index structures can be further spit into three basic types:

- Inverted files: in this case each attribute points to a list of documents
- Point Access Methods (PAM): in this case data are points in a M-dimensional space
- Spatial Access Methods (SAM): in this case data are lines, rectangles, other geometric objects in high dimensional spaces

Indexing thus represents a complex procedure aligned with many technological and logistics aspects. Some examples of practical use of indexing are outlined below.

**Text and documents retrieval**

The aim of Information retrieval (IR), in relation to textual information, is to develop models and algorithms for retrieving information from various data-bases. In large complex information systems, indexing methods arecrucial for creating links and connections between related subjects and terms. Amongst the most frequently-used indexing methods that are employed to present the content of the documents for later retrieval the following five are of the most importance: a) semiautomatic methods, b) frequency criteria, c) syntax, d) semantically oriented methods and e) a combination of frequency and its syntax oriented criteria (see for example Gray and Harley, 1971; Salton et al., 1974; Braun, 1973; Mackenzie, 1973, Earl, 1970).

According to Braun and Schwind (1976) there are two main advantages of semantically oriented methods over other approaches: First, the index vector obtained will be more precise, because it is based on indexing by inclusion (i.e. what is meant by good or useful index word is defined by a word list, and index terms are selected by help of this list only from the words of the text).  The selection method consists of the exclusion of bad index terms and the designation of the remaining terms as good index terms.

Semantic tags appear to be very useful in this process of semantic indexing. Semantic tags are usually applied to identify pieces of text within the document with a specific meaning. The text identified as a tag may be single word, a paragraph or larger parts of the document (see for example Dick and Steen, 1997; Kowalski, 1997; Mikkelsen and Aasly, 2002).

Generally no restrictions apply with respect to what information may be designated as a tag. Table 2.1 shows a fragment of the tag library that might be built in the ISAAC project with some concept of a hierarchical relationship. The figure is organized in a way that subordinate

concepts have an is-part-of relationship with superordinate concepts.**Table 2.1:** Concept of semantic tag library with the hierarchical relationships (ISAAC project)

| |
|---|
| Cultural heritage<br>      Built heritage<br>            Architecture<br>               Style<br>                    Roman<br>                    Gothic<br>                    Renaissance<br>                    Modernist<br>                    Contemporary…<br>             Year<br>             Architect<br>         Buildings<br>     Cultural Landscapes<br>     Monuments and Landmarks<br>     Museums<br>     Man-made elements with cultural significance<br>     Values and Beliefs<br>     Local traditions and Lifestyle<br>     Knowledge and Skills |

A tag, and the part of the document that is attached to, constitute the document element. Documents may contain any number of document elements. And each element is assigned a specific level.  This element level is then used to organize the document elements into a hierarchy. This process corresponds to assigning different levels of headings or paragraphs in a documents to create sections sub-sections, sub-subsections etc. This organization of individual documents, referred to as the document structure, is, in principle, independent of the relations defined in the tag library (Mikkelsen and Aasly, 2002).

**Table 2.2:** Basic retrieval methods

| |
|---|
| **Tag-based retrieval** |
| Simple tag-based: use only original query-concept |
| "Upwards" query expansion: use concepts immediately superior to the original query-concept |
| "Downwards" query expansion: includes all subordinates concepts |
| **String-based retrieval** |
| *String match criteria* |
| Match only if exact phrase occur, i.e. exact wording including any special characters in the query |
| Match its separate words in the query occur in sequence |
| Match if all words in the query occur at substrings, i.e. query words match parts of words in documents |
| Match if any words in the query occur as substring |
| *Thesaurus explanation* |
| Use all the terms of original query concept |
| Include terms from subordinates concepts in the tag library |
| **Retrieval based on the document structure, i.e. levels of the document elements** |
| Include only document elements retrieved by string matching or tag |
| Include any document element subordinate to elements retrieved otherwise |
| **Combination of string-based and tag-based retrieval** |
| Include all elements retrieved by either string matching OR tag |
| Includes only elements retrieved by both string matching AND tag |

**Source:** Mikkelsen and Aasly (2002)

Table 2.2 describes basic retrieval methods. The suggested combination of tagging and hierarchical assigning of elements and levels suggests three alternative methods for indexing information: a) retrieval based on tags in the documents, b) retrieval based on the level of individual document elements and c) retrieval based on the simple string matching mechanisms.

In order to increase the number of relevant elements retrieved, different expansion strategies can be applied to automate searches. Tag-based queries can be extended either by replacing the original query-concept with those immediately super-ordinate in the tag library or with all subordinate tag-concepts.  String matching queries can be expanded by using the tag library as a thesaurus, which means adding to queries names and labels of all subordinate concepts.

Table 2.2 also describes the model for retrieval based on a combination of different basic methods, either by including all elements retrieved by either string matching OR tag; or by including only elements retrieved by both string matching AND tag (Mikkelsen and Aasly, 2002).

**Image retrieval**

Amongst the image-retrieval systems, the content-based image-retrieval (CBIR) is the most widely-used (Subramanyam and Sett, 2007). There have been a large number of CBIR systems developed in the recent years, including IBMís QBIC project (Flickner et al., 1995), VisualSeek (Smith and Chang, 1996), PicSOM (Laaksonen et al., 2002), PicHunter (Cox et al., 2000) and MIRROR (Wong and Cheung, 2005). Most of the CBIR systems are commonly based upon non-semantic approaches employing primitive image information like color, shape, spatial relations or mixtures of these features. However, in many image database applications, the semantic content is more desirable because it facilitates the high-level application tasks (Martinez and Serra, 1999).

The general concepts of CBIR include the following aspects: a) indexing using content features, ii) query by picture example, iii) relevance feedback, and iv) multi-feature indexing.

In indexing using content features, a CBIR system implemented with prototype-based statistical methods, each of the databases is transformed with a set of feature extraction methods to a set of lower dimensional prototype vectors of respective feature spaces. (Subramanyam and Sett, 2007) These features can describe various characteristics of elements, e.g. color, textures and shapes contained in the images. Additional useful data, if available, can include metadata or key words describing the images. In a web image search application, the embedding HTML or XML page and the related hyperlink structure may also be used to provide relevant information. When the CBIR system tries to find images which are similar to the relevant-marked reference images, it searches for images whose distance to the relevant images is minimal.

Query by picture example (QBPE) is used when it is not possible to base a content-based image query on text-based terms because of low-level visual features. In such cases other query methods must be applied. With QBPE, the image queries are based on example images shown either from the database itself or some external location (Gunther and Beretta, 2000; Brunelli and Mich, 2000). The user classifies these example images as relevant or irrelevant to the retrieval task and the system uses this information to select the images that the user is most likely to be interested in.

Relevance feedback (RF) is used when a CBIR system is unable to retrieve the best available images. In these cases, satisfactory retrieval results can only be obtained if the image query can be turned into an iterative and interactive process.

The current state of image-processing technology does not allow to peg image retrieval to abstract conceptual levels. For this to work, low-level pictorial features need to be used. This is the basic problem of CBIR ñ that high-level semantic concepts used by humans to understand image content are at odds with the low-level visual features used by a computer to index the image in a database. This issue can be addressed by using several image visual

features in parallel, by giving appropriate weights to these different features, and by combining the resultant responses. (Kohoonen, 2001) This is the basis of the multi-feature indexing.

### 2.3.3   The use of indexing: Cultural Heritage Digital Libraries

In the creation of any indexing system and in attributing tags elements and concepts, it is crucial to have a clear structure. A computer meta-language that would enable us to create a graphical representation of the information structure in a form of levels and sub-levels might therefore be helpful. The best example of this kind of computer language is the Extensible Markup Language (XML).

XML is a general-purpose markup language that facilitates the data sharing across and within different information systems, particularly via the Internet. It represents a simplified subset of the Standard Generalized Markup Language (SGML) adding semantic constraints which enables the use of application languages in XML (Bray et al., 2006).

XML has been widely used in areas relevant to cultural heritage classification and retrieval, for instance, in the creation of the cultural heritage digital libraries. The PERSEUS Project, conducted by a team of scientists in Tufts University, used the XML server to build a classical digital library of Greco-Roman antiquity.  (Crane and Wulfman, 2003).

Another example of the use of XML in document structure recognition system was in the EU-funded project COLLATE (Collaboratory for Annotation, Indexing and Retrieval of Digitized Historical Archive Material). COLLATE project focused on new ways of document-centered knowledge work to distributed user groups. Its two target areas were:

- an innovative, comfortable working environment for domain experts and information consumers providing task-based, context-aware support of the users in collaborative work with digitized data, knowledge and metadata

- a comprehensive digital library/archive for European historic film documentation that has been analyzed, interpreted, indexed and annotated by a multi-national team of film experts.

The final version of the COLLATE collaboratory included innovative/advanced document processing and management facilities based on XML-based document handling, tools for automatic document structure recognition, digital watermarking and semi-automatic indexing of pictorial material (COLLATE, 2004).

### 2.3.4   Main implications for ISAAC Project

The aim of the task 1.5 of ISAAC project is to achieve an agreed indexing system that will address the technological issues related to information retrieval and will make the computer-based interactivity more accessible to potential users. Previous research (Dick and Steen, 1997; Kowalski, 1997; Mikkelsen and Aasly, 2002) and related EU projects (COLLATE, 2004; MICHEAL, 2007), suggests that semantic tags and XML language provide consistency and create a holistic system in which indexing of cultural heritage and cultural goods can be achieved. Firstly,semantic tags can clearly identify pieces of text within the document with a specific meaning, where the identified tag can be a single word, a paragraph or even larger parts of the document. Secondly, without any re-modeling, the XML system can be enriched and tailored to incorporate additional sources and knowledge into the system. XML can also build the basis for the integration of knowledge processing tools and retrieval functionality in the system. Threrefore, it is proposed therefore that the ISAAC system should be based on semantic tags and would use the XML language.

The indexing method to be used in Task 1.5 of ISAAC project is the R-tree SOM (self-organizing maps). The SOM defines an elastic topology-preserving grid of points that is fitted to the input space. Therefore it can be used for visualizing multi-dimensional data on a two-dimensional grid (Kohoonen, 2001). The map represents all available observations with an

optimal accuracy by using a restricted set of models. The idea of R-tree SOM is to map objects into points in finite-dimensional space, and to use multi attribute access methods (also known as spatial access methods) to cluster them to facilitate searching.

These spatial access methods can be split into three classes: i) R-trees and R-tree families, ii) linear quad trees, and iii) grid files. The R-tree based methods seem to be most robust for higher dimensions, provided that the fan-out of R-tree nodes remain greater than two (Frakes and Baeza-Yates, 1992). The R-tree SOM reduces the time complexity of the search compared to ordinary one-dimensional SOM (Laaksonen et al., 2002). The R-tree with fun-out that equals to 3 is shown in Figure 2.1.

**Figure 2.1:**

The file structure for R-trees
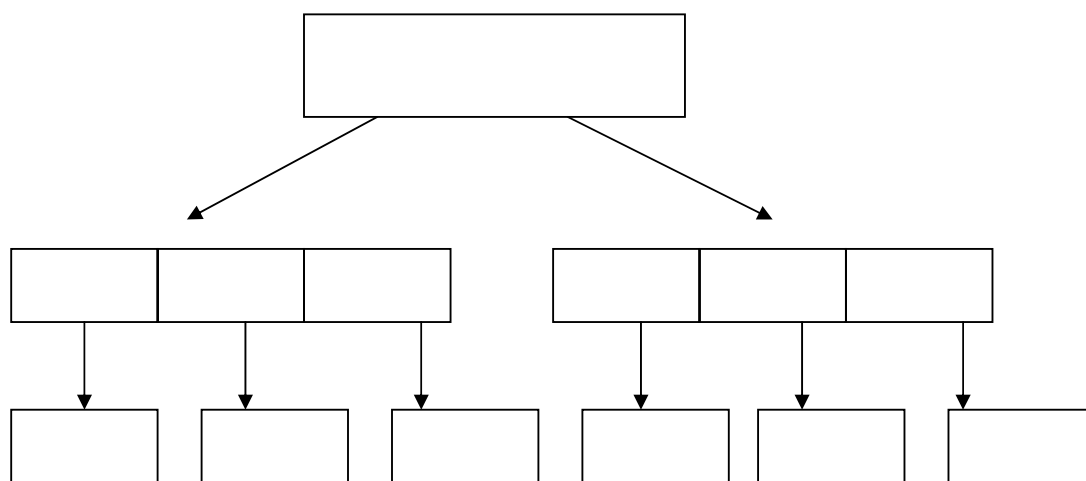


**Source:** Subramanyam and Sett, 2007, p.3.

It is suggested that to create the best framework for the ISAAC representation hierarchy of cultural heritage, the R-tree would be the best option. The framework will be further developed and graphically represented in chapter 7. It will also be discussed in further detail, outlining the typology of cultural heritage, its best representation and the schemes for its retrieval and sharing.

## 2.4    Related EU projects

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*Contributions: TXT, DCCBA*

### DESCRIPTION OF CONTENT

This sub-section discusses EU projects in cognate fields of research.

The aim of ISAAC task 1.5 is to valorize the relationship between digital heritage and cultural tourism by developing a novel user-friendly ICT environment providing new integrated e-services for European cultural destinations.   One of its main objectives is to define a European reference model to standardize representation, annotation and retrieval of cultural heritage content in cities. Reviewing related EU projects is therefore important.

A list of relevant EU projects, with a brief overview, is provided in Appendix 1 and three related EU projects, COLLATE, MINERVA and MICHAEL, have been selected for detailed reporting. These selected projects are similar to in scope to ISAAC in a sense that they aim at developing digital and electronic services for tourism and better access to European cultural heritage.

The European Union has funded a number of important projects which relate to the use of technologies for improved access to and long-term preservation of cultural heritage. Most of the related cultural heritage projects belong to the European Commission's work programme for Information Society Technologies (IST). IST is one of the most important themes in the 'Framework Programme for Research and Technological Development'. The main objectives of the programme are: (1) ensuring the cultural heritage information is easy to access for people, and helping users to understand and experience more about cultural heritage through digital libraries and virtual visits to the past; (2) recover and save the related film and audiovisual heritage of the 20th century; (3) keep the present digital information alive for the future (http://cordis.europa.eu/ist/digicult/). Therefore, the specific research focus was on providing new ways for access scientific and cultural content through the networking of Europe's libraries, museums and archives.

Since the main scope of Task 1.5 relates to indexing and information retrieval, it is appropriate to concentrate on those project that can provide guidance and inspiration for ISAAC, namely COLLATE, MINERVA and MICHEAL.

## COLLATE [1] - Collaboratory for Annotation, Indexing and Retrieval of Digitized Historical Archive Material

COLLATE (2000-2003) is one of the first working collaboratories in the Humanities  It implemented and evaluated a highly innovative web-based collaboratory for archives, researchers and end-users working with digitized historic material. The COLLATE collection of 20,000 rare historic documents, including press material and digitized photos and film fragments, was provided by three major film and national archives from Germany, Austria and the Czech Republic. COLLATE designed new ways of document-centered knowledge work to distributed user groups, and the project established an innovative Web-based collaboratory with a comfortable work environment for in-depth knowledge work with the material, and provided a comprehensive collection of rare historic documents and films, most of which are interpreted and annotated film experts.

The following Figure 2.2 Hierarchy of COLLATE goals shows COLLATE projects two complementary strategic goals: (1) To ensure content-based/semantic accessibility of the target contents (cultural material and historic documents in the current application domain); (2) To establish proved evidence empirically for the acceptability of the collaboratory approach in their domain of historic film documentation and censorship studies.

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[1] The R&D project COLLATE (IST-1999-20882) was funded by the EU within the "Digital Heritage and Cultural Content" activities. http://www.collate.de/

**Figure: 2.2:** Hierarchy of COLLATE goals
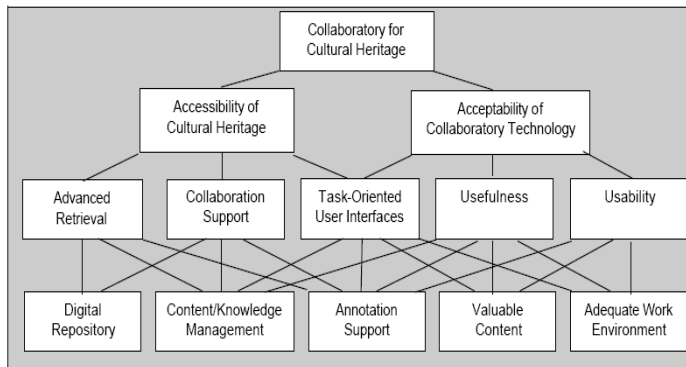


**Source:** COLLATE Final Project Report–Deliverable No. D11.1, 2004

COLLATE supports the digitization of cultural heritage corpora in the following ways. COLLATE adopts practicable methods of content and knowledge processing for traditionally isolated document collections, and it proposes a new concept of content-based organization, which can handle and present the impaired and fragile historical material. Moreover, COLLATE offers a comfortable online working environment to transfer experts professional knowledge into explicit knowledge by using detailed annotations to support the informal cooperative community in arts and humanities.

Figure 2.3 shows the user requirements and the tasks of COLLATE project. For instance, the main requirements within COLLATE are: access to integrated archive collections, knowledge sharing, and advanced search and retrieval functionalities. A first step the digitization of documents is the integration of collections demands. In COLLATE, all of the collected documents are managed in a database system that guarantees an integrated access to the diverse collections.

**Figure 2.3:** User requirements and tasks
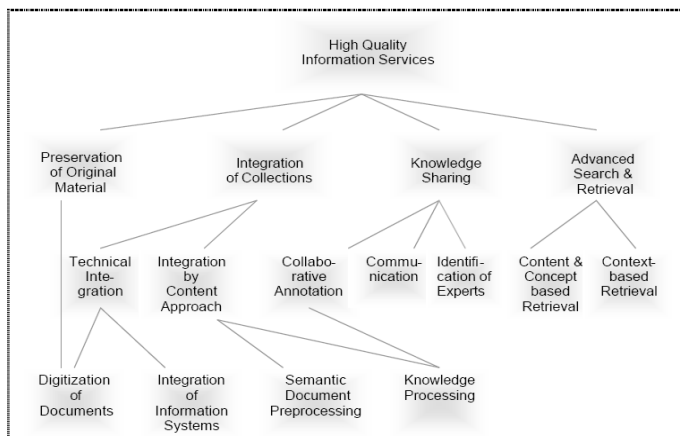


**Source:** COLLATE Final Project Report–Deliverable No. D11.1, 2004

COLLATE provides a high quality information system with advanced content-based data access. The evaluating and indexing results from current and previous scholarly work were incorporated into the information system, e.g., in the form of metadata and annotations. The following diagram (Figure 2.4) explains the COLLATE information system architecture in

details, and it is based on the reference model for an Open Archival Information System (OAIS).

**Figure 2.4:** COLLATE system architecture



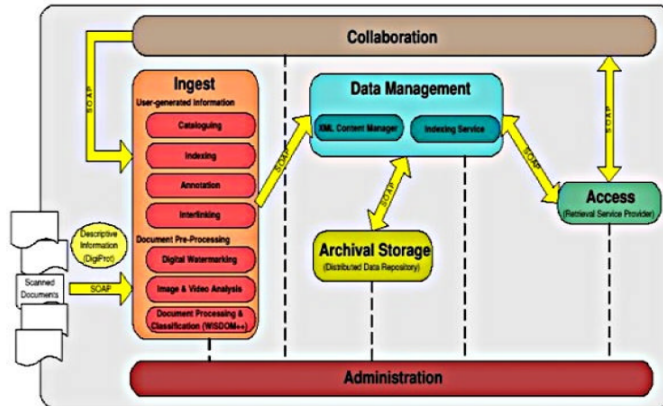**Source:** COLLATE Final Project Report–Deliverable No. D11.1, 2004

COLLATE uses XML as a standard for the encoding of generic document and metadata representation schemata in order to capture these dynamics. XML guarantees the generality of their approach, because without any re-modeling, the whole system can be enriched and tailored to additional sources and knowledge incorporated into the system. Moreover, XML builds the basis for the integration of knowledge processing tools and retrieval functionality in the system.

The following are the several functional layers in the COLLATE system is structure: operational layer, domain metadata layer, task layer and interface layer

By using the MS Access database DIGIPROT (digitization protocol) COLLATE creates a record of the digitization process with all its settings and definitions. This records the relationship of the given digitized document and the precise identification of the file name.

**Figure 2.5:** Interface / input form of DIGIPROT
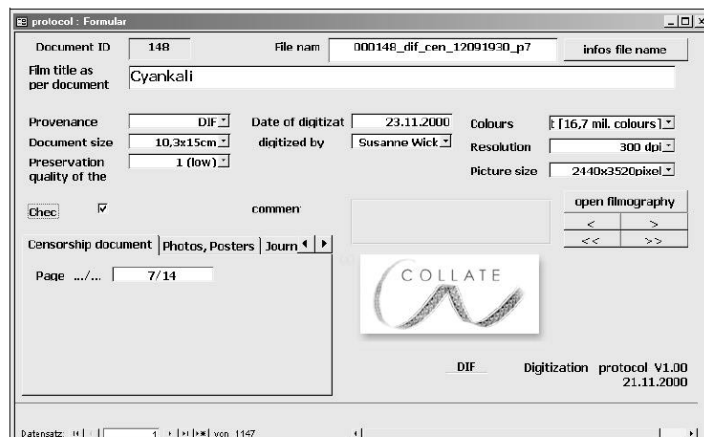


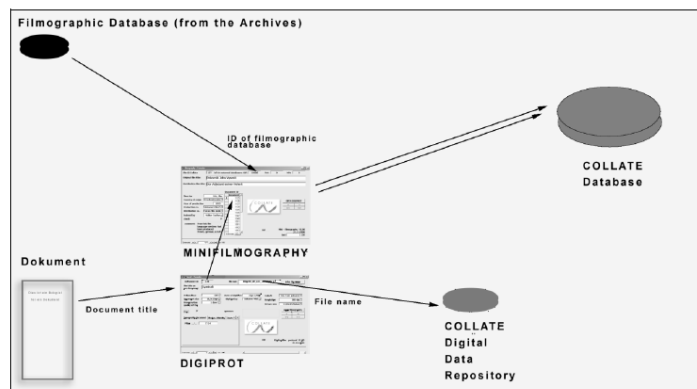**Source:** COLLATE Final Project Report–Deliverable No. D11.1, 2004

COLLATE not only makes the collected documents available to users, but it also uses a collaboratory design to support users with their indexing, annotation and retrieval. The support is by semi-automatic page segmentation and classification, which also provides

advanced search options. A very clear classification is created by both processes and in this way heterogeneous stocks of documents are functionally combined and become available for content-based retrieval. This is highly relevant for the architecture of the ISAAC system.

**Figure 2.6:** Organization of digitization data



**Source:** COLLATE Final Project Report–Deliverable No. D11.1, 2004, p17

Even digitization and system integration assist the easy accessibility of the documents, there are also some drawbacks such as the retrieval are not effective and precise enough. For example, content-based retrieval starts from demands, and next step is content analysis and finally is documentary indexing of the data collection, which include abstracting, indexing, classifying. Moreover, the COLLATE in order to ensure the high quality of the intellectual document examination and indexing/annotation by the users, the COLLATE process system adopts some innovative document pre-processing technologies, e.g., for digital watermarking, (semi)automatic document structure analysis of digitized text documents and automatic indexing of pictorial material (photos and other images).

## MINERVA[2] project

The MINERVA project funded by the IST Programme in 2002 correlates and harmonizes activities related in digitization of cultural and scientific content for creating an agreed European common platform, and provides recommendations and guidelines about digitization, metadata, long-term accessibility and preservation. Its objective is to co-ordinate national programmes, and its approach is based on the principle of embeddedness in national digitization activities. However, it also establishes contacts with other European countries, international organisations, associations, networks, international and national projects involved in this sector, and Minervaís special focus on actions are carried out in the DigiCult action of IST.

MINERVA involves more countries as the new Member States are integrated into the expanding European Union. MINERVA has been extended into the project MinervaEC from October 2006. It brings together stakeholders and experts from all European counties and includes international organisations, associations, networks, international and national projects involved in this sector. MinervaEC is a thematic network in the area of cultural, scientific information and scholarly content.

MinervaEC coordinates national policies, programmes and institutions in the cultural sector, and is supported by the National Representatives Group of the European Ministries of

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[2] http://www.minervaeurope.org/home.htm

Culture. The aims are: (1) to facilitate the creation of added value products and services at European level, (2) to improve awareness of the state-of-the-art in the sector, (3) to contribute to the overcome of fragmentation and duplication of digitization activities of cultural and scientific content and to maximize cooperation among the Member States.

The general objectives of the network are: (1) improve accessibility to and visibility of European digital cultural resources; (2) support the development of the European Digital Library for accessing cultural resources; (3) contribute to increasing interoperability between existing networks; (4) promote the use of digital cultural resources by business and citizens; (5) reinforce the European position in the global market competition; (6) facilitate exploitation of cultural digital resources, providing clear rules for their use and re-use, respecting and protecting the creators' rights. (source: http://www.minervaeurope.org/about/minervaec.htm)

MINERVA EC benefits various users and organizations. For instance, residents can receive high quality cultural content that is reliable and relevant to their specific interests; the education sector can to use this cultural content for educational purposes in school and universities; enterprises can use the content and add value through their commercial activities and services.

Minerva EC is expected to contribute in stimulating decision makers in carrying out initiatives of content enrichment, in creating the necessary conditions to improve the quality of content and services as well as improving the accessibility of digital content. The MINERVA project also proposes the peer-to-peer (P2P) approach, which allows handling huge amounts of data in a distributed and self-organizing way. However, Bender et al. (2005) indicate delivering high quality and precise results, and providing unlimited scalability in the presence of the very large amounts of data are the crucial challenges for MINERVA project in developing successful P2Pb Web search engines.

MINERVA's selection criteria are not exhaustive and are limited to guidelines for digitization of paper based documentary heritage, including manuscripts, printed books and photographs of libraries, archives and museums, but does not include the digitization of multimedia materials. Toolbox and tutorial have been included as valuable learning resources.

The selected Guidelines have been produced by public and private institutions: some are for guiding the digitization projects, others are related to digitization programs where the criterion used for inclusion was that of general interest for professionals worldwide. The data chosen for description are: Author, Contributor (if existing), Title, Description, Date, Format and URL. The presentation is in alphabetical order by author. The strategy for the enlargement of Minerva is based on two priorities: (1) to enlarge the existing Thematic Network; (2) To set the basis for the next Network of Excellence. In addition to this recent work on P2P Web search, prior research on distributed IR and metasearch engines is potentially relevant, too.

The drawback of the project for ISAAC is that it has assumed a relatively small number of databases and a fairly static configuration.

The following Minerva image shows that users can type chosen keyword queries into the GUI, it is very similar with one of today's popular web search engines.

