VENETIAN BUILDING DIAGNOSTICS INFORMATION SYSTEM

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Riassunto

Il progetto concettuale del sistema informativo per la diagnostica dell'edilizia veneziana affronta due principali livelli: il livello territoriale e il livello locale (edilizio).

I due livelli operativi richiedono la capacità di muoversi con dettagli diversi passando dalla piccola alla media e alla grande scala in termini geografici e alfanumerici senza perdere l'integrità degli oggetti e garantendo, soprattutto, il mantenimento della congruenza territoriale e temporale delle informazioni. La questione di fatto, non si limita alla georefenza del singolo elemento ma risiede nella continuità dei dati nel sistema informativo durante tutti i passaggi di scala.

L'approccio alla progettazione del sistema informativo è stato avviato su due fronti principali: l'individuazione dei requisiti funzionali, l'analisi dei materiali e delle interazioni tra utenti e sistema. In merito ai requisiti funzionali sono state definite due aree: quella relativa alla fase d'inserimento dei dati nel sistema e quella della consultazione. Le interazioni sono state definite in relazione ai requisiti e ai materiali e alle attività dei gruppi di ricerca. Sono stati così individuati cinque principali gruppi di dati: 1.edifici; 2.tecniche costruttive; 3.strutture e materiali, dissesti e meccanismi di danno, fenomeni di degrado; 4.rilievi e analisi geometriche; 5.procedure, norme, capitolati.

Il prodotto, ancora in corso di definizione, è il modello UML (Unified Modeling Language) del sistema informativo formalizzato in casi d'uso e diagrammi classi e oggetti.

La finalità di tale approccio progettuale, fondato sull'individuazione corretta dei gruppi di utenti e delle classi d'informazione, è la garanzia nel tempo della flessibilità e della vitalità del sistema come corollario della sua utilità: questi principi sono, di fatto, le condizioni necessarie e sufficienti anche per un aggiornamento continuo.

Abstract

The conceptual design of an information system for a diagnostic survey of Venetian buildings tackles two main levels: territorial (spatial) level and local (building) level.

The two operational levels require the ability to move across small, average and large-scale in geographic and alphanumeric terms, changing details without

losing object integrity. The system must assure spatial and chronological congruency maintenance of the information. The main question, of fact, is not limited therefore to a single object georefence, but it resides in the continuity of data during all the passages of scale.

The approach to design of the information system has been started on two main foreheads: identification of functional requirements; analysis of materials and interactions between customers and information system. With respect to requirements two areas have been defined: that one relative to the phase of data entry and that one of the consultation. The interactions have been defined in relation to requirements and the materials and the activities of the research units. Five main data sets were been therefore identified: buildings; constructive technologies; structures and materials, damage and mechanisms of damage, phenomena of deterioration; metric and geometric survey; rules of procedure, norms and specifications.

The product, still in progress, is the UML model (Unified Modelling Language) of the information system formalised in use cases and diagrams classes and objects.

The information system will be founded on identifying correctly users groups and defining taxonomies and information classes. The purpose of such an approach, is to assure along the time flexibility and vitality like corollary of information system usefulness: these principles are, of fact, the necessary and sufficient conditions also for a continuous updating.

1   Introduction

In the phase of the conceptual design of whichever information system resides winning elements, because here requirements are defined, users characterised with theirs requirements, too, contents are analysed and well described.

The requirements to deepen such phase, relative to the approach of the design the system as like as essential activity, demands, therefore and necessarily, the communication between those who produces data and the designers of the system. The designers are not exactly software developers, but the interface between users and software developers.

At the same time the deepening of regarding methodological and theoretical aspects involved in the design of an information system purposely addressed to support the architectural preservation, involves the development of new reflections on the preservation plan. One opens a dialectic relationship among design, data flows, and knowledge and information system. The argument concerns on the operative principles of the intervention, and also on their relationship with the urban and regional planning.

The information system is not placed like alternative to the knowledge model of acquaintance of the architecture represented from the preservation plan and design, therefore as it is proposed from part of the updated architectural culture. It is one of the job instruments and of research; it contributes to that "operational

knowledge", who generates other knowledge. For its characteristics it is dedicated to the management, to data sharing and data flows and is this aspect that one must privilege.

The preservation plan is already a system of information because its contents are defined in the essential parts and in the relations with others. The formulation of the geometric survey, of investigations like structural analysis and materials (points of sample and analyses of laboratory) analysis and characterization, rather than the role of the documentary research, or the stratigraphic analysis of elevates, are all by now acquired on the methodological and operational plan.

