State-of-the-Art Review of Building Inspection Systems

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Abstract: The scientific community is devoting more attention to the wide field of inspection, diagnosis, maintenance, and rehabilitation of buildings, including systems to support the inspection of buildings with anomalies. Since the activities of rehabilitation and maintenance are key factors in buildings' sustainability, it is essential to develop a correct interpretation of defects, supported by objective and adequate diagnosis means, with the goal of significantly increasing the quality standards of potential intervened buildings and their subsequent service life. In this paper, a brief revision of the scope of building inspection systems/methods is made, presenting some of the challenges in this expertise field. From the analysis of the inspection systems/methods found in the literature, it can be concluded that they all have a similar organization but none are entirely devoted to provide expeditious and objective information on on-site interventions. The importance of establishing a reliable Building Inspection System is demonstrated as well, in order to provide easy access to the most relevant information available on building pathology. **DOI: 10.1061/(ASCE)CF.1943-5509.0000839.** *© 2016 American Society of Civil Engineers.*

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Introduction

The use stage of buildings is by far the most important one of their service life, from economic and environmental points of view. A building lasts while it is able to meet the objective and subjective needs of the user, within the limits considered cost-acceptable and without harm to third parties (Haapio and Viitaniemi 2008). Therefore, there is a growing consensus about extending the service life of existing buildings (de Brito 2009).

In developing countries, the absence of political guidance and encouragement of the activities of rehabilitation and maintenance, combined with an economic setting that promoted new construction, favored suburban growth for decades. In this context, a paradigm shift in the construction sector is being felt, which involves changing the focus from new construction to the rehabilitation of existing buildings. In fact, when the buildings are subjected to rehabilitation and maintenance activities, the durability of the intervened construction elements is extended, increasing the building's expected lifespan (Amaral and Henriques 2013).

Despite the fact that each building is unique and presents different types of defects, it is possible to identify certain patterns when analyzing a significant sample of buildings. Through the systemic analysis of data collected during these inspections, it is possible to establish a reliable database that provides guidance to prevent and repair. Since the activities of rehabilitation and maintenance are key factors in buildings' sustainability, it is essential to develop a correct interpretation of defects, supported by objective and adequate diagnosis means with the goal of significantly increasing the quality standards of potential intervened buildings, and their subsequent service life. However, the buildings' inspection and diagnosis processes are quite complex, influencing the posterior intervention measures (Aguiar et al. 2006). Therefore, the identification, classification, and strategic planning of all stages of the processes in question will be essential.

The international scientific community is devoting more attention to the wide field of knowledge related to the inspection, diagnosis, maintenance, and rehabilitation of buildings, including building inspection systems that provide the characterization of its pathological state. A great deal of effort has been put into eliciting knowledge and reasoning strategies from engineering experts with the aim of building up computer models of their expert-knowledge-based models, in order to assist engineers in their decision-making processes (Farinha et al. 2005).

Although building management systems are commonly used in companies, the elements of asset value management, scheduling management, and energy consumption are usually the major focus of such systems. Consequently, the maintenance records section only offers brief details about repairs in relation to parameters such as time, cost, and location (Chang and Tsai 2013). However, building defects may compromise the building in several ways, such as structural performance or indoor air quality, and require expensive interventions in order to return the building to its original state. The absence of a section to assess the building's pathological situation may result in misdiagnosis on the part of the inspectors. Therefore, not using inspection and diagnosis systems, which will be from here on referred as Building Inspection Systems (BIS), may compromise the expected long-term performance of the most recent buildings (Amaral and Henriques 2013).

