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Maintenance and Asset Management Integration in Buildings for Collective Use

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2. CONCEPTUAL FRAMEWORK
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1. INTRODUCTION

- The importance of Asset Management has been under development and discussion, for several decades, connected with the life-cycle concept
- Asset Management is not a recent discipline and integrates several fields
- Recent research studies demonstrate the importance of Asset Management in different areas, levels and applications
- The publication of the Institute of Asset Management emerged with the purpose of providing a broader view of the Asset Management discipline.
- To reduce the costs associated with assets, without compromising the performance of other requirements, a critical and holistic view of the entire life cycle is required

2. CONCEPTUAL FRAMEWORK: Buildings for collective use

Buildings for public use are those managed by entities of the public administration, directly and indirectly, or by companies providing public services and intended for the general public, while **Buildings for collective use** are those intended for commercial activities, hotels, cultural activities, sports, financial, tourism, recreational, social, religious, educational, industrial and health, including buildings of the same nature activities.

2. CONCEPTUAL FRAMEWORK: Maintenance

- Defined in ISO 15686-1, as a combination of technical and administrative actions that allow the building and its constituent elements to perform the functions for which they were designed, during their useful life.

- All **maintenance concepts** meet **common objectives**: i) give better performance to the building and its elements, trying to restore its initial quality; ii) improve the useful life of buildings and their elements; iii) avoid high costs through major repairs; iv) ensure the performance requirements established in the project.

2. CONCEPTUAL FRAMEWORK: Facility Management

- Facility Management (FM) emerged in the late 1960s, in the United States of America.
- This activity has been growing a lot, since there is a greater concern with the phase of exploration and operation of the facilities.
- In Portugal, the first steps towards FM were taken in 2006.
- Although there are several definitions for FM, all of them converge in a main idea: FM is a concept that aggregates resources such as people, properties and experience in process management, in order to provide vital support services for the organization.

2. CONCEPTUAL FRAMEWORK: Asset Management

- According to ISO 55000, Asset Management (AM) comprises a coordinated set of activities from an organization to obtain value through its assets, being formulated comprehensively to adapt specific asset needs, changing contexts and differences of the organizations.
- Asset management is the set of coordinated activities that an organization uses to see its assets generate value.
- The benefits of AM may include: i) improved financial performance; ii) informed decisions on asset investment; iii) risk management; iv) improvement of services and results; v) demonstration of social responsibility; vi) demonstration of conformity; vii) improving reputation; viii) improving the organization's sustainability; ix) improving efficiency and effectiveness

2. CONCEPTUAL FRAMEWORK: BIM and CoBIE

- Since the BIM model contains all the necessary information for an installation, it is possible to carry out strict management, including its maintenance and operation.
- COBie is, in addition to other proprietary formats of commercial applications, user-specified databases, etc., an information sharing format for the life cycle of a given installation, which allows gathering all information, from the initial process to its exploitation.
- The exchange of information first occurs at the end of the construction, however the maximum efficiency exponent of COBie will be obtained during the life cycle of an installation, when there is a need to share information regarding spaces or equipment.