**Figure 2.7:** Minerva GUI
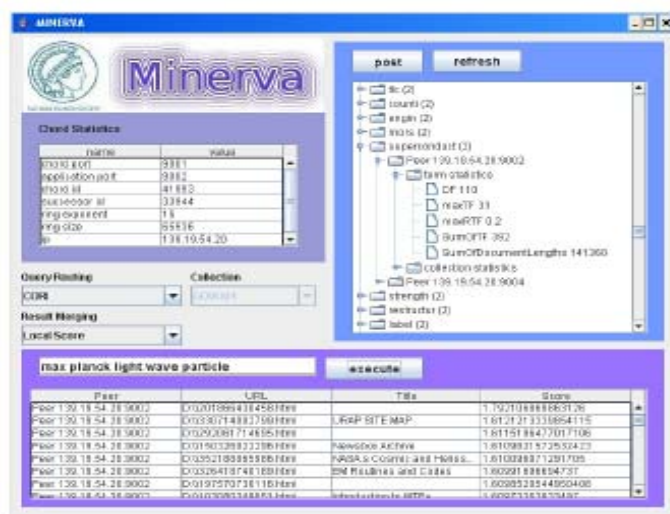


**Source:** Bender et al., 2005

## MICHAEL (Multilingual Inventory of Cultural Heritage in Europe) project

The multilingual service provided by MICHAEL (Multilingual Inventory of Cultural Heritage in Europe)[3] project enabled to find and explore digital collections from museums, archives, libraries and other cultural institutions from across France, Italy and the United Kingdom.

The MICHAEL European Service provides access to digital resources from museums, libraries and archives and the website includes: a searchable database of digital resources from museums, libraries and archives in several European countries but also articles and user stories and comments.

The MICHAEL's database is based on national inventories of digital resources that have been created by the project partners. Each national inventory includes descriptions of digital collections and the websites, CD-ROMs and other products and services that have been created by museums, libraries and archives. The descriptions are written especially for MICHAEL by people working in, or on behalf of, the cultural institutions themselves. Details are harvested directly from the national inventories to become part of the Michael database for the European services.

Michael European Service provides a thematic network, which improves the production of digital cultural heritage in Europe and their online access. Michael project data is based on the national inventories for France, Italy and the United Kingdom, but, in the next year, new contents will be added from the Czech Republic, Finland, Germany, Greece, Hungary, Malta, the Netherlands, Poland, Portugal, Spain, Sweden and the content will be supported by respective languages. Through the multilingual Michael service people will be able to find and explore European digital cultural heritage material using the Internet and long-term objectives aim to have a European cultural heritage inventory, available to all and providing access to cultural heritage resources.

The Michael project's main objectives are: (1) To provide a European cultural heritage inventory that can be available to all different users and giving easy access to cultural heritage resources; (2) Sustainable management for the project to continue; (3)

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[3] http://www.michael-culture.org/en/home

Endorsement and implementation at a national government level, in order to underpin further funding as required; (4) To establish a methodology and technical platform, which allows new national instances of MICHAEL, growing the content and user bases.

The major aim of the MICHAEL project is to build a multilingual inventory of the cultural heritage in Europe. To achieve this data will be gathered from regional and national inventories using a standard software platform and a shared data model. The Michael software platform consists of two modules that work together to provide data management and publishing services. A production module allows users to create, modify, import and manage records that describe aspects of the digital cultural heritage. All of these functions are available using a standard Web browser. Data is stored using a powerful and flexible XML database, which is based on the Michael data model. A publication module provides an intuitive interface to enable end-users to search for digital cultural heritage with their Web browser. This module uses a powerful XML search and display engine, which can be customized to allow institutions or countries to adapt the interface to meet their particular needs.

The MICHAEL project provides the several technical results, for instance: (1) the MICHAEL data model for multilingual digital cultural heritage inventories; (2) An open source technical platform for national instances built on Apache Tomcat, Cocoon, XtoGen, XML etc.  (3) Interoperability protocols for national instances to contribute data to the European service; (4) European MICHAEL search portal Methodology and model which is easy to deploy in additional countries.

Michael platform can be browsed through different indexing categories.

**Figure 2.8:** Browse MICHAEL through Digital collection



**Source:** derived from http://www.michael-culture.org/en/home
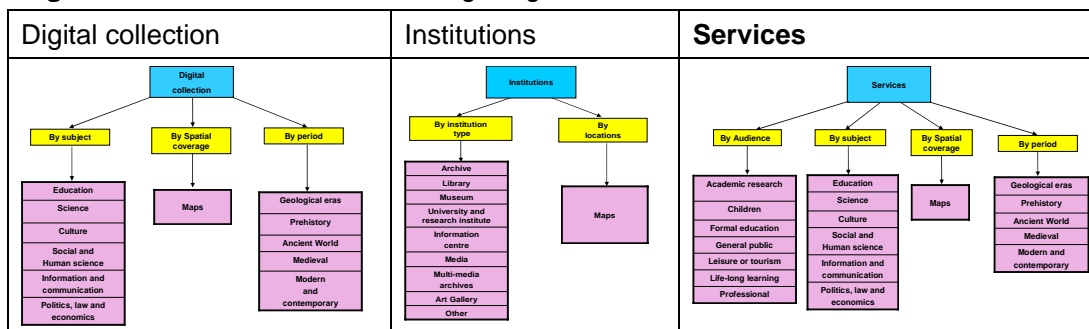
## 2.5    Issues Overview

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DESCRIPTION OF CONTENT

This sub-section focuses on the issues that have been raised in the other related EU projects and in literature on content retrieval and indexing of cultural goods and the implications to the ISAAC project.

The Internet, search engines, websites are part of everyday life in this digital world, but some challenges and issues exist, if the ISAAC project is to achieve its aims of providing useful and enticing information for cultural heritage.

Various EU funded projects have shown that providing accessibility, usage and wide knowledge of valuable historic and cultural heritages is not straightforward. Researchers have put effort and initiative to improve this situation at national and international level, and new and innovative information technologies have been adopted.

Currently, the most distinctive issue is the increasing gap between service providers that facilitate access to cultural heritage information and the dynamic technologies available for information delivery. Content providers also need to provide access to their large databases and archival holdings. In order to narrow down these widening gaps, people need to focus on the technological issues related to three areas: (1) providing access information, (2) digitization and (3) long-term preservation. Most of the experts and service providers in the cultural tourism sector are unaware of these issues , preoccupied as they are managing customer relationships or handling copyright (DigiCULT, 2002).

UNESCO (2007) indicates that Europe holds 25% of the world's 200 million hours of audio-visual heritage, including 25 million hours of film, 50 million hours of video and another 50 million hours of audio recordings. However, approximately 70% of this archive is in obsolete formats, which cannot be read using current equipment. Europe's archives are losing several 1tens of thousand of hours of their collections every year. Therefore, there is a need for providers to use the new technologies to maintain these archives for future users. Providing new digital originals is one of the best solutions in the long-term.

EU projects also aiming to create a European cultural area, to encouraging practical co-operations between EU members and to ensure that European culture heritage is  promoted so as to make European cultural tourism internationally competitive. Furthermore, some EU projects promote world wide cultural exchanges and youth education.

European researchers have developed a comprehensive set of projects, which cover networks of excellence, training, standards development, awareness cultural heritage building, and benchmarking and evaluation forums. Wide scale data collection is done by museums, public libraries, digital library researchers, historical film collections, music publishing, national libraries, architectural heritage, and digital preservation institutions. Moreover, the term of a digital culture has been popularized in past decade, and European researchers cooperate with each in the culture evolution, by transforming the traditional cultural institutions into a European cultural space. However, the feedback form the past research shows that understanding and support from residents, tourists, and stakeholders are crucial for the success of this transformation.

Improving the quality and usability of the digital content is the first priority of any research project in this area, including ISAAC. EU projects have produced a lot of work on meta-data, registries and schemas which provide better ways of resource adoption. Key tools have been used for building interoperable services, for example standards for XML-based meta-data . Furthermore, the validity of the models and multilingualism are important for cultural service accessibility and usability across Europe.

The DigiCult Report (2002) discusses the future challenges that EU researchers face in this area. Around 180 European cultural service providers concluded (1) reducing the European culture to the concept of a cultural product is a mistake and the one-dimensional notion of a free market based only upon supply and demand is also wrong; (2) the future market for cultural heritage is education; (3) Europe's museums, libraries and archives will need to enter into new relationships with both private businesses and new user groups; (4) larger cultural institutions are reasonably well equipped to deal with new technologies, however smaller institutions lack resources, adequate skills, and a clear view of the options available; (5) long-term digital preservation and born-digital objects are key drivers for technological research and innovation; (6) there is a lack of effective methodological and technological approaches for collaborative knowledge digitization in Europe.

ISAAC Task 1.5 research objectives are: (1) to develop an integrated ICT architecture made of content mapping and annotation tools, interactive e-services and decision support to harmonies and integrate diverse knowledge on EU cultural tourism destinations for the

benefit of different categories of users and enhancement of local identity and (2) to build a multi-stakeholder community for experiencing and managing European cultural heritage in cultural tourist destinations.

The issues that ISAAC project should focus on are therefore, firstly, to provide new ways for accessing and managing the very large digital cultural heritage databases in the three cities and, secondly, to collect cultural heritage content by creating a network among the Europe's libraries, museums, internet and archives, in order to facilitate relevant information retrieval by consumers.

In order to achieve an agreed indexing system that might inform the technological issues related to information retrieval in the three cities some of the COLLATE retrieval and indexing technologies can be adapted for ISAAC. In ISAAC Task 1.5, a simple classification is developed for indexing and retrieval processes by using a taxonomy in which heterogeneous sites are functionally combined together, and are available to users through content-based retrieval.

The ISAAC project embraces three cities in three different countries. The functional connections between the documents may differ from country to country but have to be made compatible and represented in the ISAAC database, hence the need to develop forms of tagging of contents.

# 3   ISAAC taxonomy of urban cultural heritage

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*Contributions: ITAS*

This chapter focuses on the development of the ISAAC taxonomy of urban cultural heritage (CH) to assist the construction of a prototype framework for storing and retrieving categories of cultural goods in tourist cities using multi-media technologies and visualisation tools.

The **work methodology** of the ISAAC taxonomy development has involved a summary review of the main literature findings in the field of environmental and cultural economics[4] (Hotelling, 1949; Weisbroad, 1964; Krutilla, 1967; Randall, 1986, 1987; Pearce et al., 1989; Pearce and Turner, 1990; Costanza, 1991, 1993; Nijkamp, 1988, 1989, 1992; Nijkamp and Voogd, 1989; Fusco Girard, 1987; Fusco Girard and Nijkamp, 1997; Litchfield, 1988; Litchfield et al., 1990;  Cocconis and Nijkamp, 1995; Stelllin and Rosato, 1988; Sirchia, 1997, 1998; Cummings et al., 2002; Brandon et al., 2000; etc.), the results from recent European projects in CH fields, including the DigiCULT Report (2002). More specifically, the following EU projects have been taken into consideration: the EU FP6 PICTURE Project (taxonomy of cultural goods in cities), International Heritage Organisations and Conventions (Convention for the Safeguarding of the Intangible Cultural Heritage, UNESCO, Tourism Organisation, WTO, ICOMOS); tourist regions (Cultural Tourism in the Buffalo Niagara Region, New York State-wide Cultural Tourism Coalition); world IT associations (Visual Resource Association); other International Organisations (International Trade Centre UNCTAD, World Intellectual Property Centre).

The above review has provided both meaning and some **basic principles** for developing the ISAAC taxonomy. The development of this taxonomy is strictly linked to the necessity to develop a form of tagging of information, which might help retrieval. A number of alternative classification systems  and approaches to support the development of metadata for digital resources are been explored, including the decentralised, social approach named *folksonomy*. This user-centred approach has been adopted in parallel to an expert perception of cultural goods. The latter was derived by literature review in environmental/cultural economics. This has highlighted the most relevant categories of values associated to cultural

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[4] For more details, see references list in chapter 10, para.3.

heritage, both use values and non-use values, including aesthetic values; spiritual values; social values; historical values; symbolic values, etc.

The methodology has also taken into account the results from the analysis of the 24 ISAAC focus groups meetings held between December 2006 and January 2007 in the three partner cities of Amsterdam, Leipzig and Genoa reported in Task 1.3, Part I, *Developing alternative platform scenarios.* Moreover, it has required a continuous iteration and feedback with the ISAAC subtask on "*Glossary of Cultural Goods and e-Services from the User Perspective*".

The **final ISAAC taxonomy** is illustrated in paragraph 3.2. This is able to combine a hierarchical classification of general categories of cultural goods, both tangible and intangible ones, with the (pre, during and post visit) e-services, considering a consumer oriented perspective and providing an appropriate role to the glossary. Whilst simplifying the articulate nature of cultural goods, this taxonomy gives the correct information to users.   The categories offered by the ISAAC taxonomy can generally be used for:

−   **cataloging**: They may be used as data value standards at the point of documentation or cataloging. They may be used as a controlled vocabulary or authority by the cataloger or indexer; they provide preferred names/terms and synonyms for people, places, and things. They also provide structure and classification schemes that can aid in documentation.

−   **retrieval:** They may be used as search assistants in database retrieval systems. They are knowledge bases that include semantic networks that show links and paths between concepts; these relationships can make retrieval more successful.

−   **research tools**: They may be utilized as research tools, valuable because of the rich information and contextual knowledge that they contain.

−   **search engine:** They may be used to support a users-self development of metadata for digital resources from

The chapter is subdivided in **three main sub-sections**. The first one illustrates the meaning and principles on which the ISAAC taxonomy is based; the second sub-section illustrates the proposed taxonomy in details and the third one discusses how the proposed taxonomy might impact the development of the ISAAC ICT architecture.


## 3.1    Meaning and principles underlying the ISAAC taxonomy


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*Contributions: ITAS*


The word "Taxonomy" (from Greek verb *τασσεῖν* or *tassein* = "to classify" and *νόμος* or *nomos* = law, science, cf "economy") […] refer to either a classification of things, or the principles underlying the classification […].

Taxonomies […] are frequently hierarchical in structure, commonly displaying parent-child relationships. Simpson's (1961) defines taxonomy as the theoretical study of classification, which includes its bases, principles, procedures and rules. Bailey (1994) also stated that a taxonomy is like a classification, and it can refer to both the process and the end results. He also addressed taxonomies are often hierarchical and evolutionary. The term taxonomy may also be applied to relationship schemes other than hierarchies, such as networked structures. Ravid (2002) defined "Taxonomy is the science of classification according to predetermined system used to provide a conceptual framework for discussion, analysis or information retrieval". A taxonomy might also be a simple organization of objects into groups, clusters or even an alphabetical list (lexicographic order). In current usage within "Knowledge

Management", taxonomies are seen as slightly less broad than onthologies." (Wikipedia). "[…] In digital terms, automated classification of documents in a hierarchy based on information gathered by a metacrawler." (DCMI Glossary)

This subsection provides an overview of the main principles underlying development of a classification system and presents an alternative decentralised, social approach to taxonomies, named **folksonomy,** which is able to support the development of metadata for digital resources. Subsequently, the subsection provides an overview of the main cultural heritage characteristics, highlighting the most relevant categories of users' interests and values associated to cultural heritage, as identified in the field of environmental/cultural economics. It finally concludes by specifying the principles on which the ISAAC taxonomy has been based. This accounts for both a user centred approach and an expert perception of cultural goods. The development of this taxonomy is strictly linked to the necessity to develop a form of tagging of information, which might help retrieval. Whilst simplifying the articulate nature of cultural goods, it gives the correct information.

### 3.1.1    Overview of taxonomy principles and approaches

There are a number of different alternative principles underlying the development of a classification system. The followings can be recognized as being the main ones:

1. A hierarchical classification of cultural goods. Examples are:

    − geographical distribution (i.e.: nation, county, city)

    − authorities in charge of (i.e.: National / Regional / City Tourism Authority)

2. A networked classification of similar cultural goods. Examples are:

    − heritage families (i.e.: Baroque)

    − style life families (i.e.: Slow cities)

3. A plain list of different cultural goods. Examples are:

    − alphabetical list

    − list by amount of yearly number of visitors

    − amount of visitors of the web sites

    − richness in term of cultural goods' availabilit

4. A short list of basic concept referred to cultural goods. In opposition to comprehensive holistic approaches, a different more operative approach is the one focusing on the selection of a small number of core categories. Examples can be found in Dublin Core Metadata Initiative (DCMI, 2005):

    − the Simple Dublin Core Metadata Element Set (DCMES). This consists of 15 metadata elements (Title, Creator, Subject, Description, Publisher, Contributor, Date, Type, Format, Identifier, Source, Language, Relation, Coverage, Rights);

    − the DCMI recommended vocabulary currently consists of 12 terms: Collection, Dataset, Event, Image, Interactive Resource, Moving Image, Physical Object, Service, Software, Sound, Still Image, Text.


A different approach to taxonomies is **Folksonomy**. The difference with a taxonomy is that the hierarchical approach, typical of a taxonomy, leaves room for a flat classification. "A folksonomy is a decentralised, social approach to support the creation of metadata for digital resources. It is usually created by a group of individuals, typically the resource users, who add natural language tags to online items, such as images, videos, bookmarks and text.

These tags are then shared and sometimes refined"[5]. […]. Robin Good (2004) says that "*a folksonomy represents simultaneously some of the best and worst in the organization of information.*" There is clearly a lot to be learnt from this new method of classification as long as you remain aware of the strengths and weaknesses".

**Strengths of a Folksonomy**

(i)     **Serendipity -** Folksonomies at this point in time are more about browsing than finding and a great deal of useful information can be found in this way; (see also: http://en.wikipedia.org/wiki/Serendipity)

(ii)    **Cheap and extendable** - Folksonomies are created by users. This makes them relatively cheap and highly scalable, unlike more formal methods of adding metadata. Often users find that it is not a case of 'folksonomy or professional classification' but 'folksonomy or nothing';

(iii)   **Community -** The key to folksonomies success is community and feedback. The metadata creation process is quick and responsive to user needs, new words can become well used in days. If studied they can allow more formal classification systems to emerge and demonstrate clear desire lines (the paths users will want to follow)" (Good Practice Guide for Developers of Cultural Heritage Web Services, 2004).

**Weaknesses of a Folksonomy**

i.     **Imprecision of terms -** Folksonomy terms are added by users which means that they can be ambiguous, overly personalised and imprecise. Some sites only allow single word metadata resulting in many compound terms, many tags are single use and at present there is little or no synonym control;

ii.    **Searching -** The uncontrolled set of terms created can mean that folksonomies may not support searching as well as services using controlled vocabularies. (Good Practice Guide for Developers of Cultural Heritage Web Services, 2004).

Examples of Folksonomies[6]

del.icio.us, http://del.icio.us/

This social bookmarking web service is used for storing, sharing, and discovering web bookmarks. It is a good alternative to search engines for discovering last trends on the web.

The site came online in late 2003, was founded by Joshua Schachter and now it is part of Yahoo. It's possible to find online other similar services, but *Delicious* has been the first, the prototype and remain the leading social bookmarking service on the web. The primary use of this is to store your bookmarks online, which allows you to access the same bookmarks from any computer and add bookmarks from anywhere, too. Besides you can use it to share favourites with friends, family, coworkers, and the del.icio.us community and to discover new things.

Everything on del.icio.us is someone's favourite - they've already done the work of finding it. So del.icio.us is full of bookmarks about technology, entertainment, useful

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[5] Good Practice Guide for Developers of Cultural Heritage Web Services, 2004

[6] From: Good Practice Guide for Developers of Cultural Heritage Web Services, http://www.ukoln.ac.uk/interop-focus/gpg/CollaborativeTechnologies/

information, and more. Delicious is catalogued by a non-hierarchical keyword categorization system; the users write a descriptive text, tag each of their bookmarks with a number of freely chosen keywords and can comment the others (infact everything posted to del.icio.us is publicly viewable). When you find a web page you'd like to add to your list, you simply select the del.icio.us book-market, and you will be prompted for a information about the page. You can add descriptive terms to group similar links together, modify the title of the page, and add extended notes for yourself or for others.

**Additional Folksonomy Bookmark Sites, Images, Video and Sites**

- *Tagsy*, <http://tagsy.com>
- *Jots*, <http://jots.com/>
- *BlogMarks*,<http://blogmarks.net/>
- *Connotea*, <http://www.connotea.org/>
- *CiteULike*, <http://www.citeulike.org/>
- *Flickr*, <http://www.flickr.com/>
- *Vimeo*, <http://www.vimeo.com/>
- *Up to 11*, <http://www.upto11.net/>
- *Freesound*, <http://freesound.iua.upf.edu/>
- *GenieLab*, <http://genielab.com/>
- *Technorati*, <http://www.technorati.com/>
- *Up coming*, <http://upcoming.org/>
- *Tagsurf*, <http://tagsurf.com/>
- *Poetry X*, <http://poetryx.com/>
- *43 things*,  <http://www.43things.com/>
- *Newsgator*, <http://www.newsgator.com/>
- *24 eyes*, <http://www.24eyes.com/>

### 3.1.2    Overview of the main Cultural Heritage categories and values

**Culture** is the product of human activity; it is an expression of the human mind in a material or in an immaterial sense. An intrinsic element of culture is heritage: to a large extent present values, attitudes, customs, lifestyles, are deeply rooted  in the past. Heritage is that part of culture which is transmitted from one generation to the next one. To some extent a society's identity is based on its heritage, which is the reason  many societies, in both the developed and developing world, place great value on heritage (Cocconis and Nijkamp, 1995).

**Table 3.1**: Classification of urban cultural attractors

| Examples of urban Cultural Attractors | Significance | Source |
|---|---|---|
| Objects from all periods and all geographic areas: Paintings; works on paper; sculpture; ceramics; metalwork; furniture; decorative arts; performance art | High | CDWA[7] |
| Visual "surrogates" of works of art & material culture Photographs; slides; digital images; videotapes | High | |
| Works of art and their visual surrogates | High | CCO[8] |
| Ancient monuments | High | Middleton 1988 |
| Historic buildings | High | |
| Museums | High | |
| Art galleries | High | |
| Object | High | PICTURE[9] |
| Event | High | |
| Place | High | |
| Architectures and their visual surrogates | Average | |
| Material cultures and their visual surrogates | Average | |
| Theme parks | Average | |
| Amusement and leisure parks | Average | |
| Parks and gardens | Low | |
| Wildlife attractions | Low | |
| Industrial archaeology sites | Low | |
| Themed retail sites | Low | |
| Countryside | Low | Scotland Trust |
| Islands | Low | |
| Famous Scots10 | Low | |
| Social and industrial heritage | Low | |

The meaning of the term **heritage** is quite broad and encompasses many aspects. Part of our heritage is visible, in the sense that it has a physical existence. It consists of various artifacts created by man in the past that are considered worthy of preservation for the future.. Some of this type of heritage is part of our everyday living environment and continues to serve as shells for our activities.  Natural or environmental heritage is also an important part of a culture, encompassing the countryside and natural environment, including flora and fauna. These kind of heritage sites often serve as an important component in a country's tourist industry, attracting many visitors from abroad as well as locally.

In terms of ISAAC project's objectives, the categories of Cultural Goods with the highest level of significance are **urban cultural attractors**. Table 3.1 lists a number of examples taken from different sources and weights them in accordance to ISAAC's objectives.

Table 3.1 shows examples of urban cultural attractors. One can see that clearly that the urban cultural attractors with high significance for ISAAC project's objectives mostly include examples of tangible urban cultural heritage related to the cultural cities, their history and overall historic and intellectual development (such as architecture, museums, arts, paintings, etc.).  Urban heritage attractors with only average significance are less strongly associated with tangible urban cultural heritage in the cities and show some indications of association

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[7] Categories for the Description of Works of Art is an articulated taxonomy of cultural heritage information. Provides detailed guidelines for the description of art objects and their visual surrogates.

[8] Cataloguing Cultural Objects is developed by the Visual Resources Association, with an advisory board from the museum, library, and archival communities.

[9] Pro-active management of the Impact of Cultural Tourism upon Urban Resources and Economies. The taxonomy of cultural attractors is developed by Chris Tweed, School of Planning, Architecture and Civil Engineering (SPACE), Queen's University Belfast.

[10] "This list is interesting because it introduces two further categories: Islands and Famous Scots. These serve to remind us that organizations will include categories as dictated by their particular circumstances, though these might be generalized to provide a broader coverage in a general taxonomy. The category of "Famous Scots" could be generalized to refer to famous people in general or, to reflect contemporary culture, celebrities. ".

with intangible urban heritage (e.g. material cultural and visual surrogates). Finally, examples of urban cultural heritage with low importance include examples of both tangible and intangible cultural heritage that are not directly related to the cities (i.e. they are non-urban or suburban).

The above mentioned definition of culture offered by experts in the field of cultural economics is also supported by the DigiCULT Report (2002) which highlights the production and consumption aspects of culture, by saying "… however, is that **there is no cultural heritage per se**. What counts and can ultimately survive as cultural heritage is an outcome not of universal ideas and objective criteria, but of selections which are motivated by particular political, social and cultural interests, academic disciplines and professions as well as market mechanisms. These selection criteria decide whether there is "a future for the past" for particular cultural artifacts."  In other words, quoting Jennifer Trant (AMICO), "Consumers are not interested in records associated with a cultural object. They are actually interested in how that object links to their lives and problems in their lives." (DigiCULT Report, 2002, p.228).

The above definition of cultural heritage, driven by a strong consumers approach, leads to the need for a deeply understanding of the values/interests associated to a cultural resource. Therefore, in order to better understand what cultural heritage is and the different views and definitions, the following paragraph presents an overview and synthesis of the main findings in the field of cultural economics, with reference to both the concept of the total economic value and other existing taxonomies.

**Hierarchy of values in cultural heritage domain**

One of the main characteristic of the cultural goods domain is "the highly interdisciplinary and multidisciplinary approach. Cultural objects are not isolated entities and each information has to be placed in its specific spatial, temporal and cultural context" (Signore, 2006).

Literature on cultural heritage conservation/valorization has stimulated the formulation of interesting taxonomies of effects/benefits/values stemming from the presence of historical heritage in a geographical area. The early pioneer taxonomies of Weisbroad (1964) and Krutilla (1967), followed by Randall (1986, 1987), Nijkamp (1988, 1989), Pearce and Turner (1990), and others.

Randall defines the "Total economic value" as the summations of subcategories expressing the different rights of existence of the resource concerned. These subcategories are:
- **Use value**, deriving from the possible commercial usage of the resources, either at the present time (direct value) or in the future (indirect value)
- **Option value**, i.e. the price paid  for guaranteeing that the resources will be available in the future (it includes the risk connected with this)
- **Quasi option  value**, i.e. value attached to the expectation of crucial information considered as indispensable in making a decision about the most sensible way to use the resource
- **Existence value**, a value derived from the pure altruistic awareness that the good exists. It is not connected with interests, benefits or return of capital. It includes the Philanthropic value, the Bequest value and the Intrinsic value.

Figure  1, below, shows these consolidated classification of values taken from scientific literature on environmental-cultural economics.