Research Methodology

The main contribution of this paper is to analyze the contents of existing databases on building pathology and provide an approach for future courses of action to optimize their potential applications by technicians. First, an analysis of the Building pathology databases was completed based on reference literature. A revision of the scope and characteristics of existing databases in different

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Table 1. Databases within the Scope of Building Pathology

Year	Method	Authors
1982	Defect action sheets	BRE
1985	Anomalies repair forms (in Portuguese)	LNEC
1993	Cases of failure information sheet	CIB
1995	Building pathology sheets (in French)	AQC
2003	Construdoctor	*OZ*—Diagnosis
2004	Learning from mistakes (in Italian)	BEGroup
2004	Patorreb	Patorreb
2009	Web-based prototype system	P. Fong and K. Wong
2010	Maintainability website	Y. L. Chew
2013	Building medical record	C. Chang and M. Tsai

countries, presenting some of the challenges in this field, is therefore presented in section "Building Pathology Databases." Next, a critical and comparative analysis of them was undertaken, going from simple databases to diagnosis support-platforms. The corresponding results are included in section "Critical and Comparative Analysis." Finally, a proposal for the development of a knowledge-based inspection, diagnosis and rehabilitation system for buildings was designed and is presented in the section "Way Forward" of this paper.

Building Pathology Databases

Towards the end of the 1980s, intense activity in knowledge-based technology led to the development of a variety of systems in a number of engineering fields, such as concrete bridge management (de Brito et al. 1997), dam safety assessment (Curt et al. 2011), or building energy management systems (Rocha et al. 2015). The main challenge of these applications was to elicit knowledge and reasoning strategies from engineering experts so that a computer model of such expertise could be developed to assist engineers in a variety of tasks.

The on-going advances in information and communication technologies are changing many aspects of engineering problem-solving as well as the decision-making processes of experts, also in what concerns building inspection systems. Subsequently, the most important databases within the scope of building pathology will be chronologically presented, in accordance with Table 1. The identification and selection of these databases were based on a comprehensive search made in refereed journals and conference proceedings.

Defect Action Sheets

A United Kingdom-based organization, Building Research Establishment (BRE), which specialized in buildings, organized a series of reports that constitute an important database on buildings and can also provide feedback to building professionals (BRE 2001). On this basis, 144 sheets called Defect Action Sheets were published between 1982 and 1990, whose aim was to provide the necessary information to professionals in the construction sector in order to prevent and correct possible defects of buildings (CIB W086 on Building Pathology 2013). The files, each consisting of two A4-sized sheets, were structured as follows: (1) description of defect; (2) description of causes; (3) preventive measures; and (4) references and supplementary information. An example of a Defect Action Sheet is presented in Figure 1.

These Defect Action Sheets have been republished as a complete set (BRE 2001). Currently, BRE periodically issues a vast list of publications in the field of construction in the form of files or guides known as Digests, Information Papers, Good Building Guides, and Good Repair Guides (CIB W086 on Building Pathology 2013).

Anomalies Repair Forms

In the proceedings of the conference *1st Meeting on Conservation and Rehabilitation of Housing Buildings*, held in Lisbon in June 1985, a methodology for building pathology assessment was presented that would be adopted in the preparation of the pathology reports called Anomalies Repair Forms, which were supported by English literature sources (LNEC 1985). The whole set of pathology reports is classified in three major groups: (1) structural defects; (2) nonstructural defects; and (3) systems and equipment.

