Digitalization and quality control in a construction site: case of Moroccan companies

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***Abstract*— The goal of this article is to shed light on the influence of digitalization on the construction and building sector, as well as how integrating digital technologies into construction enterprises' activities can improve a variety of performance indicators. We are constantly striving to improve our sales, better satisfying the demands of our clients, and, mostly important, meet deadlines.**

The organization manages to optimize time in all stages of construction thanks to the digitalization of construction processes, including the quality control process, which is the topic of our research. We provide a mobile-based digital solution for monitoring and processing non-conformities, which can be used to verify for compliance with protocols and track progress until final delivery. The digital technology allows businesses to save a significant amount of time when completing projects.

Keywords— Digitization, construction, indicator, non-conformity, platform

I. INTRODUCTION

The construction sector is an important economic pillar in Morocco, and it encompasses all building- related industries (the building, the seconds of work and the architectural batches).

The field of the building and civil engineering is the second potential creator of employment in Morocco after agriculture, representing a turnover of more than 59 MDH (1) and employing 10% of the active population of Morocco, thanks to multiple projects of instruction as well as the country's commitment to socio-economic programs of fight against the insalubrious habitat (2)

Moroccan enterprises are improving their management deficiencies and moving toward digital solutions to modify their technologies in order to be more equipped for national and international competition, as the construction sector is typically resistant to change. However, the digital transformation that this industry has undergone in recent decades meets the Moroccan company's challenges.

II. DIGITALIZATION

Companies have seen substantial changes with the advent of digitalization, which have had a significant impact on their competitiveness, investments, and the development of their employees' abilities. These changes are widespread, involving everything from individual job duties to the development of new collective models, new forms of interactions, the digitization of old processes, and new technical solutions that provide superior value to customers. As a result, digitization alters our society in several ways, presenting businesses with numerous new opportunities and problems as well.

In this regard, what is the difference between digital and digital transformation?

Digitization includes the implementation of new networks and connected devices that transform analog into digital without changing the actors involved, however when the business model of the company is affected by implementing a new process with new digital technologies (software,

application, tool ...) that change the daily lives of employees we talk about digitalization.

III. THE CONSTRUCTION INDUSTRY AND DIGITALIZATION

Nowadays, digitalization has shifted the construction industry toward digital technologies that touch all activities, beginning with support, payment management (PPM), supply chain management (PSCM), and accounting, all of which are done utilizing blockchain technology (3), In order to integrate the design, construction, and operation of buildings in a construction project, practice manuals have been developed as a reference to support the deployment of BIM software using 3D printing, production robots, and BIM software, the latter of which is about to become mandatory (4). (5).

And, like other services, quality must evolve through leveraging digitization.

By building a model for monitoring the compliance of a construction project with a regulatory framework, the compliance monitoring process might be automated, allowing for more effective monitoring (7).

And in this piece, we'll look at another revolution that the construction industry's quality control process has undergone as a result of the interplay of all other services and Big Data (6).

A. T he influence of digitalization: a case study in quality assurance

In this section we will present a digital tool that has lightened the process of quality control of works.

From the studies through the delivery, this mobile application placed on a tablet or smart phone simplifies the management of controls and the rectification of non-conformities.

The objective is to standardize the controls used during execution and then validate them digitally, without the use of paper.

To do so, the contractor and the company meet to design a control plan and incorporate it into the computer tool, which has three levels of use.

As a result of utilizing the tool

Detection of non-conformities

The quality team integrates the FQs that have been designed in a specific way into the tool before starting the construction site, then the work managers fill in the forms during the execution and the quality team validates them.

Drivers no longer need to bring printed CFs to the field, fill them out manually, and then produce Excel reports. Everything is now done on-site with a tablet or smartphone, and reports are automatically generated and distributed to all staff.