Other taxonomies take different perspectives and do not link to users preferences. For instance, these are related to multidimensional aspects of CH and no-monetary approaches (Nijkamp, 1988, Fusco Girard, 1987). Table 2, below, lists the main recognised categories of values and aspects for a cultural good according to the above identified taxonomies in the field.

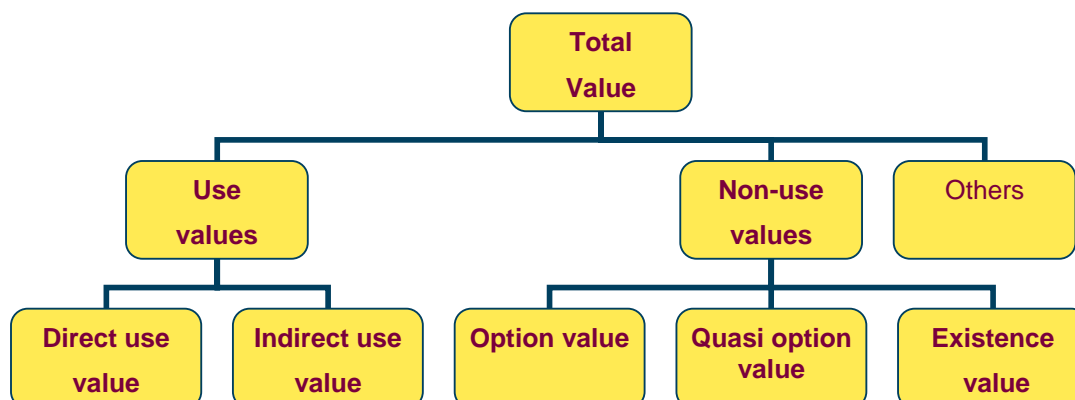**Figure 3.1;** Classification of economic values for environmental/cultural goods



**Table3. 2:** Definition of attributes and values for CH goods

| Evaluation criteria | Definition |
|---|---|
| 1.  Use V. | V. deriving from the possible commercial usage of resources, either at the present time or in the future. |
| 2.  Option V. | V. of future, modified in order to include the price of the risks connected with the future availability of the good. |
| 3.  Quasi Option V. | V. attached to the expectation of crucial information considered as indispensable in making a decision about the most sensible way to use the resource. |
| 4.  Existence V. | V. derived from the pure awareness of the existence of a resource […] Randall interprets this v. as a form of altruism (a) |
| 4.1 Philanthropic a. | The resource is valued because others at present may enjoy it. |
| 4.2 Bequest a. | This value is linked to future generations needs. |
| 4.3 Intrinsic a. | The resource is valued in itself for the intrinsic characteristics of its existence |
| 5.  Effect on regional development (rd) | The existence of Historic Heritage attracts both local residents and foreign tourists whose spending capacity in restaurants, hotel and travel can be of great importance and can create various indirect multiplier effects. |
| Actual and potential future user V. and Non-user V. | This is the V. of Historic Heritage as the primary commercial resource for recreational and tourism activities. Non-user V. is the potential V. of Cultural Good which has not been used. |
| 6.  Behavioral and spin-off effects | They stem from the psychological, aesthetic, intellectual, creative pleasure, provided by enjoyment of Historic Heritage. |
| 7.  Environmental effects | The total set of bio-ecological and spatial consequences deriving from preservation of Historic Heritage. |
| 8.  Intangibles and Perception: Economics and Ethics | Many environmental as well as cultural benefits are intangible. |
| 9.  Stewardship Function and Collective Decision | Looking at the behavior of man versus nature and history, related collective decisions cannot be derived merely from the sum of the individual decentralized preferences […]. This is the so-called definable "Stewardship Function", expressed by society through the form of elected government. |
| 10. Intrinsic Characteristic and Inherent V. | The absence of individual perceptions regarding the V. of public goods and the consequent scarce of WTP (willingness to pay) for their provision. |
| 11.1 Aesthetic Effectiveness | Potential of Cultural Good to create an immediate feeling of pleasure, idealized sentiments, aesthetic and emotional well-being, and positive intellectual experiences. It depend upon the intrinsic attractiveness of the good itself. |
| 11.2  Centrality of Historic Statement | Potential of Cultural Good to express its role as an "historical statement" |
| 11.3 Scarcity | There are very few goods belonging to the past, that have potential to express aesthetic effectiveness and historical significance. |

In conclusion, it can be recognized that in this field of CH, it does not exist a single, synthetic scheme which classifies the subject in an unambiguous way (Massimo, 1995). The main implications of this for the ISAAC taxonomy development are that both an expert perspective is not sufficient to ensure CH-list's completion and a users involvement is required.

### 3.1.3     Summary of the principles underlying the development of ISAAC taxonomy

In order to develop a general taxonomy for the ISAAC project able to combine a top-down approach of urban cultural goods categories from an experts-perspective, with bottom-up or folks approaches to the problem, the following two principles reported in para. 3.1.2 have been adopted.

1. A hierarchical expert-oriented organization and classification of tangible and intangible cultural heritage categories which encompass all the economic values recognized in the cultural economics field and which is able to develop a form of tagging of information, which might help retrieval.

2. A dynamic consumers-oriented implementation and search of contents, such as a folksonomy, and ability to enhance access in the cultural heritage domain, with reference to the ISAAC (pre, during, post visit) e-services.

## 3.2     Illustration of the ISAAC taxonomy

*Author: POLITO*

*Contributions: ITAS, UNOTT*

This sub-section presents the ISAAC taxonomy of urban cultural heritage components in more details (see Appendix 2 for more details). This combines a hierarchical classification of general cultural goods categories, from the tangible to the intangible, with a more consumer oriented perspective. Attention has been paid to the significance that such a taxonomy can have to enhance access in the cultural heritage domain, with particular reference to possible e-services to be developed by the ISAAC platform.

This taxonomy has been therefore designed to be able to organize (and to provide the framework for) the following typologies of objects :

1. tangible and intangible cultural heritage categories, hierarchically classified as follows : goods, places, landscapes and activities (see paragraph 3.2.1);

2. e-services categories listed according to both the time of the visit from a consumer perspective, i.e. (i) pre, (ii) pre and during, (iii) during and (iv) post visit, and the alphabetical order (see paragraph 3.2.2).

This organisation of contents directly refers to the *Glossary of Cultural Goods and e-Services in European cities* (Appendix 4) and has required a continuous iteration and feedback with this ISAAC subtask (see next Chapter 4).

It is based on the principles illustrated in previous sub-section 3.1, with reference to both literature review and recent European projects in cultural heritage fields, as well as to the results from the analysis of the 24 ISAAC focus groups meetings held between December 2006 and January 2007 in the three partner cities of Amsterdam, Leipzig and Genoa reported in Task 1.3, Part I, *Developing alternative platform scenarios.* These have specifically provided the typologies of e-services that users currently prefer.

The ISAAC taxonomy is able to link cultural goods categories to these e-services, organising them in accordance to the users preferences. Since preferences change over time, in relation to experienced knowledge, perception, awareness and sensitivity, because human being are part of a dynamic community of interest, the proposed taxonomy has been

designed as a folksonomy (see para 3.1.1), which allows implementation on the base of a wiki approach.  Figure 2 provides a general representation of this taxonomy. (Note the crucial role and interface played by the ISAAC Glossary in linking the two systems of Cultural Heritage and e-services with users.)

This sub-section is divided in three parts. The first one illustrates in details the contents on which the cultural heritage ISAAC taxonomy is based; the second one lists the categories of e-services in a consumer oriented perspective and the third provides final remarks.

**Figure 3.2:** General ISAAC taxonomy framework
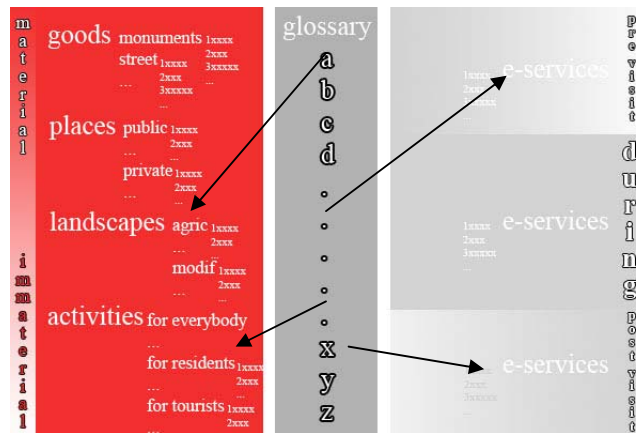


### 3.2.1    A hierarchical classification of Cultural Heritage

The suggested hierarchical classification of cultural heritage - see **Appendix 1**, includes three levels of objectives, starting from the most general tangible and intangible CH categories of: goods, places, landscapes and activities, till the most specific elements, supported by examples from case studies (last column). The class of **Goods** is subsequently specified in terms of: Monuments, Streets, Buildings, Infrastructure, Popular venues, Settlement. The category of **Places** includes both Public and Private places. The family of (Cultural) Landscapes, includes all the followings sub-categories: Agricultural Systems, Environment, Modified Landscapes, Patterns of Settlement and Human Activity, Scene, Urban landscapes. Finally, the last section of the Cultural Heritage hierarchical classification about Activities includes Events for all the three groups of potential users: Events For Everybody (all stakeholders), Events For Residents and Events for Tourists.

In **Appendix 2**, the terms **in bold** are extracted from the City Cultural Goods Glossary currently consisting in 154 terms[11]; the words *in italic* derive from the Urban cultural tourism E-services report [12] . Participants to ISAAC Focus Groups provided a significant implementation of the vocabulary, especially in the Activities section. This has been a confirmation of the need to adopt a dynamic system in the technological ISAAC platform. In total, the taxonomical list of cultural heritage categories includes 257 terms.

Following the above illustrated folksonomy approach (see section 3.1), the proposed Cultural Heritage hierarchical classification supports a users participation for implementing this initial

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[11] ISAAC Task 1.5.1, Part 1 Report, *Glossary of Cultural Goods and e-Services from the User Perspective*, 27/03/07, Version 0.1

[12] ISAAC Task 1.3, Part I, *Developing alternative platform scenarios*, Project Deliverable 1.3, 15/03/07, Version: 0.4

list. For example, a stakeholder, i.e. manager of a historical café, could be interested to contribute to the third level of the list of private places.

### 3.2.2   E-services in a consumer oriented perspective: before, during and after the visit

This section refers to the **230** possible pre, during, post-visit e-services that ISAAC platform could develop that are listed in Appendix 3. The terms **in bold** are extracted from the City Cultural Goods Glossary[13]; the words *in italic* derive from the Urban cultural tourism E-services report[14].

All these e-services can be viewed as an answer to the general question on "How can ICT help user in developing his/her own Cultural Heritage interests?", linking to the concept of (urban) e-governance. This vision of an e-inclusive and citizens-centred urban digital governance that reflects the requirements of the stakeholder by means of four main schemes (i) government to government (ii) government to citizens (iii) government to businesses and (iv) government to community[15].

### 3.2.3   Final remarks

What, Who, How, When, and Why, are five basic questions answered by the ISAAC taxonomy (see Figure 3.3).   These questions constitute a basic framework for ISAAC's taxonomy, explaining in brief what is taxonomy, who are its main users, how the taxonomy can assist users to develop their interest in cultural heritage, when the available cultural heritage services are organized in relation to timing of the visit and finally, why users are motivated in implementing ISAAC cultural heritage list as a folksonomy with possible implications for the e-governance.

1. **What.** The taxonomy provides a systematization of both material and immaterial Cultural Heritage categories which link directly to the Glossary terms;

2. **Who.** Users may implement the list of activities included in the ISAAC taxonomy of CH (as illustrated in the example of paragraph 3.2.1);

3. **How.** The Cultural Heritage e-services provided by the ISAAC platform assist users to develop their interests in Cultural Heritage (see paragraph 3.2.2).

4. **When.** The available Cultural Heritage e-services are organised in relation to the time of the visit.

5. **Why.** Users are motivated in implementing ISAAC CH list as a folksonomy and this is seen a contribution to e-governance.

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[13] ISAAC Task 1.5.1, Part 1 Report, *Glossary of Cultural Goods and e-Services from the User Perspective*, 27/03/07, Version 0.1

[14] ISAAC Task 1.3, Part I, *Developing alternative platform scenarios*, Project Deliverable 1.3, 15/03/07, Version: 0.4

[15] See: www.intelcitiesproject.com. See also: Lombardi P. (2006), "Città intelligenti: valutazione dei servizi di e-government nell'ottica dei cittadini", Urbanistica Informazione, n.205, pp.53-55; Lombardi P., Cooper I. (2007), Progress toward Sustainable Development in a Knowledge Society in Italy and EU, paper in preparation for the International Conference on Whole Life Urban Sustainability and its Assessment, M. Horner, C. Hardcastle, A. Price, J. Bebbington (Eds), Glasgow;  Curwell, S., Deakin, M., Cooper, I., Paskaleva-Shapira, K., Ravetz, J., Babicki, D., 2005. Citizens' expectations of information cities: implications for urban planning and design. Building Research & Information (January-February) 33(1), 55-66.

**Figure 3.3:** The five basic questions included in the ISAAC taxonomy
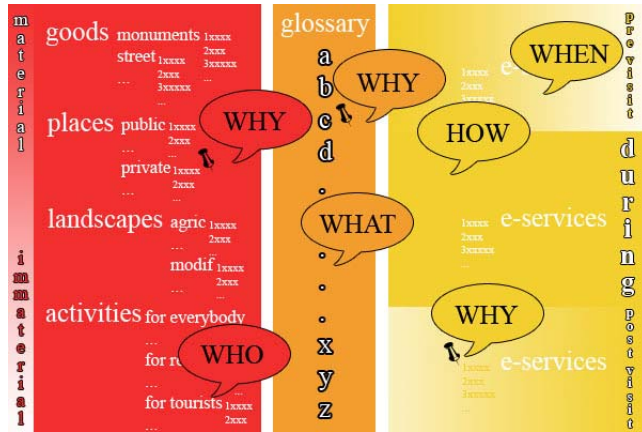


## 3.3 Implications for the ICT architecture

*Author: TXT*

*Contributions: POLITO, ITAS*

This sub-section discusses how the proposed taxonomy might impact the development of the ISAAC ICT architecture.

As describe in the project Annex I "Description of Work", technology innovation of ISAAC falls in five priority areas: In particular, the second priority area is the following:

"***Smart agent technologies*** *will significantly enhance the ability of a user to get relevant information from the web. Intelligent agents are already able to surf the web to get information according to the owner's profile. Further advances will involve enhanced proactivity (i.e. capacity to anticipate the owners' needs); automatic brokerage based on a common ontology, and enhanced understanding of human situations.*

*ISAAC will build on critical factors involving:*

> ***Ontology****: It is important to create a wide consensus on common definitions of terms so that users can understand and compare different offers/opportunities. Moreover, a common semantic would also allow smart software agents to operate automatically on the web on behalf of a person. Emerging semantic web enabling standards like RDF, DAML (http://www.daml.org), DAML-S and web ontology language (OWL, http://www.w3.org/2001/sw/WebOnt/) will provide the tools with which heritage e-destinations can be described so that different software vendors and applications can become heritage-enabled.*"

The most general and complete definition of Ontology is "An explicit and formal specification of a shared conceptualization".

- It is explicit because it defines the concepts, properties, relationships, functions, axioms and constraints that compose it.

- It is formal because it is machine readable and interpreted.

- It is a conceptualization because it is an abstract model and a simplfied view of the existing things it represents.

- it is shared because there is consensus about the information and is accepted by a group of experts.

In brief, it can be said that an ontology is the definition of a set of concepts, its taxonomy, interrelation and the rules that govern such concepts.

In an intelligent agent system, the ontology is a declarative formalism, the vocabulary for the representation of knowledge for a specific domain[16]. Ontology definitions in the ISAAC related domain associate the names of entities in the universe of cultural heritage objects (e.g., goods like monuments, streets, buildings, places like public or private, activities and so on) with human-readable text describing what the names mean, and formal axioms that constrain the interpretation and well-formed use of these terms.

Researchers believe that ontologies are notoriously difficult to build[17]. Ontology engineering requires in depth knowledge of the domain as well as expertise in building knowledge representation and organization techniques, a rare combination that can be found for any domain.

A good methodology for knowledge engineers to build ontologies in the easiest and quickest way in any given domain of knowledge could be the one analysed below.

The first step of this transformation process is to identify some source of knowledge in the requisite domain (cultural heritage for the ISAAC project objectives).

The taxonomy identified during the Task 1.5 research activities and explained in paragraph 3.2 is the example base for the analysed methodology. In fact it provides hierarchical view of concepts of the cultural heritage domain that is required to build the ISAAC ontology. The proposed ISAAC taxonomy is also in line with the following rudiments that should inspire the development of the ISAAC ICT architecture[18]:

1. standardisation of the Glossary; precise use of wording

2. clearness of the adopted structure (initial declaration of how it is, bird view on the site, locator aid – where am I now?, ease of navigation, common standards)

3. precise use of syntax

4. preference for icons instead of multi-language

5. provision for multimedia (words, tables, maps, images, videos, sounds)

6. provision for side-applications (3D viewers, virtual reality, virtual tours, games, chats, feedback collection)

7. provision for heritage interpretation and not just information

8. provision for easy accessibility and usability: in general, no technology apartheid and, for particular users, special provisions such as touch screen and voice activated controls.

The methodology for designing the ontology therefore will go along the following steps:

1. Study the taxonomy and list the major headings in which the concepts are classified. Put them in the hierarchical format.

2. These heading will be the classes in our ontology in such a fashion that the first heading will be the top class and the second heading will be its first sub class and next heading will be the next sub class of the first sub class and so on.

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[16] Gruber, T.R. Toward principles for the design of ontologies used for knowledge sharing. International Journal of Human Computer Studies, 43 (5-6). 907-928.  Gruber, T.R. A translation approach to portable ontologies. Knowledge Acquisition, 5 (2). 199-220.

[17] From « Designing Ontologies from Traditional Taxonomies » - Punam Bedi, Sudeep Marwaha (2004)

[18] From Lombardi, P., Ciaffi, D., Polytechnic of Turin, IT (2007). ISAAC project internal working paper. Sub-task 1.5 "Taxonomy of cultural goods", www.isaac-project.eu

3. List different properties that are applicable for the instances or individuals of the top class. These properties will be applied to all the individuals of its own as well as the individuals of the classes that are derived from it.

4. Decide the range and data type of values for each property of the class. In Protégé 2.1 we can have two types of properties Data type Property and Object property. The Data type property can have Boolean, Float, Integer, String, and Symbol values while Object property can point to class and instance or individual of the classes. Create these properties for each class through Properties tab of protégé as shown in Fig. 2. on the right hand side section of the screen.

5. Create individuals of the top class from the values that appear under the first heading of the taxonomy.

6. Similarly, as in step 3 assign all the properties that are applicable for the second heading to the first sub class, and that are applicable for the third heading to the next sub class and so on.

7. Also assign one more property named Parent of the type Object to the first derived class. This property will point to the individuals of the top class.

8. Create individuals of the first sub class from the values that appear under the second heading of the taxonomy and also assign the parent property of each of these individuals to the corresponding value under the first heading.

9. Similarly, create individuals for all the sub classes of the ontology and assign values to the different properties for the individuals of different classes of the ontology.

Embedded into the ISAAC Platform design, the ICT architecture should be built in coherence with the scheme suggested in paragraph 3.2, considering various "accessing points" for users, and specifically the following key ones:

1. on the base of the interest one may have in CH goods, e.g. an art gallery or a musical event;

2. on the base of the target, e.g. if I am a tourist, the system navigates me into the appropriate section of events for tourists; if I am a business man, I directed to private places, etc.

3. on the base of specific concerns, e.g. I can navigate throughout the glossary;

4. on the base of the time period, e.g. if I am planning a trip, the system helps me with appropriate e-services.

Finally, according to the folks approach, ICT architecture shall allow users to implement the suggested classification. It shall also take users expectations into account as identified by the DigiCULT Online Delphi ((DigiCULT Report, 2002) as follows:

- Immediate access to everything;

- provision of integrated services,

- applications to be user friendly, multilingual, providing full cultural information about the stored objects,

- core information written simply and accessibly, without using jargons or making assumptions about prior knowledge,

- quality and pertinence of the content,

- "processes" rather than static artefacts,

- increased interactivity,

- fully documented collections presented in engaging ways,

- richer imaginative experiences,

- ability to create personal collections and to surface resources in own working or learning environments,

- acceptance as an equal partner; have a "voice" that is heard,

- opportunity to criticise and debate issues, resources and services provided by cultural institutions.


# 4   Defining the glossary for content retrieval

*Author: ITAS*

*Contributions: POLITO*

## 4.1 Introduction

ISAAC is an interdisciplinary project facilitating synergies between cultural tourism, heritage and information society technologies in European urban destinations. Developing the integrated ISAAC platforms requires a novel indexing system to standardise retrieval and use of information in cultural heritage in tourist cities from the perspectives of the main users – tourists, residents, businesses and urban decision-makers. Defining an appropriate Glossary is a critical step that is being taken in the development of the ISAAC taxonomy of cultural goods and e-services in ISAAC. The task is developed by ITAS in coordination with POLITO and other project partners and rests on project findings, a broader study of the topic in European and world contexts and a verification process conducted among the ISAAC multi-disciplinary team of experts.

## 4.2 Task objectives

The objective of current task is to define a glossary of terms in cultural tourism e-services and goods in European cities to serve the definition of the ISAAC taxonomy from the consumer perspective, i.e. how potential users can search, access, retrieve and use information in cultural tourism relevant to their preferences and user background.

The work is part of ISAAC Workpackage 1: E-Heritage and Cultural Tourism Services, Task 1.5: European indexing system for standard retrieval of information in urban cultural tourism, Sub task 1.5.1: Taxonomy of cultural goods and e-services. The aim of the overall task is to develop the ISAAC indexing system to assist the design and construction of the ISAAC Integrated IT Platform in information retrieval and use. This particular part focuses on the development of a Glossary of Cultural Goods and e-Services, a sub-part of Task 1.5.1: Taxonomy of cultural goods. The latter, in relation, will assist the construction of a prototype framework for storing and retrieving categories of cultural goods in tourist cities using multi-media technologies and visualisation tools, the core objective of task 1.5.

## 4.3 Methodology

The ISAAC's glossary is divided into two parts (**See Appendix 4**) Part 1 provides a set of terms and definitions of cultural goods that are considered most relevant to urban cultural tourism in Europe. Part 2 identifies a list of cultural tourism e-services that can provide access to the urban (regional) cultural goods and allow a full life experience for the user through participatory and interactive applications. The glossary was developed in three phases:

- **Phase 1**: Preliminary glossary development

- **Phase 2:** Verification of preliminary glossary

- **Phase 3**: Final ISAAC glossary development

**Phase 1**: Two main methodological approaches (one for each group of terms ) were used in this phase. The identification of the cultural goods focused on both tangible and intangible assets in city/region environments. Interim results of Task 1.5.1 'Taxonomy of cultural goods' served as a base line. The selection was made using a wide range of research and professional sources – promoted by both tourists and citizens users and institutions (tourism, cultural, city and regional) such as, for example  the EU FP6 PICTURE Project (taxonomy of cultural goods in cities), a variety of online glossaries promoted by consumers, (e.g. Wikipedia), International Heritage Organisations and Conventions (Convention for the Safeguarding of the Intangible Cultural Heritage, UNESCO), Tourism Organisations (WTO, ICOMOS), tourist regions (Cultural Tourism in the Buffalo Niagara Region, New York State-wide Cultural Tourism Coalition), cultural institutions (Dunban Museum Glossary), world IT associations (Visual Resource Association), other International Organisations (International Trade Centre UNCTAD, World Intellectual Property Centre) and the so forth. The DigiCULT Report (2002), which highlights how future R&D projects should focus on combining research on knowledge interfaces and language technologies with cultural heritage applications was particularly helpful in understanding which, how and why traditional urban-related cultural goods can be digitalised.

The list of e-services derived primarily from three baseline ISAAC studies: D1.1: Digitisation and cultural data interpretation review, D.1.3: Alternative platform scenarios and D.2 1: User needs specification. The proposed definitions are considered as widely representative of the broader user considerations. They result from a large range of user-specification studies undertaken in ISAAC, including literature reviews, concept mapping exercises of stakeholder's perceptions in cities, analysis of good practice cases world-wide and in-depth case study analysis of the partner cities Amsterdam, Genoa and Leipzig.  The defined e-services were considered relevant both to potential users – experts, tourists, citizens - and for ISAAC's specific project objectives. In both lists, a number of general terms relevant to sectoral and city destination decision-making were also included, as a framework point of reference.

**Phase 2:**  In this phase, the glossary development was carried out with the ISAAC partners, specifically with city representatives, through a further process of verification of the preliminary definitions. Verification involved backtracking to cross-check and cross-fertilise new ideas and definitions using additional glossary sources – such as the Dublin Core Metadata Initiative Glossary, Trails and Greenways Clearinghouse: the Use of the Original List from Trails Primer: National Trust for Historic Preservation: Cultural heritage tourism glossary of terms, and BEQUEST EU project glossary of terms: Building Environmental Quality for Sustainability through Time.

Verification was also undertaken through extensive project discussion. Reflecting these internal debates, the number of the Wikipedia terms, for example, was reduced from 18% in the preliminary glossary to about 14% in the second phase (26 of the 190 overall terms).

Further discussions with POLITO, lead of the ISAAC Taxonomy, led to the integration of some additional terms into the cultural goods list and the e-services. Further precision of the list  was achieved with the contributions from Genoa and other discussions with several ISAAC partners. As a result, phase two offered a list of 151 terms related to cultural goods and 39 to cultural tourism e-services. The use of both bottom-up and top-down approaches in the development of this proposed glossary incorporates both the researchers and the practitioner's perspective.

**Phase 3:** In this final phase, the ISAAC glossary is defined in relation to the remaining studies of task 1.5. The final glossary will become part of the Task's Final Report: European indexing system for standard retrieval of information in urban cultural tourism that will help build a user-friendly and user-relevant ISAAC IT platform. It should be noted, that the ISAAC glossary can be considered unique in bringing together terms and definitions of tourism and urban heritage under the new IT knowledge platform of ISAAC.

The proposed Glossary List is included in **Appendix 4.**  The glossary is structured into two parts: The first one (Appendix 4.1) offers a list of cultural goods (and, to a smaller extend, services) and the second (Appendix 4.2) includes city relevant cultural tourism e-services. Each category is organised in an alphabetical order.

# 5   Selection of cultural sites in the 3 chosen cities

*Author: UNOTT*

*Contributions: DCCBA*

## 5.1    Sites' Selection Criteria

*Author: UNOTT*

*Contributions: TXT, DCCBA*

Identifying cultural sites (including both tangible and intangible cultural assets) in the three cities is of considerable importance both practically and strategically for Task 1.5.  The ISAAC platform or portal as envisaged will evolve with the addition, over time, of further e-services and items of cultural heritage.  Initially, the platform will contain a limited selection of cultural heritage items in each city. These have therefore to be selected.