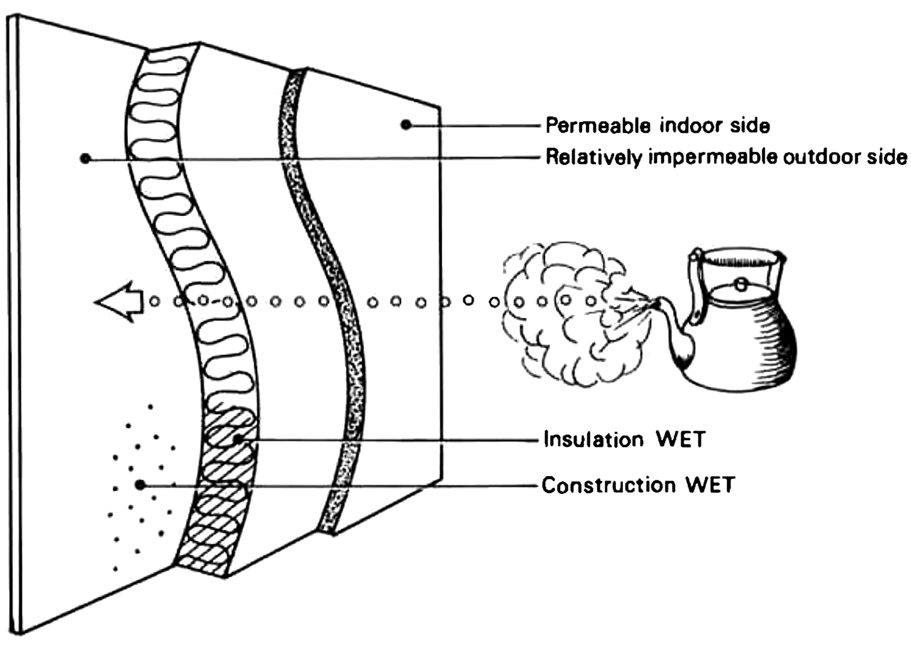

Fig. 1. Example of a defect action sheet (© HIS, reproduced with permission from BRE Defect Action Sheet DAS 6)

The files are structured as follows: (1) symptoms; (2) examination; (3) causes; and (4) repair.

Cases of Failure Information Sheets

The *Conseil International du Bâtiment* (CIB) has a working group responsible for research on building pathology, designated the W086 Building Pathology. This working group published, in June 1993, a model of pathology sheets called Cases of Failure Information Sheets entirely devoted to pathology records or reports, pointing out the need for the systematization of knowledge in the field (CIB W086 on Building Pathology 1993). A format for the preparation of pathology reports was suggested according to the following structure: (1) component concerned; (2) failure description; (3) description of evident anomalies; (4) description of anomalies that can be monitored using instruments; (5) graphic representation (photo, drawing, and/or draft); (6) defect description; (7) identification of the agents that caused the defect; (8) errors; and (9) specific fault tree and diagnosis report. Examples of cases of failure information sheets are presented in https://www.irbnet.de/daten/iconda/CIB11719.pdf of the 1993 CIB report. (CIB W086 on Building Pathology 1993, pp. 47–49).

Building Pathology Sheets

In 1995, the French agency *Agence Qualité Construction* (AQC), in partnership with the SMA Foundation, developed a set of pathology reports, known as Building Pathology Sheets (AQC 2014). These files have been prepared in order to prevent major defects of buildings in France, based on the analysis of claims reported to insurance companies.

The 61 existing sheets were created in 1995, have been available on line since 2003 and were updated in 2015. They are grouped in accordance with the parts of the building affected (as seen in http://www.qualiteconstruction.com/outils/fiches-pathologie.html) namely: (1) defect description; (2) diagnosis; (3) sensitive points; (4) prevention advices; and (5) additional information.

Construdoctor

The Portuguese company OZ—Diagnosis developed a service for prediagnosis of defects in buildings, called Construdoctor (Ribeiro and Cóias 2003). The service emerged as a system that provides online diagnosis, whose main aim is to help users and owners of the buildings in the correction of defects, providing them with basic explanations about their probable causes, making a preliminary diagnosis, and defining corrective measures.