It will be however necessary to define specific topics in order to avoid a generic and unfruitful result because if their contents are conceptual clear, it is equally clear amplitude, complexity and troubles to transform in database the relations generated from the contributions of the several disciplines. Of necessity it comes down to work by a modular approach that it inquires the topics of base of the preservation plan and the users objectives, and "it receives" developments dictates from future questions, always with the conscience that the information system is not exhaustive of the consistency of the analyses and results, but can address to the informative resources.

2   Territory and architecture in the levels of planning

The conceptual plan of information system for the diagnostic survey of Venetian building tackles two main levels: the territorial (spatial) level and the local level (building).

The spatial level allows to organise environmental problems that are only meaningful to this scale, but that are lend to determine informative requirement and deepening of investigations to the local and building scale. To this level it is necessary to have specialized information, even if general, to the aim of correct operating, in order to plan the intervention, in order to program the resources, to achieve strategic and main objectives and to understand relations between the parts, that constitute the territory in its unity, singularity and complexity. To the spatial level they compete, however, other information of general character that are intimately connected with the local level: The geologic and hydrographical conditions and those seismic that, influencing the mechanics of the ground and therefore the structural answer of the buildings, address the diagnostic techniques. Just as the general level and that particular one do not have clean borders, in so far as the construction of the information system must allow the coherent management of the levels and the interoperability of data.

The local level, in specific "the building", is indispensable for the data acquisition with an appropriated level precision suitable to supporting the restitution of information for the plan of preservation and the consequent planning activities. The participation to this scale demands detailed diagnostic and project action, supported from general knowledge about the context and other ones detailed of the building, aimed to resolve in the best way problems "reasonably" defined.

The work progress previews the definition in the detail of the levels territorial and local in function of requirement, the users and geographical and alphanumerical data.

3   Materials and data sets

The materials available for the total development of the plan are of varied nature: geographic and alphanumeric data, images, documents of text. Part of they derives from the analysis of documentary sources and cataloguing of examples in several the fields of the research (degradation and damage phenomena catalogue, abacuses). Others depend on investigation on the field dedicated to specific cases study: they are the structural diagnostic tests in situ and laboratory, the characterization of the materials, the building survey, the ground/building interaction in the foundation structures.

The location of the data set comes down from the contents of the entire project and it is articulated in the analysis of the data typology, of their form and contents, and of their relations.

The project is much articulating. His complexity is reflect also from the making competences reference to as many work groups. The first phase of analysis of the complex of the activities of the WP (Work Packages) has carried to characterize the following main data set:

- Buildings.

- Constructive technologies/techniques.

- Structures and material.

- Damage and mechanisms of damage, phenomena of deterioration.

- Geometric and photogrammetric survey.

- Rules of procedures, norms and specifications.

The information system therefore will be constituted from one first size of data, deriving from the acquisition and organization of existing sources and new data on the field according to specific formats.

A second size of data will regard the study of sample buildings from which acquiring specific data. The representation of results of diagnostic (the structures in masonry, armed concrete and ferrous materials, wood) is from defining in modality 2D and 3D in function of the level of deepening of the information.
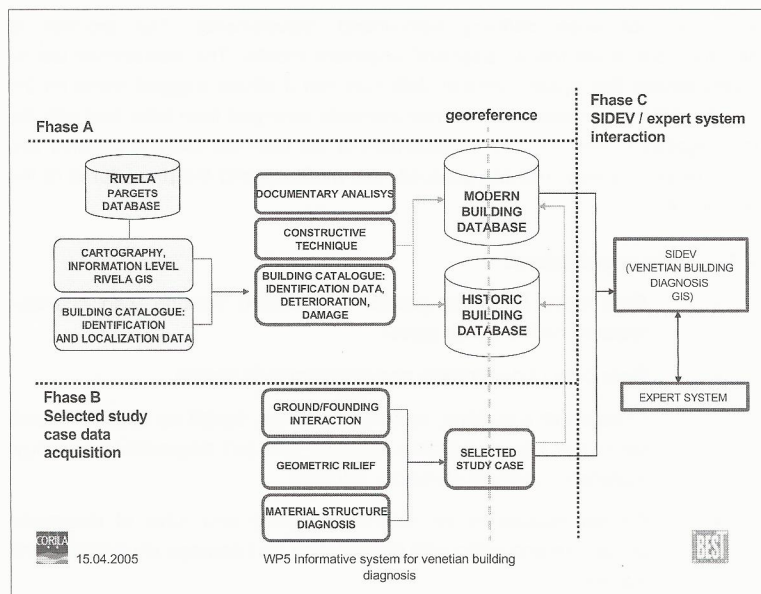
Fig. 1 – General scheme of the information system planning. The A phase regards the relations between the specific materials of the research and the geographic and alphanumeric database of the RIVELA system. The B phase evidences integration of the database of the A phase with data set deriving from the study cases; geographic localization of the building is the element that unifies the system. The C phase is dedicated to the interactions between the SIDEV (Information System for the Diagnostic of the Venetian Building) and the VMDS (Venice Monument Diagnostic System).

