# CIÊNCIAS SOCIALMENTE APLICÁVEIS:

## INTEGRANDO SABERES E ABRINDO CAMINHOS

DAVID GARCÍA MARTUL

(Organizador)

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## PRÓLOGO – VOLUME I

La redacción de un prólogo nunca es una tarea fácil, más aún cuando se trata de la presentación de un libro de temática interdisciplinar y transdiciplinar en el campo de las ciencias sociales aplicadas. Es interdisciplinar porque los trabajos que aquí se presentan utilizan un amplio abanico de técnicas de investigación para investigar su objeto de estudio especializado. Así es común encontrar trabajos que por la técnica empleada podríamos pensar son propios de la Antropología y la Sociología. Sin embargo, por el objeto de estudio tratado nos ha parecido más pertinente situarlo en el campo de la Comunicación. Por tanto, hemos dado relevancia al objeto de estudio frente a la metodología investigadora para determinar el campo temático de cada trabajo.

También consideramos que **Ciências Socialmente Aplicáveis: Integrando Saberes e Abrindo Caminhos** es un libro transdisciplinar porque los resultados de las investigaciones son aplicables a muy distintos campos del conocimiento; es decir, una investigación sobre alfabetización mediática puede muy bien ser aplicada tanto al campo de la Educación como a los campos de la Comunicación y la Sociología.

Sin embargo, previa labor de preparación de este prólogo hemos llevado a cabo una labor de análisis de contenido temático de cada uno de los trabajos aquí presentados. Su resultado ha sido un índice desarrollado por un metódico trabajo de selección de los descriptores más acordes a la temática y objeto de estudio de cada capítulo. Para la selección de los descriptores hemos seguido una herramienta, consensuada por la comunidad internacional, como es el Tesauro de la UNESCO; pues en él, se presenta de forma homogénea y normalizada la manera de designar cada uno de los campos del conocimiento. Y si bien debemos considerar toda herramienta de descripción como condicionada por el contexto ideológico, plasmado por sus sesgos y matices socioculturales, de la institución que lo edita pero que aporta un instrumento de navegación por las distintas materias que conforman el mapa de conocimiento de nuestro libro.

Es pues con ello que hemos procurado, de forma estructurada y sistemática, facultar al lector para introducirse en los heterogéneos contenidos del libro de una manera progresiva, armónica y lógica.

En este **Volumen I** se incluyen los trabajos relativos a los campos de Antropología-Sociología, Educación-Alfabetización Digital y Comunicación-Divulgación-Social Media. El criterio seguido ha sido agrupar las materias que en el campo de las Ciencias tienen como foco principal no el desarrollo de actividades económicas, sino el estudio de las actividades sociales.

En el campo de la Antropología-Sociología hemos incluido diez trabajos de investigación que tratan desde aspectos concretos del individuo y por tanto pertenecen al campo de la Antropología hasta aquellos ligados con el análisis de las sociedades y que por tanto entendemos estarían más ligados con la Sociología.

En el campo de la Educación-Alfabetización Digital hemos incluido catorce trabajos agrupados bajo el criterio de análisis y propuestas de mejora del proceso educativo y alfabetizador.

Cierran este volumen seis trabajos propios del campo de la Comunicación-Divulgación y Medios Sociales. En este campo el criterio de agrupación seguido ha sido recoger propuestas y reflexiones cuyo eje central es el proceso de transmisión, comunicación y divulgación de mensajes entre la comunidad ciudadana. Por tanto, son trabajos cuyo objeto de estudio primordial es el mensaje informativo.

Esperamos que el presente volumen de **Ciências Socialmente Aplicáveis: Integrando Saberes e Abrindo Caminhos** les resulten de interés pues busca proporcionar una foto fija del estado de la investigación a través de un grupo heterogéneo de trabajos aplicados y previamente evaluados sobre distintos temas comprendidos en este campo. Con ello procuramos al mismo tiempo sugerir futuras líneas de investigación a desarrollar a partir de los textos aquí publicados para todas aquellas personas ligadas a la actividad académica.