The service provides a prediagnostics based on an on-line enquiry form, collecting data on the building and the anomalies, including photos or drawings. After form submission, the user's answers are evaluated by experts in building pathology and rehabilitation, who fill in an on-line report with anomaly identification and importance, specifying possible causes and corrective action. This on-line report includes (1) Anomaly identification and importance; (2) possible causes; and (3) corrective actions as common fields. In one example already published [adapted from Construdoctor by Ribeiro and Cóias (2003)], the diagnosis of the anomaly "Water leakage, causing efflorescence, and detachment of coating and stucco" was completed. The possible causes given were "the water access through building envelope, namely via the waterproofing system of the flat roof." This last problem can be due to the aging of the waterproofing system, which has a potential service life of only 10 years or due to water accumulation promoted by the insufficient slope of the flat roof, in turn caused by an obstruction of the drainage system, or by a leakage in the drainage piping system. The following corrective measures were mentioned: (1) in the flat roof, it is necessary to remove the waterproofing system, which has reached the end of its service life, apply a new waterproofing system, paying special attention to the rakes on the walls and the drainage system; and (2) verify the slope of the flat roof and correct it if necessary, to provide a correct water drainage. The following diagnostic techniques were suggested to reach a more conclusive diagnosis: (1) in order to locate infiltration points, a humidity evaluation can be made for the wall/ceiling surface; and (2) it is also important to identify and characterize other visible anomalies in order to quantify building's anomalies. It is also highlighted that water leakage will lead to deterioration of the building's structural and nonstructural materials, causing changes in building's thermal behavior, and deterioration of plaster, stucco, and coating, enabling the development of microorganisms, if anomaly causes are not eliminated.

Learning from Mistakes

The Italian pathology catalogue *learning from mistakes* (BEGroup 2004) was developed by the Building Envelope Group (BEGroup) of the Department of Science and Technology of the Constructed Heritage (BEST) at the Polytechnic of Milan. The referred catalogue is accessible via a website, entirely in Italian, from where the pathology files may be downloaded or printed. This website, which is an archive of failures to support the design and management of building technological systems, is divided in the following modules: (1) materials records; (2) degradation mechanism and failure mode records; (3) pathology/failure records; (4) case-study records (render coating, other coating, and other envelope coating); and (5) defect records (terminology).

Portuguese Group of Studies on Construction Pathology

The Portuguese Group of Studies on Construction Pathology (Patorreb) created a website devoted to disseminating a pathology catalogue, which consists of a set of pathology reports (Freitas et al. 2007). Since 2004, registered users are granted access to the pathology field, where a schematic envelope presents the reports according to the construction element listed in Table 2 (Patorreb 2004). By

Table 2. List of Construction Elements in Patorreb (Data from Freitas et al. 2007)

Reference	Construction element
1	Pitched roof
2	Flat roof–inaccessible
3	Flat roof–accessible
4	Roof garden
5	External wall
6	Basement wall
7	Internal wall
8	Ground floor
9	Floor
10	Floor over exterior space
11	Doors and windows
12	Plat band
13	Joints
14	Skylight
15	Balcony
16	Flowerpots
17	Terrace parapet
18	Others

clicking on the respective element, a list of associated pathology reports is presented.

The report files are organized as follows: (1) identification; (2) description; (3) assessment and measurements; (4) causes of the pathology; and (5) recommendations.

Web-Based Prototype System

In 2009, Fong and Wong (2009) created a prototype system with several objectives in mind: (1) to provide a user-friendly approach in the process of retrieving knowledge and experience; (2) to provide a simplified approach in the process of submitting and contributing knowledge and experience; and (3) to allow communication between different users of the system and enhance the exchange and sharing of knowledge and experience related to building maintenance projects (Fong and Wong 2009).

In this research, a questionnaire survey was used to investigate the opinions of professional building surveyors regarding the capture and reuse of knowledge and experience in building maintenance projects and to study the requirements of a proposed web-based prototype system. In-depth interviews with professional building surveyors were carried out after the survey. The purpose was to capture the knowledge and experience used by building surveyors in building maintenance projects, as well as to use that knowledge to develop the prototype system. Based on the survey and interviews, the requirements of the system were obtained and used as a guide for the development of the web-based prototype system. The system allows users to share and retrieve the knowledge and experience of other professionals in building maintenance, in order to facilitate their own decision-making process.

