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Information and Communications Technology in Construction: A Proposal for Production Control

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Abstract

In order to improve feedback from the Cost Performance Index (CPI), it is necessary to know the reasons why Actual Cost differs from Planned Cost. At present, this information is collected and transferred orally, on paper, by telephone or e-mail. This paper proposes an information and communication technology that uploads information to an Intranet using electronic devices and mobile applications, thus encouraging the participation of workers and other stakeholders. This proposal aims to contribute towards information quality improvement in Production Control.

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1. Introduction

If we want to talk about improvement, of either companies or businesses from any field, we necessarily need to revisit Kaizen or Continuous Improvement, which proposes putting into practice the Shewhart Cycle, better known as Deming Cycle in Japan since it was Dr. Deming who made it public, or the PDCA Cycle (Plan–Do–Check–Act) [1-3].

In the civil construction field, applying this cycle consists of planning, execution, evaluation, and corrective measures for improvement; however, in practice, the third stage—the one pertaining to evaluation—is not successfully complied with. This is significantly due to the fact that information about the use of work resources is not reliable or is not available when necessary [4].

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This article proposes an information and communication system to collect data directly from the worksite and process it on the Web, thus we will be able to evaluate and control all the construction site activities on a continuous basis, having access to it from any place. This system was already patented by its authors several years ago with excellent results, but what we are incorporating in this new proposal is the technology to automatize both data collection and processing. Said system collects data from the three resources of production through electronic devices and process it with online software available in a Web application.

The Labour resource is reported by workers using touch screens in the late morning, and in the late afternoon at the end of each shift. Material consumption is recorded online by tracking the materials leaving the warehouse and being subsequently used. The use of Equipment, as the use of labour is controlled by the operators themselves. Finally, work progress is reported online on a daily basis from their worksite through digital tablets using store-and-forward applications.

2. Managing Production Information in Construction Works

The quality of production information in construction works is not consistent with current times; in practice, we can obtain accurate information at the end of the works in a financial statement of income and expenses. Apart from being late, the information delivered by traditional control systems is too grouped to be useful for controlling and planning decision making [5, 6].

In the last two decades, construction industry has shown great advances in the use of ICTs worldwide, even in small and medium-sized enterprises, as described by several authors [7-12]. However, as Dave et al [13] conclude based on the work of Tartari et al [14]: the “majority of ICT solutions within construction industry are applied to the peripheral processes” and “site management and other construction related activities have remained virtually unaffected.” Additionally, 90% of ICT expenses are incurred for the technical work office or head office and only 10%, for field use [15].

This is consistent with Bowden’s studies [16, 17], which presents the existence of 85 paper-based tasks carried out on-site as part of their daily normal work. “These were grouped into different document types revealing the most commonly identified tasks as completing data collection forms (25%), dealing with correspondence (18%), viewing and reviewing drawings (13%) and reading and writing specifications (6%)”.

From the research conducted in the UK by Chen and Kamara [18], it can be concluded that the information necessary for production monitoring (materials, labour, equipment and progress) is collected using paper-based forms (65%); by remembering the information (28%); and through mobile devices (only 7%), as can be seen in Figure 1. In addition, as shown in Figure 2, transfer of the information collected is done mainly in face-to-face meetings (42%), by e-mail (31%) or phone (20%), and only 7% is sent over the Intranet or Extranet [18].

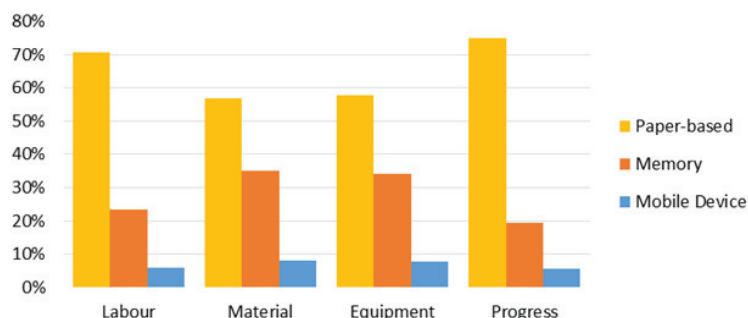


Fig. 1. Production information collection methods.

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