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Procedia Engineering 161 (2016) 711 – 715

Procedia Engineering

www.elsevier.com/locate/procedia

World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium 2016, WMCAUS 2016

Survey of Construction Management Documentation Usage in Planning and Construction of Building Project

Maria Kozlovska[a], Daniela Mackova[b,*], Marcela Spisakova[c]

[a]*Technical University of Kosice, Faculty of Civil Engineering, Vysokoskolska 4, Kosice, Slovakia*

Abstract

Project management presents the management and the coordination of human and material resources throughout the life of project by using the modern techniques of management for achievement of predetermined objectives in particular scope, costs, time, quality and the satisfaction of projects stakeholders. The construction project is unique summary of activities which resulted in product meeting the required quality parameters limited by time and costs. These parameters can be managed only through the carefully planning. The wide range of plans is the result of construction planning. The plans allow the effectively manage the achievement of planned construction parameters. Not only the time, costs and quality are important for construction project management, but also the plans in the field of safety, construction equipment and measures for eliminating the impact of the winter season for construction as a part of construction management documentation. For effective planning and the management of construction process by the plans, it is currently necessary to use more sophisticated ICT tools.

The paper presents the results of longitudinal research focused on the opinion of construction companies in Slovakia related to their approaches to processing these important plans for management of their construction projects. The survey was repeated in 1996, 2003, 2008 and 2013, therefore it is possible to examine the trends in the field of plans processing and then their using for construction management. The aim of research is to find out the trend in processing of construction management documentation.

Peer-review under responsibility of the organizing committee of WMCAUS 2016

Keywords: construction management documentation; planning phase; construction phase; questionnaire survey;

* Corresponding author. Tel.: +421 55 602 4383.
E-mail address: daniela.mackova@tuke.sk

Peer-review under responsibility of the organizing committee of WMCAUS 2016
doi:10.1016/j.proeng.2016.08.747

Previously is necessary to determine the dependence of construction management documentation processing on time which is confirmed by statistical method (chi-squared test) for investigation of quantitative characters. The findings of research indicate that trend in the processing of construction management documentation is improving.

1. Introduction

The construction management documentation presents the result of planning of construction processes and is necessary for its management. The processing and continual updating of construction management documentation are essential for management of changes which are very common issues in construction projects. Any additions, deletions, or revisions to project goals or scope are considered to be changes; regardless of whether they increase or decrease the project cost, quality or schedule [3]. Project changes have obvious impacts on the construction process, not only on the project's schedule and cost but also on the project's performance. Furthermore, it is hard to predict the changes in construction projects. This is mainly because of the uniqueness of each project and the limited resources that can be spent on planning, executing and delivering the project [4]. Project manager needs to predict changes in a timely manner. According to Kartam [9], conflict will be minimized when problems are found at the earliest possible stage of a project thereby enabling the implementation of counter measures. The changes in construction projects are implemented in its design and planning through a complex and iterative process, which may extend over a long period of time. The impact of these changes on the project often becomes clear only at the end of this process [10]. On the other hand, the study of authors Cox et al. [2] estimated that the direct cost of post contract design changes in building projects amounts to 5.1% - 7.6% of the total project cost. Author Ballard [1] discovered that over 50% of site work had not been finished on time according to weekly plans because of the construction changes.

The processing of construction management documentation in phase of building project planning and construction presents the significant part of information management which is essential in construction project [11]. The construction management documentation is important resources of information for planning and the management of construction processes which are needed for each project stakeholders (investor, designers, contractors and subcontractors, suppliers and government administrators). An inefficient collaboration among participants has been identified as a part of the reason for frequent overrunning in terms of time and cost and an inefficient level of construction quality [1]. On the other hand, not only the time, costs and quality are important for construction project management. The issue of building site planning has to be an integral part of construction planning. The result of planning of construction processes is the processing of construction management documentation which is generally focused on main aspects of construction – time, costs, quality closely linked to building site conditions including the safety on site (tab. 1).

Table 1. Analyses of construction management documentation for planning and construction phase

Evaluated aspect	Required document
Time	schedule of construction works
Costs	budget
Quality	quality control plan for construction realization
Building site	construction site layout planning
	plan for occupational safety and health
	plan of measures for eliminating the impact of the winter season for constr. plan

Management of information flows is crucial for construction projects [7]. Considering schedule of construction works, the site manager assesses the ability to meet the deadline specified in the business. Planning and management of construction costs are provided by construction budget containing the construction cost estimating. During the construction phase of building is needed the constant monitoring and updating of construction resources and spending costs [5,12,13]. The quality control plan for construction realization is document processed by quality manager where is assessed the compliance the required and offered quality of construction works what presents quality aspects of construction [6]. Construction site layout involves identifying, sizing, and location building site equipments within the boundaries of construction site. This document allows effective planning and management of construction process

conditions. Plan for occupational safety and health (OSH) on the construction site is a document containing data, information and procedures prepared in details necessary to ensure a safe and healthy work during construction [8]. The plan of measures for eliminating the impact of the winter season is used to eliminate the effects of weather conditions to a construction process that affect its progression and continuity.