Maintainability Website

In 2004, the Building Construction Authority and National University of Singapore (NUS) developed a two-year project designed to study the problems suffered by different types of buildings in tropical climates. As result, a Maintainability website was developed in 2005, being updated until 2010 (https://www.hpbc.bdg.nus.edu.sg/). The website seeks to create an awareness of the current obstacles for the adequate maintainability of facilities (Chew 2010). It was developed in English and is divided in the following modules: (1) defect library with information about types of defects and their causes, maintenance, and diagnosis methods; (2) material manual with information on the performance and durability of materials; and (3) maintainability scoring system that was developed to facilitate the selection of alternatives of maintenance interventions. The sheltered building areas are divided in four groups: (1) façades; (2) wet areas; (3) basement; and (4) rooftop.

Regarding the defect library module, which is related to the scope of this document, the defect database is classified according to various materials. In the first two sections, the defect type and the possible causes are explained and illustrated with photographs. Good practices are compiled into the next section in order to provide guidelines to prevent the occurrence of systematic errors and omissions. In the fourth, maintenance and diagnosis techniques are illustrated, while possible remedial techniques are illustrated in the fifth section (Chew 2010).

Building Medical Record

In 2013, Chang and Tsai proposed a concept of Building Medicine Record (BMR) that is analogous to the human medical records, in the *Advanced engineering informatics* journal (Chang and Tsai 2013). A Building Diagnosis Navigation system (BDN system) was presented as well, with the capacity to streamline the BMR. In the BDN system application scenario, an expert retrieves case experiences from the BMR database, as shown in Fig. 2, to assist operation. The on-site manager receives the initial problem notification via internet connection. Information access and the on-site facility management can be coordinated via a wireless Internet connection.

The BDN System architecture is illustrated in Fig. 3, and comprised four main modules: (1) document processing; (2) key

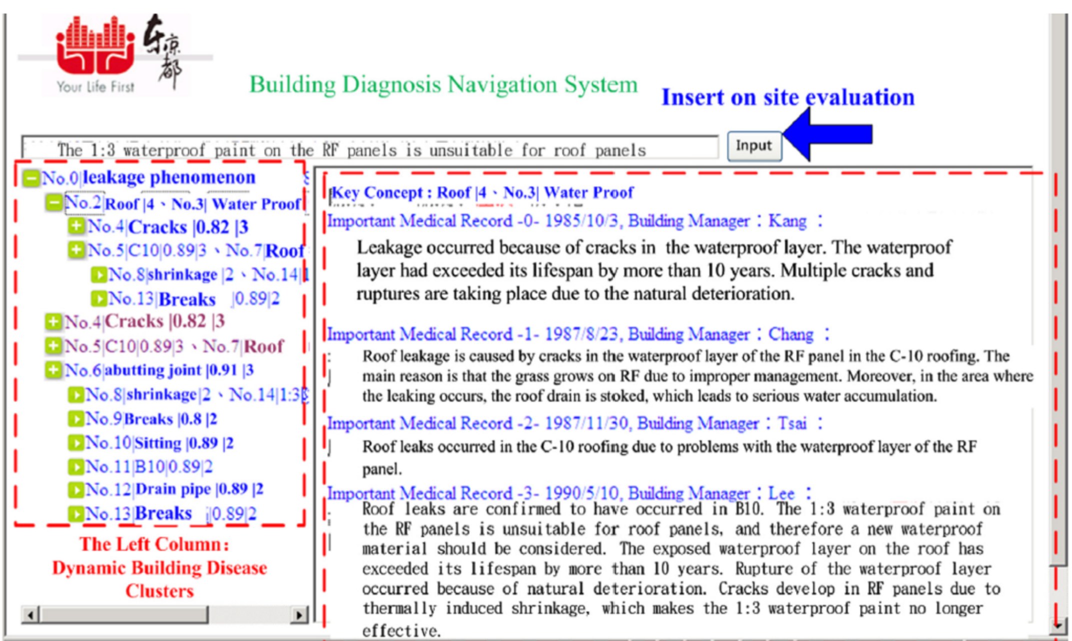

Fig. 2. Main page of BMR database (reprinted from *Advanced Engineering Informatics*, Vol. 27, C.Y. Chang and M.D. Tsai, "Knowledge-based navigation system for building health diagnosis," pp. 246–260, Copyright 2013, with permission from Elsevier)