**David García Martul**
***Universidad Rey Juan Carlos***

## SUMÁRIO

### ANTROPOLOGIA E SOCIOLOGIA

# CAPÍTULO 22

## AN APPROACH TO STUDY THE MEDITERRANEAN MODERN AGE DEFENSIVE NETWORKS WITH RELATIONAL AND CONCEPTUAL MODELS FOR DATABASES AND CMS[1]

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**ABSTRACT:** This paper presents a possible approach to study analytically the coastal defense structures, and in particular, the coastal defense towers of the Mediterranean, using some of the powerful tools made available by Information Technology. This methodology will focus itself to the building of an open database inspired to the relational and conceptual models. Studying the defensive systems under every aspect means to resort to multi, cross and transdisciplinary analysis. The creation of a collector that gathers information of different contributions will help in understanding some aspects not immediately observable. Adding new correlations between seemingly unconnected elements with the help of information on the history, chronology of events, construction data, interaction with the territories and peoples regarding to the power and economic systems from which they depended, helps in the global vision of the defensive systems and their subsystems.The study and implementation of an integrated database covering all this information and that could generate contextual views based on the needs of study and analysis, it can be used to gather information and increase the efficacy of the research on defensive systems to be integrated both on current and future projects that deal with the same themes. Once populated the database with different contributions, it could be integrated furthermore with useful information coming from other different sources and embedded into several open CMS (Content Management Systems), GIS (Geographical Information Systems) or VE (Visual Environments) regarding the same argument, not to study the monument "in itself", but inserted within a system of relations and thematic aggregations that can promote further conceptual ones.

**KEYWORDS**: Digital Humanities. Database. CMS. Modern Age fortification networks. Mediterranean.

### 1 INTRODUCTION

The modern data treatment and management offers many ways to manipulate and interface systems, information and datasets. What is important for scholars and decision makers as well, is the availability of as powerful as possible tools to manipulate and

[1] The original version of this article was first published by the University of Alicante (2017), in the conference proceedings of the "International Conference on Modern Age fortifications of the Mediterranean Coast".

interpret data's multiple meanings depending both on the observer and on the point of view from where they are seen. Even if there was a large debate around late 70's and early 80's between network model, relational model databases and many other models such as hierarchical, we'll focus our attention on the "Relational" ones, the more used and the more known today, since E.F. Codd invented this model while working at IBM in 1970. Relational DataBases (from now on RDB) and the Relational DataBase Management Systems (from now on RDBMS) consequently, are powerful systems to manage datasets basing their connection on relations between the entities that make up the database itself. To complete the scenario of what we are talking about it's due to cite Peter Chen who devised, in 1976, the E-R model (Entity-Relationship Model) to represent, conceptually, the interactions between different objects inside a relational DataBase (DB).

While planning a DB we have generally to pass through three independent and consequent levels, which are: conceptual, logical and physical project. In the past, Relational Model and the later E-R Model have often been confused each other. Simplifying, we can only say that Chen's E-R Model is the paradigm most used in the conceptual design phase, while the Codd's Relational Model is used for the logical design phase. Thus, it allows us to describe the conceptual schema of a real situation without worrying about the efficiency nor the physical design of the DB. So, we're safe in saying that if we would transform the E-R Model into the Relational one each important "entity set" with its relationship set and attributes, would define a separate "table" with its tuples, attributes and attribute's domain.

## 2 DBMS AND GIS

The most common RDBMS today available are the heritage of Codd's intuition and are divided into two main categories: proprietary and open source. Among the first one we can notice Oracle as the most important reality in the market, even if MSSQL (Microsoft SQL), IBM DB2, Sybase are valid alternatives too. For our purposes, we will consider open-source solutions that are quite sufficient to satisfy our needs, such as MySQL (recently acquired by Oracle Corporation) and PostgreSQL, both leaders of the open-source scenario. They are both stable and strong DBMS that can guarantee the ACID properties (Atomicity, Consistency, Isolation, Durability) of a DB. While the first one is more oriented on web applications and always present into the LAMP, MAMP or WAMP platforms (Linux/Mac/Windows, Apache, MySQL, PHP) as engine for CMS (Content Management Systems), the second one is equally stable, but more oriented on GIS (Geographic Information System) applications with its powerful extension PostGIS.

This important section of Databases, that belongs to the wider academic discipline called Geoinformatics, is very useful to represent data sets considering their whole geographic aspects. On one side this is very valuable when we try to analyze areas, visualizing its related data on a map, on the other side we can drill down historical, social or economic data, looking them connected each other into a map from different new perspectives.