Previous studies show that practically it is difficult to build a digital e-services platform that can be used with equal success in different cities and countries. Each city has a different cultural heritage. These differences are of both kind and status. Each category of cultural heritage needs to have good visual representation to allow users to sample and appreciate this heritage. But each city has different levels of digitalization of their cultural heritage. These differences, at least initially, hinder the development of a single universal information platform. This means that items should be chosen according to the availability of digital resources in the cities.

The selection of cultural sites in the three cities needs to account for each city's tourism strategy. Nowadays most cities have a tourism strategy that includes aspects of cultural heritage. Generally, a cultural tourist strategy defines how to arrange, manage, promote and market cultural heritage (in terms of tangible and intangible heritage) for the city's residents and for incoming tourists. The priorities outlined in this strategy will determine how the city wants to promote its cultural heritage. This means that the selection of items for cultural tourism promotion should be driven by what is strategically important for the cities.

These two issues – practicality and strategic importance – are linked. If a cultural heritage item already has good digital representation, it is likely that it is already a priority for the city.

If the city wants to build e-services, it needs to answer to the following questions:

a) What are the local priorities for developing access to cultural heritage within the city?

b) Do any sites of cultural heritage need protecting through the use of digital promotion?

For example, in the city of Rome the Coliseum is truly icon. But there are many other sites in Rome that do not have iconic status but remain to be discovered by visitors. Neglecting these sites might lead to their destruction and vandalization. These sites are important for many people. For example, during the focus groups in Genoa, people mentioned as important strolls around the small historic parts of the city. The failure to promote such sites to the general public and tourists happens because these items or sites have not been adequately digitized or because of the city's funding priority are ill-defined.

The selection of cultural sites should also be related to the e-services ISAAC proposes, the cultural heritage each city is promoting and the taxonomy we are developing. The taxonomy proposed by ITAS can be used to define three categories of cultural heritage:

i)       Iconic landmarks

ii)      Sites needing protection to prevent neglect or devastation

iii)     Sites that have the potential to be enhanced or promoted.


**Diagram 5.1:** Classification of proposed criteria for selection of sites in three cities
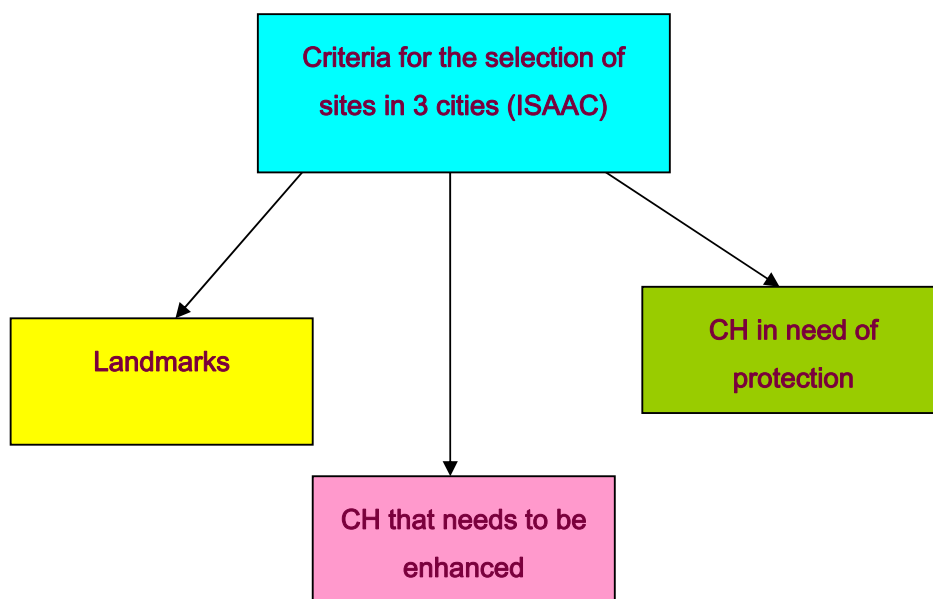


**Group I:** Landmarks (examples of cultural heritage (CH) in your city with iconic status.
- Sites that have a defining importance/role and function in the neighborhood/city/region as a tourism area/destination
- Sites in which all the stakeholders have an invested interest and support , i.e. is equally valued as a landmark for the city/community/tourism future by tourist, citizens and decision-makers
- Sites which have a strong part or role to play in the cities/destination strategic policy and planning

**Group II:** Examples of sites (CH) that needs to be enhanced.

- Sites which management requires a stakeholder shared approach and efforts, i.e. which requires stakeholder integration in its maintenance and enhancement
- Sites which the city itself would like to see/ has planned to have further promoted and enhanced
- Sites which has a sufficient IT legacy of presentation in heritage and/or tourism- content, access and infrastructure
- Sites which has the potential to be further enhanced as to respond to the ISAAC's specific IT platform
- Sites which allows the institutional collaboration and organizational facilitation of the ISAAC integrated e-services

**Group III:** Examples of sites (CH) that are in need of protection (requite immediate promotion or action towards promotion, otherwise they can be neglected/devastated)

- Sites which would bring more value to the site/city sustainable tourism future
- Sites which would bring new value to the city as a destination
- Sites which are supported by all the relevant stakeholders necessary to provide the design, development and take up (optimal) of the Isaac e-service, once they are built?
- Other sites

Selected sites for the three cities Amsterdam, Genoa and Leipzig are provided in **Appendix 5.**

# 6  Towards a new content retrieval system

*Author: UNOTT*

*Contributions: TXT*

## 6.1    Critical assessment of representation media

*Author: VU-SPINLAB*

*Contributions: TXT, DCCBA*

This reflection on representation media is in two parts. The first covers the available media types, while the second discusses the delivery methods. This is because, in order to provide critical assessment, we must seperate the blurry popular definitions of media into the 'carrier of the information' (is it described in a codified language, or is it conveyed visually by an image, or an audio effect?) and the 'carrier of the carrier' (textual information can come to us written on paper, displayed on an electronic screen, or spoken. Visual information can likewise come on paper, or a variety of electronic devices. Sound effects can only come from recordings or devices that are themselves capable of producing the desired sound. Olfactory and tactile information is so difficult to convey that it is disregarded by all but a few specialized museums, and outside of the scope of this assessment).

### 6.1.1    Media types

#### Textual representation

A textual representation is any representation of information which relies on a codified language to convey meaning. In order to achieve its purpose, it is necessary that the language used is properly codified and understood in the same way by both the originator and the recipient of the message. It will be assumed from here on that this is the case – but the reader is advised to keep in mind that, in practise, this is not a given certainty, and textual representation is not risk-free. This point can be equally illustrated by reference to any 1980's

Made-in-Asia consumer electronics manual (failure to have mutual understanding of a codified language), or attempting to print any article from the Lancet in a 'popular' magazine (properly codified extentions on a common language, but not commonly understood by the target group of the latter publication).

**Audio (including spoken textual representation)**

Audio media have both advantages and disadvantages over the written word. The clear disadvantage is that of finding the right segment in a non-indexed selection. Even if a recording is played at several times natural speed, the human ear cannot 'skim' through spoken text as the eye can do through writing. On the other hand, audio can convey mood through tone effects, where a written representation would need to use additional descriptive words. Also, audio can represent non-word sounds which have no written equivalent, and handle multiple messages at once (as in the case of people speaking at the same time, which cannot be represented in writing).

Turning specifically to the cultural heritage domain, there are elements of cultural heritage which are inseperable from an associated sound effect. It would, for example, be quite difficult to explain the style of a composer without a sample of his or her work. Audio has greater information density than writing, but can only be properly registered by a normal human mind when played back in the right sequence, and at the right speed.

**Imagery**

It is said that an image is worth a thousand words. Now while there is no correct way to actually quantify a comparison like that, it is certainly true that a visual image can convey a lot of data at once. It is most useful as a medium to convey data that is intended to assist the imagination – for example providing pictures of a site in various seasons and under various weather conditions, or of what a site must have looked like at different points in time. It is, however, much less useful to convey 'hard facts' such as a site's opening hours.

**Maps**

A map is a special kind of image representation in which the spatial relationship between objects on the map dictates their arrangement in the image. Maps can be made of either physical space, or of a defined abstract thought-space. From here on, when this text refers to a map, it will be assumed that the spatial relations pertain to physical space unless specifically declared otherwise.

While no authoritative figures are available, a majority of the general population is assumed to be sufficiently map-literate to recognise and use maps when presented with them, and even use maps when they are not intuitively recognizable as maps (such as subway diagrams, which are not usually dimensionally correct but are correct for station order and transfer points along a line).

The map as a representation is uniquely qualified for the following:
- to communicate visually how to get from one place to another (in top-down view)
- to communicate information about the immediate surroundings of a given feature.
- to communicate information about explicit spatial conditions (e.g. which is the correct driving direction through a one-way street).
- to assist in finding the user's own position by referencing an identifyable point nearby (e.g. an intersection of two named streets).

**Dynamic map**

A map does not need to be created once and remain the same forever. When a map has at least one component that can be recalculated between uses, we call the map dynamic. A dynamic map can do everything a 'normal' static map can do, and then some more – as it draws on one or more dynamic data sources and/or models to render as part of its content. A

dynamic map might reflect for example the latest available traffic density, of hotel availability information so that the user can make travel plans more efficiently.

### 6.1.2     Media delivery types

**Paper**

Paper remains the preferred medium (over electronic equivalents) when the amount of information to be carried is limited, because it has little 'overhead'. In that it requires no special devices to make the content accessible to users, and does not need power to operate. As a result, paper has a better 'content per weight' ratio in the first part of the graph that lists amount of contents to weight.

*Can deliver:*
- Static text
- Static imagery
- Static maps

*Advantages:*
- Paper has extremely low 'overhead' cost of use.  It requires no special devices to make the content accessible to users, and does not need power to operate. As a result, paper has a better 'content per weight' ratio when the user only needs to bring along a limited amount of information, such as what might fit in a single folded flyer.

*Disadvantages:*
- Information committed to paper remains static.
- The search function for paper media exists only in the interaction between the user and the layout and indices provided.

*Opportunities for ISAAC :*
- Using the ISAAC information base, it could in theory be made possible to create and print a custom flyer tailored to the wishes of a user for any given day. Taking the same tourist booklet format of short descriptions of the sites that will be visited, presented in the order desired by the user – with route descriptions from one to the next included, and even the possibility -with the cooperation of local entrepreneurs- to print in a coupon for a restaurant near where the user expects to be around lunch or dinner time.

**Stationary computer**

Text, images and other data can be delivered to the user through a conventional computer either at the user's home connected to a network that can reach the Isaac portal, or in the guise of an information kiosk in the host city.

*Can deliver:*
- Static and dynamic text
- Static and dynamic imagery (aka video)
- Static and dynamic maps
- Audio

*Advantages:*
- Can deliver any media format desired – text, image, maps, and audio.
- Often has printer attachment so that content can be written to hardcopy. Especially convenient if a kiosk terminal is located inside a hotel so that a visitor can make use of it to make a printout for his plans for the day.

*Disadvantages:*
- These are only useful when a user is researching cultural heritage sites or in the planning stages of a visit.

**Portable or handheld computer**

*Can deliver:*

- Static and dynamic text
- Static and dynamic imagery (aka video)
- Static and dynamic maps
- Audio

*Advantages:*

- The portable computer can store a large amount of digital information, well beyond the capacity of a book of equal weight.
- A computer screen can present on-screen either text, images, map and, if a headset plug is also available, audio.
- If a network connection is available, the portable computer can be used as an accessway into a vast network of additional information without the user needing to prepare this ahead of time. It makes 'unprepared' visits to cultural heritage sites easier because information can be accessed on the spot.

*Disadvantages:*

- The added value of a portable over a  non-portable computer is that it allows the user to use it anywhere, but this comes with a cost - a portable computer is still fairly inconvenient to carry around and use in the streets.
- Since the delivery medium is capable of so much, there is risk of flooding the user with access to too many facts at the wrong time. Once someone is actually moving around and only means to retrieve extra information about a cultural heritage item before moving on, receiving an elaborate index of facts is not desirable – the user will not likely at this time be in the mood to sit down and read what could well be a whole book on the background of the item.

**Telephone based**

The modern mobile phone has evolved into a platform for message delivery and small services as well as its traditional role as a voice communication enabler. A typical modern phone is capable of at least text messaging (SMS), and usually multimedia messaging services (MMS). This provides another possible outlet for the data  of the ISAAC network.

*Can deliver:*

- Static text
- Static and dynamic imagery (aka video)
- Static maps, but these can be static snapshots of otherwise dynamic maps
- Audio

*Advantages:*

- The mobile phone is a device that most Europeans carry already.

*Disadvantages:*

- At the rates charged by the networks for mobile text/multimedia messages, this content delivery medium quickly becomes rather costly.
- Mobile phones are designed for a single user. Both the screen size and audio volume make it hard to share the incoming content with companions, should there be any.

**Audio playback device**

Audio playback devices in the role of audio guides have become a fairly common sight around museums. Whether they operate as guiding – compelling the user to move as dictated by the recording – or as teachers that will explain about an item or location in response to a user initiated action, audio guides can provide a user with the comfort of having a knowledgeable guide with them, while leaving their other senses free to enjoy the

*Can deliver:*

- Audio

*Advantages:*

- Very useful to add value to the user experience of visiting a site

*Disadvantages:*

- There is a distribution issue of getting the right kind of device and associated audio recordings into the hands of the intended user. The known cases are limited to situations where the user receives such a device on loan at an entry point.
- There is no common standard in the schemes used to create the trigger events that make triggered audio guides select which content to play.


## 6.2    Developing a new content retrieval system in the cultural domain

*Author: TXT*

*Contributions: POLITO, ITAS, VU-SPINLAB*

This section reviews the state of the art in content retrieval of cultural heritage information.


**Current issues**

The market for cultural heritage content is highly fragmented with a lack of integration at the European level.  The current situation is typified by:

- Content on a particular cultural heritage subject (e.g. information on works of art by a particular artist, or audiovisual material describing a particular historical event of national or international importance) is often distributed across Europe,.  Therefore, collecting information on a particular subject will frequently require aggregation of content from multiple sources.  Furthermore, content is not available in a form or framework suitable for its use (e.g. in an editorial context).

- Most content holders typically only annotate their content in one language.  This might be because the content is primarily created for internal use, for example curation, or because content sales only target a national market.

- Multilingual annotation of content would facilitate the international market for the content.  However, annotations are often very rich, include free text, and contain information that is not relevant outside of the organisation.  Up-front translation to multiple languages is time consuming and expensive (consider translating the annotations on 100,000 images into 5 languages at 30 minutes per language per image, this totals over 150 person years of effort!).  Therefore, bulk translation is often not cost effective, especially for the smaller or non-commercial content holding organisations.

- Content typically exists in legacy formats, systems, and schemas.  Description of content frequently uses non-standard terminology.  Wholesale content migration to common schema and format is not an option due to the technical (data transformation, cleaning and translation) and cost barriers (manual processes, skilled effort, volumes and return on investment).

- Relevant standards do exist for content description, for example: AAT- Art and Architecture Thesaurus; ULAN – Union List of Artist Names; ICOM-CIDOC CRM - International Committee for Documentation of the International Council of Museums Conceptual Reference Model, soon to become an ISO standard; as well as national standards such as the UK Museum Documentation Standard SPECTRUM.  There are many more in specific areas such as ICONCLASS for images and TGN for places. However, these standards are not adopted uniformly, if at all.  Therefore, it is difficult to understand and navigate content from a particular organisation without being

familiar with the particular schema (standard or otherwise) used to structure and describe that collection.

- With the exception of large commercial image or audiovisual libraries, external access to content is typically limited to small subsets delivered through bespoke, content-holder specific services and Web sites. There is precious little in the way of information integration across organisations so that this content can be collectively searched, navigated, linked, bundled, repurposed, used and exploited in a unified way.

- Cultural heritage content is readily exploitable in a wide range of commercial applications, but the public-private partnerships are not in place to allow this to happen and furthermore, exploitation of cultural heritage content is often not considered core business for many organisations such as museums, galleries and archives.

**Current technology**

Much of the technology already exists to solve the technological barriers to large-scale, cross-border content exploitation. In particular several projects under the IST FP5 programme (for example ARTISTE and SCULPTEUR) have produced relevant technology proofs-of-concepts. In particular:

- Tools and methods for augmenting existing systems (e.g. hosting of new/additional web-based services);

- Data integration and mapping to common schema and ontologies; use of synonyms, hierarchies, controlled vocabularies; multilingual thesauri;

- Multi-lingual, cross-collection searching;

- Cross-modality searching, in particular ability to search by multimedia content;

- Easy-to-use graphical presentation and navigation of information structures and content, in particular presentation by content areas (people, places, events, periods) and by application context (e.g. publishing); and

- Dynamic linking of content to relevant sources of third-party information or services (e.g. linking textual information in the Alinari collection to relevant books, web sites, on-line shops etc.).

The ISAAC approach couples search and retrieve technologies with intelligence about the structure and terminologies used in different repositories to provide a fast, comprehensive resource retrieval and delivery service.

The technical analysis will:

- Develop and deploy innovative new services for searching and navigating cultural heritage collections in a way that is easy to use for non-experts in specific application contexts.

- Address language issues through use of content indexing according existing multilingual thesauri.

- Index content in a standard way without the need to change/migrate from legacy systems.

- Augment existing access mechanisms by integrating concept and content-based techniques into the systems and services of a range of content holding organisations.

- Use domain standards to achieve content aggregation.

**Current research into knowledge representation**

In order to realise the objectives of the ISAAC project a wide range of disparate documents, audio visual/multimedia data and information must be brought together, structured, reformulated and presented in a context sensitive way and sometimes interactively to end users. The possibility of achieving such a goal is enhanced by recent progress in the areas of knowledge representation and reasoning stimulated, in part, by growing interest in the idea of the semantic web (www.w3.org/2001/sw/ ). Substantial efforts are being made to design and build ontologies as shared conceptualisations of domain knowledge (McGuinness, 2002). This is seen in the CIDOC effort to build the Conceptual Reference Model (CRM) for museum data (http://cidoc.ics.forth.gr/), in emerging standards for ontology representation such as OWL (Dean et al., 2003) in tools for creating ontologies (http://protege.stanford.edu/) and for tackling the difficult issue of mapping between ontologies (Kalfoglou et al., 2005). The value of ontologies for knowledge structuring is clear and this, in turn, is leading to their increasing use in knowledge exploration, retrieval and navigation (Addis et al., 2005), as a valuable vehicle for interoperability and as a platform for reasoning (Mei and Bontas, 2004).

For cultural heritage information one of the key problems is that much of the information is multimedia in nature. Metadata describing audio visual information can be used as a source for mapping the multimedia items to the ontology, a task where there is still a need for research into the development of generic tools. Although most published work on the use of ontologies has been concerned with textual information, there is increasing research into their use with multimedia collections. Schreiber's team in Amsterdam are using ontologies on image collections and have shown how spatial information may be included in the annotations (Hollink et al., 2003; 2004). Jaimes et al (Jaimes et al., 2003) have introduced a semi-automatic approach to the construction of ontologies for semantic description of videos and several authors have described efforts to move the MPEG7 multimedia standard closer to ontology languages such as RDF and OWL (Hunter, 2001). Currently, the aceMedia Project is developing a knowledge infrastructure for multimedia analysis, which incorporates both a visual description and multimedia structure ontology (Kampatsiaris et al., 2004). In the MIAKT project image annotation tools for region delineation, feature extraction and image analysis were integrated with an ontology to capture the semantics associated with the various medical imaging modalities (Dupplaw et al., 2004). By contrast, in SCULPTEUR (Addis et al., 2005) and eCHASE (Mei and Bontas, 2004), museum and other multimedia object metadata was mapped to an ontology based on the CIDOC CRM to provide semantic level retrieval which could be combined with content based techniques.

In contrast to the formal approach to knowledge capture and organisation, an important new trend is the emergence of informal knowledge capture in the form of folksonomies where communities cooperate in order to annotate or categorise shared information. Flickr (http://www.flickr.com), a web based photo sharing and management application, is probably the best known example and includes free-form tagging for photos. del.icio.us is a tool to organize web pages and it too pioneered the use of free-form tagging as an organisational construct. Applications to cultural heritage data are also beginning to emerge (Trant and Wyman, 2006). Such activities can significantly enhance search capabilities and offer an important alternative approach, particularly for multimedia information where textual annotations are often an unaffordable luxury. However the weakness of uncontrolled tags is that they are not easily related to their semantics.

**Current research into multi-media information handling**

One of the objectives of ISAAC is to be able to gather knowledge, not only from structured metadata, but also from unstructured sources such as conventional web sites and community annotations, and to structure it in the knowledge base. Progress on such tasks has been made in recent years on many aspects of multimedia information handling using content.

In traditional information retrieval vector-space retrieval models and Latent Semantic Indexing (LSI) approaches to retrieval have been used extensively (Deerwester, 1990). The application of these approaches to multimedia retrieval has been more limited but interest is growing rapidly. Both vector space models and LSI have now been applied to image retrieval (Zhao and Grosky, 2000; Cascia at al., 1998). LSI was initially applied to text retrieval to remove the effects of synonymy and polysemy. Words are mapped into a semantic space in which words or documents with similar meanings are mapped to nearby locations. Applying LSI to image retrieval the idea is to extract features or "visual terms" from the images which can be treated in the same way as textual terms. Text based LSI has also been used for cross language retrieval through a technique know as Cross-Language Latent Semantic Indexing CL-LSI (Berry et al., 1994; Laundauer and Littman, 1990) In ISAAC we will use the ontological approach for both content based retrieval, text based media retrieval and soft annotation of media (by which we mean the ability to use textual terms to retrieve a media object even if the textual term has not been explicitly assigned to the media object).

## Current progress into information integration

ISAAC aims to allow the integration of different information coming from museums, public administrations, publishers and individuals. Exchange of data between needs to be done in highly managed and controlled way to ensure that licensing and rights are respected and that content is not made available more widely than for the specific purpose for which creation or release is agreed.  ISAAC does not aim to address the general issues of constructing an infrastructure for content distribution and digital rights management, but instead aims to allow secure accessing of content according to pre-agreed policies.

Current systems exist that provide a variety of secure data access and integration capabilities for file systems, RDBMS and metadata catalogues along with strategies for replication and synchronisation.  For example, GridFTP, Globus-RFT, SRB, OGSA-DAI and NERC DataGRID.  These technologies are focused on supporting file-compute execution models where transparent and efficient access to files is required.  Some metadata annotations can be published but this is limited to basic flat structures or relational schemas using OGSA-DAI (www.ogsadai.org.uk).  The Diligent project (www.diligentproject.org) is exploring how grid technology can be used to provide a grid enabled digital library with a focus is on how to support efficient delivery and classification of large multimedia objects within a virtual research organisation.  Diligent does not however tackle issues of a rich semantic network of cross-linked information. Semantic integration and navigation has largely been dealt with in the semantic web community.

## Current progress into content packing

ISAAC will analyse the state of the art in secure and managed remote access to semantic search, retrieval and annotation systems as well as the state of the art in content packaging. The scope of the content packaging is defined by interoperability between systems that wish to import, export, aggregate, and disaggregate packages of content. A package represents a unit of usable (and reusable) content. This may be a "simple" asset such as a Web page, a media file, a text, or a more complex and structured object like a course or a part of it. Content packaging is commonly used for educational purposes. IMS Global Consortium (www.imsglobal.org) proposes the IMS CP specification (Smythe and Jackl, 2004a; 2004b) (a de facto standard in education), to describe data structures that are used to provide interoperability of Internet based content with content creation tools, learning management systems (LMS), and run time environments.

 In ISAAC, content packaging will be exploited to create structured cultural contents (e.g. illustrating a restoration technique or discussing the "Lanterna di Genova") that can be delivered independently, on different user's devices (PC, PDA, Mobile etc).  The market already offers several editor tools to package contents according to the IMS CP format; examples are Learn eXact (www.learnexact.com), Reload (www.reload.ac.uk), ForceTen (www.eedo.com), Outstart (www.outstart.com), Lectora (www.lectora.com). For all of them

the content packaging is a manual process: ISAAC will investigate the possibility to automate content aggregation by using crawling agents that select cultural resources, access and acquire knowledge on the available cultural objects within information providers' repositories and packaging agents that automatically aggregate the cultural contents on the basis of textual/semantic information into reliable, consistent and value added smart content packages which can be delivered into any environment, for example using packaging standards such as e-learning (IMS CP).

# 7  Framework for a systematic representation hierarchy

*Author: UNOTT*

## 7.1. Introduction

This section summarises discussion in the previous sections of the report. It introduces the proposed framework to inform future ISAAC ICT architecture development. The work developed in Task 1.5 suggests an *R-tree organization* based on a *semantic* that would respect the conceptual nature of cultural heritage whilst accounting for a consumer perspective. The development of the ISAAC Taxonomy (**Appendices 2-4**) represents an important step towards the definition of such framework. Nonetheless, the proposed R-tree hierarchical system constitutes only a preliminary step of general guidelines, which will feed the work to be undertaken in Workpackage 2, where the actual ICT architecture and its organization will be developed and tested.

The proposed ISAAC retrieval framework aims to support the development of future e-services in the three cities, accounting for the specific representation needs of different cultural heritage categories that will be presented to potential consumers of such e-services. This report addresses the minimum representation requirements for the different categories of cultural goods that will be illustrated in the ISAAC platform. Such e-services will enhance the digital access of European cultural heritage for the benefits of individual residents and tourists, as well as facilitating the work of cultural tourism service providers and decision makers. As highlighted in Section 1 of this report, such access is still undermined by technological difficulties that the ISAAC platform will need to overcome. The development of new ontologies and of an appropriate semantic for cultural heritage is a first step in this process.

As previously highlighted in Section 3 a discussion of cultural heritage needs to take account of what we mean by cultural heritage and how the values that people attach to different categories of cultural goods can impact on how tourism and its related e-services are promoted to potential consumers. These values are of different kinds, and have an economic dimension which has the potential to impact on the regional economic growth of the cultural good's catchment area.

Cultural heritage has been rightly defined in the relevant literature as *cultural capital*. Throsby defines cultural capital as *"the stock of cultural value embodied in an asset. This stock may give rise to a flow of goods ad services over time, i.e., to commodities that themselves may have both cultural and economic value"* (Thorsby, 1999). Throsby highlights how there is a correlation between the cultural and economic value of items of cultural capital. The concept of cultural value is widely used in different disciplines, but a stress on the economic dimension of values associated with cultural assets has implications for the management of cultural goods, and also therefore on the way such assets are presented to potential tourists. From this it stems that the preservation and promotion of historic heritage maintains and may even increase the level of cultural capital producing multidimensional non-market social benefits, of for example, social identity and cohesion, thus becoming one of the major features of cities' sustainable development.