2. CONCEPTUAL FRAMEWORK: Standards and Legislation

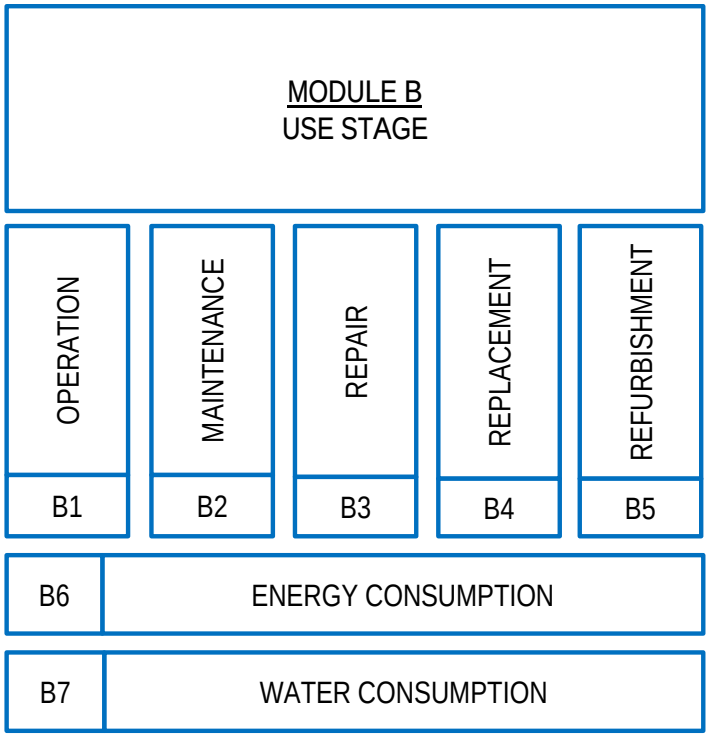
- EN 15643-4 and EN 16627 are related to the life-cycle cost concept in the sustainability context.
- EN 16646 is related to maintenance within physical asset management, highlighting the importance of the use stage throughout the building life cycle.
- EN 15221 follows the need to unify FM in the European space.
- The Institute of Asset Management (IAM), in partnership with the British Standard Institute (BSI), developed PAS 55 specification.
- ISO 55000 defines the requirements for an AM system throughout the asset's life cycle.
- EN 16646 introduces Asset Management as a framework for maintenance activities.

3. CASE STUDY: Public school buildings

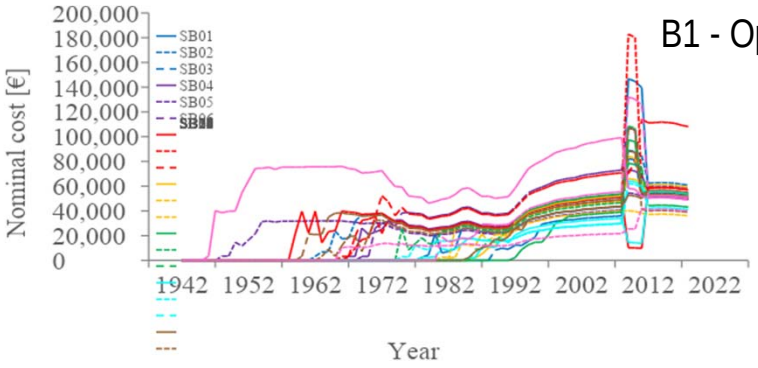
- ✔ 166 School buildings
- ✔ Constructed area of 2,404,500 m^2
- ✔ Estimated use stage net costs of 5,12 billion €
- ✔ Heterogeneous portfolio

3. CASE STUDY: Public school buildings

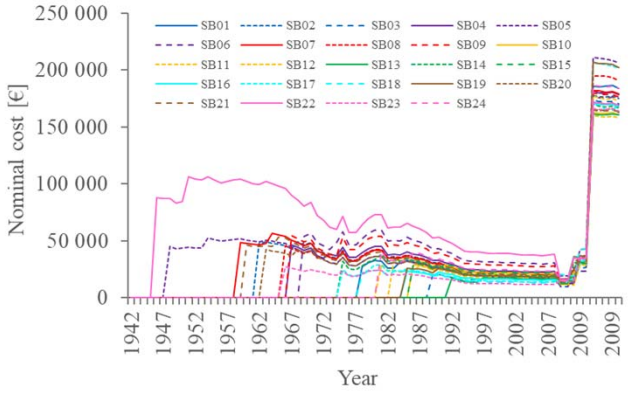
- ✔ Costs related to Use Stage (EN 16627) were collected
- ✔ The period begins in the 1940s with the original construction
- ✔ The costs were collected as real cost
- ✔ Nominal costs were obtained using a multiplicative factor that considers the annual inflation/deflation rate during the period of analysis