## 3 CONTENT MANAGEMENT SYSTEMS (CMS)

A CMS is a platform that allows us to manage data and collect structured information easily readable within an Internet browser. To do this is not needed any programming skill or complex knowledge on programming languages nor IT systems. Nowadays CMS are easy to install, ready to use and easy to maintain. For these reasons, they are very diffused and daily used by millions of users. Even if their main use is to build a *wiki-wiki* source or a blog, we can use them for other particular purposes, modifying the main structure and shaping it on our needs. A CMS is composed by a Server Operating System, an active web Server installed on it, a database and a programming language for web applications. The most used archetypal model of web service stacks is LAMP, an acronym that means Linux, Apache, MySQL, PHP. Without explaining in deep each component of this platform, we limit ourselves to say that this system needs an operating system (Linux, Windows, Mac OS X, others...) to host a web server (Apache) that presents, through web pages written in PHP, the data stored in a database (MySQL). In the following paragraphs, we will focus on the design of the database on which the chosen CMS could base itself to present the data.

## 4 THE HISTORICAL SOURCES, MACRO AND MICRO INFORMATION

To study the Mediterranean defensive networks we have many sources, which tell, each, some piece of their history from different perspectives. To acquire economic information, we can use parliamentary reports or trade reports, but not only. To have geographical information we can use army reports, public or secret maps, sketches, paintings, views, but not only; to have border definition or land use we can take a deep look into notary's deeds, church's registers and records but not only, and so on. These ones can be used in addition to emphyteusis (perpetual lease) to know detailed dimensional and economic aspects which are difficult to extract from other official sources, and, somewhat, they are very useful to understand everyday life and habits, sometimes barely described elsewhere. All the macro information that we can infer from objective aspects, like placement, architectural and dimensional parameters are quite easy to analyze for

scholars, simply using patterns that have been settled step by step. Other microelements, less easy to notice, arose from such kind of documents and from analysis and correlation of complex crossed studies of several disciplines. The intent of this paper is to propose a simple approach to the defense structures' study distributed in the territory, including the towers, their relationship both with the strongholds from whom they depend, the lands themselves and landscapes in which they're placed, with the help of the IT resources. It is very difficult to have a homogeneous descriptive model for every single ring of this chain, such as lands, villages and its folks, rulers, army generals, towers, cities, citizens and so on. On the other hand, it is possible to start to normalize information in a dynamic way, adding missing or somewhat useful detail about every single component of the complex modern age's society.

## 5 METHODOLOGIES AND MODELS

Designing a life cycle of an IT system, we have to consider, usually, the following activities: a) the "feasibility study" to define as precisely as possible costs and priorities of all components realization; b) "The collection and analysis of requirements" which consists in the study and analysis of both properties and functionalities the information system must have. This phase requires the suggestions of the end users who will use the system itself and starts to shape an informal, but complete, description of data involved, operations on them, and both software and hardware requirements of the IT system dedicated to its management; c) "the design" that is divided into data design and applications design: the first one focuses its attention on data structure and organization, while in the second one are defined the characteristics of the application programs; d) The "Implementation" during which are applied the characteristics defined during the design phase; e) The "validation and testing" one, that is used to verify both quality and functionalities of the IT system considering as best as possible every operating conditions; f) The "Functioning" phase that is definitive if no malfunctioning or bugs occur. After all these phases, and after this last one, the system can run autonomously with periodic management and maintenance operations. For the purposes of this paper, we focus our attention on the design, following a simple but effective engineering principle: analyze the whole design project with a clear separation between the "what" we are representing in a database and the "how" we can do it. Thus, to set a flow in the design process we can split the design into three main steps: "Conceptual Design", "Logical Design" and Physical Design". Dropping the physical one, we will only outline the conceptual and logical ones, leaving the more technical to the IT experts, DB designers and DB administrators as well.

## 6 CONCEPTUAL AND LOGICAL DESIGN

The aim of the conceptual one, is to represent informal specifications of the realities we want to model into formal and complete description, but independent from representation criteria we'll use in the database itself. The final outcome of this process is known as "conceptual schema" and refers to the conceptual model of data. It belongs to the abstraction layer, which describes from a high level the data organization without care about the implementation aspects. The subsequent logical design strictly depends from the previous one, and it is a translation of the conceptual schema that must fit with the data representation model of the DBMS we'll have chosen. The logical schema obtained from the logical model, even if still independent from the physical details, allows us to describe data more and more fitted to the DBMS in use through verification techniques also known, in the relational data models, as "normalization". We can summarize by saying that the respective results of each phase of the most used conceptual model, the E-R one, are the following: starting from some documents, prerequisites, users' needs, it's drawn an E-R schema which describes the database from a conceptual level; this representation is converted into a relational schema made by a collection of tables. Finally, data are defined by dimensional constraints, which are thus the physical description comprising type and dimensions of fields.