Since tourism is an important economic activity, any taxonomy developed within the cultural heritage domain for tourism purposes needs, either directly or indirectly, to refer to the economic values associated with different categories of goods.

The proposed ISAAC framework for a systematic representation hierarchy is presented following three steps. First we introduce the rationale behind the framework. Then, we focus on how the proposed taxonomy of cultural heritage can be used for standardization and retrieval of information. Finally we look at which forms of representation are more suited per each general category of cultural goods.

The final results presented in this section are based on the relevant research literature overview and in particular on the development of Section 3 of this report.

## 7.2 Developing the conceptual framework

*Author: UNOTT*

In order to define the appropriate framework for a systematic representation hierarchy of cultural heritage, it is important to focus first on the rationale behind its development.

The ISAAC platform will develop a number of e-services; some of them have been clearly identified during the focus groups phase of the research. Such e-services will provide information on how to better enjoy and appreciate the cultural offer of the three European cities of Amsterdam, Leipzig and Genoa that constitute our test bed cities. Of course, each e-service will need to provide information to potential users in a way that is relevant to them and conceptually appropriate to convey the nature of the cultural goods to be accessed.

The cultural offer in each city spans different kinds of heritage, which can be broadly categorized into *tangible and intangible cultural goods*. Currently, such goods have a digital representation, often dispersed in various archives and under various competences. Such representation varies from simple text and pictures, to more sophisticated virtual tours. The level of digitalization and representation of such goods of course differs according to the priority given to the process of digitization of cultural heritage in each city. The ISAAC platform will need to access such digital information, manage and store it after appropriate retrieval. The work in Task 1.5 aims to suggest which sorts of information should be retrieved and how. As discussed in previous sections, since the way the information is conveyed and retrieved needs to be relevant to consumers, we suggest a way of tagging the information that is both top down (experts perception) and bottom up (consumer generated tagging). The R-tree system here presented allows for both the **expert taxonomy** and the **consumer oriented folksonomy** discussed in chapter 3.

Figure 7.1 expresses the relationship we envisage among the categories of cultural heritage, and the levels of information and representation related to the different e-services. The organization of such information will then be presented to users by the ISAAC platform. Of course, the retrieval system will need to ensure that both the basic information and its representation are presented to the users posing the query in the best possible way. As discussed in Chapter 6, there are several digital media available to graphically represent a piece of information. The diagram indicates the most common ones.

**Figure 7.1:** Rationale behind ISAAC indexing system
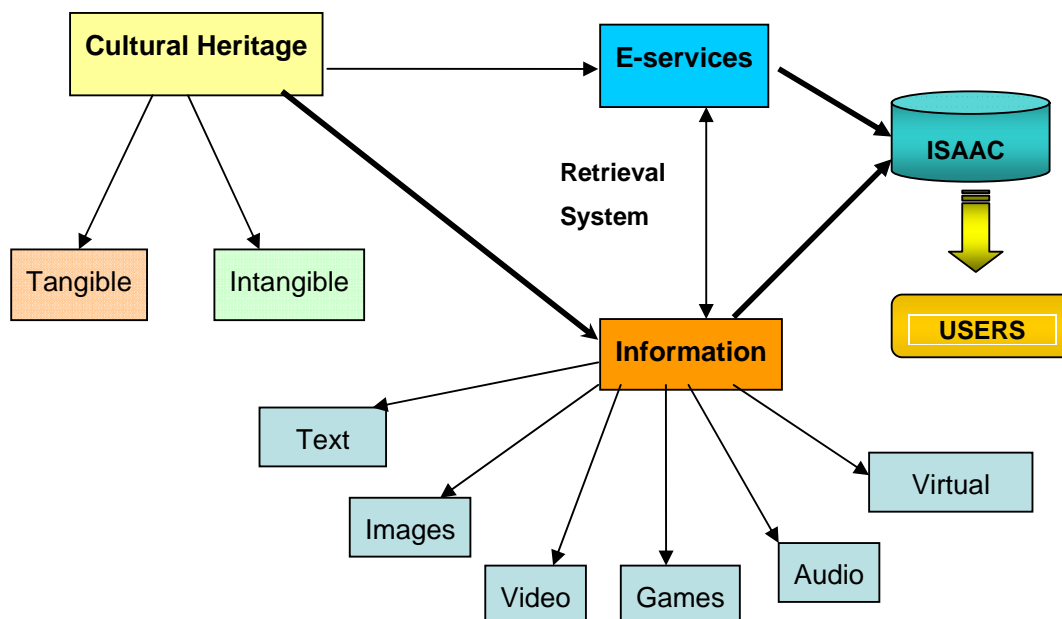


## 7.3 Taxonomy of cultural heritage for standardisation and retrieval

The UNESCO Convention[19] defines the concepts of "cultural heritage" and "natural heritage" (UNECO, 1972). According to it, cultural heritage encompasses the following:

- monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science;
- groups of buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science;
- Sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

 "Natural heritage" is defined as:

- natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;
- geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;

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[19] UNESCO CONVENTION CONCERNING THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE, Adopted by the General Conference at its seventeenth session Paris, 16 November 1972 (whc.unesco.org)

- Natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

As discussed in Chapter 3, a distinction between tangible and intangible cultural heritage. can include: i) cultural goods, ii) places, iii) (cultural) landscapes, iv) activities. On the basis of such taxonomy, we can identify the classification described in figure 7.2.

**Figure 7.2:** ISAAC Taxonomy of cultural goods for optimal retrieval
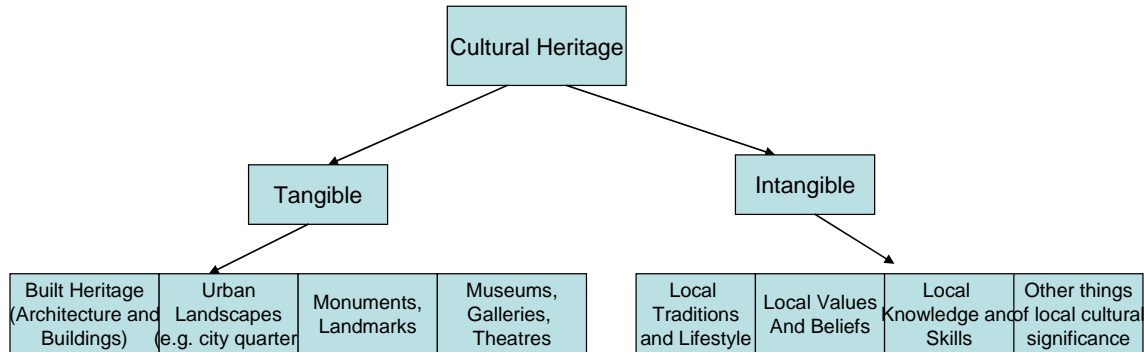


Source: Lombardi (2007); UNOTT (2007)

The diagram identifies some of the major tangible and intangible cultural goods. Among the tangible goods, we can identify: 1) the built environment, which encompasses places of cultural significance and urban ambience; 2) urban landscapes, where nature is combined to some extent with human intervention or imaginary; 3) monuments and ladnmarks: building of outstanding cultural significance; 4) museums, galleries and theatres.

Similarly, among intangible goods we have: 1) local traditions and lifestyle, 2) local values and believes 3) local knowledge and skills; 4) other things of cultural significance.

**Figure 7.3:** Tangible heritage
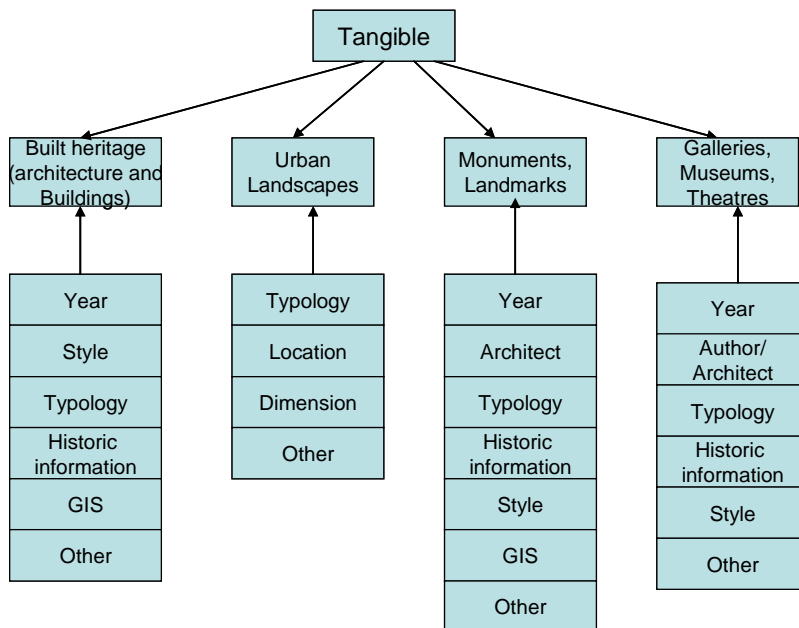


Such cultural elements are important resources to be presented to visitors and residents alike. The relevant information in each category is defined by the typical classifications that

usually accompany the illustration of such goods. A minimum level of information is needed to appreciate such goods, and such information needs to be conveyed using the appropriate representation strategies. The following diagrams illustrate an R-tree organization of the basic tagging as in a top down approach. Such organization will need to be flexible to allow for consumer generated tagging and additional relevant information (indicated as "other" in the R-tree diagrams).

Tangible cultural heritage needs to be identified by a number of basic information tags that need to be indexed. Figure 7.3 shows the major ones. For tangible heritage, it is usually important to identify the period to which the heritage belongs to, the style, possible the author/architect, the location (including the GIS coordinates) and all other historic information that might help appreciate its development.

Intangible heritage can also use information tags. Fig 7.4 presents an indication of example of such tagging that might help retrieve the relevant information on intangible categories of goods. As it can be noted, values and beliefs need historic information relating to their origin, their author (in the case of music and other performing arts such dance and choreographies) their style or general typology (e.g. religious vs. political values and beliefs). Local traditions and skills also need practical information that might help their access.

**Figure 7.4:** Intangible heritage
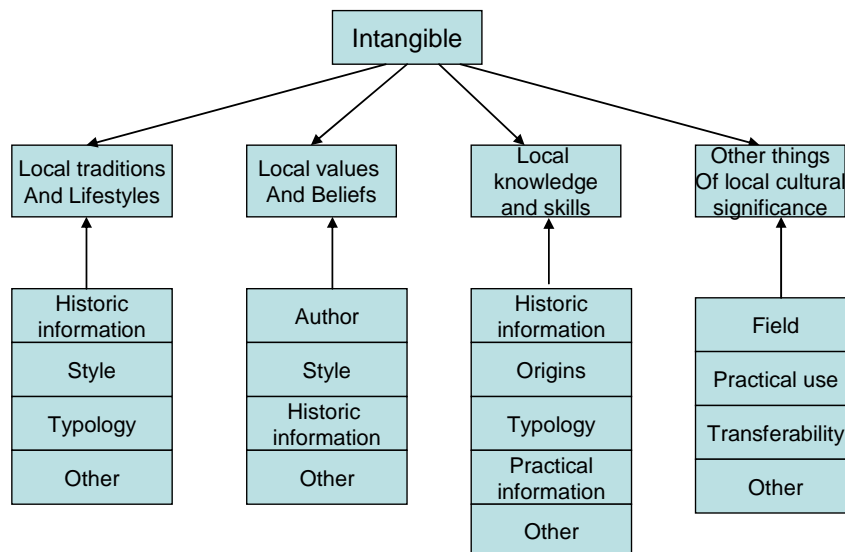


## 7.4 Representing cultural heritage for optimal retrieval

Table 7.1 illustrates which possible representation media might be used to represent the different categories of cultural heritage mentioned above. Such media are of course are limited and we refer only to what is currently readily available or could be made available without incurring excessive cost. Therefore, some media recur for similar categories of tangible and intangible goods. This is envisaged as the minimum level of representation needed to convey correct information for the appreciation of the good at hand.

**Table 7.1:** Representing tangible and intangible heritage for retrieval

| Type of cultural heritage | Major cultural goods | Possible representation media |
|---|---|---|
| **Tangible** | Built Heritage (architecture and buildings) | Historic images, pictures, documents, drawings, context maps, video clips, virtual tours, audio tours, narratives |
| | Urban landscapes (e.g. city quarter) | Historic images, pictures, documents, context maps, video clips, virtual tour, narrative |
| | Monuments, landmarks | Historic images/pictures, documents, drawings, context maps, video clips, virtual tour, audio guides, narrative |
| | Galleries, museums, theatres | Historic images/pictures, documents, drawings, context maps, video guides, audio guides, narrative |
| **Intangible** | Local traditions and lifestyle | Historic images/pictures, documents, video clips, audio clips, narrative |
| | Local values and beliefs | Historic images/pictures, documents, video clips, audio clips, narrative |
| | Local knowledge and skills | Historic images/pictures, documents, demos, games, video clips, audio clips, narrative |
| | Other things of local cultural significance | Historic images/pictures, documents, video clips, audio clips, narrative |

The representation of urban heritage has a long tradition. Drawing, pictures, maps are the traditional representation means.  But to fully appreciate such complex goods, video tours and movie clips are also useful. These can be complemented by narratives and other audio information.

The built environment, urban landscapes, monuments and landmarks have similar representational needs and can be treated in a common fashion. Museums, galleries and theatres are part of the built environment, therefore have similar representation needs, but in addition have collections of cultural objects and will need additional consideration.

On the other hand, representing intangible cultural heritage by tangible means requires different treatment. Traditionally documents and narrative have sought to explain such goods. More recently videos and audio recording have improved this physical representation considerably.  Local traditions and lifestyle, values and beliefs, and knowledge and skills can be described by documents, narratives, pictures and videos. The same is true for other intangible goods of local cultural significance sought after by tourists. Particular festivals and events can also be represented by video clips and additional text/documents explaining the background.

## 7.5 Implications of the systematic representation hierarchy for ISAAC

The ISAAC retrieval system will be built on the basis of the framework proposed in this report.  Structuring the available information is a crucial step in this process.

During the focus groups held in Amsterdam (see report on Task 1.3 activities) participants addressed the issue of appropriate tagging of information for optimal retrieval. Such tagging should be flexible enough to accommodate consumer generated definitions and annotations which are likely to change over time. In addition to this, the indexing system needs to allow the retrieval of the information that best conveys the nature of the cultural heritage on offer. This means that the system has to retrieve many kinds of graphic and multimedia

information. Videos, audios and other form of images are needed to encourage potential tourists to visit a destination. Such videos might also be consumer generated.

The work undertaken in Task 1.5 tackles the highlighted needs to identify an appropriate **Knowledge Organization System** (KOS) within the cultural heritage domain. Such knowledge organization contributes to make information accessible to users when they search. The way the system is defined has impacts on information seeking and retrieval. KOS is a core discipline in "memory institutions" such as libraries, archives and databases. It reflects an understanding of specific "paradigms" or epistemologies". As discussed by Ørom (2003), such epistemologies operate with different theories and semantic relations. Therefore, different KOS reflect different views of the knowledge domain. However, this does not necessarily have negative implications. Each KOS is biased by definition, and could be modified and restructured. To some extent the bias is necessary, since the classification of knowledge needs to reflect the interest and concerns of the users groups, their priorities and their perception.

Though there is a conceptual distinction between Knowledge Organization (KO) and information retrieval (IR), in practice this is blurred.  For this reason, the subject of knowledge organization has been addressed by the development of taxonomy of cultural goods, whilst the proposed framework has accounted for the need to identify both the content to be retrieved and its format (text, image, video etc).

The representation hierarchy suggested in the previous sections is a first step at informing how to structure the information in the different cities within the ISAAC project. This hierarchy will be integrated once the survey on the level of digitalization in each city is completed.

# 8  Conclusions

*Author: UNOTT*

*Contributions: TXT*

**DESCRIPTION OF CONTENT**

The work conducted in Task 1.5 aimed to achieve an agreed indexing system that might help the technological issues related to information retrieval, which can also make the computer-based interactivity more accessible to all potential users. This represents an important step towards the development of the ISAAC ICT architecture. The task directly addresses ISAAC operational objective of defining a European reference model to standardize representation, annotation and retrieval of cultural heritage content in the selected three European cities of Amsterdam, Leipzig and Genoa that constitute our test beds. The work methodology has been based on extensive literature review and expert opinion and debate within the project partnership.

The work in the task envisaged two major steps: first the development of taxonomy for the cultural domain, with the specification of a relevant glossary; and second the development of a representation hierarchy or framework that could reflect the achievements of the identified taxonomy.

The role of the taxonomy has been essential in providing indications for the annotation phase of the ICT architecture. It conveys expert opinion on the development of the appropriate form of "tagging", to be associated with the e-services contents. Agent technology will also partially depend on the way the annotation system is developed within the proposed ISAAC framework.

The proposed framework is an important step in the development of the appropriate web ontologies within the cultural heritage domain for the purposes of the ISAAC project. The definition of such ontologies is not stratghtforward and could be subject of debate. As

discussed, such semantic relations are dependent on the knowledge organization system (KOS) developed within the domain. A KOS reflects specific "paradigms" or epistemologies", which can be object of debate. For example the theory of cultural heritage as *cultural capital* implies an understanding of the diverse values that can be attached to different cultural goods, and in particular to the economic values which have the potential to increase regional growth and competitiveness. This has been expressed in the proposed taxonomy and is the first step in the definition of the appropriate knowledge organization.

Within this conceptual framewokr, Task 1.5 aimed to define a taxonomy that would inform the development of an indexing system for optimal information retrieval. An indexing system aims to extract specific information (query related) from available data. A major point to optimise retrieval is to minimize "false alarms", and the provision of information that is not relevant to the query, or even worse, information that is not correct. Several approaches have been developed in the relevant literature (Braun and Schwind,1976), and is now clear that semantically oriented methods perform better compared to other approaches, since the index is more precise.

The taxonomy identified during Task 1.5 can be considered as the basis for the way ontologies will be built in the ISAAC architecture. It provides a hierarchical view of concepts/goods within the cultural heritage domain that are relevant to the e-services identified in the previous stages of the ISAAC project. Taxonomies are usually hierarchical in structure, displaying a parent-child relationships among its elements.

In the ISAAC project the taxonomy is directly related to the tagging of the available information. Bearing this in mind, a number of alternative classification systems and approaches were explored, including the decentralised, social approach named *folksonomy*. This user centred approach, representing what we have defined as a *bottom-up approach*, has been combined with an expert perception *(top-down approach)* of how cultural goods should be categorized to form the ISAAC framework.

What, Who, How, When, and Why, are five basic questions answered by the ISAAC taxonomy. They also have clear implications for ISAAC platform as far as they constitute a basic framework for ISAAC's taxonomy, explaining in brief what is taxonomy, who are its main users, how the taxonomy can assist users to develop their interest in cultural heritage, when the available cultural heritage services are organized in relation to timing of the visit and finally, why users are motivated in implementing ISAAC cultural heritage list as a folksonomy with possible implications for the e-governance.

Since the way the information is conveyed and retrieved needs to be relevant to consumers, we suggest a way of tagging the information that is both top down (experts perception) and bottom up (consumer generated tagging).  This task therefore proposes an R-tree system allowing for both the **expert taxonomy** and the **consumer oriented folksonomy**. We have suggested which sort of information should be retrieved and how, according to the different category of goods that are most relevant for the ISAAC project's objectives.

The information that will be conveyed is related to the nature of the **e-services** identified so far in the ISAAC project. Such e-services are integrated; therefore the agent based system will need to access information stored in diverse archives and domains. Moreover, such e-services relate to different categories of goods, which will need to be appropriately illustrated to potential users using different available digital media.

Task 1.5 has provided a first indication of the minimum representation level to be conveyed for the major categories of cultural goods representing the cultural offer in the three cities of Amsterdam, Leipzig and Genoa. The selection of cultural sites in these three cities needs to account for each city's tourism strategy. Nowadays most cities have a tourism strategy that includes aspects of cultural heritage. The priorities outlined in this strategy will determine how the city wants to promote its cultural heritage. This means that the selection of items for cultural tourism promotion should be driven by what is strategically important for the cities.

The selection of cultural sites is also related to the e-services ISAAC proposes, the cultural heritage each city is promoting and the taxonomy the poject is developing. The taxonomy proposed by ITAS can be used to define three categories of cultural heritage: i) iconic landmarks, ii) sites needing protection to prevent neglect or devastation, iii) sites that have the potential to be enhanced or promoted. The choice of the best available digital material to be used in the three cities is being developed in Task 3.1 and will be progressively assessed during the construction of the ISAAC ICT architecture.

The proposed representation hierarchy or **framework** combines the developed taxonomy of cultural goods with their representation needs. As discussed, such goods represent the cultural capital of each city, therefore an important economic asset. Each acts as attractor of potential tourists who will use the provided information at different stages of their visit: before the visit, to get information on what is the current cultural offer in the destination of their choice; during the visit, to better enjoy the cultural resource they are visiting; and finally, after the visit, to get to know better what they have already experienced and probably to share their personal information with other potential users.

Providing useful and enticing information for cultural heritage using e-services is plain sailing. Several EU projects (i.e. COLLATE, MINERVA or MICHAEL) aimed at creating a European cultural area in order to encourage practical co-operation between EU members and to ensure that European culture heritage is  promoted. The wider objective is, of course, to make European cultural tourism internationally competitive. These projects have clearly shown that, despite researchers' efforts to improve this situation at national and international level by the adoption of the new technologies, providing accessibility, usage and wide knowledge of valuable historic and cultural heritages is not straightforward.

One of the most notable issues is that service providers increasing lack of understanding of the new dynamic technologies available for information delivery.  Content providers also need to provide access to their large databases and archival holdings. According to DigiCULT report (2002) these widening gaps can be narrowed down by focusing on the technological issues related to three areas: (1) providing access information, (2) digitization and (3) long-term preservation. Many experts and service providers in the cultural tourism sector are unaware of these issues, preoccupied as they are managing customer relationships or handling copyright.

The cultural offer in each city spans different kinds of *tangible and intangible cultural goods*. Some of these goods have more iconic status, embed the image of the city and have a high symbolic value. Such goods are generally better represented digitally; though often the relevant information is still dispersed in various archives and under various competences. The representation varies from simple texts and pictures, to more sophisticated graphical expressions. The process of digitalization for different categories of goods in each city depends on the priority given and it is linked to the marketing and cultural tourism strategy developed in recent years.

The suggested KOS, and the R-tree representing it, aims to facilitate and standardise the retrieval of information in a way that is more appropriate to convey the nature of the information itself. We have suggested appropriate media and a minimum level of information for the different categories of goods, but such organization needs to be evolutionary and account for the possibility of consumer tailored and generated content. This implies a number of challenges for the future ICT architecture that will be developed within Workpackage 2. These issues include:

- There is tension in developing the KOS between a semantic related to the concept of "literary warrant", in which decisions to include a class of things in the index are based on scholarly literature, and an index which is created in an evolutionary way based on usage.

- The suggested KOS is expression of specific "paradigms" or "epistemologies" that respond to a specific theoretical approach about the way cultural heritage is valued.

- These two essentially different approached to building an index are not necessarily incompatible. The ISAAC system will need 'seeding' with information and this might be indexed along existing scholarly lines. But usage might determine how the system develops and grows.

- The proof of the KOS or indexing that is developed will depend on how well the system responds to an individual user's query.  To deliver relevant and useful information the system will need to cope with ambiguity, homonyms, synonyms and hypernyms.

- To capture the user's interest and encourage them to sample a city's cultural heritage the system will need to deliver the information in a relevant and appropriate format.

The research work performed in this task aimed to give general guidelines, a framework, which might optimise and standardise retrieval of the information at the basis of the future ISAAC e-services. Such guidelines have been summarised in a number of diagrams combining the proposed taxonomy and the representation needs related to the diverse nature of cultural heritage. Such guidelines are limited and provisional and will need to be tested and developed during the construction phase of ISAAC ICT architecture. The results of this task will impact on the work to be done in Workpackage 2 and 3.