4   Analysis of functional requirements

This activity constitutes the premise for the conceptual organization of the database, through the appraisal of the information to insert, the location of the bases of external connected database, the query formalization to which the system must answer. Its development happens at least on two sides:

The first-one interests the contents of the information system;

The second one regards the technologies of the information: data typology (alphanumeric, geographic, iconographic) and software for the implementation of the prototype on geographic base.

For both it will not leave out off consideration the integration with the Corila/RIVELA database (database for the Searches on Venice and the Lagoon).

The complexity of the plan and the non-uniformity in the research development

ways do not allow defining beforehand requirements. The process of development of will follow "adactive" approach mostly. The interactions will be characterized that appear simpler definition and if others suggest some on the supply of the information and the requirements emerged from talks had with the investigators of the WP The development of the plan will follow a iterative and multidisciplinary way, refining gradually the methods and the procedures of the researcher.

4.1 Main requirement

- Data entry from the groups of research through web interface resident on the Corila server.

- Possibility of geographic and alphanumeric search.

- Location of a building, or same buildings, based on specific search keys: typology of building, damage and (or) degradation typology, materials, resistant elements, address.

- Further indications on diagnostic survey and rules of diagnostic procedure according with degradation and damage phenomena first survey.

- Further indications on the access to the expert system to forehead of determined situations of damage according with SIDEV users outcome.

- Integration with the existing systems.

4.2 Requirement to deepen

- Cross-sectional relations between the several DB of the SIDEV.

- Criteria of search

- Representation of the deterioration and the damage associated to the quality and by piece in the geometric and cartographic representation of the building.

  o Localization of the points of withdrawal of money of the champions for the characterization of the materials.

  o Localization of the points or fronts for the diagnostic in situ (masonries, wood).

  o Geometric survey of the cases study (restitution 2D and 3D).

  o Representation of damage and deterioration (restitution 2D and 3D).

- Relation between the table of the deterioration and that one of the damage, that is their integrated reading to determinate the state of preservation of the building.

- Regarding the variety of the produced materials and which will produce, it must define which will be organizes in database, which will be managed like enclose and which others are products that will not make part of the SIDEV.

5   Users groups

In the case of an information system dedicated to architectural preservation plan, the first analysis are about users (agencies, institutions, until to the physical persons) that they will use the system; in the second place it inquires the identified users for the tasks that are call to carry out through specific professional competences. It is implicit, but it is always better to remember it, that this phase is in tightened relation to specific well defined objects for the entire information system and to requirement, therefore to the contents and to the quality of data.

The determination of users, or user groups, is tackled in the respect of two main requirement.

The first one regards the access to data therefore like previewed from Corila.

The second one, inside to logic of the I.S., interests the location of data sets in relation to some typologies of users:

- Corila, client, administrative and technician referring and of the having plan role of validation of data and of the system.
- Researcher of the Institutions partners of the Corila.
- Agencies, Institutions or single researchers (user subscribed and authorized from Corila).
- Researchers of the specific project of research. They are specialized users because they are professional operators of the field and researchers.
- Skilled professional operators. It comprises various skilled professional operators with competences and different interests in relations to the building scale intervention.
- Common of Venice (urban and building scale). One characterizes from a part for the capacity of the institutional tasks (decisions, planning, allocation of resources). From the other it is part of the "Skilled professional operators" category as far as the activity of the technical offices (plan evaluation, control of the building activity, drafting of plans...).
- Superintendence to the Architectonic assets, the Landscape and the Historical, Artistical and Demoethnoanthropological Heritage of Venice and lagoon (BAPPSAD). It has institutional tasks in quality of supervisory body for the participations on buildings and architectonic wholes, subordinates to the State protection, with the

advanced competences of preservation skilled professional operator.

- Province of Venice (territorial scale).

- Magistrate to waters of Venice (territorial scale).

- Insula S.p.A, Corporation for the urban maintenance of Venice (urban scale).

They are users bearers of various requirements of information for which, to forehead of the interest for the entire complex of data of the SIDEV, some groups can be more meant or important of others. In some cases, draft then to inquire the usefulness to determine priority of display, or distances of search dedicates to you.

6   UML model of information system for the diagnostic one of the Venetian building

For the requirements understanding and their code implementation the information system works with UML language, useful to describe with graphical formalisms the complex systems operation. Through the use cases, based on a description in text and graphical shape, is possible to describe the interactions between the components of the system. The diagrams of classes are of use to list in way sufficiently detailed the same components. Other diagrams, like the diagram of the flows, will be realized subsequently, during the implementation of the system.