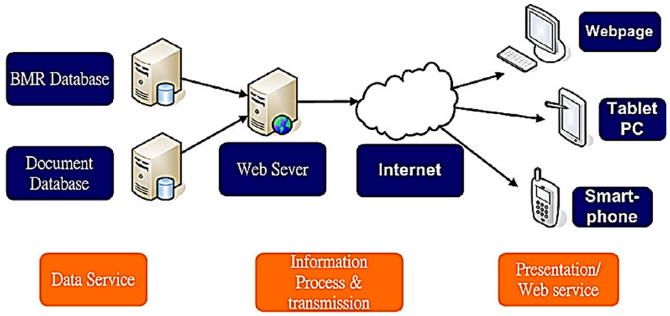

Fig. 3. Overall architecture of the BDN system (reprinted from *Advanced Engineering Informatics*, Vol. 27, C.Y. Chang and M.D. Tsai, "Knowledge-based navigation system for building health diagnosis," pp. 246–260, Copyright 2013, with permission from Elsevier)

concept extraction; (3) concept similarity calculation; and (4) important concept classification.

According to the authors (Chang and Tsai 2013), construction companies may offer experts service commissions in response to maintenance and management problems, following the BDN system. The effective accumulation and reuse of repair records can also provide feedback during the planning and design stage of a building's lifecycle. Property management and construction companies stand to gain from the incorporation of a BDN system into their workflows.

Critical and Comparative Analysis

While in building rehabilitation, each case is a unique case, the majority of occurrences of defects in nonstructural elements can be solved in a systemic way. Using data from inspection, the intersection of information, and the computation of a system in a software tool, an inspector can diagnose the pathology process and set to perform the repair. Data acquisition on the development of building defects is indispensable to plan maintenance and repair actions and relates to a wide set of in situ inspection techniques. The reliability of these data is fundamental to making rational decisions.

Structure and Main Characteristics

From the analysis of the discussed building pathology databases, it can be concluded that they all have a similar structure, comprising four main groups: (1) description/identification of the defects; (2) description of causes; (3) diagnosis; and (4) repair. It appears that all building pathology databases found in the literature have a similar organization but none are entirely devoted to the on-site intervention, since no statistical data have been found that specifically concerns correlations between defects and maintenance, diagnosis, and repair techniques. As a result, the diagnosis may not be as accurate as desired, being dependent on the user/inspector's experience.

Regarding the paper-based databases of "Defect Action Sheets" (BRE 2001), Anomalies Repair Forms (LNEC 1985) and Cases of Failure Information Sheet (CIB W086 on Building Pathology 1993), they all represented important turning points in pathology analysis. Through the systematic analysis of the data collected during these investigations, it is possible to establish a reliable database that provides guidance to prevent and repair problems. However, the information content may no longer represent current best practice due to the continuous advances made in construction and repair techniques. All this information must be considered alongside other current professional advice.

Going through the information-technology-related methods referred in section "Building Pathology Databases," it is possible to identify three similar methods: (1) building pathology sheets (AQC 2014); (2) learning from mistakes (BEGroup 2004); and (3) Patorreb (2004). In these cases, various pathology catalogues are accessible through a website, from where the pathology files may be downloaded or printed. Through these methods, the dissemination of pathology records became a reality. However, no further steps were taken in order to filter the content of these pathology files, in what offers long pathology descriptions and possible repair solutions in order to provide users with an expedited solution to their needs.