# 9 Acknowledgments

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# Appendices

## Appendix 1 EU projects relevant to ISAAC

**Table A1:** EU projects related to indexing and standartizing retrieval in the CH domain

| Name | PROJECT DESCRIPTION | R&D program |
|---|---|---|
| **AGAMEMNON** | AGAMEMNON researched how to exploit 3G mobile phones equipped with embedded cameras for enhancing visits of open-air archaeological sites and museums. These devices can provide visitors with enriched and personalized multimedia (pictures, video, audio, text) information on monuments. The system developed by the project also combines functions to optimise the visit path and to contribute to the protection of the site by sending images to site guardians. | EU FP6 IST project - Specific Targeted Research Project |
| **BRICKS** | BRICKS will enable a new generation of digital libraries by establishing the organizational and technological foundations of the European Digital Memory (EDM). Conceived as an open, networked system to integrate distributed collections of multimedia resources in museums, libraries and archives, it will improve the access to and the use of cultural heritage in Europe and beyond. | EU FP6 IST project - Integrated Project |
| **CASPAR** (Cultural, Artistic and Scientific Knowledge Preservation, for Access and Retrieval) | The project team aims to establish an authoritative foundation methodology for digital preservation activities, supported by a general system framework guaranteeing the requirements of longer term preservation of heterogeneous digital resources. Work will include the development of key components and modules providing characterisation, virtual storage and access services, including intuitive query and browsing mechanisms and exploiting the potential of semantic web and advanced storage technologies. The framework will be validated through three test-beds of different digital resources (science data, multimedia and music, and digital representations of heritage sites). | EU FP6 IST project |
| **CINeSPACE** | CINESPACE aims to enable users to access and interact with location-based audiovisual cultural information while navigating a city through a special device. This device will consist in a low-cost wireless head mounted high definition screen, audio phones and a small camera enabling mobile collaborative experiences over WLAN hotspots or 3G connections. The project team will validate its R&D work in three pilot experiences. | EU FP6 IST project |
| **DELOS** | The Network of Excellence aims at integrating and coordinating European research in the field of digital libraries. The project will perform research on digital library architecture, information access and personalization, audio/visual and non traditional objects, user interfaces and visualization, knowledge extraction and semantic interoperability, preservation and evaluation. | EU FP6 IST project |
| **EASAIER** (Enabling Access to Sound Archives through Integration, Enrichment and Retrieval) | EASAIER focuses on several key areas to improve access to sound archives: multi and cross- media retrieval, interactivity tools, integration of speech and music processing methods, and systemic archive analysis. The project will develop innovative audio processing, data mining, and visualisation techniques, alongside user needs and evaluation studies, and integrate them into prototypes. | EU FP6 IST project |
| **EPOCH** (Excellence in Processing Open Cultural Heritage) | EPOCH is a Network of Excellence joining a large number of academic, research and cultural institutions. It aims at improving the quality and effectiveness of the use of information and communication technologies for cultural heritage in Europe's museums, monuments and sites. Part | EU FP6 IST project |

| | | |
|---|---|---|
| | of its work will be to build up an integrated information base on the current situation and the potential of ICT, and on obstacles to progress as regards technical, socio-economic and business issues. The Network will also perform research to complete a toolkit for creating cultural heritage applications and an integrated infrastructure, and it will contribute to spreading excellence through on-line services and resources, dissemination activities, education, training and staff mobility. | |
| **IMAGINATION** - Image-based Navigation in Multimedia Archives | IMAGINATION proposes an automated method for capturing, indexing and semantic representation of non-textual objects to provide intuitive access and interaction through image embedded metadata. Major outcomes of the project will be a new and intuitive method of navigation through images and a set of technologies and tools to support the annotation of images by manual, semi-automatic and automatic techniques. | EU FP6 IST project |
| **MEMORIES** | It designs an audio semantic indexation system allowing information retrieval for the access to archive content. This project will create a generic software library in order to facilitate the extraction of high level information from audio signals. The main expected innovations of the MEMORIES project are a user-friendly system that matches archivist needs for information retrieval in audio databases, the definition of a format for database structuring of information content descriptors and an efficient tool for audio restoration. | EU FP6 IST project |
| **MINERVA PLUS** | MINERVA was set up in 2002 as a network of EU Member States' ministries and cultural agencies with the mission to facilitate the adoption of the Lund action plan on the coordination of digitisation programmes and policies. The network aimed at harmonising activities carried out for the digitisation of cultural and scientific content and at coordinating national programmes. Under FP6, the MINERVA network was extended to 'MINERVAplus' and included also new EU Member States, Russia and Israel. | EU FP6 IST project |
| **MOSAICA** | MOSAICA will deliver a technology toolbox for intelligent presentation, discovery of and new experiences with culture, to be demonstrated on the heritage of 2000 years of Jewish communities in Europe. | EU FP6 IST project |
| **MultiMATCH-** Multilingual/Multimedia Access to Cultural Heritage | This project focuses on multilingual information retrieval for cultural objects of different formats: text, images, audio, video. The system will be designed to support diverse user classes but also to assist cultural heritage institutions to disseminate their content widely and raise their visibility. | EU FP6 IST project |
| **COLLATE -** Collaboratory for Annotation, Indexing and Retrieval of Digitized Historical Archive Material | COLLATE developed digital library services for film researchers enabling them to work collaboratively on digitised historical films, film fragments and related archive documents (censorship documentation, programmes etc.) and to analyse, interpret, index and annotate this material. | EU FP5 IST project |

| MICHAEL - Multilingual Inventory of Cultural Heritage in Europe | Through the multilingual MICHAEL service you can find and explore digital collections from museums, archives, libraries and other cultural institutions from across France, Italy and the United Kingdom. Whether you are interested in art or archaeology, family history or planning holidays, the Romans or modern History, MICHAEL can show you what is available. | The European Commission |

**Source:** own retrieval from http://cordis.europa.eu and http://www.michael-culture.org

## Appendix 2   Possible classification of cultural heritage

The following is a tentative suggestion for a possible hierarchic classification of cultural heritage, moving from tangible objects to less tangible aspects of culture. The final column currently includes just an example from Genoa case-study and it is intended to be completed by the Cities involved in the project.

**Table A2:** Tentative suggestions for a possible hierarchic classification of cultural heritage

| Cultural Heritage families From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| **1. Cultural goods** | Monuments | **Fine Arts: Painting** | | |
| | | **Fine Arts: Drawing** | | |
| | | **Fine Arts: Large-Scale Sculpture** | *Arts in public spaces* | |
| | | | **Fountains** | |
| | | | **Drinking Fountain** | |
| | | | **Statues** | |
| | | **Fine Arts: Small-Scale Sculpture** | **Archeological Resources** | |
| | | **Fine Arts: Photography** | | |
| | | **Industrial** | **Factory** | |
| | | **Artisan** | **Decorative Arts In Ceramic** | |
| | | | **Decorative Arts In Wood** | |
| | | | **Decorative Arts In Glass** | |
| | | | **Decorative Arts In Metal – Metal work** | |
| | | | **Decorative Arts In Textile** | |
| | | | **Furniture** | |
| | | **National monument** | *Famous landmarks* | |
| | | | **Natural landmark** | |
| | | | **Site of historic interest** | |
| | | | **Structure** | |
| | Streets | **Preserved By The Authorities** | **Preserved By UNESCO** | Musei di Strada Nuova in Genoa |

| Cultural Heritage families  From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples  From Case Studies |
|---|---|---|---|---|
| | | Road | | |
| | | Street… | furniture | |
| | | | lighting | |
| | Buildings | Abbey | | |
| | | *Architecture* | *Contemporary architecture* | |
| | | Art Galleries | Ceramics | |
| | | | Collections | |
| | | Barracks | | |
| | | Castle | | |
| | | Cathedral | Anglican | |
| | | | Roman Catholic | |
| | | Chapel | | |
| | | Church | Altar | |
| | | | Altar Rails | |
| | | | Confessional | |
| | | | Dome | |
| | | | Dome Confessional | |
| | | | Lych Gate | |
| | | | Mosque | |
| | | | Nave | |
| | | | Pew | |
| | | | Pulpit | |
| | | | Sanctuary | |
| | | Distillery | | |
| | | Easement | | |
| | | Exhibition Venues | Exhibition Hall | |
| | | Gallery | | |
| | | Gate | | |
| | | House | House Museum | |
| | | | Mansion | |
| | | | Manor house | |
| | | Heritage Thematic Centers | | |
| | | Lighthouse | | |

| Cultural Heritage families From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| | | Monastery | | |
| | | Museums | | |
| | | Town Hall | | |
| | | Wall | | |
| | Infrastructure | Communication | Telecommunication | |
| | | Mobility | Bike Path | |
| | | | *Cycling routes* | |
| | | | Roads And Streets | |
| | | | Railways | |
| | | Production | Dam | |
| | | | Water tower | |
| | | | Wind turbine | |
| | | Transportation | Aqueduct | |
| | | | Bridge | |
| | | | (Transportation) enhancement | |
| | | | Pier | |
| | | | Power Lines | |
| | | | Wharf | |
| | Popular venues | Wishing well | | |
| | Settlement | Colony | | |
| | | Social Housing | | |
| | | Village | | |
| 2. Places | Public (Public Authority) | Access point | | |
| | | Archaeological Site | | |
| | | Area | | |
| | | City Centre | Downtown | |
| | | Cultural Theme Park | | |
| | | Facilities | Toilets | |
| | | | Telephones | |
| | | | Heating | |
| | | Garden | Food-Producing | |
| | | | Residential | |

| Cultural Heritage families **From Tangible To Intangible** | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| | | | **Zen** | |
| | | | **Zoological** | |
| | | **Geographical indication** | | |
| | | **Heritage Place** | **Buried** | |
| | | | **Indigenous** | |
| | | | **Underwater** | |
| | | **Historic resources** | *Historic city centre* | |
| | | | **Historic Property** | |
| | | | **Historic District** | |
| | | **Information centre** | | |
| | | **Institutions** | **Post offices** | |
| | | | **Prisons** | |
| | | | **Schools** | |
| | | **Market** | *Christmas* | |
| | | | *local crafts* | |
| | | | *local food* | |
| | | **Park** | | |
| | | **Public square** | | |
| | | **Settlement** | | |
| | | *Theatres* | | |
| | | *University* | | |
| | | *Waterways* | | |
| | | *Zoo* | | |
| | Private | **Agriculture** | | |
| | | **Asset** | | |
| | | **Central Business District (CBD)** | | |
| | | *Clubs* | | |
| | | **Commercial** | *Bars* | |
| | | | **Bed and Breakfast** | |
| | | | **Communications** | |
| | | | **Cuisine** | |
| | | | **Finance** | |

| Cultural Heritage families From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| | | | Fisheries | |
| | | | Forestry | |
| | | | Hostel | |
| | | | Insurance | |
| | | | *Internet cafes* | |
| | | | Mall | |
| | | | Personal Services | |
| | | | Real Estate | |
| | | | Restaurant | |
| | | | Retail Trade | |
| | | | *Shops* | |
| | | | Showroom | |
| | | | Tour Leader | |
| | | | Tour Operator | |
| | | | Transportation | |
| | | | Travel Agent | |
| | | | Wine cellar | |
| | | Health | Sanitary Services | |
| | | | Sauna | |
| | | | Spa | |
| | | | Turkish Bath | |
| | | Hotel | | |
| | | Leisure | Casino | |
| | | | Cookery | |
| | | | Theme park | |
| | | Motel | | |
| | Partnership | To delivery … | given action | |
| | | | policy development | |
| | | | programs | |
| | | | services | |
| | | To invest… | joint investment of economical, human resources | |
| | | To share… | liability or risk-taking | |
| | | | mutual benefits | |

| Cultural Heritage families From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| 3. (Cultural) Landscapes | Agricultural Systems | Nature Of Towns Or Villages | | |
| | Built Environment | City | | |
| | | City Region | | |
| | *Environment* | | | |
| | Landscape Quality | | | |
| | Modified Landscapes | Defensive Sites | Fortifications | |
| | | | Rampart | |
| | Patterns of Settlement and Human Activity | Industrial Systems | *Book industry* | |
| | | Factory | | |
| | | *Ruins* | | |
| | *Scene* | | | |
| | Sustainable Development | | | |
| | *Urban landscapes* | *Urban areas* | | |
| | | *Urban sights* | | |
| 4. Activities Events in relationship with Customers | For Everybody | Actor (Societal Actor) | | |
| | | *Alternative sub cultures* | | |
| | | Art | *Art communities and ateliers* | |
| | | *City of … (i.e. fur trade)* | | |
| | | Concerts | | |
| | | Cultural services | | |
| | | Dissemination | | |
| | | Eco-Tourism | | |
| | | *Excursions* | | |
| | | *Exhibitions* | | |

**Empowerment**

| Cultural Heritage families From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| | | **Festival** | **Art** | |
| | | | **Film** | |
| | | | *neighbourhood festivals* | |
| | | | **Religious** | |
| | | *Food as special ingredient* | *Local food* | |
| | | **Guideline** | | |
| | | *History of …* | *Industry* | |
| | | | **Intangible Heritage** | |
| | | | **Intellectual Property** | |
| | | | *Local business* | |
| | | | *opencast mining* | |
| | | | *sports* | |
| | | **Knowledge** | | |
| | | *Lifestyle* | | |
| | | *Music* | *Concerts* | |
| | | | *Nightlife* | |
| | | *Opera* | | |
| | | **Parades** | | |
| | | *Photography* | *Historic photography* | |
| | | **Performance art** | | |
| | | **Preservation** | **Ordinance** | |
| | | | **Plan** | |
| | | **Sports** | *Extreme sports* | |
| | | **Theatres** | | |
| | | **Urban Cultural Tourism** | | |
| | | **Urban Tourism** | | |
| | **For Residents** | **Cinemas** | | |
| | | **Design Review** | | |
| | | **Libraries** | | |
| | **For Visitors, Tourists and different Stakeholder** | **Attractions** | | |

| Cultural Heritage families From Tangible To Intangible | 1st Level Of Hierarchical Classification | 2nd Level Of Hierarchical Classification | 3rd Level Of Hierarchical Classification | ISAAC Examples From Case Studies |
|---|---|---|---|---|
| | | Destination | | |
| | | Foreign Independent Travel | | |
| | | Guide | Escort | |
| | | | Familiarization tour | |
| | | | Host-escort | |
| | | Itinerary | | |
| | | *Local habits* | | |
| | | Package | Hotel Package | |
| | | Special Cultural Activities | Tradition | |
| | | | *Enogastronomy* | |
| | | | Gastronomy | |
| | | Tour | Packager tour | |
| | | | Trail | |

## Appendix 3   List of possible e-services

The following is a tentative listing of e-services organized in terms of whether they are likely to be access before, during or after a visit.

### 1       Pre-visit e-services alphabetical list

This list contains all the e-services useful to plan and organise a trip:

1. *3D City, the user can choose his/her character and visit the city (features are stream live audio/video)*
2. *Advertising/promotional messages*
3. *Advertising films in mp3 format or on CD*
4. **Advertising of local highlights**
5. **Advertising on events**
6. *Advises*
7. *Archives*
8. *Audio/video download possibilities*
9. **Best Practice**
10. *Booking and purchase system*
11. *Booking service on line*
12. *Booking of tickets / buying goods*
13. *Children web-site*
14. *Costs information*
15. *Cultural agenda*
16. *Database which generates personalized information offers (according to someone's interests)*
17. **Digital tourist**
18. *Disables' access*
19. *Download of guided tours*
20. *Download of important telephone numbers*
21. *e-flux*
22. *e-governance[20]*
23. *e-guides for tourists (download MP3 or mobile)*
24. *e-newsletters*
25. *e-pay*
26. *e-payments, with web based services or dedicated cards*
27. *Electronic guides*

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[20] "E-governance allows an easy access to bureaucratic procedures such as registration of address, tax declaration. It also facilitates the contact to the authority or the job centre." (pag. 119).

28. *Electronic Map indicating how to get from one place to the other and how much time and money it would cost*

29. *Google earth like service for cultural heritage*

30. *Host system*

31. *Hotel reservations*

32. *How to arrive*

33. *Information on line*

34. *Information on schedules*

35. *Information on cheap flights to the city*

36. *Information on hotspots*

37. *Integrated system built into your home (with voice system, agenda, planner etc.)*

38. *Integrated ticket service for all cultural venues*

39. *Integrated system Home (alerting with tailored information)*

40. **Interactive Maps**

41. **Journey Planner including video tours, virtual tours, time-planner by mode of transport, alert on highlights as well as an interactive map**

42. *Journey of travel*

43. *List of accommodation structures*

44. *Meet-up service[21]*

45. *Official home page of a city*

46. *On line answers*

47. *On line basic information like exchange*

48. *On line presentation of important projects, events, sights*

49. *Ordering of brochures*

50. *Personalization (itineraries, answer to request, etc.)*

51. *Pre-paid tourist cards*

52. *Programs*

53. *Promotional e-service*

54. *Search function*

55. *Search venues by criteria (price level/genre/age)*

56. *Special presentation of cultural venues which lay beyond classical tourist paths*

57. *Suggested walks*

58. *Suggestions for day trips to surrounding cities*

59. *Suggestions for thematic journeys*

60. *Thematic information for different target groups*

61. *Thematic itineraries (available also for downloading)*

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[21] "A service that put in contact people from different cities with similar interests. This could be useful to use residents as "live"" (pag. 88)

62. *Tickets booking*

63. *Traveling schedules*

64. *Virtual city tour*

**65. Virtual tours**

66. *Virtual tour with a personalization system*


## 2      Pre-during visit e-services alphabetical list

The e-services listed below are useful for both pre and during the visit, depending on both the technologies used (mobile personal computer, GPS etc.) and availability or access to them in real time:

**67. 3-D representation**

68. *Attraction of the city*

**69. Booking system (one-stop shop)**

70. *Cartography*

71. *CCTV with local themes in newsletter public transport*

72. *Central multi-layered web-site (with many features as interactive map with icons, categorized by music, theatre etc., virtual tour with pictures i.e., user profile, info on free events or new hip bars/rest.*

73. *City card / combined ticket*

74. *City's information*

75. *City map*

76. *Commercials in the cinema*

77. *Cultural information*

78. *Cultural navigator*

**79. Decision Support**

80. *e-commerce (booking, reservation, souvenirs)*

81. *e-service providing advices*

**82. Event calendar on line**

83. *Event calendar in different languages*

84. *Event finder*

**85. General information services**

86. *Generic informations*

87. *GPS information - 'GPS- like system' or other mobile device that offers the user information 'on the spot' about architecture, buildings, streets or paintings. Containing also material gathered and saved in the city archive.*

88. *GPS navigation*

89. *Images*

90. *i-mobile*

91. *Information about hotels and related services*

92. *Information on attractions*

93. *Info- points*

94. *Information offer according to personal interests*

95. *Information Pole*

96. *Information system upon events, tickets (also round ones and party one), transports, cost and discounts*

**97. Interactive Maps with a GPS system (satellite navigation)**

98. *Interactive website with links*

99. *Itineraries*

100. *Links to cultural venues*

101. *List of attractions*

102. *List of events*

103. *List of events (divided for categories and chronology)*

104. *List of itineraries (Differentiation of itineraries for tourists and residents)*

105. *Live web-cams*

106. *Logistic information (transports, hotels, restaurants etc.)*

107. *Mobile phone translating service*

108. *Not accessible buildings video tour*

**109. On line bulletin board[22]**

110. *On line city magazines*

111. *On line yellow pages with cultural venues*

**112. Online practical information**

113. *One-stop shop*

114. *PDA system (info delivery)*

115. *Podcasts for attraction guides*

**116. Promotional Tourism Messages**

117. *Radio broadcasting*

118. *Radio station for tourists*

119. *Route planner*

120. *Telephone help service*

**121. Thematic Search**

122. *Ticket service for cultural venues and events*

123. *Time tables for public transport*

124. *Tour organization*

125. *Tourist information*

126. *Tourist promotional messages*

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22 "An online bulletin board (or notice board) enables the residents to provide information for tourists as well as for other residents." (pag.119)

**127.** **Totems**

**128.** **Trail Access Information**

129. *Trip planner*

130. *TV broadcasting*

**131.** **User Fee**

132. *Videos of interesting places*

133. *Videos (internet), pod casts*

134. *Video reconstructions*

**135.** **Voucher**

136. *Websites*

137. *Webcam*

138. *Webcam (checking traffic, attractions, etc.)*


**3    During visit e-services alphabetical list**

The following e-services may be useful during stakeholders' visit:

139. *Audio-guides*

140. *Audio guides in combination with on-site posters*

141. *Central tourist site*

142. *Eating out*

143. *Electronic Kiosk to access the service (directive maps, suggestions of venues)*

**144.** **Electronic ticket (city card)**

**145.** **Emergency services**

146. *Guided tours*

147. *Guided tours with rented mobiles*

**148.** **GPS and PDA systems (info delivery)**

149. *Historical information*

150. *History*

151. *i-pod audio tour*

**152.** **Information "of the day" services**

153. *Informative Desk*

154. *Information terminals (internet) at important tourists points, e.g. airport, main station*

155. *Information hotline*

156. *Interactive audio tours*

157. *Interactive map*

158. *Interactive panels*

**159.** **Interpretative Display**

160. *Just in time information during the stay (no media suggested)*

161.   *Local radios*

**162.**   **Local TV in foreign languages**

163.   *Mobile device GPS*

164.   *Mobile GPS info on the spot*

165.   *Mobile services*

166.   *Navigation systems*

167.   *Newsletter to mobile phone*

168.   *Promotional tourism messages via SMS*

169.   *Public information terminals*

170.   *Self guided walking tours*

171.   *Shopping card system to restore results*

172.   *SMS services*

173.   *Totem on site for consulting*

174.   *Welcome SMS*

175.   *Wi-Fi access systems in the city*

176.   *Wi-Fi system*

**177.**   **Wireless welcome network**

178.   *Virtual map (on Central Station with touch and pop-up screen)*

179.   *Travel service with local information*

180.   *Travel time indicator (scale= walking distance)*

181.   *Travel timetables*

182.   *Public Internet service points*

183.   *Video messaging*

184.   *Video screens*

185.   *Video screens in public transport system/public space*


## 4    Post visit e-services alphabetical list

Once at home, a tourist, a resident or a stakeholder may use the following e-services:

**186.**   **Blogs**

187.   *Chat forum*

188.   *Chat sessions forums (i.e. chatting with the choreographer of a play)*

189.   *City wikipedia*

190.   *Comments*

**191.**   **E-Forum**

192.   *Forum about the city, with satisfaction charts*

193.   *On line forum*

194.   *On line information on tourists highlights*

195.   *On line questionnaire*

196.  *On line tourists dictionary*

197.  *Pictures*

198.  *Questionnaire for improvement*

199.  *Satisfaction charts*

200.  *Shared information system Suggestions*

201.  *Tourist satisfaction questionnaire*


## 5      Transversal e-services

The following e-services cannot be associated to any specific (pre-during-post visit) time but they are mainly transversal to time criterion:

**202.      Game ("Second life" –type games)**

203.  *Hidden interest/surprises*

204.  *Everything integrated*

205.  *Information on city development / transformation process*

206.  *Information "of-the-day" services[23]*

207.  *Integration of existing e-services*

208.  *Internet community*

209.  *(Larger) language selection*

**210.      Personalized ("tailored") websites**

**211.      Profiling**

212.  **Online Official Journal** *of the municipality*

213.  *On line library*

214.  *On line newspaper*

**215.      On line opinion polls**

216.  *One central website*

217.  *Portal*

218.  *Profiling*

219.  *Quotations about the city from main international websites*

220.  *Services in different languages*

**221.      Semantic Web**

222.  *Site map*

223.  *Specific requests*

**224.      Tool-Kit**

**225.      Union List of Artist Names**

226.  *Virtual department*

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23 "up-to-date information such as events at present as well as information about weather, pollen, road works etc. Emergency services, i.e. information about medical care, opening hours of pharmacies, foreign language speaking physicians and chemists." (ISAAC Task 1.3, Part I, Developing alternative platform scenarios, Project Deliverable 1.3, 15/03/07, Version: 0.4, p.119)

227.     *Virtual municipal offices*

228.     *Wire-less network*

**229.**     **World Wide Web**

**230.**     **World Wide Web Consortium**

## Appendix 4   Proposed Glossary

## A4.1    Urban cultural goods

**Abbey** is a monastery ruled by an abbot or an abbess. (Princeton University 2006)

**Access Points** designated areas and passageways that allow the public to reach a trail from adjacent streets or community facilities. (Schmidt 2001)

**Actor (Societal Actor)** is a member of society who may play one or more roles. Stakeholder in the community. (BEQUEST 2001)

**Aqueduct** is a conduit or artificial canal for bringing water from a distant source. (Williams 1979)

**Archaeological Resources** (Cultural, Heritage) is any material of past human life, activities, or habitation that are of historic or prehistoric significance. Such materials include, but are not limited to, pottery, basketry, bottles, weapon projectiles, tools, structures, pit houses, rock paintings, rock carvings, graves, skeletal remains, personal items and clothing, household or business refuse, or any piece of the foregoing. (Schmid 2001)

**Archaeological Site** is a concentration of material remains of past human life or activities that is of historic or prehistoric significance and that has been surveyed by a qualified archaeologist. (Schmid 2001)

**Area** is any defined extent of land surface. (Williams 1979)

**Art** is the product of human creativity; works of art collectively; "an art exhibition"; "a fine collection of art". (Princeton University 2006)

**Art gallery** or art museum is a space for the exhibition of art, usually visual art, and usually primarily paintings and sculpture. It is also sometimes used as a location for the sale of art. (Wikipedia Foundation Inc. 2007)

**Asset** is a physical property or intangible right that has economic value; in satatistical terms assets are entities that must be owned by some unit, or units, and from which economic benefits are derived by their owner(s) by holding or using them over a period of time. (World Intellectual Property Organization 2003)

**Attraction** is a natural or cultural object or event that encourages travellers to visit. (California Travel Industry Association 2004)

**Barracks** is building in which soldiers or convicts were lodged. (Nelson and O´Donovan 2003)

**Bed and Breakfast** are overnight accommodations, usually in a private home or boarding house, with a full American-style breakfast included in the rate. (National Trust for Historic Preservation 2001)

**Bike Path** (Shared Use Path, Bicycle Path, Bike Trail, Multi-use Path/Trail) is any corridor that is physically separated from motorized vehicular traffic by an open space or barrier, and that is either within the highway right-of-way or within an independent right-of-way. Besides bicycles these paths may also be shared by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users. The term bicycle path is becoming less common, since such facilities are rarely used exclusively by bicyclists. (Schmid 2001)

**Bridge** is a structure built to span a gorge, valley, road, railroad track, river, body of water, or any other physical obstacle. (Wikipedia Foundation Inc. 2007)

**Building** is a term of wide range covering anything with walls and a roof. (Williams 1979)

**Built Environment** refers to the external surroundings and atmosphere of urban areas, including the buildings, infrastructure and green space. (BEQUEST 2001)

**Casino** is a building or large room devoted to gambling games or wagering on a variety of events. (Google Inc. 2007)

**Castle** is a fortified building or group of buildings, used as a residence by powerful nobles in feudal times. (Williams 1979)

**Cathedral** is a Christian church building, specifically of a denomination with an episcopal hierarchy (such as the Roman Catholic Church or the Anglican churches), which serves as the central church of a bishopric. As cathedrals are often particularly impressive edifices, the term is sometimes also used loosely as a designation for any large important church. (Wikipedia Foundation Inc. 2007)

**Ceramics** is the art and technology of making products with clay and other similar materials. (Williams 1979)

**Chapel** is a room or recess in a church containing an altar; small place of worship. (Williams 1979)

**Church** is a building used in Christian worship. See also altar, altar rails, confessional, dome confessional, dome, nave, pew, pulpit, sanctuary, lych gate. (Wikipedia Foundation Inc. 2007)

**City** refers to a large urban area of sufficient size to support a high level of cultural and industrial activity. (BEQUEST 2001)

**City centre** Central business district (CBD) and downtown are terms referring to the commercial heart of a city. Downtown is the usual term in North America. In the United Kingdom, Australia and New Zealand the "central business district" is used by geographers and sometimes by others, but the term city centre is much more common in everyday usage. (Wikipedia Foundation Inc. 2007)

**City Region** is the spatial zone larger than the city that represents that area that acts as the hinterland of the city. (BEQUEST 2001)

**Collection** is several things grouped together or considered as a whole. (Princeton University 2006)

**Commercial** is a service to customers who are primarily engaged in wholesale or retail trade, agriculture, forestry, fisheries, transportation, communications, sanitary services, finance, insurance, real estate, personal services, government and service that does not fall directly within one of the other classifications. (Madison Gas and Electric 2007)

**Concert** is a performance of musical entertainment. (Wikipedia Foundation Inc. 2007)

**Cookery** is the act of preparing food for consumption. It encompasses a vast range of methods, tools and combinations of ingredients to improve the flavor and/or digestibility of food. It generally requires the selection, measurement and combining of ingredients in an ordered procedure in an effort to achieve the desired result. Constraints on success include the variability of ingredients, ambient conditions, tools and the skill of the person cooking. (Wikipedia Foundation Inc. 2007)

**Cuisine** is the practice or manner of preparing food or the food so prepared. (Princeton University 2006)

**Cultural goods and services** refer to those goods, services and activities that embody or yield cultural expressions and have the following characteristics:

- they are the outcome of human labor (industrial, artistic or artisanal) and require the exercise of human creativity for their production;

- they express or convey some form of symbolic meaning, which endows them with a cultural value or significance distinct from whatever commercial value they may possess;

- they generate, or may generate, intellectual property, whether or not they are protected under existing intellectual property legislation. (UNESCO 2004)