The first phase (illustrated in figure 2) regards the identification of elementary data deals you from the several WP. From the cataloguing system developed has been extrapolated the necessary generalizations to rationalization both of data entry and use. They had been identified all the elements that need of the definition of a thesaurus shared between all WP. It's important in fact to share a common set of definitions that it is widest possible, in way of being able to increase the possibility to lead analysis on the information collections.

Therefore some scenes have been described step by step: they are the sequence that characterize a determined interaction between customer and system, or subsystem and system.
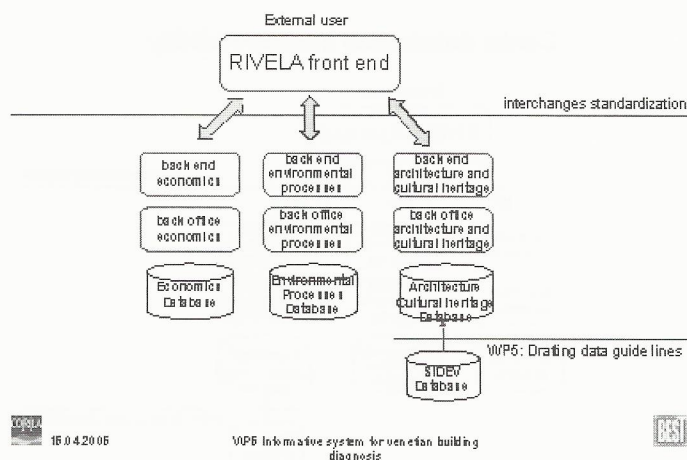
Corila databases interoperability

Fig. 2 – Work phases, from the analysis of the members of the information system is gone in the detail of the database, comprised the thesaurus. The application of the I.S. integrates the data supplies them to the customers, after the authorizations to the access. For the date entry they come *ad hoc* developed interfaces.

7   Conclusion

The conceptual plan demands not only the acknowledgment of the groups of users and the mutual collaboration, but the first interpretation of the relations between spatial information and local information.

To the definition of the users of information system often corresponds a directory of typologies reported to competences, roles, positions that are inside of processes. In truth beyond to the competences and roles, the communication between the groups is faced also and the possibility to surf inside various data set, as like as database users, or database processors.

To use data set and information from other user groups, must be offer a level of interoperability that does not force in rigid cages the job, but that it allows to share mutual the acquaintances on geographic and alphanumeric base. It is necessary an open system that allows trying new relations between observed phenomena, independently from observation scale.

Diagnostic and metric surveys, techniques, technologies and interventions will be stored updating information systems. Knowledge so collected can be worked by appropriate data mining. This way will be like one of the more interesting ways in order to develop theoretic and operational approaches to preservation of architectonic heritage, where every case is singular but not cut off from

context, so much that it will be, at the same time, exemplary of building and framework texture, where all is intimately and structural connected.
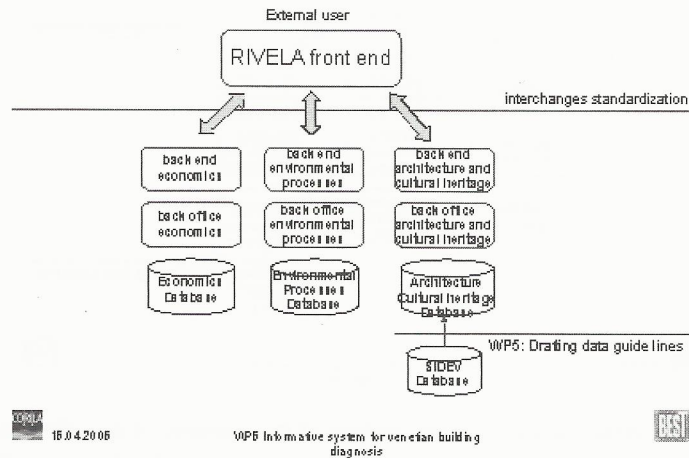

Fig. 3 – Corila database interoperability.

It is essential that the final product of the research is opened to other groups of users and decisional levels. The definition of objects passes from the phase of proposal to the operating phase through the work groups that of it articulate the definition.

This process must obviously recognize same ties:

a) pluralism data processing;

b) limited resources;

c) cooperation in the management of the procedures and the combined developments.

These inner and external aspects to the system require answers in terms of interoperability of data, whose existence will be guaranteed alone if to the technologies (hardware, net and software abundantly involved in operations derived from norms and standard as how much product from ISO-International Organization for Standardization and OGC-Open Gis Consortium) will place side by side positively a turned semantic activity to the use trans- and inter-disciplinary.

All the system will be subordinate to a political interoperability, revolt to sanction the legal value and the legal protection of the data. The interoperability will guarantee not by a unique System (comparable to the old hypothesis of a mainframe with several terminals), but a friendly front-end, accessible to all

workstations from a network.