Chapter 20
Digital Twin for Maintenance Information Management:
Scenarios and Perspectives for Sustainable Smart Cities

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ABSTRACT

BIM and the construction sector have long been an inseparable pair: in many European Countries it is a consolidated practice while in others there is a big debate about it but. Although there are important signs of a turning point, it still does not seem to be really feasible. In Italy, the leverage for transformation is certainly the public works sector, but this is not enough: to really talk about a whole digitization of the AEC sector, it is necessary to "attract" the private sector, where more than 50% of investments are invested. The chapter will attempt, starting from an Italian framework overview, to assess the main perceived obstacles of the applicability of a BIM model for facility management. The tool chosen by the authors as a preliminary approach to the problem, the SWOT analysis, allows an effective synthesis of the strengths and weaknesses resulting from such implementation.

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INTRODUCTION

BIM and the construction sector have long been an inseparable pair: in many European Countries it is now a consolidated practice while in others (i.e. in Italy) there is a big debate about it but, although there are important signs of a turning point (Frontera, 2019), it still does not seem to be really feasible. As it is well known, digitalization in the construction sector - which now mainly impacts on public works - has to do with a shared approach of information management in the entire process of design and construction of works. Integration and collaboration are thus in opposition with the old (sectorial) model of production of goods and services: the contract was divided into competence areas and the specialists worked in their respective one, carrying out their task in substantial autonomy, to the detriment of the internal coherence of the project. BIM methodology represents an important paradigm shift in the construction sector and its benefits in terms of process optimisation have also been reflected in the legislation in many countries: in Italy from 1 January 2019 it is mandatory to use electronic modelling methods and tools for the design and construction of public works of EUR 100 million or more.

At the moment the regulation provides a voluntary introduction without any limits of amount, in accordance with the decision of the contracting authorities, but at the same time it establishes the obligation to introduce BIM for subsequent steps: from 1/1/2019, if the amount exceeds EUR 100 million; from 1/1/2020, if the amount exceeds EUR 50 million; from 1/1/2021, if the amount exceeds EUR 15 million; from 1/1/2022, if the amount exceeds EUR 5.2 million; from 1/1/2025 also for public works of less than EUR 1 million.

As the construction sector is very slow to take up innovations (for example, the prefabrication or the introduction of new non-traditional building systems), the perception of the market and the structure of the operators is partially inadequate with regard to the standards required by law. The costs of training personnel/professionals and of implementing (performing) BIM services are still too high compared to the actual current benefits, both for production and management: not all professionals are aligned to the same production standard, with a clear reduction in the competitiveness of the sector; not all contracting authorities are able to manage and implement BIM systems; few companies are equipped with internal structures and trained in order to interact with the other actors in the process. [...] Compared to a traditional design, BIM systems are not yet competitive if not in a long-term vision and particularly linked to the impact of maintenance, both from an economic point of view and in terms of prevention of negative events for the whole system (the work being planned). (Moglia et al., 2019).

The driver of transformation is - through a regulatory imposition - the public works, but this is not enough: to really talk about a whole digitalization of the AEC sector, it is also necessary to attract the private sector, where more than 50% of investments are directed (ANCE, 2019).

How can we spread the BIM culture and not only from a theoretical point of view? This chapter will attempt to take stock of the main perceived obstacles, such as the static nature of operators, start-up costs and the need for training towards a new technical level dedicated in particular to management.

Specifically, in paragraphs 2 and 2.1 it has been reported the analysis carried out on the construction sector in Europe to identify the average structure of production factors and those on the facility management sector to highlight how this represents a real opportunity to relaunch the AEC market. Paragraph 3 contains an analysis of the use of BIM in the construction sector to provide a framework for its potential development. Paragraphs 4 and 5 show an analysis of the literature on Building Information Modeling (BIM) and Digital Twin (DT). Section 6 discusses the strengths and weaknesses of using BIM for four