**Cultural heritage** has both tangible and intangible components. Tangible cultural heritage refers to the built heritage, cultural landscapes and all manmade elements with cultural significance. Intangible cultural heritage refers to the practices, representations, expressions, memories, attachments, values and beliefs, as well as the knowledge and skills, that communities, groups and, in some cases, individuals, recognized as part of their cultural heritage. This is sometimes called living cultural heritage, and is manifested in oral traditions and expressions, performing arts; social practices, rituals and festive events. (Besson et al. 2006)

**Cultural Landscapes** describe those places and landscapes that have been shaped or influenced by human occupation. They include agricultural systems, modified landscapes, patterns of settlement and human activity, and the infrastructure of production, transportation and communication. The concepts of cultural landscapes can be useful in understanding the patterns of activity as diverse as industrial systems, defensive sites and the nature of towns or villages. (Drdracky et al. 2004)

**Customer** is the user, consumer, patron, guest, stakeholder, or visitor who consumes a product, resource, or service provided "free," at some level of fee or user charge below the true cost, or at full cost from a park and recreation agency or private concessionaire operating under the control of the park and recreation agency. (Schmid 2001)

**Dam** is a barrier across flowing water that obstructs, directs or retards the flow, often creating a reservoir, lake or impoundment. Most dams have a section called a spillway, over which or through which it is intended that water will flow. (Wikipedia Foundation Inc. 2007)

**Decorative arts** are traditionally defined as ornamental and functional works in ceramic, wood, glass, metal, or textile. The class includes furniture, furnishings, interior design, and architecture. The decorative arts are often categorized in opposition to the fine or high arts (or just art), namely, painting, drawing, photography, and large-scale sculpture. ... (Wikipedia Foundation Inc. 2007)

**Design Review** is a tool used by many communities to ensure that changes to local landmarks are made in a way that is sympathetic to the buildings' historic character, and in the best interest of conserving the buildings' historic fabric. (National Trust for Historic Preservation 2001)

**Destination** is the place to which a traveler is going; or any city, area, region or country be marketed as a single entity to tourists. (National Trust for Historic Preservation 2001)

**Dissemination** is to communicate effectively with a wide number of stakeholders and/or decision makers. (BEQUEST 2001)

**Distillery** is a plant and works where alcoholic drinks are made by distillation. (Princeton University 2006)

**Drinking fountain** is a public fountain to provide a jet of drinking water. (Princeton University 2006)

**Easement** is a tool for preserving historic properties. An owner may donate a part of his/her historic property to a non-profit organization, granting the organization permission to see that the features on which it holds the rights are maintained and preserved by the owner and any future owners. The non-profit organization monitors the property to ensure compliance with preservation standards and/or guidelines. (National Trust for Historic Preservation 2001)

**Eco-Tourism** (Eco-recreation, Nature-Based Tourism) is a purposeful travel to natural areas to understand the culture and natural history of the environment, taking care not to alter the integrity of the ecosystem, while producing economic opportunities that make the conservation of natural resources beneficial to local people. (Schmid 2001)

**Empowerment** Giving stakeholders and citizens the means to control their own environment or to influence decision making. (BEQUEST 2001)

**Escort** is a person, usually employed by a tour operator, who accompanies a tour from departure to return as guide or trouble-shooter; or a person who performs such functions only at the destination. The terms host-escort or host are often used, and are preferred, to describe this service. (National Trust for Historic Preservation 2001)

**Event** Something that happens at a given place and time. (Princeton University 2006)

**Exhibition hall** is a large hall for holding exhibitions. (Princeton University 2006)

**Facilities** are the services that are people feel are essential such as toilets, heating, telephones etc... (Barcelona Field Studies Center 2007)

**Factory** is a plant consisting of one or more buildings with facilities for manufacturing. (Princeton University 2006)

**Familiarization Tour** is a complimentary or reduced-rate travel program for travel agents, airline or rail employees or other travel buyers, designed to acquaint participants with specific destinations or suppliers and to stimulate the sale of travel. Familiarization tours, also called fam tours, are sometimes offered to journalists as research trips for the purpose of cultivating media coverage of specific travel products. (National Trust for Historic Preservation 2001)

**Festival** is an event, usually staged by a local community, which centres on some unique aspect of that community. Among many religions, a feast or festival is a set of celebrations in honour of God or gods. A feast and a festival are historically interchangeable. However, the term "feast" has also entered common secular parlance as a synonym for any large or elaborate meal. When used as in the meaning of a festival, most often refers to a religious festival rather than a film or art festival. In the Christian liturgical calendar there are two principal feasts, properly known as the Feast of the Nativity of our Lord (Christmas) and the Feast of the Resurrection, (Easter). In the Catholic, Eastern Orthodox, and Anglican liturgical calendars there are a great number of lesser feasts throughout the year commemorating saints, sacred events, doctrines, etc. (Wikipedia Foundation Inc. 2007)

**Foreign Independent Travel or Foreign Individual Travel**: FIT is an international pre-paid unescorted tour that includes several travel elements such as accommodations, rental cars and sightseeing. An FIT operator specializes in preparing FITS documents at the request of retail travel agents. FITS usually receive travel vouchers to present to on-site services as verification of pre-payment. (National Trust for Historic Preservation 2001)

**Fortifications** are a military work erected for defense. (Williams 1979)

**Fountain** is a structure from which an artificially produced jet of water arises. (Princeton University 2006)

**Furniture** is furnishings that make a room or other area ready for occupancy. (Princeton University 2006)

**Gallery** is a room or series of rooms where works of art are exhibited. (Princeton University 2006)

**Garden** is a planned space, usually outdoors, set aside for the display, cultivation, and enjoyment of plants and other forms of nature. The garden can incorporate both natural and man-made materials. The most common form is known as a residential garden. Western gardens are almost universally based around plants. Zoos, which display wild animals in simulated natural habitats, were formerly called *zoological gardens*. Some traditional types of eastern gardens, such as Zen gardens, use plants sparsely or not at all. Food-producing gardens are distinguished from farms by their smaller scale, more labor-intensive methods, and their purpose (enjoyment of a hobby rather than produce for sale). The gardening article discusses the differences and similarities between gardens and farms in greater detail. (Wikipedia Foundation Inc. 2007)

**Gastronomy** is the art of good eating. (Williams 1979)

**Gate** is a movable barrier giving access, as through a wall or fence. (Williams 1979)

**Geographical** indication is a sign used on goods that have specific geographical origin and possess qualities or reputation that are due to their place of origin. (ITC 2003)

**Guide** refers to an agency for directing or showing the way, specifically a person who leads or directs a stranger over unknown or unmapped country, or conducts travellers and tourists through a town, or over buildings of interest. (Wikipedia Foundation Inc. 2007)

**Guideline** A directing or standardizing principle laid down as a guide to procedure, policy etc. (BEQUEST 2001)

**Heritage** is a broad concept that encompasses our Natural, Indigenous and Historic or Cultural inheritance. (Drdracky et al. 2004)

**Heritage Place** describes a site or area of heritage significance that contains a number of buildings and structures, cultural landscape, monument, building or other structure, historic human settlement, together with the associated contents and surroundings or cartilage. Heritage places include those, which may be buried or underwater. (Drdracky et al. 2004)

**Historic District** is a defined geographical area which may be as small as a few contiguous buildings, or as large as an entire neighbourhood, central business district, or community, within which historic properties associated with a particular time or theme in a community's history predominate. Often the collective significance of the district may be greater than that of any one building or archaeological site. As a planning tool, historic district designation is often used to ensure the preservation of historic properties within the defined boundary, or to encourage reinvestment of the buildings. (National Trust for Historic Preservation 2001)

**Historic Property** is a site which has qualities that make it significant in history, architecture, archaeology, engineering or culture; sometimes more specifically a site which is eligible for or listed on the National Register of Historic Places, or on a local or state register of significant sites. (National Trust for Historic Preservation 2001)

**Historic Resource** is a historic building, site, structure, object or district which has the potential to benefit the community economically, educationally or in some other way if it is preserved. (National Trust for Historic Preservation 2001)

**Hostel** is an inexpensive, supervised lodging, particularly used by young people or elders. (National Trust for Historic Preservation 2001)

**Hotel** is an establishment that provides lodging, usually on a short-term basis. Hotels often provide a number of additional guest services such as a restaurant, a swimming pool or child

care. Some hotels have conference services and encourage groups to hold conventions and meetings at their location. (Wikipedia Foundation Inc. 2007)

**Hotel Package** is a package offered by a hotel, sometimes consisting of no more than a room and breakfast; sometimes, especially at resort hotels, consisting of (ground) transportation, room, meals, sports facilities and other components. (National Trust for Historic Preservation 2001)

**House Museum** is a residence which has been preserved or restored to represent a particular point in time or a particular theme in history, and which is open to the public as a museum. (National Trust for Historic Preservation 2001)

**Indigenous Cultural Heritage** is dynamic. It includes both Tangible and Intangible expressions of culture that link generations of Indigenous people over time. Indigenous people often express their cultural heritage through "the person", their relationships with country, people, beliefs, knowledge, law, language, symbols, was of living, sea, land and objects all of which arise from Indigenous spirituality. Indigenous Cultural Heritage is essentially defined and expressed by the Traditional Custodians of that heritage. (Drdracky et al. 2004)

**Information centre** is an organizational unit whose mission is to support users in exploiting information technology. (Google Inc. 2007)

**Infrastructure** is the basic facilities, services, and installations needed for the functioning of the community, such as transportation and communications systems, water and power lines, and public institutions including schools, post offices, and prisons. (Southampton City Council 1997)

**Intangible Heritage** is the practices, representations, expressions, knowledge and skills, that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. (UNESCO 2003)

**Intellectual Property (IP)** is the name given to property arising out of human intellectual effort. The output of human intellectual effort often manifests itself as new or original knowledge or creative expression which adds a desirable quality to a marketable product or service. Intellectual property refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images and designs used in commerce. Intellectual property is divided into two categories: industrial property, which includes inventions (patents), trademarks, industrial designs, and geographic indications of source; and copyright, which includes literary works such as novels, poems and plays, films musical compositions; artistic works such as drawings, paintings, photographs and sculptures, and architectural designs. Rights related to copyright include those of performing artists in their performances, producers or phonograms in their recordings, and those of broadcasters in their radio and television programmes. (ITC 2003)

**Itinerary** is a travel schedule provided by a travel agent for his/her customer. A proposed or preliminary itinerary may be rather vague or specific. A final itinerary, however, provides all details - flight numbers, departure times, reservation confirmation numbers- and describes planned activities. (National Trust for Historic Preservation 2001)

**Knowledge** is the awareness and understanding of facts, truths or information gained in the form of experience or learning (a posterior), or through introspection (a priori). Knowledge is an appreciation of the possession of interconnected details which, in isolation, are of lesser value. (Wikipedia Foundation Inc. 2007)

**Landmark** is a building, structure or object that marks the land - the familiar old building or other property - that provides orientation to a community or region. (National Trust for Historic Preservation 2001)

**Landscape** is the sum total of the characteristics that distinguish a certain kind of area on the earth's surface and give it a distinguishing pattern in contrast to other kinds of areas. Any

one kind of soil is said to have a characteristic natural landscape, and under different uses it has one or more characteristic cultural landscapes. (Schmid 2001)

**Landscape quality** used to indicate value based on character, condition and aesthetic appeal. (Drdracky et al. 2004)

**Leisure** is the time available for ease and relaxation. (Princeton University 2006)

**Library** is a collection of literary documents or records kept for reference or borrowing. (Princeton University 2006)

**Lighthouse** is a tower with a light that gives warning of shoals to passing ships. (Princeton University 2006)

**Mall** used to refer to the entire shopping complex but properly a reference to the pedestrian area of the mall that connects shopping areas. (Real State Agent Listings 2007)

**Manor house** is a mansion on an estate or plantation. (Williams 1979)

**Mansion** is a large and imposing house, stately residence. (Princeton University 2006)

**Market** refers to a public place where goods and services are traded purchased and sold. (AIG VALIC 2007)

**Metal work** encompasses many kinds of different decoration using various metals including silver, gold, bronze, copper, iron and others. Techniques include hammering, embossing (or repoussé), chasing, inlaying, gilding, molding and casting (pushing or pouring melted metal into a mold). (Google Inc. 2007)

**Monastery** is the habitation of monks. Originally: a hermit's cell. Christian monasteries are also called abbey, priory, charterhouse, friary, and preceptory, while the habitation of nuns can also be called a convent. (Wikipedia Foundation Inc. 2007)

**Monument** is any work of lasting significance. (Williams 1979)

**Mosque** is a Muslim place of a worship that usually has a minaret. (Princeton University 2006)

**Motel** is a type of hotel in which parking is provided at or near the room and the room door gives out onto the parking lot. (Google Inc. 2007)

**Museum** "A museum is a non-profit making, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment. (...)". (ICOM 2001)

**National monument** refers to a natural landmark or a structure or site of historic interest set aside by a national government and maintained for public enjoyment or study. (Princeton University 2006)

**Packager** refers to anyone organizing a tour including prepaid transportation and travel services, usually to more than one destination. (National Trust for Historic Preservation 2001)

**Package Tour** is a saleable travel product offering an inclusive price with several travel elements that would otherwise be purchased separately. Usually has a pre-determined price, length of time and features but can also offer options for separate purchase. (National Trust for Historic Preservation 2001)

**Paintings** is the practice of applying pigment suspended in a carrier (or medium) and a binding agent (a glue) to a surface (support) such as paper, canvas or a wall. This is done by a painter; this term is used especially if this is his or her profession. Evidence indicates that humans have been painting for about 6 times as long as they have been using written language. Artistic painting is considered by many to be among the most important of the art forms. (Wikipedia Foundation Inc. 2007)

**Parade** is a public procession honouring an anniversary, person, or event; ostentatious display. (Williams 1979)

**Park** is a large area of land preserved in its natural state as public property. (Princeton University 2006)

**Partnership(s)** refers to arrangement(s) between two or more parties who have agreed to work cooperatively toward shared and/or compatible objectives and in which there is: shared authority and responsibility (for the delivery of programs and services, in carrying out a given action, or in policy development); joint investment of resources (time, work, funding, material, expertise, information); shared liability or risk-taking; and ideally, mutual benefits. (Schmid 2001)

**Performance arts** refer to arts performed in public as drama, music, ballet, etc. (Williams 1979)

**Pier** is a structure built out over the water for docking, or as an amusement area or promenade. (Williams 1979)

**Preservation** refers to the conservation of the qualities and materials that make historic buildings, sites, structures, objects and districts significant. Approaches to preservation include stabilization, restoration, rehabilitation, and reconstruction. (National Trust for Historic Preservation 2001)

**Preservation Ordinance** is a local law enacted to protect a community's historic resources. Although such ordinances vary in specifics from community to community, typically they establish the preservation of a community's historic resources as being in the public interest, provide for the creation of a historic preservation commission to advise the mayor and council on historic preservation matters, establish a procedure for designating local landmarks and historic districts and authorize the commission to review proposed alterations, additions and demolitions affecting local landmarks and historic districts to see that they are in accord with a set of broad community guidelines for such work which are part of the ordinance. (National Trust for Historic Preservation 2001)

**Preservation Plan** is a document which evaluates a community's historic resources and makes recommendations on steps which may be taken to ensure that they are preserved and reused to the community's economic and social benefit. (National Trust for Historic Preservation 2001)

**Public Authority** refers to
- government at national, regional and other level;
- natural or legal persons performing public administrative functions under national law, including specific duties, activities or services in relation to the environment;
- any other natural or legal persons having public responsibilities or functions, or providing public services, in relation to the environmet, under the control of a body or person falling within subparagraphs (a) or (b) above;
- the institutions of any regional economic integration organization referred to in article 17 which is a party to this Convention.
- this definition does not include bodies or institutions acting in a judicial or legislative capacity (Drdracky et al. 2004)

**Public Square** refers to an open area at the meeting of two or more streets. (Princeton University 2006)

**Railway** refers to the land transport of passengers and goods along railways or railroads. These consist of two parallel rails, usually of steel, generally mounted upon cross-sectional beams (termed "sleepers" or "ties") of timber, concrete or other material. The underlying support maintains the rails at a fixed distance (gauge) apart. Usually vehicles running on the rails are arranged in a train (a series of individual powered or unpowered vehicles linked together). (Wikipedia Foundation Inc. 2007)

**Rampart** is a defensive stone or earth wall surrounding a castle. (Castles on the Web 2007)

**Restaurant** is a place where meals are served to customers. (Williams 1979)

**Retail market** is a market in which goods (usually in small quantities) are sold directly to the end-user customer. (NORESCO 2007)

**Road** is a strip of land, smoothed or otherwise prepared to allow easier travel, connecting two or more destinations. (Wikipedia Foundation Inc. 2007)

**Sauna** is a Finnish steam bath; steam is produced by pouring water over heated rocks. (Princeton University 2006)

**Sculpture** Art of fashioning figures or other objects by chiselling stone, casting metal, carving wood, modelling clay, etc. (Williams 1979)

**Settlement**
- *Colony*: a body of people who settle far from home but maintain ties with their homeland; inhabitants remain nationals of their home state but are not literally under the home state's system of government
- *Village*: a community of people smaller than a town. (Princeton University)

**Showroom** is an area where merchandise (such as cars) can be displayed; "in England a showroom is called a salesroom". (Princeton University 2006)

**Site** is a location where human activities once took place and left some form of material evidence. (Google Inc. 2007)

**Social Housing** refers to housing provided by Government (public housing) and community organisations (community housing). (Google Inc. 2007)

**Spa** is a place where there is a curative mineral spring – according the concise Oxford Dictionary. (Google Inc. 2007)

**Stakeholder** is a person or organization who has an interest or concern in something. (BEQUEST 2001)

**Statue** is a sculpture depicting a specific entity, usually a person, event, animal or object. Its primary concern its representational. However, as with all artistic topics, this definition of the concept statue is far from exhaustive and can be/needs to expanded. (Wikipedia Foundation Inc. 2007)

**Street** is a public thoroughfare in the built environment. It is a public parcel of land adjoining buildings in an urban context, on which people may freely assemble, interact, and move about. A street can be as simple as a level patch of dirt, but is more often paved with a hard, durable surface such as concrete, cobblestone or brick. Portions may also be smoothed with asphalt, embedded with rails, or otherwise prepared to accommodate non-pedestrian traffic. (Wikipedia Foundation Inc. 2007)

**Street furniture** is municipal equipment placed along streets, including light fixtures, fire hydrants, police and fire call boxes, signs, benches, and kiosks. (State of Nevada 2002)

**Street lighting** or street lamp, also known as a light standard, is a raised light on the edge of a road, turned on or lit at a certain time every night. Modern lamps may also have light-sensitive photocells to turn them on at dusk and off at sunrise, or activate automatically in foul weather. It is also not uncommon for street lights to be on posts which have wires strung between them (telephone poles or electrical poles). (Wikipedia Foundation Inc. 2007)

**Sustainable Development** refers to the development that maintains or enhances economic opportunity and community well-being while protecting and restoring the natural environment upon which people and economies depend. Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs. (Schmid 2001)

**Sustainable Urban Tourism** is
- a holistic, equitable, and future-oriented development strategy, part of the wider **Urban Sustainable Development Agenda**
- part of the **principles and objectives of urban integrated development**
- consistent with **long-term community progress** and prosperity
- a **tool to increase social welfare**, achieve greater and more equitable distribution of local wealth and enhance the integrity of the local ecosystems.

(Paskaleva-Shapira 2003)

**Theatre** is that branch of the performing arts concerned with acting out stories in front of an audience using combinations of speech, gesture, music, dance, sound and spectacle — indeed any one or more elements of the other performing arts. In addition to the standard narrative dialogue style, theatre takes such forms as opera, ballet, mime, kabuki, classical Indian dance, Chinese opera, mummers' plays, and pantomime. (Wikipedia Foundation Inc. 2007)

**Theme park** is an amusement park that has one underlying theme, or topic. (Google Inc. 2007)

**Tour** is journey or route all the way around a particular place or area. (Princeton University 2006)

**Tour Leader** A person with special qualifications to conduct a particular travel group, such as a botanist who conducts a garden tour. (National Trust for Historic Preservation 2001)

**Tour Operator** is a company that creates and/or markets inclusive tours and/or performs tour services. (National Trust for Historic Preservation 2001)

**Town Hall** is a government building that houses administrative offices of a town government. (Princeton University 2006)

**Tradition** is a story or a custom that is memorized and passed down from generation to generation, originally without the need for a writing system. Tools to aid this process include poetic devices such as rhyme and alliteration. The stories thus preserved are also referred to as tradition, or as part of an oral tradition. For example, it is now a tradition to have a Christmas tree to celebrate Christmas. (Wikipedia Foundation Inc. 2007)

**Trail** refers to a route on land or water with protected status and public access for recreation or transportation purposes such as walking, jogging, motorcycling, hiking, bicycling, ATVing, horseback riding, mountain biking, canoeing, kayaking, and backpacking. (Schmid 2001)

**Transportation Enhancement Projects** that include: providing bicycle and pedestrian facilities; converting abandoned railroad rights-of-way into trails; preserving historic transportation sites; acquiring scenic easements; mitigating the negative impacts of a project on a community by providing additional benefits; and other no motorized projects. (Schmid 2001)

**Travel Agent** is the individual who sells travel services, issues tickets and provides other travel services to the traveler sat the retail level. (National Trust for Historic Preservation 2001)

**Turkish Bath** refers to room where facilities are available for a bath followed by a shower and massage. (Princeton University 2006)

**Urban Cultural Tourism** refers to cultural tourism development within the complex economic, political, social and cultural framework that confers a unique identity to any given city. It mainly concerns built heritage assets but also includes the intangible elements intrinsic to local activities (shopping, eating, and entertainment) and creative industries (design, fashion) which support the overall dynamic urban ambience and provide experiences for cultural tourists and locals. (Besson et al. 2006)

**Urban tourism** is the set of tourist resources or activities located in towns and cities and offered to visitors from elsewhere. (Drdracky et al. 2004)

**User Fee** is any charge for use of services, facilities, trails, or areas. Examples include trail use fees, entrance fees, parking fees, shelter fees, or voluntary donations. (Schmid 2001)

**Visitors** are the total number of people that visit an area during some unit of time, usually a year. Used by agencies to count visits to developed sites, trails, and backcountry. (Schmid 2001)

**Vouchers** are documents issued by a tour operator to be exchanged for accommodations, meals, sightseeing, admission tickets, etc. (National Trust for Historic Preservation 2001)

**Wall** is a usually solid structure that defines and sometimes protects space. Most commonly, a wall separates space in buildings into rooms, or protects or delineates a space in the open air. There are three principal types of structural walls: building walls, exterior boundary walls, and retaining walls. (Wikipedia Foundation Inc. 2007)

**Water tower** is a very large tank constructed for the purpose of holding a supply of water at a height sufficient to pressurize a water supply system. (Wikipedia Foundation Inc. 2007)

**Well** is a hole in the ground dug or drilled in order to obtain water. (Google Inc. 2007)

**Wharf** is a man-made structure bonding the edge of a dock and built along or at an angle to the shoreline, used for loading, unloading, or tying up vessels. (Google Inc. 2007)

**Wind turbine** is a device for converting wind energy into mechanical (windmill) or electrical energy. (American Meteorological Society 1995)

**Wine cellar** refers to the space built underground or hewn out of live rock used to age wine in casks and/or in the bottle. (All Food Businesses 2007)

**Wishing well** is a term used in European folklore to describe wells that a person could, at the location of one of these wells, have a wish granted if he or she spoke it. After speaking the wish, a person would generally drop coins in the well, from which the tradition of dropping pennies in ponds comes from.  (Wikipedia Foundation Inc. 2007)

## A4.2   Urban cultural tourism E-services

**Advertising on events** is advertising on the upcoming events in the city that can be done on large screens on public places around the city, but also on screens in public transport and tourist sites. (Arezza et al. 2007)

**Advertising of local highlights** is a system that provides information on cultural events to the city's potential visitors. The information can be conveyed through video screens in public transport as well as SMS. (Riganti et al. 2007)

**Best practice** Guidance and documentation to describe and standardize the use of metadata elements that best support a community's needs. (Woodley, Clement, and Winn 2005)

**Blogs** An Internet-based on-line diary that can be kept either privately or opened to all viewers (usually exists in its latter form). Using the blog users do not engage in the direct dialogue, but rather post their comments to someone's article. Similar to e-forums, blogs can be important in describing some "insiders' hints" about the city for potential visitors, helping tourists to share their impressions on the city with the others, as well as helping local residents to discuss the events and issues within the city. (Arezza et al. 2007)

**Booking system (one-stop shop)** An integrated Internet website that includes bookings (tickets, hotels, restaurants, venues, event), practical information on all city services for tourists (e.g. timetables, first aids, useful numbers, insiders' hints, dangers and annoyances, opening times, access to all other e-services), events calendar and interactive maps and plans of the city. This service includes all important information and can also redirect the potential users to other relevant Internet websites. It has a memory of previous visit and suggests events/highlights according to previous behaviour. (Arezza et al. 2007)

**Decision Support** is a system or aide which assists in making a judgment by means of simplification, structurization, illustration etc. (BEQUEST 2001)

**Digital tourist** is an inexperienced searcher in the digital environment who does not possess knowledge of community- specific vocabularies. The Dublin Core provides a rudimentary vocabulary, or "pidgin language" for information discovery when exploring new digital territories. (Woodley, Clement, and Winn 2005)

**E-Forum** is an Internet-based chat-room, which enables the users to exchange messages, files and video stream. The main purpose of the e-forums for the cities' residents is to establish a dialogue with local authority, others residents and to share practical information about the city. In the case of tourists the e-forums aim at providing recommendations on the city and interacting between tourists (exchanging hints, opinions, and highlights). (Arezza et al. 2007)

(**Urban) E-governance** refers to the capacity & ability of urban government, in collaboration with citizens, firms and voluntary organizations, to deploy advanced ICTs to achieve cross-cutting solutions to urban policy goals aiming competitive and sustainable cities. (Paskaleva-Shapira and Besson 2007)

**Electronic ticket (city card)** is used like a card and you only have to pay once for all the attractions. (Riganti et al. 2007)

**Emergency services** refer to information about medical care, opening hours of pharmacies, foreign language speaking physicians and chemists. (Riganti et al. 2007)

**Event Calendar** is an Internet application that allows seeing the city's highlights and upcoming events by date or topic. It is an extensive database of events in the city that not only delivers information but also allows getting to the event's website (if any) for booking tickets or getting more information. (Arezza et al. 2007)

**Game** Virtual games allow to explore the city as cultural destination and/or using the city as the background for popular on-line games (such as Second life, for instance). (Riganti et al. 2007)

**General information services** Residents would appreciate concise information about opening hours, special prices, free admission, local events, and local specialities. (Riganti et al. 2007)

**GPS and PDA systems (info delivery)** Creating linkages between mobile devices (PDA, mobile phone, etc.) and GPS are seen by the participants as an interesting manner to create interactive and personalized tourism services. For example, this would enable a tourist to obtain information about the building he or she is passing by on the mobile phone or PDA. Live webcams could also form a source of information, for example, about cues in front of a particular museum.