From Databases to Diagnosis

The databases Construdoctor (Ribeiro and Cóias 2003) and Building Medical Records (Chang and Tsai 2013), emerged as systems that provide online diagnosis. After a form submission, the user's answers are evaluated by experts in building pathology and rehabilitation, who fill an on-line report. However, the information provided in the report is only on a prediagnosis given by technicians without an actual visit from an engineer to the building. For that reason, the report may not be sometimes as accurate as desired.

Regarding the database Web-Based Prototype System (Fong and Wong 2009), this system was not designed to provide any systematized rules related to building maintenance. According to the system's authors (Fong and Wong 2009), surveys found that knowledge in building maintenance projects is context-specific and it cannot be generalized. Instead, the system allows users to share and retrieve the knowledge and experience of other professionals in building maintenance.

A longer comment should be made about the Maintainability website (Chew 2010). This method represents the first attempt in order to provide objective diagnosis, through the development of a comprehensive defect library, a material manual, and a maintainability scoring system. Regarding the defect library, possible defects and causes are explained and illustrated through photographs; good practices, and maintenance, diagnostic and repair techniques are also included. Thus, users of this database are encouraged to find a diagnosis based on images. However, no statistical data have been found, specifically in what concerns to correlations between defects and maintenance, diagnosis, and repair techniques. As a result, diagnosis may not be as accurate as desired, since it is clearly dependent on the user/inspector's experience. For that reason, the method presents some challenges in what concerns on-site intervention.

Building Inspection Systems

Among other identified challenges in the building pathology databases found in the literature, the objectivity of the information granted is a prerequisite to making rational decisions. In order to face some of the related challenges, researchers from the Instituto Superior Técnico (IST)–University of Lisbon spurred the creation of Building Inspection Systems (BIS), applied to several nonstructural building elements. These systems are characterized by the definition and classification of the four most important variables in pathology: defects, causes, diagnosis, and repair techniques, to which quantitative correlations are assigned (de Brito 2009). Within this context, several authors have developed inspection and diagnostic systems for nonstructural building elements, following a systemic approach, which is anchored on knowledge-based inspection, diagnosis and rehabilitation.

Within the scope of the BIS developed at IST–University of Lisbon and the Institute of Structural Engineering, Planning and

Table 3. BIS Developed at IST–University of Lisbon

Building elements	References
Flat roofs waterproofing systems	Walter et al. 2005
Wall and floors ceramic tiling	Silvestre and de Brito 2009, 2010, 2011
Epoxy resin industrial floor coatings	Garcia and de Brito 2008
Masonry walls	Gonçalves et al. 2015
Wood flooring	Delgado et al. 2013
Wall and floors natural stone cladding	Neto and de Brito 2011, 2012
Pitched roofs cladding	Garcez et al. 2012b, a, 2015
Gypsum plasterboard walls	Gaião et al. 2011, 2012
Gypsum plaster coatings	Palha et al. 2012; Pereira et al. 2011
Wall renderings	Sá et al. 2014, 2015
Painted walls	Pires et al. 2014, 2015
ETICS	Amaro et al. 2013, 2014
Window framing	Santos 2012; Vicente 2012

Construction (ICIST) research group, studies have been reported according to Table 3.

These works collected available information on the pathology of nonstructural elements through intense literature surveys using international scientific publications. Together with the execution of field work on large representative samples, those authors created a greater understanding regarding the building pathology, providing a systemic inspection method. These systems integrate a large set of tools, as described in Table 4.

This systemic approach allowed the creation of databases and the withdrawal of quantitative and qualitative conclusions, proving to be indispensable tools for implementing a proactive maintenance strategy (de Brito 2009). However, none of the systems is fully computed and is still susceptible to misinterpretation, allowing for their inaccurate use. Upon completion of the implementation of the systems by element, an integration of a global analysis perspective is required.

Way Forward

In the field of rehabilitation, it is established that the procedure to rehabilitate must begin with an inspection, ensuring that it adequately characterizes the existing defects, using the necessary tests, which will culminate with the presentation of a diagnosis that encompasses the origin of change and knowledge of construction materials and systems used. Based on this information, one can select the best repair solution.