Obligation of processing almost all documents (except quality control plan for construction realization and plan for OSH) is not legislatively required. On the other hand, this documentation provides the necessary and valuable information and data for effective and correct management of construction in all aspects of construction.

2. Methodology

The goal of research is to find out the trend in processing of construction management documentation in Slovak construction companies. Previously is necessary to determine the dependence of this documentation processing on time. The dependence is determined by the results of questionnaire survey which have done since 1996 in Technical University in Kosice. This research analyses data collected in four years - 1996, 2003, 2008, 2013. Respondents (experts) were asked by personal questioning to answer questions relating to construction management documents. In 1996 were interviewed 64 respondents, in 2003 48 respondents, 159 respondents in year 2008 and 59 respondents in year 2013. This study analyses selected six construction management documents processing in Slovak construction companies depends on time: schedule of construction works (question Q1), budget (question Q2), quality control plan for construction realization (question Q3), construction site layout planning (question Q4), plan of occupational safety and health (question Q5), plan of measures for eliminating the impact of the winter season for construction (question Q6). The questionnaire mentioned above contained questions related to the processing of these documents and the respondent had scale of possible answers: always, sometimes and never documents are processed. The share of answers (in percent) for all six questions depending on time is shown in table 2 and also in figure 1.

Using chi-squared test (significance level $\alpha = 0.05$) by software MS Excel it was investigated influence of time to construction management documents processing. A null hypothesis was: The processing of documents is independent on the time. The share of answers (in percent) for all six questions depending on time is shown in table 2. Consequently chi-squared test was done and the results are shown in table 3.

Table 2. Share of answers for questions Q1, Q2, Q3, Q4, Q5, Q6 [%].

	always [%]				sometimes [%]				never [%]			
	1996	2003	2008	2013	1996	2003	2008	2013	1996	2003	2008	2013
Q1	54	43	71	69	46	50	25	25	0	7	4	6
Q2	61	50	57	51	31	38	36	35	8	12	7	14
Q3	50	35	44	46	33	50	35	40	17	15	21	14
Q4	38	22	48	26	54	40	31	55	8	38	21	18
Q5	54	53	74	71	31	38	21	21	15	9	5	8
Q6	31	22	27	20	61	43	53	54	8	35	20	26

Table 3. Results of chi-squared test.

	Q1	Q2	Q3	Q4	Q5	Q6
p-value	$3.39\ 10^{-5}$	0.49	0.182	1.10^{-7}	$4.2\ 10^{-3}$	$6.8\ 10^{-4}$
	$p < \alpha$	$p > \alpha$	$p > \alpha$	$p < \alpha$	$p < \alpha$	$p < \alpha$
C	0.846	-	-	0.885	0.782	0.813

p-value of chi-squared test; significance level $\alpha = 0.05$, C - Pearson contingency coefficient.

3. Result and discussion

As we can see in table 3, p-value of chi-squared test is for questions Q2, Q3 higher than significance level $\alpha=0.05$, therefore we accept null hypothesis: Processing of these two construction management documents (budget of construction works and quality control plan for construction realization) is independent on time. On the other hand,

we can see that p-value of chi-squared test is for questions Q1, Q4, Q5, Q6 lower than significance level α=0.05, therefore we reject null hypothesis and accept alternative hypothesis: Processing of these four construction management documents (schedule of construction works, construction site layout planning, plan of OSH and plan of measures for eliminating the impact of the winter season for construction) is dependent on time.