Delivering tourism-related information (podcasts, virtual tours or audio or video guides) on PDA that city's visitors either bring with themselves or rent from the tourism information offices around the city. PDA represents portable digital media devices that can also connect to the Internet via Wi-Fi network for getting travel updates. (Arezza et al. 2007)

**Information "of the day" services** refers to up-to-date information about weather, pollen, road works, etc. (Riganti et al. 2007)

**Interactive Map** refers to an interactive map that allows the visitors and residents alike to plan their way in the city, choose the shortest way to the local highlights or provide a suggested itinerary for the visit. In a combination with a GPS system (satellite navigation) the interactive map becomes even more useful, as far as it allows the user to locate her position within the city and plan her movement from point A to point B using the optimal route. Interactive map is more user-friendly than usual maps and can be used for exploring the city on the thematic basis. Interactive maps are very useful during the visit, so the majority of them should be offered on mobile phones or portable media devices (PDA) as well as satellite navigation devices. (Arezza et al. 2007)

**Interpretive Display** is an educational display usually in an interpretive centre or at a trailhead that describes and explains a natural or cultural point of interest on or along the trail. (Schmid 2001)

**Journey Planner** is an interactive application that allows planning one's trip. It not only passively provides information requested by the users, but also allows modifying this information and creating personalized travel itineraries. This journey planner includes video tours, virtual tours, time-planner by mode of transport, alert on highlights as well as an interactive map. Sometimes, in its most advanced applications the journey planner also includes satellite navigation (such as GPS). (Arezza et al. 2007)

**Local TV** Short films about sights and attractions, event calendar, in foreign languages. (Arezza et al. 2007)

**Online bulletin board** is an online bulletin board (or notice board) enables the residents to provide information for tourists as well as for other residents. (Riganti et al. 2007)

**Online Official Journal** refers to an online version of the Official Journal of the municipality that provides the residents with precise information about policies and public announcements. (Riganti et al. 2007)

**Online opinion polls** or opinion voting allow the residents to participate in policy making. (Riganti et al. 2007)

**Online practical information** refers to Internet-based practical information mainly on local transport, public transport, opening times of museums, public offices and shops. Apart from the possibility of be redirected to the relevant websites, it also provides "traditional" contacts, such as telephone numbers. (Arezza et al. 2007)

**Personalized ("tailored") websites** are internet websites that adjust to users' needs and profiles by offering the user the selected information only; to this might prevent the "information overload". (Riganti et al. 2007)

**Profiling** is a feature of the Internet website allowing users to create their own profiles in accessing information (either tourism-related or practical information on the city). This is mainly done due to the possibility of information overload. Using profiling, users can select their areas of interest and create accounts, so that when they enter the website for the second time, their profile is stored in the computer's memory and the information is delivered to them according to their specific interests. (Arezza et al. 2007)

**Promotional Tourism Messages** refers to SMS updates sent through the local operator whilst visiting cultural tourism attractors; it might include information on events; cultural highlights; locations and places of interest in the area. (Riganti et al. 2007)

**3-D representation** Video reconstruction allows imagining how the city looked like, e.g., lost buildings, reconstructed buildings. (Riganti et al. 2007)

**"Second life" –type games** are a special type of on-line games that operate with virtual reality and enable the high level of personalization and role-building for the users. These games create the virtual world that resembles the real world in many details. One of these details is the visual presentation of the cities where the game players operate: the creators of the game are trying to reconstruct the real, existing cities using the computer animation and graphics. The virtual models of the cities include all the elements of their real counterparts, such as historical landmarks, buildings and landscapes. Therefore players can also create their own itineraries. (Riganti et al. 2007)

**Semantic Web** is a term coined by Tim Berners-Lee which views the future Web as a web of data, like a global database. The infrastructure of the Semantic Web would allow machines as well as humans to make deductions and organize information. The architectural components include semantics (meaning of the elements), structure (organization of the elements), and syntax (communication). (Woodley, Clement, and Winn 2005)

**Thematic Search** refers to an Internet-based search where users can look for specific tourism-related information that is of a special interest only for them. Thematic search includes creating a suggested itinerary that would usually be following one topic (i.e. Renaissance buildings or art museums). (Arezza et al. 2007)

**Tool-kit** is a set of logical tools which together provide powerful analytical assistance (usually electronic). (BEQUEST 2001)

**Totems** are panels on site for tourist and residents that could offer information and help in the choice of itineraries. (Riganti et al. 2007)

**Trail Access Information** is objective information reported to trail users through signage, about the grade, cross slope, tread width, and surface of a trail. (Schmid 2001)

**Union Lists of Artists' Names (ULAN)** is a controlled vocabulary of artists' names and biographical and bibliographic information produced by the Getty Vocabulary Program. (Woodley, Clement, and Winn 2005)

**Virtual tours** refers to guided tours of the city using either virtual maps or virtual presentation of the city (recreated on the computed using the computer graphics). The potential visitors can see the city or at least get an idea about it without leaving their living room. Some virtual tours are delivered on PSP devices (gaming consoles) and mobile phones. (Arezza et al. 2007)

**Wireless welcome network** is a special mobile-based welcoming network for the city's visitors (this is a tourist specialised service). The main principle of its functioning is the following: as soon as the local mobile operator identifies the user, whose SIM card is not registered in the given city, information (in the form of SMS or MMS) on events and highlights are sent to the user's mobile. (Riganti et al. 2007)

**World Wide Web (WWW)** is the panoply of Internet resources (text, graphics, audio, video, etc.), that are accessible via a Web browser. (Woodley, Clement, and Winn 2005)

**World Wide Web Consortium (W3C)** is an international industry consortium founded in October 1994 to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability. (Woodley, Clement, and Winn 2005)

## Appendix 5   Selection of sites of cultural heritage

### A5.1. The city of Amsterdam

*Author: Amsterdam*

*Contributions: DCCBA*

**Group I: Landmarks**

- Grachtengordel en grachtenhuizen - The canals and the canal houses
  (ware-) houses, 16th and 17th century

  http://www.bma.amsterdam.nl/adam/uk/monum.html
- Paleis op de Dam - Dam Palace
  1648, town hall, now: palace

  http://www.bma.amsterdam.nl/adam/uk/groot/paleis.html
- Nieuwe Kerk – New Church
  Church, 1400 onwards

  http://www.bma.amsterdam.nl/adam/uk/groot/nwkerk.html
- Oude Kerk – Old Church
  Church, 1300 onwards

  http://www.bma.amsterdam.nl/adam/uk/groot/oukerk.html
- De Waag / St Antoniespoort – Waag Building
  City gate, public weigh house, guild rooms, 1488

  http://www.bma.amsterdam.nl/adam/uk/intro/topo1.html;
  http://www.waag.org/page/waagsociety
- Burgerweeshuis, Kalverstraat 92
  Orphanage, now in use as historical museum, 1570

  http://www.ahm.nl/faqs.php; http://www.bma.amsterdam.nl/adam/nl/groot/ahm.html
- West-Indisch Huis
  Headquartes of Dutch West Indies Company, 1615

  http://www.amsterdamtourist.nl/en/home/about+amsterdam/district+information/around+the+haarlemmerplein/west+indies+house.aspx
- Rijksmuseum
  Museum, 1885

  http://www.rijksmuseum.nl/hetnieuwerijksmuseum?lang=en
- Zuiderkerk
  Church, 1603

  http://www.bma.amsterdam.nl/adam/uk/groot/zkerk.html
- Westerkerk
  Church, 1631

  http://www.bma.amsterdam.nl/adam/uk/groot/wkerk.html
- Noorderkerk
  Church, 1620

  http://www.bma.amsterdam.nl/adam/uk/groot/nkerk.html

- Schreierstoren
  Defensive tower, 1480

  http://www.bma.amsterdam.nl/adam/uk/intro/topo1.html
- 's Lands Zeemagazijn – National Naval Warehouses
  Warehouse, now: museum, 1655

  http://www.bma.amsterdam.nl/adam/uk/pakh1e.html;
  http://www.scheepvaartmuseum.nl/index.php?PageID=1567
- Portugees Israelitische Synagoge – Portuguse Synangogue
  Synagogue, 1675

  http://www.jhm.nl/amsterdam_eng.aspx?ID=2


**Group II:** Sites that need to be enhanced
- Industrial architecture 1850-1940
  For example:
    o Westergasfabriek (Imperial Continental Gas Association) 1885
      http://www.westergasfabriek.nl/engels_history.php
    o Graansilo Westerdoksdijk (Grain Silo, Lofts), 1896
      http://www.bma.amsterdam.nl/adam/nl/msp/graansilo.html
- Amsterdam School architecture, from the 1910's and 1920's
  http://www.fhh.demon.nl/amsschool.html; http://en.wikipedia.org/wiki/Amsterdam_School
- The boroughs of the 'Berlage Plan' built in the 1920's and 1930's
  http://www.nai.nl/e/collection/news/2004/0412_adam_zuid_e.html
- Olympisch Stadion – Olympic Stadium (1928)
  http://en.wikipedia.org/wiki/Olympisch_Stadion_(Amsterdam);
  http://www.lim.nl/articles/stadion.html
- Modern architectural landmarks, e.g.:
    o Beurs van Berlage – Stock Exchange http://en.beurs-van-
      berlage.nl/beursvanberlage/index.html
    o Nederlandse Handelsmaatschappij (1926, former buildings of ABN Amro Bank,
      now City Archives)
      http://www.nai.nl/e/collection/news/2003/0302_bazelmaq_e.html
    o Tuschinski theatre (1921, http://www.jhm.nl/amsterdam_eng.aspx?ID=38)
    o Joodse Invalide (1935, former Jewish hospital, now City Health Service,
      http://www.jhm.nl/amsterdam_eng.aspx?ID=17)


**Group III:** Sites in need of protection
- Architectural landmarks outside the city centre (mainly after 1875)
- Westelijke Tuinsteden - Western Garden Boroughs
- Nieuwendam, village in the North of Amsterdam
- Ransdorp, village in the North of Amsterdam
- Kadoelen, village in the North of Amsterdam

## A5.2 The city of Leipzig

*Author: Leipzig*

*Contributions: DCCBA*

General remarks:

Leipzig's architectural uniqueness is defined by its affluent architectual heritage from the *Gründerzeit* (Wilhelminian époque 1870 - 1914). 15.000 buildings are classified monuments, most of them dating from the turn of the 19th and 20th centuries. The cityscape is dominated by residential quarters, public buildings and former industrial plants which represent the styles of late classicism, historicism and art nouveau. Dimension and closeness of these ensembles are unique in Europe.

This architectural heritage reflects the booming years of the industrialisation, which brought economic power, an enormous growth of population, and considerable wealth to the city. During the GDR years, the built structure of the historic quarters was left largely untouched, as most of the construction activities took place in the outskirts. After the reunification the *Gründerzeit* quarters were found in a devastated but mostly original state. Tax relief and high subsidies led to a boom in refurbishment, with the result fact that nowadays 12.500 classified monuments are in a very good condition and build a beautiful and valuable cityscape. For this reason, Leipzig is said to be one of the best examples of the urban qualities of a European city.

Leipzig is aware of the value and touristic potentials of its urban *Gründerzeit* heritage. Yet there is no specific tourism strategy, nor integrated touristic services for *Gründerzeit* up to now. Therefore the city of Leipzig decided to focus on Leipzig's cultural architectual heritage within the European project ISAAC. This is the main criteria for the selection of sites here presented.

The level of digitisation varies and is quite low. Most information and web sites are in german language.

**Group I:** Landmarks

### Hauptbahnhof (main station)

Leipzig's main station is the biggest terminal station (dead-end station) in Germany and was built from 1909 to 1915. Since 1997 there is, besides the railway station, a big shopping mall and a car garage inside the restructed building. The combination of train access, parking space and shopping makes it a vivid venue in a superb architectural ambience. According to recent research results, Leipzigs's main station is one of the most important touristic symbols for the city of Leipzig.

Level of digitisation:

www.leipzig.de/en/tourist/leipzig/spaziergang/rundgang/02307.shtml

www.promenaden-hauptbahnhof-leipzig.de

### Völkerschlachtdenkmal (monument of the battle of the nations)

Built in 1913, the monument for the battle of the nations gives evidence of the Wilhelminian way of remembrance. It is one of the main tourist sites in Leipzig according to recent research results. The monument itself is an impressing building with lots of interesting and amazing details. Because of its height it is also a popular viewpoint which offers a great view over the city and its surroundings.

Level of digitisation:

www.voelkerschlachtdenkmal.de

http://www.stadtgeschichtliches-museum-
leipzig.de/voelkerschlachtdenkmal/voelkerschlachtdenkmal_start.htm

### Neues Rathaus (new town hall)

The new town hall was built by Hugo Licht in Neorenaissance style (1899-1905). It has grandiose staircases and foyers and more than 900 rooms. In its cellars, a traditional restaurant is located.

Level of digitisation:

http://www.leipzig.de/de/buerger/kultur/musik/festivals/buergerfest/100NR/

### Bundesverwaltungsgericht (federal administration court)

The former Reichsgericht (High Court of the German Empire) is one of Europe's largest and most beautiful law courts. Its Wilhelminian style architecture was restructured carefully. Besides the court, it houses a museum about its history.

Level of digitisation:

http://www.bverwg.de/enid/f8650f5c0b65181a807029ba20e9ae41,0/Aktuelles/Reichsgerichtsmuseum
_hn.html

### Gasometer (gas holder)

Built in the middle of 19th century and early testimony of modern infrastructure, the restructured gasometer is nowadays used as a museum. It shows huge panoramas that cover its round walls all over. At the moment, there is a 360°-panorama of the ancient Rome, which is one of Leipzig's most popular tourist attractions.

Level of digitisation:

http://www.swl.de/de/aktuelles/artikel/gasometer.htm

**Group II:** Sites that need to be enhanced

### Single sites of the *Gründerzeit*

### Gründerzeit erleben (Experience Gründerzeit)(forthcoming)

The project wants to revive the Wilhelminian lifestyle by allocating old crafts and a historic hotel in a Leipzig *Gründerzeit* street (Hedwigstraße at Neustädter Markt, an old working class quarter. Further information: please see below). Tourists and residents alike can experience the original ambience in ancient architectural settings with craftsmen and hotel personnel partly in historic wardrobe. It is planned that the hotel should have the original technical equipment of the old times. The workshops along the streets offer shopping possibilities and insights in ancient craftsmanship alike.

Level of digitisation:

www.gruenderzeit-erleben.de

### Museum of Wilhelminian style living (Gründerzeitmuseum) (forthcoming)

Situated at the entrance of historic Waldstraßenviertel, the museum wants to show the upper class life of the turn of the centuries. As a first step, an exhibition will be located (2008), which concentrates on the house and its inhabitants. Later on, a permanent museum with a wider range of topics around the Waldstraßenviertel will be established (2009). The museum will be a further highlight in the historic Waldstraßenviertel (further information: please see below), which is Europe's largest Gründerzeit-Ensemble with 80 per cent of its buildings classified as monuments. It used to be home of – mainly jewish - merchants, high-range employees and university staff and shows a wide variety of upper class building culture of the turn of the centuries.

Level of digitisation:

www.waldstrassenviertel.de

### Karl-Heine-Kanal

Built 1856 to 1862, the canal was meant to develop the new industrial sites of Plagwitz. It served for transport purposes and as water supply for the industrial plants. 1990 it was in an ecologically disastrous state. Revitalisation started soon after the German reunification. In 2000, the revitalised canal with its new bicycle track became an EXPO2000 project. Today, it is a popular venue for water sports and guided tours for tourists. It leads through a picturesque cityscape of revitalised former industrial plants which nowadays give house to lofts, restaurants and offices (more details about Plagwitz: please see below).

Level of digitisation:

http://www.wasser-stadt-leipzig.de

### Baumwollspinnerei (cotton mill)

A former cotton mill became an area of intensive cultural live. A large number of ateliers, galleries, workshops and other cultural venues flourished in the 23 brick buildings and make it a vivid centre of the arts and crafts. It became the crystallisation point for the New Leipzig School of painting (e.g. Neo Rauch) and attracts arts aficionados from all around the world during the yearly galleries festival. It is located in Plagwitz, a quarter which is characterized by an emerging arts scene (see below).

Level of digitisation:

www.baumwollspinnerei.de

### *Gründerzeit* quarters

Leipzig has several quarters which are closed architectural ensembles from *Gründerzeit*, each with its own traditional characteristics and its own way to re-interpret and re-use this built structure for modern life. Three examples can illustrate the wide variety of this heritage and its transfer to 21st century:

*Neustädter Markt:*

Traditionally, the east of Leipzig was dominated by working class. The built structures are very dense and small-scale. In former times, the houses offered a poor standard of living and used to be overcrowded. Instead of backyards they had workshops, small production plants and other buildings behind them. Today, most of the houses are restructured, the backyards are green. The historic cityscape with its patterns of streets and squares survived completely. The atmosphere of the old times is still there. It remains a quarter with complicated social structures, but it gets new impulses from its newly emerging ethnical variety and a vivid scene of civil engagement.

Main sights within this context are *Gründerzeit erleben* (forthcoming, see above), the *Neustädter Markt*, an ancient square with its church, school, and surrounding houses, all from the *Gründerzeit*, and some new restructuring projects like the *Eisenbahnstraße* (main street of the quarter) and the *Rabet* (rebuilt park with lots of sports facilities and playgrounds).

Level of digitisation:

www.buergerverein-neustaedter-markt.de/

www.leipzig.de/de/buerger/stadtentw/stadtern/gebiete/osten/nm/

www.lokmeile.de

*Waldstraßenviertel:*

This quarter has always been and still is an upper class quarter (see above). It is a closed ensemble of impressing *Gründerzeit* apartment houses and villas, most of them restructured. The cityscape survived almost completely. The houses build huge blocks with park-like backyards full of old trees. One forthcoming main attraction will be the *Gründerzeitmuseum* (see above).

Level of digitisation:

ArchitekTouren Leipzig (DVD with films on several aspects of Leipzig's architecture, a presentation on *Waldstraßenviertel* amongst them)

www.waldstraßenviertel.de

*Plagwitz:*

Plagwitz and the Leipziger Westen are dominated by old industrial plants, most of them from the turn of the 19th and 20th centuries. They survived until the German reunification, shortly afterwards almost all of them went bankrupt and closed down. The remaining industrial landscape became the starting point for an ongoing process of revitalisation, which turned Plagwitz into an attractive place for living, working and leisure. Its attraction for tourism emerges from the high density of classified monuments of industrial architecture (e.g. *Buntgarnwerke, Stelzenhaus, Konsumzentrale*), and of the vivid arts scene, which uses the potentials of the large number of empty buildings. There are lots of galleries and ateliers (e.g. *Baumwollspinnerei, Tapetenwerk, Westwerk*), and a number of regular arts and lifestyle events of all kinds, e.g. *geöffnet!, Westbesuch, 24-Stunden-Ausstellung*. The fashionable *Neue Leipziger Schule* (New Leipzig School of Painting) with the painter Neo Rauch and the galerist Judy Lybke as its main protagonists has its home base in the *Baumwollspinnerei* and attracts visitors from all around the word.

Level of digitisation:

Arts and events (mostly in old industrial plants):

www.tapentenwerk.de

www.tapetenwerk-galerien.com (also in English)

www.baumwollspinnerei.de

www.westwerk-leipzig.de (forthcoming)

www.geoeffnet-leipzig.de

www.westbesuch.com

www.24-stunden-ausstellung.de

Links on industrial monuments:

www.stelzenhaus.de

http://www.rumschauen.de/buntgarnwerke/2/

www.konsum-zentrale.de

ArchitekTouren Leipzig (DVD with films on several aspects of Leipzig's architecture, a presentation on *Plagwitz* amongst them)

www.wasser-stadt-leipzig.de


**Group III:** Sites in need of protection


**Main streets (Magistralen)**

Wilhelminian main streets are today Leipzig's most frequented roads. Due to the high volume of traffic, many of the buildings are unoccupied and in danger of being devastated. This would damage severly the historic urban structure of Leipzig with its specific qualities. Moreover, the bad estate of the houses along the main streets is the first impression tourists get when they enter the city.  It is necessary to find solutions for these problems. On the one hand, strategies for a preservation of these historic streets are to be developed. On the other hand, there must be an image campaign to explain the historic role of these streets and to visualize their existing qualities.


Level of digitisation (examples for specific streets or projects):

http://www.leipziger-osten.de/page.htm?node_id=2002109120917226180 (Eisenbahnstraße)

http://www.urban-leipzig.de/presse2.asp?id=208 (Zschochersche Straße)

http://www.bund-bin.de/projekte/anzeige.phtml?id=3010 (Projekt Wächterhäuser)


**Historic ballrooms**

Leipzig has a lot of historic ballrooms. At the turn of the century people used to go to ballrooms at Saturday nights for dancing. They were places of popular cultural events. They also housed political meetings. The ballrooms give evidence to Wilhelminian lifestyle and are of high architectonic quality. Some of these ballrooms do still exist, though not all of them are in adequate use. Examples are the *Schaubühne Lindenfels*, the *Felsenkelle*r, and the *Musikalische Komödie* in Lindenau, or the *Kongresshalle* in Gohlis.


Level of digitisation:

http://www.schaubuehne.com

http://www.leipzig-lexikon.de/HAUSHOF/felsenk2.htm

http://www.operette-leipzig.de

http://www.kongresshalle-leipzig.de

## A5.3. The city of Genoa

Author: Genoa

Contributions: DCCBA

The city of Genoa is located in the region of Liguria in northwestern Italy on the coast of the Mediterranean Sea. An ancient Ligurian port, during the 12th and 13th centuries, Genoa developed into one of Europe's largest cities. From the end of the 17th and through the 18th century, the economic and political influence of the city of Genoa declined, and it was occupied first by Austria and then by Napoleon. In the unified Italy, Genoa has again emerged as a major port city, and has also succeeded in keeping its historic urban fabric (UNESCO, 2007).

Following the criteria previously cited, this sub-section list the sites selected by the city of Genoa.

For all the three categories the level of digitalisation is very high.

Group I: Landmarks

The most important landmarks are to be found in the site "Le Strade Nuove and the system of the Palazzi dei Rolli", which in 2006 was inscribed in the UNESCO World Heritage List.

The Strade Nuove and the system of the Rolli palaces, in Genoa's historic centre (late 16th and early 17th centuries), represent the first example in Europe of an urban development project parcelled out by a public authority within a unitary framework and associated to a peculiar system of an offer of public lodging in private residences, as decreed by the Senate in 1576. The site includes an ensemble of Renaissance and Baroque palaces along the so-called «new streets» (Strade Nuove).

The Rolli palaces were residences built by the wealthiest and most powerful aristocratic families of the Republic of Genoa at the height of its financial and maritime power. The big residential palaces erected on the Strada Nuova (now Via Garibaldi) in the late 16th century formed the quarter of the nobility, who had assumed the government of the Republic since 1528.

The palaces feature spectacular staircases, courtyards, and loggias overlooking gardens built at different levels in a relatively tight space. The originality of this urban design model is evidenced by the critic literature.

The palaces offer an extraordinary variety of different solutions and achieve universal value in adapting to the peculiar characteristics of the site and to the needs of a specific social and economic organization. They also offer an original example of a public network of private residences designated to host state visits, thus contributing to the dissemination of knowledge of an architectural model and a residential culture, which attracted famous artists and travellers, such as it is testified by a collection of drawings by Pieter Paul Rubens.

http://whc.unesco.org/en/list/1211/

http://www.rolliestradenuove.it/

http://www.irolli.it/english.html

Group II: Sites that need to be enhanced

Buffer zone of the previously cited UNESCO site, the historic city centre still needs to be enhanced.

An ancient Ligurian port, Genoa was conquered by the Lombards in the 7th century, and sacked repeatedly by the Saracens in the 10th century. From the 11th century onwards, often in alliance with other city-states, the Genoese were able to strengthen their trade connections, becoming experts and innovators in shipbuilding, navigation, and cartography, in industrial and banking techniques, and in drafting contracts that enabled overseas partnerships and investing in lucrative trade. During the 12th and 13th centuries, Genoa developed into one of Europe's largest cities, having some 100,000 populations around 1300. In the 15th century, it suffered from decline and was frequently governed by the French or by Milan.

From the middle Ages, Genoa became "Libero Comune", focused on a densely populated area between the sea and the hillsides. Politically, Genoa was characterised by a system of "Contrade consortili", corresponding to urban quarters, so-called "Alberghi", i.e. divided into zones influenced by noble families. Resulting from criticism of this system, a system of "Dogi perpetui" was established, which remained in force until 1528. Andrea Doria (1468-1560), a renowned Genoese admiral, who had served the popes and several European kings, had built a powerful fleet overpowering the Corsairs in the Mediterranean. In 1528, he established a new social division and an aristocratic constitution in Genoa, which continued in force until 1798. Under Doria, in alliance with Spain, Genoese financiers started controlling Spanish and Neapolitan trade, and receive gold from the New World. By 1570, they were the principal bankers of the Catholic Europe, and a stable and prosperous oligarchic government ruled Genoa.

It is in this context that there was the need to provide new palaces for the extremely rich families, and residences that could host distinguished guests, such as cardinals, governors, and ambassadors visiting the city. As a result of the need for such representation, the Strada Nuova was built starting in 1551, and the official list (Rollo) of palaces selected for official representation was proclaimed in 1576. The typology of these aristocratic palaces was clearly distinguished from the earlier, late-medieval typology, consisting now of grandiose spatial unities (entrance halls, vast staircases, atriums, gardens) and a rich internal decoration in the style of late Renaissance and Mannerism. This model was also applied in other parts of the city.

Thanks to the enthusiasm of artists, e.g. Peter Paul Rubens, who surveyed and published the drawings of the palaces, as well as Giorgio Vasari, Vincenzo Scamozzi and Joseph Furttenbach, the model of Genoese palaces was carried to other European cities, especially the Low Lands and Britain. From the end of the 17th and through the 18th century, the economic and political influence of the city of Genoa declined, and it was occupied first by Austria and then by Napoleon. In the unified Italy, Genoa has again emerged as a major port city, and has also succeeded in keeping its historic urban fabric.

http://www.centrostoricogenova.com/index_storia.php3

Group III: Sites in need of protection

The fortifications of Genoa are a good example of sites in need of protection.

Due to its access to the sea, the city of Genoa has always been an object of great interest for the foreign powers. The history of the town is therefore full of warlike events and the heritage deriving from it is simply enormous.

At present, many of such fortifications, which by the end of 19th century were completely abandoned, are in poor conditions. Some have been demolished, while others have been

surrounded by the city. Only a few remains of the numerous city walls are left. The seventeenth century "New Walls" are the ones best preserved.

Today, the forts belong to the State Patrimony Office and cannot undergo modifications that could alter their original structure (Finauri, 2006).

Most of the forts are real highlights of the Genoese landscape, such as the Sperone, the begato, the Puin or the beautiful Diamante.

http://www.fortidigenova.com/