## 7 MAIN MODEL CONSTRUCTS

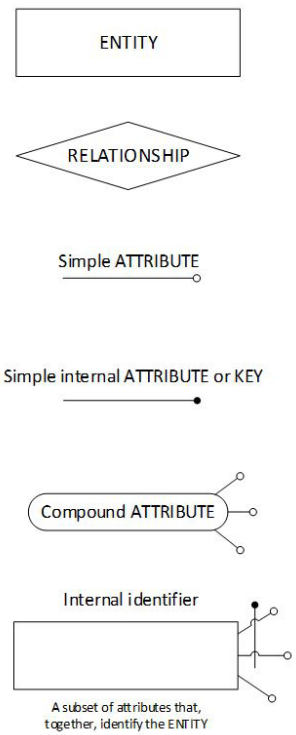
The basic constructs of the model are: Entities, Relationships, Attributes (simple or compound ones), Cardinalities both of relationships and attributes, Identifiers (internal or external ones), Generalizations and Subsets. Let's take a quick look to each of the first three ones: the Entities usually represent classes of autonomous objects, each with common properties such as "CITY", "PERSON", "KINGDOM", "KING", "ARMY", "GARRISON", "TOWER", etc. They are graphically represented by a rectangle (and | | in plain text). The Relationships usually represent logical bonds between two or more entities. Some examples are <PROVENANCE> between |CITY/VILLAGE| and |PERSON|, <BELONGING> between |PERSON| and |GARRISON| or between |KINGDOM| and |KING| as well. Occurrences of a Relationship are named umpteen (nth numbers, tuples), or simply couple/pair if there is a binary relationship between two entities. They are graphically represented by a rhombus (< and > in plain text). The Attributes, are basic descriptions of both Entities and Relationships that are related to the reality we're representing e.g., possible attributes for the Entity |TOWER| are "NAME/NAMES", "CODE", "BUILDING". These last Attributes linked each other can be grouped by to compose a "compound" attribute, but to avoid too many complexities is advisable to use atomic attributes every

time is possible. The “compound” attributes are graphically represented by a rounded rectangle, while the single (or atomic) attributes, are graphically represented by a line with a terminal circle. If the attribute is a unique identifier, also called “key”, the corresponding terminal circle is black. For simplicity we don’t consider cardinality of both relationships and attributes, it lies outside our speech, but when designing a database, it’s very important to assign a cardinality to each of them, to make safe the referential integrity constraints.

## 7.1 TOWERS ENTITY, RELATIONSHIP AND ATTRIBUTES

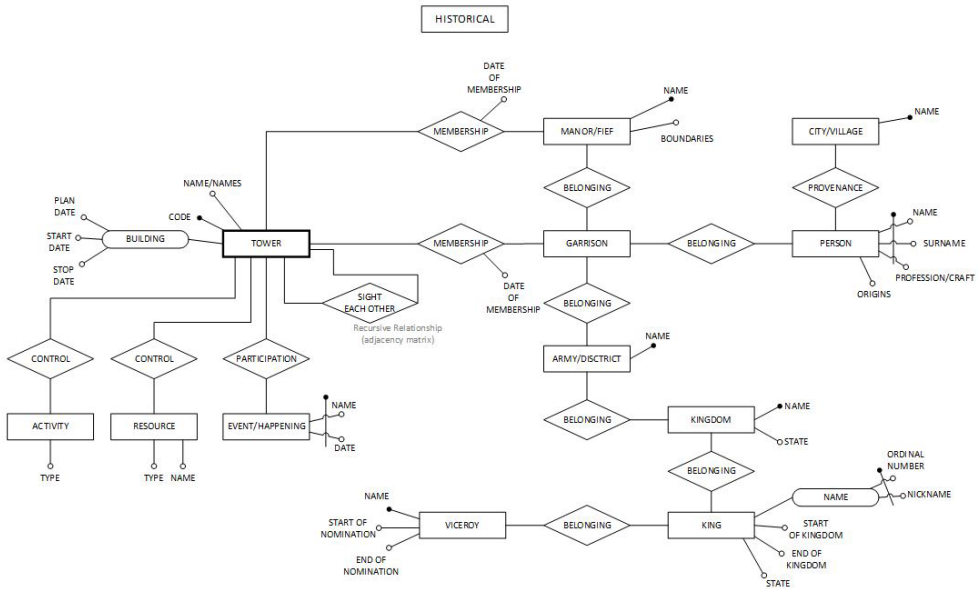
To give a basic idea of the importance of databases and its contents, let’s try now to define some aspects of the entity |TOWER|. One of the approaches we can follow, is to divide the different aspects that involve the object of our attention. To simplify the logical classification for each of the tower, we’ll consider only Historical ones, but Geographic, Technical, Economic and Bibliographic /Archival aspects can be iterated with the same graphic technique exploding each characteristic. Let me say that this is one of the several approaches we can follow, and it may not be the best or the more exhaustive one. However, we’ll try to represent a simple reality with this raw simplified model, even if with its intrinsic complex implications are not apparently visible to neophytes.

