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DIGITIZATION OF CONSTRUCTION COMPANY

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Abstract

In connection with the ongoing digitization of society and individual market sectors, the digitization of the construction industry cannot be avoided either. Currently, one of the big topics in construction digitization in the Czech Republic is the introduction of the BIM method, which is supposed to increase the efficiency of construction project management. For construction companies, the main areas are planning and realization of construction projects. However, the digitization of construction companies cannot be perceived only from the point of view of project realization, but it is necessary to look at the given issue also from the point of view of the whole construction company within which the goal should be constantly improving processes and achieving higher productivity.

Keywords

DMS, digitization, company, process

Introduction

When we say digitization of a construction company, people can often at first imagine digitization of processes related to the realization of construction projects, which of course is not wrong, but it is necessary to realize that the construction company does not consist only of realization teams, but also a number of other organizational units. one without the other could not function properly and is thus an interconnected management system.

Nowadays, due to advanced technologies and ever-increasing requirements for up-to-date data and document availability, digitization of a company is what, when properly implemented, should bring competitive advantages in the form of improved management processes and increased productivity.

From the point of view of today's society, which is endangered by emergency measures, many companies are forced to implement all preventive measures against the spread of the disease, such as home office. In order for the employee to be able to perform their work as effective as possible, it is necessary for them to have all current data and documents available in digital form.

Methodology

The goal of this work is to design an innovation of repetitive work processes in a selected construction company to increase labour productivity. Processes for case studies are selected on the basis of practical experience from the company without established digitization and data management. Based on the analysis of the current state, the case study defines a chronologically arranged set of activities from the beginning of the process to achieving the goal in a real environment without digitization and then the process is modeled for the proposed environment with digitization.

Process innovation

Process innovation can be defined as the implementation of a new or significant improvement in an existing management process, which can be, for example, a change in software or an improvement in hardware. Before implementation, all innovations should have a defined expected benefit for the company after implementation, such as a reduction in labour costs, an improvement in working conditions or a reduction in operating costs. [1]

In general, the innovation process can be divided into four steps:

1. find the spot of a process with a potential for innovation;
2. find solution;
3. test solution;
4. implement solution.

A person responsible for each innovation should be identified. When it comes to innovations in specific departments of the company, the guarantor of the innovation is most often determined, which is most often the executive. One of the most important points before starting the introduction of innovations is to get the support of the company's top management [2].

Areas of digitization of construction companies

Today, most digitization in the construction world revolves mainly around the introduction of the BIM method, which brings many changes, including digitization of the traditional construction process. Construction companies need to be understood as a whole consisting of several organizational units that can be interconnected, and their processes need to be constantly monitored and streamlined. In the case of process innovation and the introduction of new software solutions, the biggest trend today is the use of available commercial solutions, which pose minimal risk compared to developing company’s own software solutions, which can be more costly and time consuming. In the case of digitization of a construction company, it is necessary to focus on three key points [3]:

* data digitization;
* process automation;
* connectivity.

According to an analysis by ROLAND BERGER [3] managing the transition of construction companies to the digital world is a key to increasing productivity and maintaining competitiveness. In the Czech Republic, the greatest innovations and digitization of the construction industry can be observed especially in multinational companies, which duplicate a large number of processes from abroad.



Figure 1: Main points of digitization (source: author)

Digitization in society should be understood mainly as a change of existing habits in set processes and to determine what benefits digitization should bring.

Data digitization

Companies are beginning to perceive data digitization as important and are aware of the indisputable benefits that data digitization can bring them. According to a survey conducted by IPSOS in February 2020 (4), most companies perceive data protection as the biggest threat associated with digitization. Among the most important points for digitizing society are better access to information combined with faster communication, simplification of work and acceleration of work processes [4].

Existing paper documents also need to be digitized. Conversion to the electronic version can be realized, for example, by using OCR technology (Optical Character Recognition), which is able to recognize printed characters and convert them into written and editable form. Digitized documents are also stored, for example, in a DMS data management system, which allows searching in documents according to set criteria [5].

Process automation

Within automation, it is necessary to focus mainly on processes that are performed manually and are constantly repeated. Even before automation itself, it is necessary to perform an analysis of processes within which the course and partial activities of the process are described, process participants and role specifications, identification of inputs and outputs and identification of used data formats with determination of access rights [6]. A representative example of the process can be the creation of paper documents, the retrieval of which can be time-consuming and wich must be found physically at zero digitization. For such a process, for example, digitization using OCR technology mentioned in the article „Data digitization“ can be used. For subsequent data management in digital written and editable form, for example, commercially available DMS (Document Management System) systems are used, which help to categorize documents, assign access rights, approve documents according to company management levels or search in documents according to specified criteria [7]. In the case of a DMS system, the term document is specified regardless of the document format, which can be from a standard MS Office application or an email or audio recording. All these documents carry certain information [8].

