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DOCUMENT MANAGEMENT SYSTEMS FOR DATA SHARING IN CONSTRUCTION PROJECT MANAGEMENT

SYSTEM ZARZĄDZANIA DOKUMENTAMI DLA DANYCH DOTYCZĄCYCH ZARZĄDZANIA PROJEKTEM BUDOWLANYM

Abstract

Management of construction projects is being carried out through modern information-communication and knowledge technologies. These innovative technologies are to be implemented extensively in the process of construction as much as possible. Document management systems are information systems which ensure an efficient exchange of data and information between the participants in the construction project. Current data and information facilitates decision-making, as well as serving to improve control over projects. Modern DMS are among the most used in construction worldwide, including in Slovakia and Poland.

Keywords: document management system, data sharing, construction project management

Streszczenie

Zarządzanie projektami budowlanymi jest realizowane za pośrednictwem wiedzy i nowoczesnych technologii informacyjno-komunikacyjnych. Innowacyjne technologie wykorzystuje się w procesie budowy tak często, jak jest to możliwe. Systemy zarządzania dokumentami to systemy informatyczne, które zapewniają skuteczną wymianę danych i informacji między uczestnikami projektu budowlanego. Aktualne dane i informacje ułatwiają podejmowanie decyzji, a także służą poprawie kontroli projektów. Nowoczesne DMS są jednymi z najczęściej używanych w budownictwie na całym świecie, w tym na Słowacji i w Polsce.

Słowa kluczowe: system zarządzania dokumentami, udostępnianie danych, zarządzanie projektem budowlanym

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1. Theoretical review

Information and communication technologies (ICTs) have made significant progress [1]. Investment in research on information and communication technologies are transformed into new hardware formats that are accessible for everyday tasks, whether at home or at work [2]. These innovations are not only included in hardware features, but also in software solutions and applications, which support effective ways of communication in the management of construction projects.

Information and communication technologies represent complex hardware and software, including means of communication that enables processing and data manipulation [3]. These technologies include a document management system, which are often inseparable from the information system whose main priority is to manage the processes of documents. According to Čarnický, information is data that has a particular meaning for the recipient, and it satisfies the specific need for objective information.

1.1. Data sharing

When defining the information system used for the exchange of information in construction project management, which includes an integrated exchange of data and information, it is necessary to define the concept of data and information.

The term "data" is broader than the term "information". One conception is that data stands for received information, but it does not. Data are messages that have some explanatory power. Often they are obtained by observing, measuring, or other methods. They represent a specific data bank which includes data with similar content [4].

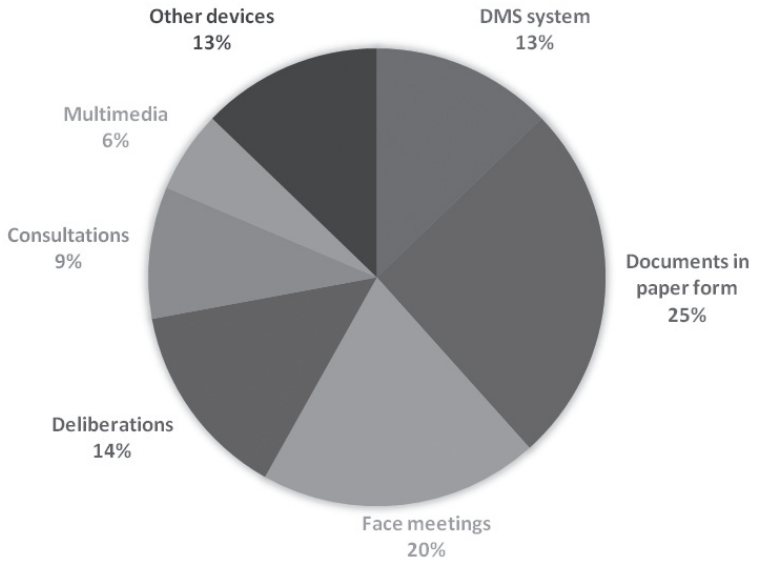


Fig. 1. Data sharing and DMS in the management of construction projects [6]

The growing importance of data and information as critical resources for business enterprises led to systematic work in obtaining, storing, and sharing data and documents, resulting in document management systems [5]. It is also important to look at ways of sharing and exchanging data and documents among participants in construction projects. In their study, Lee and Lin [6] highlighted the general methods of knowledge sharing between participants in construction projects.

Construction projects include a number of participants who usually have different data and documents. The exchange and sharing of documents are very important. The study shows that only 13% of participants who are involved in construction projects use document management systems for document sharing, and 22% of the documents are in printed format. To increase the efficiency of these processes, it is necessary in the future to take the steps that will lead to the implementation of innovative technologies for document sharing.

1.2. Document management systems in construction industry

Document management systems (DMS) are systems whose main function is to store and share documents in different formats. Document management systems are important tools for businesses because they help streamline business processes and improve methods of cooperation between employees.

Electronic document management systems have been developed to track and store electronic documents, while allowing "storage" (retention) of documents [7]. The basic feature is document sharing in real time, which allows documents to be edited efficiently. Then perfect integration with enterprise systems and other applications must be ensured in order to produce documents, as well as allow them to be corrected. These systems enable multiple users (participants in a building project) to edit one document simultaneously.