Fig. 1 - Some E-R basic Constructs and Symbols.



The following schemas can be used, and further well integrated as well, to describe a generic defense monument into its context. Here it is applied to the towers.

Fig. 2 - Conceptual Schema from Historical point of view focused on the Kingdom of Sardinia's towers.




Just few words to explain the reading keys of such kind of representation. As anticipated before, the main subject in bolded rectangle is the |TOWER| from which are derived some relationships, described in general, into rhombus versus other objects described into rectangles too. One word about the attributes and the difference between simple and internal attribute. Among the attributes of |TOWER| there is one labelled as "code" with the black terminal. In this case we've identified a unique identifier, called KEY, needed to distinguish every object inside the entities' subset, without ambiguity. In this case, e.g., the Entity |TOWER| has one or more attributes, but every occurrence is identified as unique thanks to the "code", which acts as the identifying key. The "name" couldn't be a key because we can have, somewhere in someplace, more than one "monument" with the same name, so falling into ambiguity. Another useful compound attribute is the "building" one: we can specify its plan date, the build start and stop date. Other attributes can be added based on the needs. Then the monument could have one or more relationships with other Entities. With this method it is possible to broadly understand how to read this schema and the following one. The particular recursive Relationship <SIGHT EACHOTHER>, referring recursively to the Entity |TOWER| itself, take into consideration which other towers, each tower can sight from its position. This simple information, gives us the idea of all lines of sight, as seen from each observing point, so

that we can infer, simply analyzing the resulting adjacency matrix, the propagation paths of the alarms from peripheral places till to the main command stronghold. With the same logic approach, we can extend this representation for further aspects from Geographical, Technical, Economical, Bibliographic-Archival points of view for a complete vision of these monuments (without commenting them for brevity).

Fig. 3 - Conceptual Schema from Geographical point of view focused on the Kingdom of Sardinia's towers.

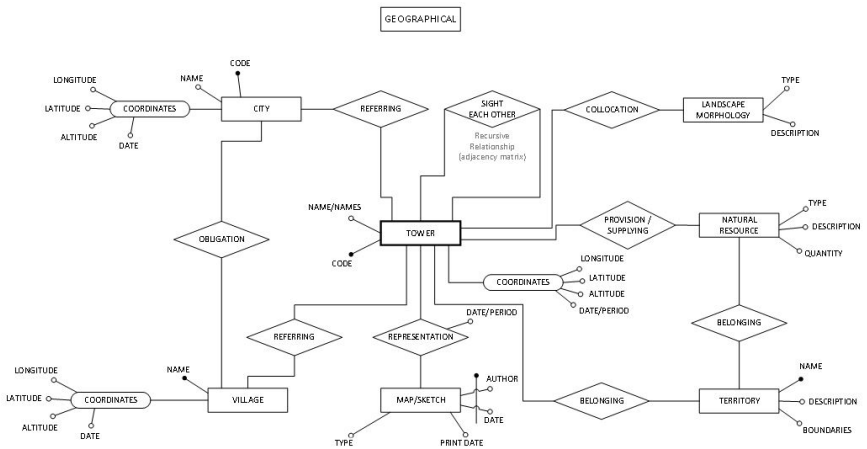



Fig. 4 - Conceptual Schema from Technical point of view focused on the Kingdom of Sardinia's towers.