Connectivity

In the current, ever-accelerating times, there is an increasing emphasis on the greatest possible connection and constant up-to-dateness of data, including the possibility of connecting, for example, from home. Given that almost everyone owns a smartphone with the possibility of connecting to the Internet, access to corporate data is all the easier if the company uses the connection, for example, using mobile applications, which speed up communication and data flow [9]. Among the basic connectivity that is currently widely used is the connection of the email box and calendar with a mobile phone. One of the possibilities offered by modern DMS systems is, for example, linking the approval process of documents in a company with a notification in a mobile application if, for example, documents are approved or commented on.

Case study

In the case study, two different processes are presented, which are repeatedly performed manually. The selected processes are a practical example from an unnamed construction company, in which the process of digitization documents and document management using a DMS system is not implemented. The study compares the real process divided into activities without digitization and proposes a new process solution using document digitization and DMS system.

Case study no. 1

The first case study is an analysis of individual activities that are performed as part of the process of finding information on an invoice that has been posted and filed in an archiving file. The whole process of finding an invoice is divided into basic activities and the number of activities needed to find an invoice is compared.

Table 1: Case study no.1 (source: author)

|  |  |
| --- | --- |
| **Without digitization** | **With digitization** |
| **Number of tasks** | **Name of task** | **Number of tasks** | **Name of task** |
| 1 | Open accounting software | 1 | Open DMS software |
| 2 | Find the contractor  | 2 | Find contractor |
| 3 | Find the internal invoice number | 3 | Open the invoice |
| 4 | Find the file |   |   |
| 5 | Find the invoice in file |   |   |

Based on a comparison of the total number of activities listed in Table 1, it is clear that in the case of digitization and use of the DMS system, the process of finding information on the invoice would be faster and shortened by at least two activities. As part of the proposed process in the case of digitization, it is also necessary to state that all activities are performed using a computer, while in the case of non-digitization, the searcher must first find the necessary data on the computer and then search in the file, which increases the time needed to find information. In the case of digitized form, other advantages can also be seen, such as the stability of archived materials; in the case of sophisticated connectivity within the company, authorized persons can have access to materials without the need for physical contact. Other advantages include a more intuitive search within the DMS system, where the structure of document storage is defined.

Case study no.2

The process of approving a subcontract was selected as the second case study. Within the framework of internal company guidelines, each contract must be approved by the financial and legal department, which signs the approval letter for each contract, before being signed by the company's statutory body.

Table 2: Case study no.2 (source: author)

|  |  |
| --- | --- |
| **Without digitization** | **With digitization** |
| **Number of tasks** | **Name of task** | **Number of tasks** | **Name of task** |
| 1 | Creation of the approval letter | 1 | Creation of the approval letter |
| 2 | Bringing the approval letter to legal department | 2 | Sending the approval letter to the legal and financial department digitally |
| 3 | Approval/denial | 3 | Approval/denial |
| 4 | Bringing the approval letter to financial department | 4 | Attaching to the contract |
| 5 | Approval/denial |  |  |
| 6 | Attaching to the contract |  |  |

In the case of comparing individual activities within the approval process, the approval process is two steps shorter within digitization thanks to the possibility of sending an approval letter to interested parties through the DMS system. In the case of electronic approval, there is no need for physical printing and securing the necessary signatures, which in the case of paper cannot take place at the same time at the finance and legal department and the applicant for approval can be automatically notified by the system if the approval letter has been approved or commented.

Digital approval also has the advantage that the construction site is further from the company's headquarters, so employees can send documents immediately after creation without the need to travel, which also brings financial savings shown in Table 3.

All input data in Table 3 are based on the author's practical experience based on an analysis of the current state of management in a selected construction company and are intended as a representative example of possible savings after data digitization and implementation of a data management system.

Table 3: Case study no.2 - costs (source: author)



In Table 3 we can see the difference in costs with and without digitization of processes. After the implementation of digitization, a possible saving of up to CZK 3,210 is evident in the model study. The amount of cost savings within the company can thus increase further depending on the number of buildings located at a greater distance from the headquarters**.**

Conclusion

Digitization of construction companies is increasingly inevitable and can bring companies higher productivity and cost savings if new processes are used correctly. Based on the two case studies presented, it can be said that the digitization and implementation of DMS systems saves time needed for individual activities and increases connectivity, which allows employees to work from home in crisis situations where it is not possible to go to work.

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