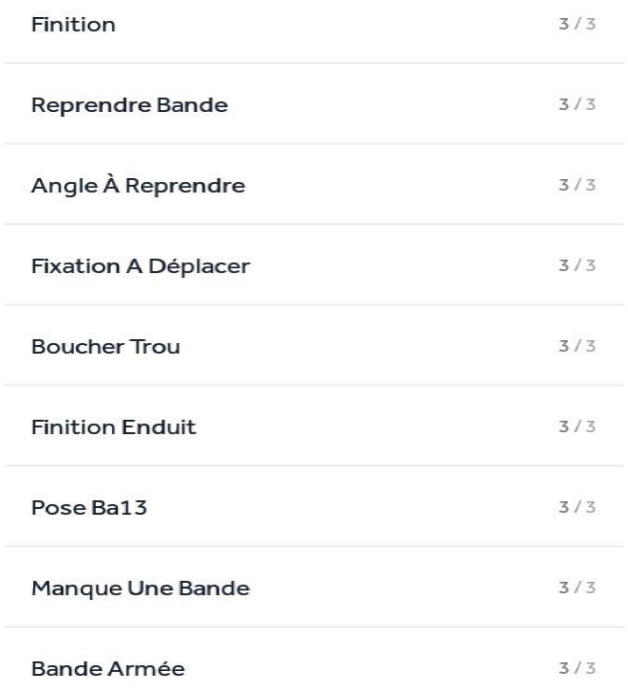

Fig. 1Exemple FCQ

Treatment of non-conformities

The tool will notify the quality management of any identified non-conformities; the quality manager will discuss the non-conformity, show it with pictures, and even provide solutions and a treatment deadline.

After the non-conformity has been corrected, the team leader notes on the tool that it has been treated as such, and the quality manager can close it if the remedy is complying.

Fig. 2 non-conformities detected on a plan

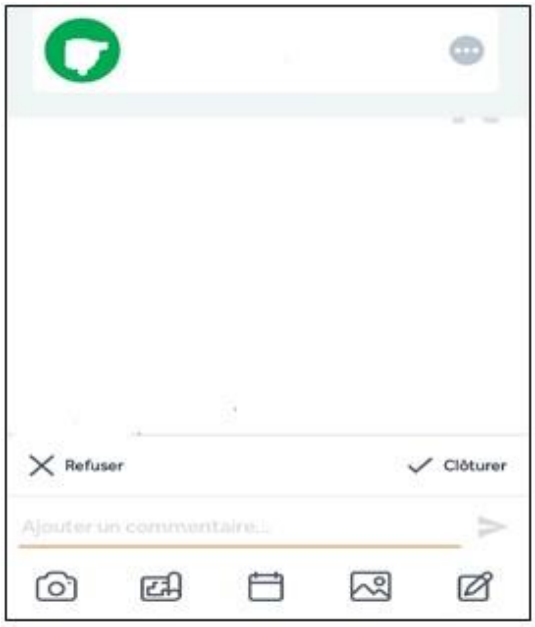

Fig. 3canevas of non-conformity

The lifting of reservations

The project team prepares its OPR by following up on its reservations in real time. During easy trips to the construction site, collaborators can create reservations on the tool with the relevant information, and after lifting these reservations, the person in charge closes them on the spot.

The geolocation of the blocking sites made it possible to lift 70% of the reservations in half the time it would have taken to remove 100% of the reservations on a construction site without this digital tool.

The volume of reserves to be processed no longer poses a time constraint.

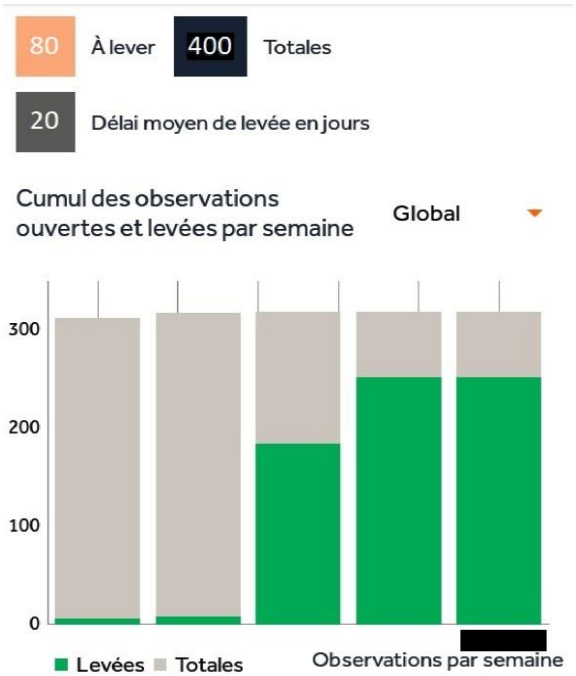

Fig. 4Statistics of reservations

IV. CONCLUSION

In summary, the digital tool demonstrated allowed first and foremost for the mobility of documents and plans, secondly, for the quick treatment of non-conformities (as soon as the non-conformity is detected, it is communicated directly to the tool for treatment), and thirdly for the reduction of delivery time due to the simple reception.

The construction industry's shift to digitalization has simplified operations, but digitalization-focused programs may not be effective on a bigger scale, leaving small enterprises unable (or unwilling) to participate (5).

To encourage all businesses to digitalize their processes, easier and less expensive technologies must be developed.

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