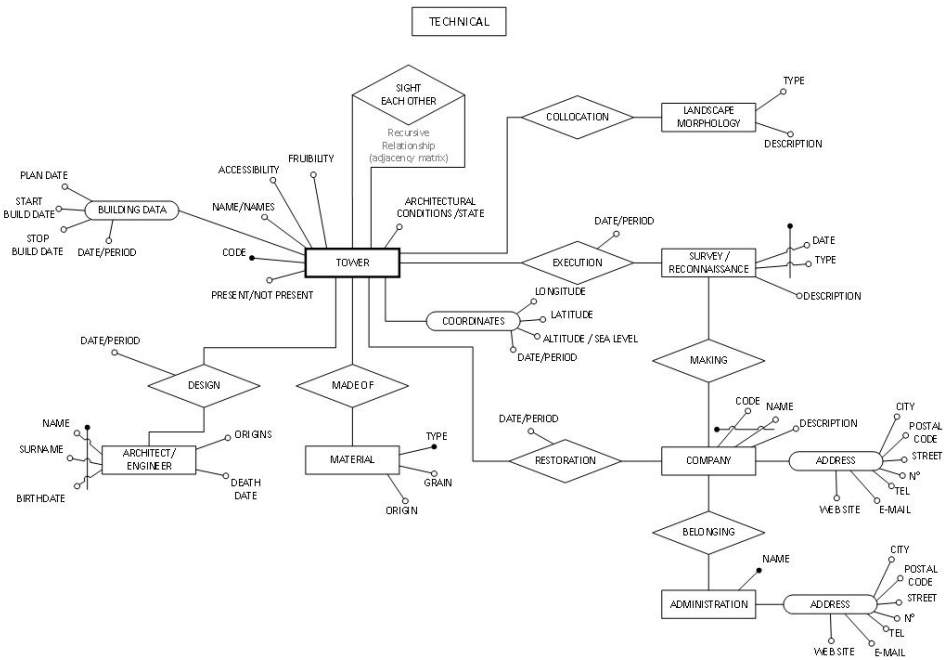


Fig. 5 - Conceptual Schema from Economical point of view focused on the Kingdom of Sardinia's towers.

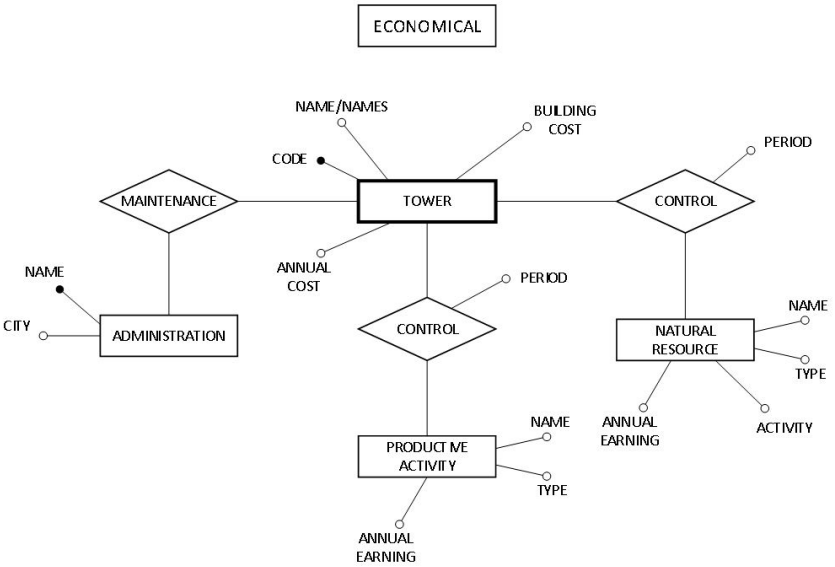
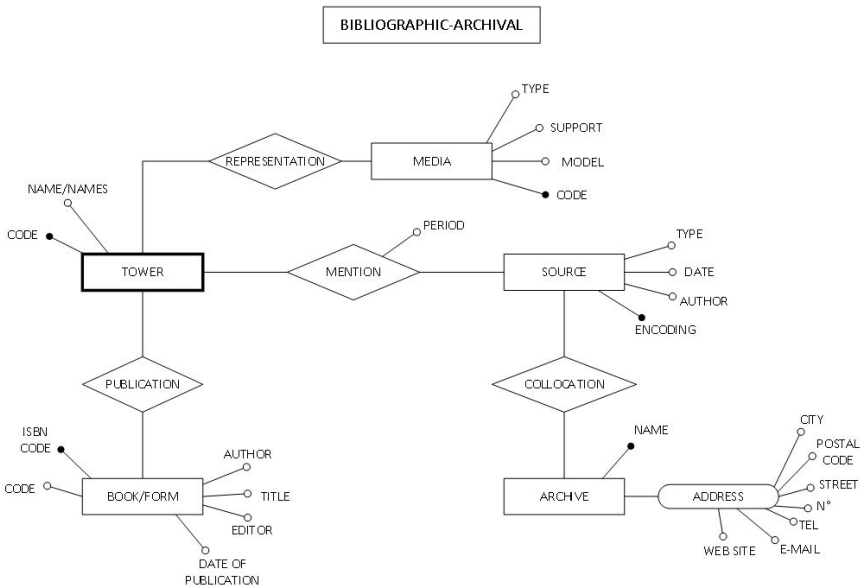



Fig. 6 - Conceptual Schema from Bibliographic-Archival point of view focused on the Kingdom of Sardinia's towers.