There are also document management systems for working with unstructured data. System DMS is one such filing service. These systems protect content by storing documents as objects. EDM systems (Electronic Document Management) are designed to manage electronic documents as digitized paper documents, e.g. documents converted into digital form by scanning.

A storage site or archive for documents often includes a document management system. The information that they contain can be stored for however long, and transferred from one storage medium to another (Hierarchy Storage Management), and can be eventually deleted from the system.

2. Problem statement and methodology

IT support in business processes has become indispensable for a host of enterprises in every field [8]. Moreover, innovative IT systems generally offer great opportunities to make companies, including construction firms, more competitive [9].

ICTs have been extensively applied across many sectors in order to achieve their main goal of increasing competitiveness and reducing costs [10]. The average annual growth

rate of ICT investment in the construction industry is increasing every year and currently constitutes a significant part of the total project cost. However, some studies indicate that the scope of ICT utilization is still relatively low in construction. This study discusses the current problems in construction, particularly concerning data and document sharing.

This paper discusses the exchange of economic information between selected participants in construction. The main aim of this paper is to highlight the need and possibilities for information sharing, as well as to make an overview of available DMS in construction project management. The basic research objectives are summarized as follows:

– describing document management systems, and perspectives on data and document sharing,
– an overview of current document management systems.

3. Overview of available solutions for document management systems in construction projects

There are many DMS solutions. Table 1 displays a brief overview of available solutions for document management systems which are often used in the management of construction projects. These software solutions frequently offer much more functionality than simply document management. In many cases, there are possible extensions to other applications and software solutions, enabling a number of features that are important for the management of construction projects.

Table 1

Overview of available solutions for document management systems in construction projects

Software	Size of project	Cloud solution	Participants in construction projects
Procore	SM projects	yes	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Aconex	SM projects		Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
CMIS (Construction Management Information System)	SM projects		Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
SAGE 300	SM projects	C/S	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
ComputerEase	SM projects	C/S	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Mawwell Systems ProContractorMX	SM projects	C/S	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies

Continue Table 1

Software	Size of project	Cloud solution	Participants in construction projects
Jonas Enterprise	S projects	C/S	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Jonas Premier	S projects	yes	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
HC S S Equipment360	SM projects	n/a	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
BuildTools Construction Management Platform	SM projects	yes	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
AccuBuild Construction Project Management	SM projects	n/a	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
BuilderTREND	SM projects	yes	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Co-construct	SM projects	yes	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Paskr Project Management Suite	SM projects	yes	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Primavera P6 Profesional Project Management	SM projects	n/a	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Project DocControl	S projects	n/a	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Prolog	SM projects		Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
Structure	SM projects		Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
UDA ConstuctionSuite	SM projects		Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies
eSUB	M Project	yes	Contractors, sub-contractors
EADOC	SM projects	n/a	Investors, developers, contractors, sub-contractors, architects, designers, planners, state agencies

SM projects – small and medium sized projects, S project – small projects [11].

4. Conclusions

Construction project management is a complex process. Currently there are a diverse range of options for effective project management. One possibility is the Document Management System. The sharing of data and documents is necessary for project management, because building projects have many participants who exchange various types of documents

(economic or otherwise). Keeping track of these technologies is crucial. The results of the analysis present a number of possible solutions for the construction industry. The list is by no means exhaustive. This warrants further research to determine what extent individual DMS are used.

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The paper presents partial results of the research project VEGA No. 1/0562/14 "The impact of Business Intelligence tools on corporate performance".

References

[1] Kršák B., Hricová R., Sudzina F., *Manažérske informačné systémy a ich využívanie v priemyselných podnikoch na Slovensku v rokoch 2003–2005*, New Members – New Challenges for the European Regional Development Policy: September 27th–30th, 2005, Nový Smokovec: international conference proceedings, 2005, 218–221.
[2] Kršák B., *Measuring information technology's impact on company performance*, Metalurgija, Vol. 43, No. 3 (2004), 261.
[3] Gála L. et al., *Podniková informatika* – 2. prepracované a aktualizované vydanie, Praha: Grada Publishing, a.s., 2009, 496.
[4] Čarnický, Š., *Manažérske informačné systémy podnikov*, Bratislava: Ekonóm, 2004.
[5] Dingsryr, T., Rryrvik E., *Skills management as aknowledge technology in a software consultancy company*, Industrial management Journal, Vol. 15, 2010.
[6] Lin Y., Lee H., *Developingn project communities of practice. based knowledge management system in construction*, 2012.
[7] Chassiakos A.P., Sakellaropoulos S., *A web-based system for managing construction information*, Advances in Engineering Software, Vol. 39, 2008, 865–876.
[8] Müller A., Thiemen L., Schröder H., *IT – Controlling. So messen Sie den Beitrag der*, Formationstechnologie zum Unternehmenser – folg. Der Controlling-Berater (1) 2006, 99–122.
[9] Henderson J.C., Venkatraman H., *Strategic alignment: leveraging information technology for transforming organizations*, IBM Systems Journal 38, 1993, 472–484.
[10] Marsh L., Flanagan R., *Measuring the costs and benefits of information technology in construction*, Engineering Construction and Architectural Management, 7, 2000, 423–435.
[11] http://construction-project-management-software.findthebest.com/ [online: 26.08.2015].