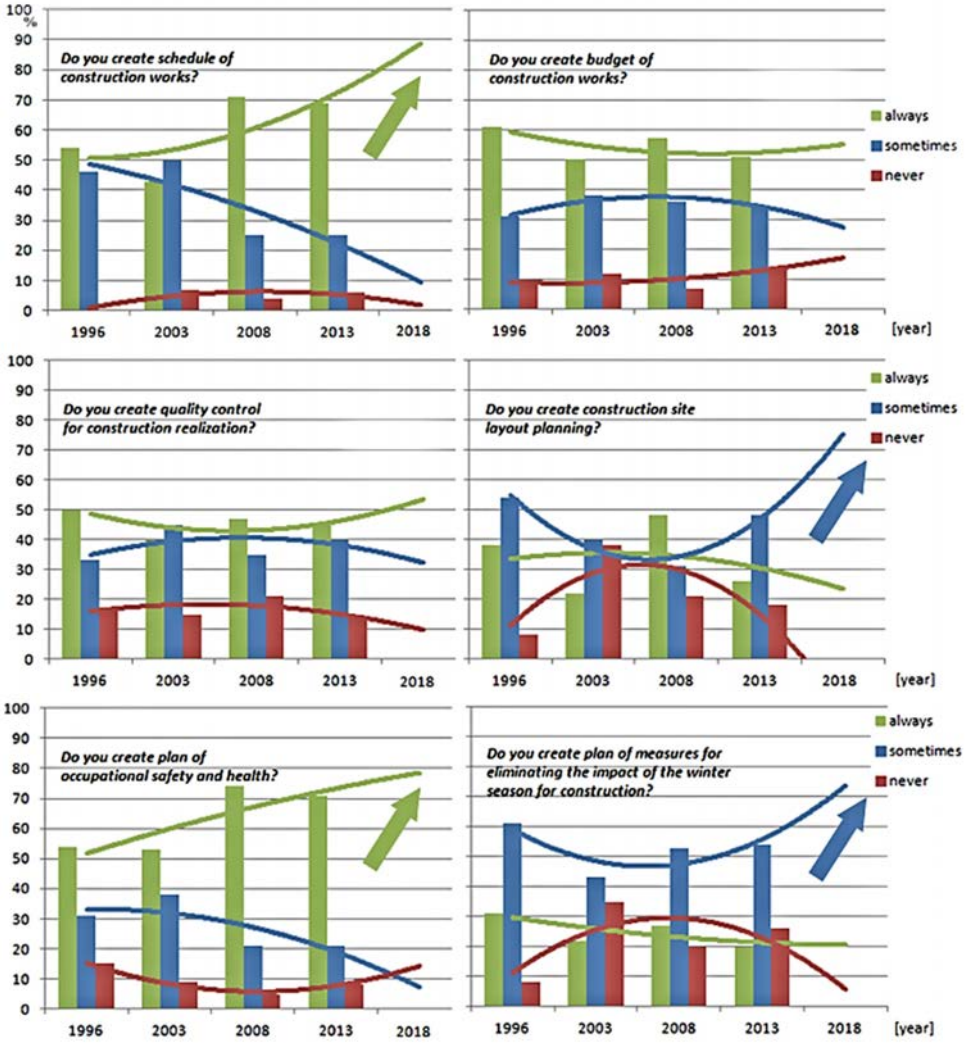

Fig. 1. The share of answers and trend curve for questions Q1-Q6 depending on time.

In addition, it can be interpret also strength of dependency by the Pearson contingency coefficient (C). Pearson contingency coefficient (can take values from the interval from 0 to 1) values of 0.846 for question Q1, 0.885 for question Q4, 0.782 for question Q5 and 0.813 for question Q6 points the high degree of dependency. Fig. 1 shows share of answers (in %) for all six questions in monitored years (1996, 2003, 2008, 2013) and there are also indicated trend curves for each possible answer within all questions, which were drawn up according to collected data in research mentioned above. Trend curves (polynomial functions of one variable - time) show future direction in the field of construction management documents and it is possible to say, that processing of construction management documents has improving tendencies in generally. Specifically, we can argue that the trend of schedule of construction works processing, construction site layout planning, plan of OSH and plan of measures for eliminating the impact of the

winter season for construction will be improving. The trend of processing of construction works budget and quality control plan for construction realization is unchanged. The construction companies had created the budget of construction works and quality control plan already in investigated period (1996-2013). Thus, this unchanged trend is satisfactory. The budget of construction works provided to companies the valuable information in the field of construction costs. On the other hand, the obligation of quality control plan processing is legislatively required (Act 254/1998 Coll. of Laws on Public works, standard STN EN ISO 9001).

4. Conclusion

The construction process is complex system. Primarily, the successfully completed project must be carefully planned. The aim of submitted paper is to determine the trend in processing of construction management documentation. Initial step was to find out the dependence of its processing. According to confirmed and verified dependency (using chi-squared test) of impact of time to construction management documents processing in Slovak construction companies, there were determined the trend curves of their processing in future. The trend of schedule of construction works processing, construction site layout planning, plan of OSH and plan of measures for eliminating the impact of the winter season for construction will be improving. The processing of budget of construction works and quality control plan has been already satisfactory and in the future will not change.

It can be concluded, that in spite the fact that obligation of construction management documents processing is not defined in any legislation (except quality control plan for construction realization and plan for OSH), the construction companies focus their attention on its processing in planning phase of construction process. Precisely planned and constantly updated progress of construction presents a primary assumption for successful completion of the construction according to contract terms (costs, time, quality).

Acknowledgements

This work has been supported by Grant Agency of Slovak Republic to support of project VEGA No.1/0677/14 “Research of construction efficiency improvement through MMC technologies”.

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