

Chapter 10

Digital Transformation Stemming From a Business Assessment of Construction Industry 4.0

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ABSTRACT

The methods, processes, and tools adopted according to the needs of the transition based on the Industry 4.0 should be based on the level of digitization of the companies, checking and monitoring their digitization over time, and considering the relation within the society. The study presented in this chapter starts from the work of the European community, directed to the assessment of the digital maturity of companies in the context of the European network of digital innovation hubs. Assessment that takes place through the compilation of questionnaires assessing the digital maturity of companies. Starting from what has been developed by the European community, the authors believe it is essential to develop specific focal points according to the peculiarities of the different sectors and in particular considering the construction one. This approach will open a new key to promote the digitalisation of the construction sector that is still lagging compared to the other industrial sectors.

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INTRODUCTION

Construction contributes significantly to a country's socioeconomic development. The construction industry, accounts for 9% of global GDP, which indicates its significant impact on economic development. Global construction spending hit \$11 trillion in 2017 and is expected to hit \$14 trillion by 2025, according to McKinsey (2018). However, the construction industry is characterized by a low productivity that can be related to lack of technological advancements, computerization, and robotics.

Despite its significance, the industry has long been plagued by poor product delivery in the majority of developing countries (Ogunsemi & Jagboro, 2006). For example, South Africa, according to Emuze (Emuze, 2011), is a country where it is nearly impossible to fulfil a client's dream. This is due to a lack of project delivery within budget, time frame, and specification parameters. Although the construction industry has struggled with poor project delivery for many years, the technological innovation is demonstrating the ability to reduce the industry's long-standing issues (Aghimien et al., 2018).

When digital technologies (DTs) are used, such as Building Information Modelling (BIM), project delivery can be improved in terms of both cost and time. This can be related to the fact that clashes in designs can be more easily identified and that the possibility of faulty design and rework, as well as the associated cost and time wastage, is reduced. One of the most significant impact of digitalization, automation, and integration of processes is related to an increased productivity improving also design and construction quality. For example, technologies such as the Internet of Things (IoT) are reshaping the way data can be captured and shared during the construction process phases (Ammar et al., 2018). Big data analytics (Jin et al., 2015) promises improved predictions of future construction project delivery because patterns from previous projects can be identified and informed decisions can be made early before a project commences, allowing for better project planning and execution (Bagheri et al., 2015).

On the one hand, when it comes to adopting new technologies and automating processes, the construction industry is moving at a glacial pace. On the other hand, technological innovation is revolutionizing the construction sector, a change that requires precise strategies essential for increasing the processes efficiency in the entire sector and considering the peculiarities of each stakeholder. The objective of this chapter is to develop a process framework to assess the level of digitization of construction companies to provide a common ground of analysis that can be used to identify and develop the best strategies for the digital innovation. The phase of investigating and assessing the level of digital maturity is often neglected or discredited, bringing to the development of strategies that are not aligned with the real needs and requirements of the companies. In fact, the assessment process can work on two drivers. On the one hand it makes possible to establish which are currently the most important digital trends in the construction market with a better understanding of the advantages they can introduce. On the other hand, it highlights the digitally deficient areas of the business facilitating the identification of the existing issues and limitation for a faster and more targeted change to business needs.

The rest of the chapter is structured as follow. A background section, divided into two parts: the first one explaining the main developing technological trends about construction; the second one analyzing the main references of the scientific world for the evaluation of the digital maturity in construction sector. Then an analysis of the existing issues and open research areas is proposed followed by the presentation of the approach proposed in the research that the Authors developed around the assessment topic. Finally, future trends and conclusions are reported.

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