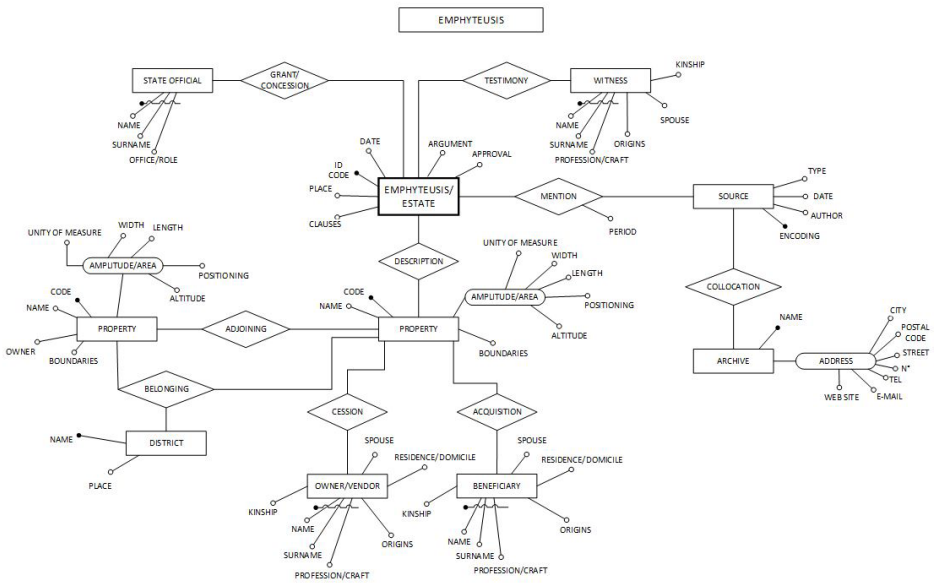



## 8 TOWERS AND RELATED STRONGHOLDS

Using this proceeding, it is possible to extend the classification and both the conceptual and logical representation of every reality we want to model. Joining the keys of each subset, seen from the different perspectives we've chosen, it is possible, potentially,

to cover and describe all the aspects of the reality from which we've started. Among these ones we can consider, in deep, a city, a stronghold or every else subject. In particular it is one of the future intentions of our institute, to analyze the stronghold of Cagliari, studying it as anticipated before, starting from sources like notaries' deeds and emphyteusis contracts through which we have detailed descriptions and precise references to people, kin groups, and in general on social organization of the city and landed estates near the urban settlement. A method already used by other scholars, which can benefit from computer tools linked to a polyhedral database. The following schema shows the |EMPHYTEUSIS| entity, which can be represented by all these entities, their attributes and mutual relationships. The model can be expanded and used as a basis for further models, or well integrated by other information, evidences, reports and labels, to study in depth the argument with the effective collaboration of those interested on this subject.

Fig. 7 - Conceptual Schema of a database subset focused on emphyteusis contracts. Model currently applied to the study of the emphyteusis held in the State's Archive of Cagliari (ASC).