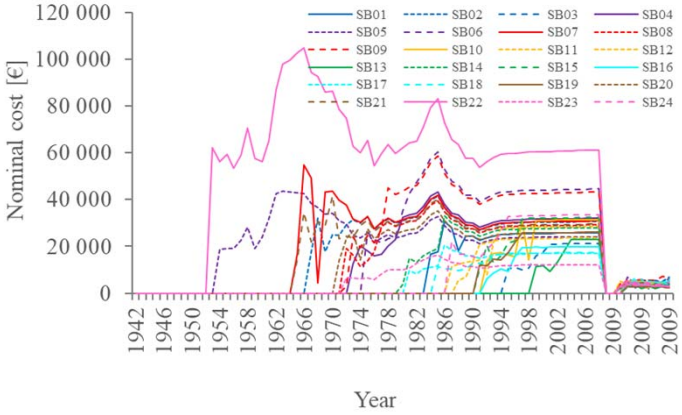
3. CASE STUDY: Public school buildings



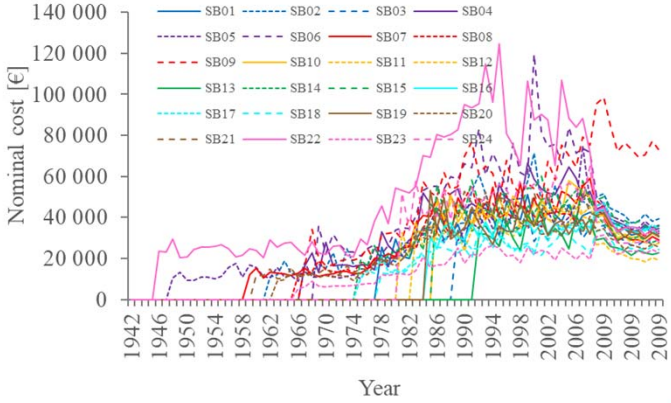
B1 - Operation



B2 - Maintenance

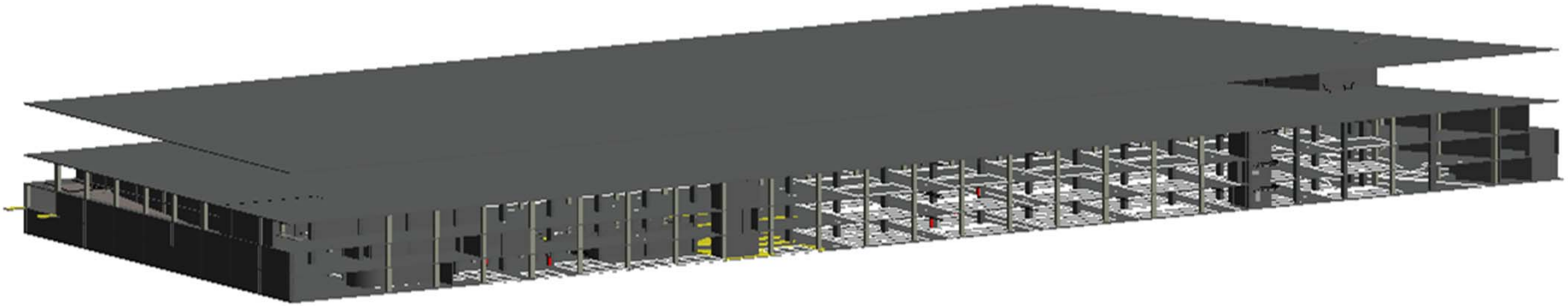


B3 - Repair

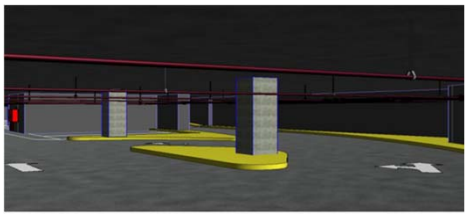
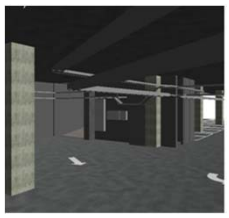
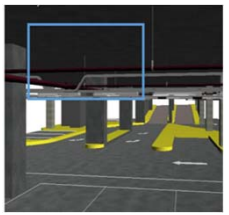
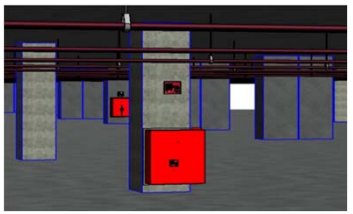


