# Chapter 33
# Digital Tools for Urban and Architectural Heritage

**Michela Cigola**
*University of Cassino and South Latium, Italy*

## ABSTRACT

*The aim of this chapter is focusing on experiences that combine an analysis on territorial, urban and architectural scale with computerized techniques of representation. These experiments (conducted in PRIN 2006 and 2008 national researches) had as focus the use and development of information systems to test their efficiency as an aid to analysis and survey of the Cultural Heritage, specially Urban and Architectural Heritage. Particularly, the aim of this chapter is focusing on experiences that combine an analysis on territorial, urban and architectural scale with computerized techniques of representation.*

## INTRODUCTION

This chapter intends to focus on the research and study path carried out by a group of lecturers from the Documentation, Analysis, Survey of Architecture and Territory Laboratory - DART ([1]) who work at the Department of Civil and Mechanical Engineering ([2]) of the University of Cassino and Southern Lazio, which has been working at length in the field of the knowledge, preservation and conservation of Cultural Heritage, in particular Urban and Architectural Heritage.

Particularly, the aim of this chapter is focusing on experiences that combine an analysis on territorial, urban and architectural scale with computerized techniques of representation. These experiments had as focus the use and development of information systems to test their efficiency as an aid to analysis and survey of the Cultural Heritage, specially Urban and Architectural Heritage.

The results achieved in the course of several Research Projects of Relevant National Interest (identified in Italian by the acronym PRIN) are detailed below. These projects between 2002 and 2012 ([3]) enabled our research team to gain experience in a variety of ways with digital tools and Information Systems, testing them on various forms of Cultural Heritage with applications that were quite innovative in those years.

## DIGITAL TOOLS AND INFORMATION SYSTEMS

Without dwelling on the many definitions that have come into being with regard to Information Systems as their applicability evolved, one can simply and briefly consider them, on the basis of their general use, as the union of a database with the information vectors [*point, line or polygon*] or rasters [*centre of the pixel*] of the digital cartography [*georeferenced*] that is used (Maguire & Rhind, 1999).

This kind of structures, if properly designed, are a dynamic and integrated system for the ongoing management of information on the part of the territory to which they relate, focusing on the transformations to which the latter is subjected (Maurelli 2006).

If the founding principle of Information Systems is the desire to represent reality in order to boost its knowledge and therefore manage it, their main feature is the way in which they represent reality itself: by making it possible to show a multiplicity of, or potentially all information on a single sheet of map [*overlaying*].

The process is made possible by the capability these systems have to create on maps different themes via the connection of databases to the representation of the elements that are the object of study, and to "intersect" the information gained, providing the complete displaying of results without any loss of legibility.

Because of these features, Information Systems are playing an increasingly important role as regards issues relating to Urban and Architetural Heritage, because they make it possible to develop different analytical methods in relation to the spatial forms and their different scales of representation, or to environmental modelling, which is generated by the 3D capabilities of the systems themselves.

Currently the features of these IT facilities, which have been designed to manage spatial data on maps at scales between 1:100,000 and 1:1,000, lack *editing* in the three-dimensional modelling at scales between 1:50 and 1:10; therefore, representations on these scales are handled in CAD environments and are subsequently acquired on request by the system, with procedures that have not yet been completely defined, in particular as regards particularly complex graphical models (Longley, Goodchild, Maguire & Rhind, 2001).

On the basis of these premises, our work began in 2002, with an early experiment that then had a high degree of innovation: the project was the planning and execution of a Geographic IT System applied to Cultural Heritage, in particular to urban heritage.

Our attempt was based on the belief that the digital tools constituted by IT Systems were and still are an adequate means of representation with which one can learn about and therefore enhance the cultural heritage of our country, and manage the data acquired through the gathering of documentary material or metric surveys; that is, the most typical tasks relating to the analysis and the knowledge of architecture and urban fabric (Cigola, 2010).

## CULTURAL HERITAGE, URBAN HERITAGE, AND ARCHITECTURAL HERITAGE

"Many of the terms that define the objects of our cultural heritage have undergone a transformation over the years, which is also revealing of the conceptual evolution that has been at the basis of the Italian legislation on this matter.

As the notion of cultural heritage evolved from that of "art object" or of "antiques and fine arts," likewise the notion of architectural heritage ([4]) has evolved from that of "monument"; by this word (from

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