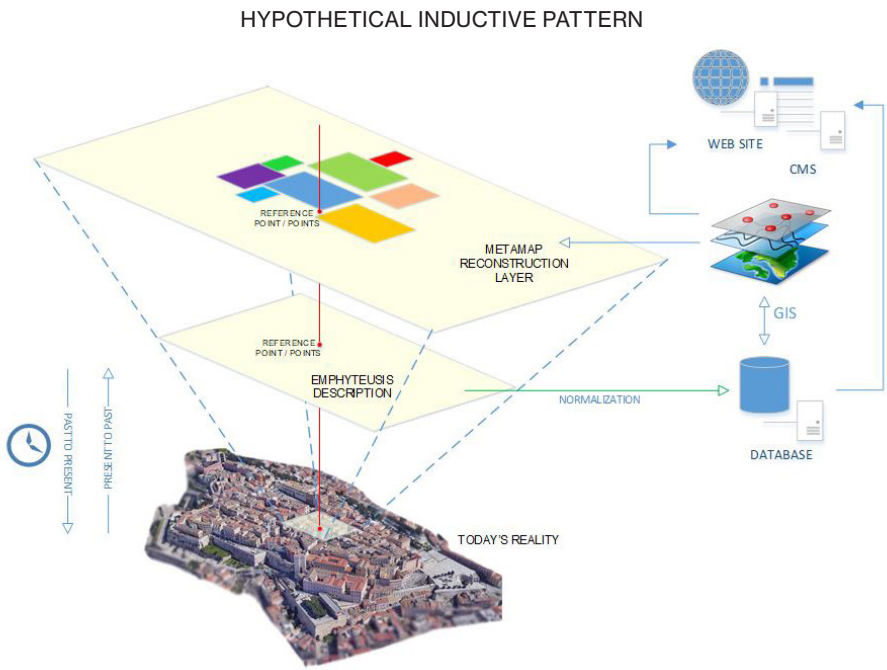



## 9 USING METADATA FOR META MAPS

Another challenge we would face, moreover we never attempted before for this specific use, is to translate all the attributes of every entity we have defined before, and hypothetically of each one emerged from the emphyteusis, into data and metadata expressly translated and normalized so that they can be used in other contexts. The difficulty is to have as precise as possible measuring units, starting from fixed reference

points, to locate the plots and delimit their boundaries as described in the sources, to be transposed after on a map. Such kind of ancient units could be: *canna*, *palmus*, *passus*, *starellus*, *salma* etc. Being possible to make a conversion between old measurement units and modern ones, the neighborhood and its borders could be hypothetically reconstructed and visualized with empiric, or better, heuristic algorithms, to draw a *meta map* as close as possible to reality, interpolated with adjacency matrixes, polygonal shapes, vector coordinates following the descriptions inside the reference source. Thus, to represent single estates or plots, little portions of a neighborhood or a suburb, graphically approximated and displayed into a visual environment, materializing one of the possible fictitious, reconstructed representation referenced with the scarce reference points given in the documents. Very difficult task, but not impossible.

Fig. 8 - Hypothetical GIS reconstruction, from emphyteusis' descriptive data, about Cagliari and its publication flow on a CMS website (photo from Google Earth™ 3D edited with PhotoShop CS4 and VISIO by Luigi Serra).




## 10 META MAPS ON GIS, LOGICAL MAPS, CONCEPTUAL MODELS AND VISUAL ENVIRONMENTS

There are many solutions today, proprietary and open source as well, that help us in such kind of representation I've described before. Once we have a populated container of multiple data, we can use the whole database extracting the information we need simply

making queries, projections or views with SQL language or other similar interrogation tools. Displaying geographic information about a set or a subset of data, gives us a visual depiction most effective than tabular or textual ones. We often waste time data mining trying to gather information from a huge, not homogeneous amount of data, while it could be most effective to have a map with incidences, density or such kind of information related to the object inserted in its geographical context. Toponyms and different spatial synonyms could be treated more efficiently if related each other, compared and studied with others similar. Among the abundant free tools that we can use for this task, there are two interesting open-source solutions that are growing and becoming more and more popular that fit well to the Humanities: QGIS and GEPHI.

## 11 CONCLUSIONS

Modelling the reality using the Information Technology simply extracting data from descriptive documents, it is a tricky challenge in representing a picture of the modern age's social, economic and military organizations. This passes through the catalyzation of the IT specialists' attention on humanistic contents. Strong skills in programming and in software design can benefit many aspects of Digital Humanities. IT solutions are quite always very important in helping the job of researchers: different views of the same argument are fundamental to find new reading keys about that argument itself. It is not a new that many times, when we look at something differently than we've made it before, we are able to discover new facts, from curiosities to important unknown aspects, even if we weren't looking for those at all. This contributes to describe, in full relief, the origins, the history of a place and its surrounding, adding new elements to the global knowledge. Through this vision, and the evidences, we can study the relationships between different actors of the defensive system of the kingdom of Sardinia as a part of the more complex Mediterranean defense system of the Hispanic Monarchy of the modern age. The links between the peripheral structures and the control centers of the main strongholds can be observed as a complex control system of the territory, the population and the productive activities. All the interests orbiting around them from the Historical, Geographic, Technical, Economic, and Social aspects emerging from the archival sources, give us a stereoscopic photography through which observe that period so diversified.

## 12 NOTES

RDBMS are a consolidated reality in everyday life. Through many applications, we use them in transparent mode without perceiving the complexity that stands behind,

but benefiting from the simplifications that they make us available. A colleague of our Institute has started to collect information taken from emphyteusis held in Cagliari's State Archive. Next step is to try to normalize data and test a minimal database that will be used into GIS platforms and Visual Environments, aiming to realize the base idea of this paper. I conclude with the auspice, that it would also be a collaboration request, to form a research group, including historians, archeologists, geologists, engineers, architects and IT experts, to deepen the feasibility of such a project idea.

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