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PROPOSED MODEL FOR ECONOMIC DATA COLLECTION OF THE BUILDING USE STAGE

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ABSTRACT

The Life Cycle Cost (LCC) methodology is an important tool in the Architecture, Engineering and Construction (AEC) sector. It promotes proper management of the resources involved. The use stage is a relevant stage in the building life cycle, because it covers an extended range of time with several economic variables with associated uncertainty. Accurate cost estimation during this stage thus contributes to improve the economic performance throughout the building life cycle.

This paper aims to present a model for economic data collection through the buildings use stage in accordance with the recent European standards. A case study related to buildings demonstrates the benefits of the proposed model and its integration in building economic performance assessments.

Keywords: buildings, life cycle cost, use stage.

INTRODUCTION

Until recently, the attention of stakeholders was mainly directed toward reduction of construction costs, and only a few paid attentions to the reduction of maintenance and operation costs of buildings. While architects and planners can refer to several tools for the planning and calculation of construction costs, calculation methods for use costs are scarce and not very accurate. It has been reported that between 70% and 85% of the building maintenance and operation costs can be influenced during the design stage, which is a significant part of the total building life cycle costs (Biondini and Frangopol, 2008).

Long-term economic sustainability represents an important factor in the AEC sector. To assess the buildings economic sustainability the LCC approach can be used. LCC is defined as the cost of a building throughout the consecutive and interlinked stages in its life, while fulfilling the technical and functional requirements (EN 15643-4).

In the sustainability context, several standards, related to the LCC have been published, such as EN 15643-4 and EN 16627. On the other hand, EN 16646 related to maintenance within physical asset management, highlights the importance of the use stage throughout the building life cycle.

A model for structuring data collection and the economic information of buildings during the use stage is presented. This model can be applied to all types of buildings and is intended to be used as a tool to improve decision-making processes related to building projects.

RESULTS AND CONCLUSIONS

The building life cycle economic information is divided in three groups (EN 15643-4 and EN 15643): i) before use stage; ii) use stage; iii) and after use stage. Table 1 shows the organization and the types of costs to be included, according to the proposed model, for economic data collection during the use stage of buildings.

Table 1 - Model for economic data collection

Use Stage	Typical scope of costs
Use	Building-related facility management costs; Cyclical regulatory costs; Building-related insurance costs; Subsidies and incentives; Professional fees.
Maintenance	Costs related to all components and products used in maintenance activities; Cleaning; Land and garden maintenance costs, consistent with the environmental assessment; Costs related to processes to ensure functional and technical building performance; Redecoration; Disposal inspections at end of lease period; End of lease; Taxes on goods and services; Subsidies and incentives; Professional fees.
Repair	Repair of minor components / small areas; Repair of major systems and components; Costs related to repair waste management; Taxes on goods and services; Subsidies and incentives; Professional fees.
Replacement	Replacement of minor components / small areas; Replacement of major systems and components; Costs related to replacement waste management; Revenue from sale goods, elements or components; Taxes on goods and services; Subsidies and incentives; Professional fees.
Refurbishment	Costs related to new building components; Costs related to planned refurbishment; Costs related to building adaptations; Costs related to refurbishment; waste management; Revenue from sale goods, elements or components; Taxes on goods and services; Subsidies and incentives; Professional fees.
Operational energy use	Energy costs related to fuel and electricity for heating, domestic hot water, cooling, ventilation, lighting, power and other systems; Taxes; Subsidies and incentives.
Operational water use	Costs related to water for consumption, sewerage, hot water, irrigation, roofs or green facades, heating, cooling and ventilation, specific systems; Taxes; Subsidies and incentives.

The proposed model is applied to a case study related to school buildings in order to plan and predict the use stage costs. It is shown that the results can be incorporated in LCC assessments.

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