B6 - Energy consumption

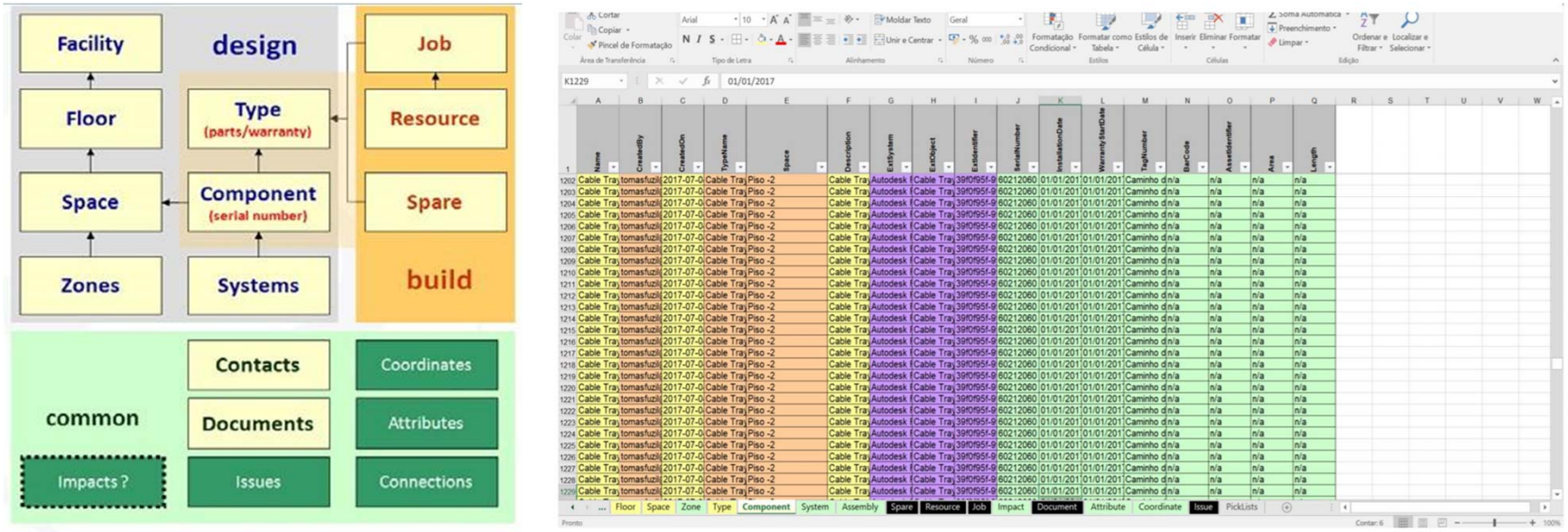
3. CASE STUDY: Comercial buildings



BIM Final model of the commercial building for maintenance and FM purpose

3. CASE STUDY: Comercial buildings

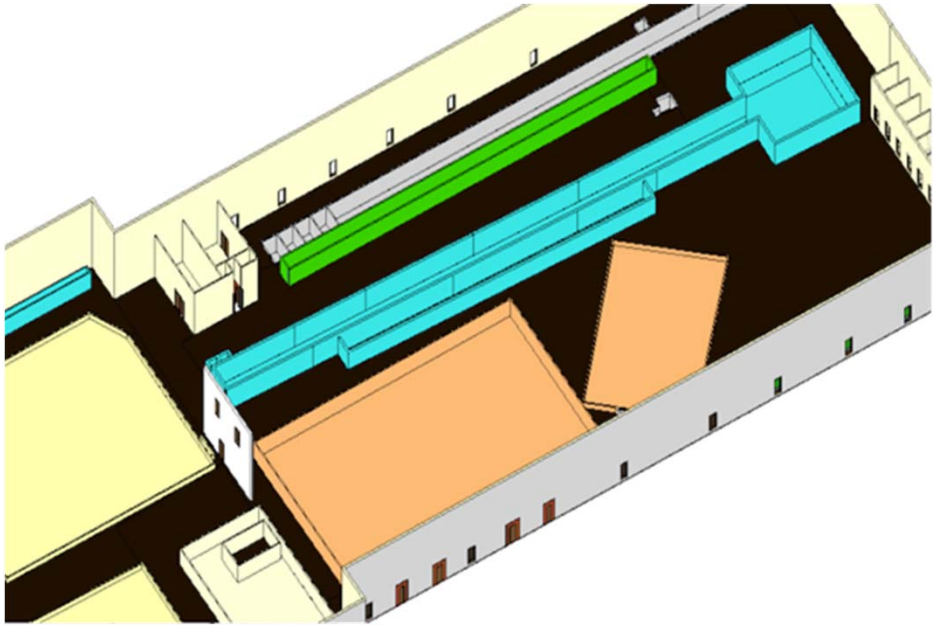


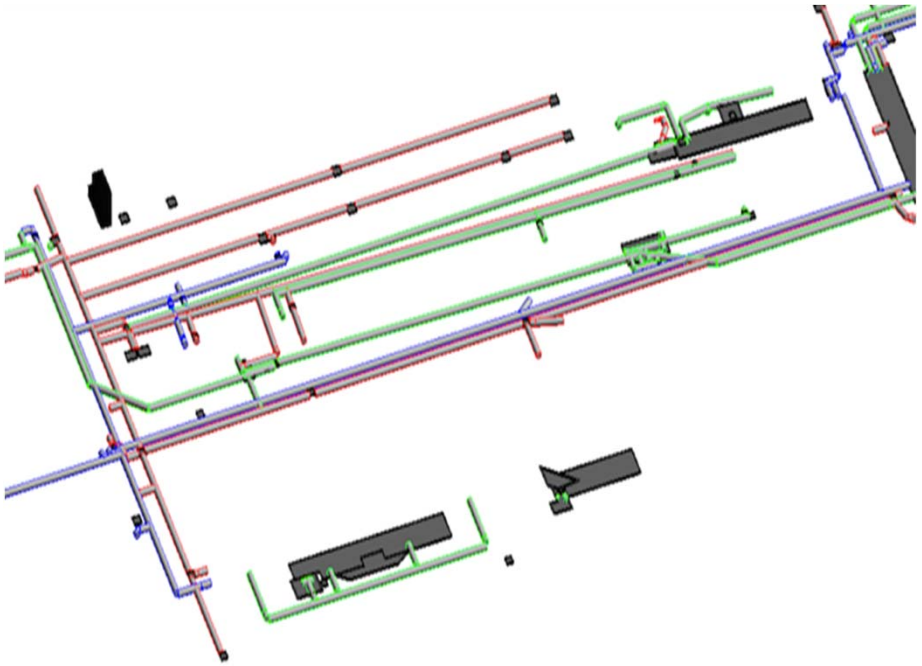
COBIe sheets used for integration with the BIM model of the commercial building generated for FM [33]: a) General structure; b) example of sheet for electric network

3. CASE STUDY: Comercial buildings

- Possibility of creating alerts when there is a need to repair or replace a certain element.
- As such, and considering the previous work done on the various elements, the right time to carry out interventions will be more or less known.
- After BIM modelling, it was proposed to carry out its management using FM software, a survey of the necessary steps was taken to follow, with a view for structuring a method for altering COBIe.
- When using BIM and CoBIE together, it is essential that all the information in the model is available in an organized manner so that the model is constantly up to date, in order to provide correct management.
- Choosing the COBie extension, to solve the problem of how and when information for installation management should be collected, further improves the efficiency of FM.

3. CASE STUDY: Buildings for scientific research use





3. CASE STUDY: Buildings for scientific research use

- The **first stage (Plan)** corresponds to the definition of asset management strategy and requirements.
- In the **second stage (Do)**, a set of information was grouped for the implementation of the Asset Management Plan.
- In the **third stage (Check)**, the efficiency of the asset management system and the performance of this activity is monitored.
- The **final stage (Act or Action)**, includes taking measures to control and correct; dealing with consequences; assess the need to eliminate the causes of incidents; determine the causes of non-compliance or incidents; determine the existence of non-conformities or the susceptibility of their occurrence.

4. CONCLUSIONS

- Buildings for collective use represent an investment effort that mobilizes significant financial resources from public budgets, which are restricted.
- However, while it is increasingly important to justify investments and subsequent associated expenditure over several decades or even centuries, information relating to the economic performance over the use stage of those buildings is practically unknown.
- Maintenance and Asset Management activities do not directly address overarching issues, such as policy and strategy for organizations, but can be used to support decision making processes in building projects, or in managing building asset portfolios.
- It contributes to more accurate cost estimates over the life cycle of a building, while optimizing maintenance and operation costs.

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THANK YOU for your attention!