Having demonstrated the importance of establishing building pathology databases and inspection methods, it is important to create a reliable BIS in order to provide easy access to the most-relevant information available on building pathology. From the analysis of the building pathology databases found in the literature, it can be concluded that they all have a similar organization but none are entirely devoted to on-site intervention. In order to create a reliable BIS, the various partial systems developed at IST–University of Lisbon may be reliable substructures since they follow the same systemic approach, which is anchored on knowledge-based inspection, diagnosis, and rehabilitation. Through this systemic approach, the most important parameters in pathology were defined and classified for several building elements, and quantitative correlations were determined. In this context, the creation and computation of an overall system, including all the partial systems developed so far, emerges as a credible way forward on the pursuit of a reliable BIS.

The implementation of a BIS anchored on the partial systems developed at IST would put in practice all the potential referred in the "Critical and Comparative Analysis" section. However, there is still a long path to follow in order to put such a system in place. The creation of an overall system based on normalized lists of defects, causes, inspection methods, and repair techniques is a big challenge due to the overwhelming amount of information. The analysis and normalization of the several partial systems still encompass the joint examination of defects, causes, diagnosis techniques, and repairs methods of each building element, in order to optimize the following actions to be taken. As an example, the diagnosis methods or repair techniques to use in a given defect occurrence may be transversal to different building elements and, because of that, the identified defects may be correlated with diagnosis techniques or similar repair in the same quantitative level. Furthermore, the integration of new systems for other relevant building elements, following the same systemic approach, is also a possibility.

In order to put such system in place, the development of a computer tool that describes the building and its various elements is suggested. This system should include (1) a database where the relevant information about the building shall be stored; (2) an inspection module, allowing the standardization of inspections and the resulting reports; and (3) a decision-making module on the action to be carried out after inspection and diagnosis of any existing defect, dedicated to building maintenance operations. The Internet capability and mobile devices availability of such system shall also be addressed, for the following reasons: (1) the accumulation of systematized, centralized, and validated case knowledge; (2) the real-time knowledge dissemination of lessons learned; and (3) the online dissemination of case knowledge can overcome

Table 4. Tools Integrated in the BIS Developed at IST–University of Lisbon

Tool	Description
Ranking list of defects	Identification and classification of the most common defects in each building element
Ranking list of causes	Identification and classification of the most likely causes of the several identified defects
Ranking list of diagnosis techniques	Classification of the type of tests allowing the characterization the identified defects, as well as assisting in the determination of their possible causes
Ranking list of repair techniques	Type classification of the most appropriate intervention techniques for each of the identified defects
Correlation matrix defects: causes	Assigning null, indirect, or direct relationships between each defect and respective cause
Correlation matrix between defects	Probability of occurrence of a defect when another is detected
Correlation matrix defects: Diagnosis techniques	Assigning a ratio to the diagnosis technique required for characterization of a defect and understanding or knowledge of its location or origin
Correlation matrix defects: Techniques of repair	Assigning a ratio to each repair technique

geographical barriers. Employing the referred attributes to the desired BIS, a relevant minimization on the subjectivity of inspections of buildings elements is expected as well as the elimination of the dependence on the inspector's experience, which have been pointed as some of the biggest challenges related to the objective of the building pathology databases analyzed in the "Critical and Comparative Analysis" section.

Finally, it is expected that the proposed computerized inspection system has a range set of practical applications: (1) use in inspections; (2) use in plans of proactive maintenance of buildings; (3) decision support in rehabilitation projects; (4) preparation of dilapidation reports of buildings; (5) use for official recognition (preintervention; the effects of insurance policies; and sales/rental); (6) preparation of the final report of diagnosis with a standardized structure; and (7) use as prenormative basis of standardized inspections for buildings that must be subjected to an officially recognized methodology.

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