

INNOVATIVE PERSPECTIVES ON THE ANALYSIS OF WORK IN THE CONSTRUCTION INDUSTRY

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Abstract

The current economic crisis is forcing construction companies to save. At the same time, waste on construction sites and in construction has not faded. Savings are often in the wrong places, because the evaluation of where to save is based only on financial indicators. Therefore, analysis and measurement of work – not only manual, but also mental – get back to the fore.

The methods used for the standardisation of work in engineering and other industrial processes are being modified and are also used in construction. Currently, the normative base for construction works is outdated and needs to be updated. New technologies and materials provide performance options and performance standards for the construction output that are completely different from the ones valid almost 30 years ago, when the normative base still used nowadays for the pricing of construction work in the Czech Republic was created.

The aim of the paper is to analyse the current situation in the use of traditional and new methods of standardisation of work in the construction industry. The analysis is based on a questionnaire survey with subsequent statistical evaluation. This research will serve as an initial basis for mapping the current situation and finding problematic areas of measurement and standardisation of work.

Key words

Standard; measuring of work; analysis of work; construction industry

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1 INTRODUCTION

The modern world keeps changing and developing and companies need to follow this trend. It is not enough to innovate the company management in the areas of marketing, technologies and information systems. The need for and the methods and approaches to internal process management and optimisation are getting more and more important. Currently, it is rather the engineering and electrical engineering companies that are beginning to realise this. Here, the so-called lean management (or lean manufacturing) is at the forefront: it is a relatively simple and at the same time a very efficient tool in fighting waste and inefficiency in the work processes.

Due to the increasing competition pressures and requirements of customers regarding lower prices, higher quality and shorter delivery times, companies must constantly review their processes and endeavour to improve them on a continuous basis. Various tools for the measurement and analysis of work help increase the efficiency of these processes and simplify production, thus ensuring continuous innovation.

The objective of this paper is to ascertain the real situation in this area in construction companies and to use these results as a basis for finding problematic topics and suggesting possible areas for future research.

2 RESEARCH METHODS

2.1 Development and History of Construction Standardisation in the Czech Republic

The endeavour to study and improve human labour and its effects has very deep roots. The first references to the importance of the organisation of work come from ancient Egypt.

In Czechoslovakia, the development of the standardisation of work was very strong at the beginning of the 20th century. A typical industrial enterprise that created, implemented and applied work standards was the Baťa company based in Zlín, which also had its own construction department. The company thus gradually created an internal system of construction budgeting. *“The detailed budget covered not only the expected material consumption and the period of time required for the work including the monetary values, but it also set the technology and the guidelines for the process of performing each operation.”* [1]

After 1948, when the Czechoslovakian companies were nationalised, a uniform system of work, material and machinery standardisation gradually emerged. Thus, a national database of standards was gradually created. To a large extent, this database was based on what Baťa introduced in his plants. As a result, a database of standards including performance standards, standards of material consumption and standards of productivity and capacity standards of machines started to be created in the 1950s. From the 1960s, the development and maintenance of this database was the responsibility of the Institute for Rationalisation in Construction (Ústav racionalizace ve stavebnictví).

At the end of the 1980s, an extensive high-quality database of standards existed in Czechoslovakia. Its creation and development was ensured by the Institute for Rationalisation in Construction, which was subordinated to the Ministry of Construction of the Czech and Slovak Republics, in cooperation with the trade unions. In this way, the *Základní výkonové normy* (ZVN, *Basic Performance Standards*) series, later called *Standardy času* (*Time Standards*) and the *Normy spotřeby materiálů*, (NSM, *Material Consumption Standards*) series were created. [2] [3]

After 1990, during the transformation of the centralised economy to a market economy, the requirements to update the standards and diligently maintain the central database of standards gradually disappeared. The ÚRS Praha, a.s. company, the successor of the Institute for Rationalisation in Construction, continued to use the existing database without updating it in any significant way.

It was only the onset of the crisis in 2008 that brought an increased interest in the standardisation of work. The standards gradually started to be updated and the ÚRS a.s. began to standardise selected types of work at constructions. The companies found that internal performance standards were their “family silver”.

2.2 Innovative Business

The world keeps searching for new and innovative methods in the area of measuring and analysing production, human labour, material resources use and finance management. A new point of view – even if not as new as it might seem – was brought, among others, by the lean management approach.

In the 1990s, a “revolution” of the automotive industry started both in Europe and in North America. The world discovered the Japanese methods, which had been developing from the middle of the 20th century and had helped the Japanese automobile manufacturers produce their cars in a better way, more quickly and cheaply. [4] The world discovered lean management. [5] These methods are currently being transferred from the automotive industry into banks, chain stores, public administration, construction companies etc.

Lean management is defined as a method of working or a philosophy that increases the added value of all the company activities for the customer while decreasing the level of resource waste at the same time, whether they are funds, human labour, time, material or storage space. [6] The goal is to decrease needless and non-productive waste of all resources to the minimum, which may either increase the added value for the customer or decrease the costs for the company. [7]

A lean company focuses not only on lean manufacturing, but also on more efficient company management. The basic principles of lean management may be applied to these activities as well. [8]

2.3 Analysis and Measurement of Work

The analysis and measurement of work, including a set of tools and methods to analyse and measure the work done, form a component part of company management. The main goal of the analysis of work is to identify waste and non-productive activities in the work processes and simplify the work done. The result is a new optimal method of work. The measurement is aimed at setting the time required for performing the individual construction activities. The consumption of time may be determined on the basis of direct measurement (record of a workday, record of repeated activities) or indirect measurement (MTM, MOST, MUDA, DOE...). The output of the analysis and measurement of work is a time consumption standard. These analyses are being introduced into various industry sectors, such as electrical engineering production. [9]

One of the many other directions in work standardisation is REFA, a methodology used to optimise work processes and finding out and evaluating company data. [10] Then there is also the Kaizen system, which is a system of continuous improvement in personal, social and working life of manual workers as well as managers. [11]

“It is often the case that the analysis of work consists solely of detailed observation of work process, using common sense and incessantly asking the question whether we carry out the given operation in the best possible way.” [12]

3 RESULTS AND DISCUSSION

New technologies and materials bring new performance possibilities and standards into construction production, which are vastly different than the ones that existed almost thirty years ago, when the base of standards for setting the prices of construction works in the Czech Republic was created. Various methods used for analysis and measurement of work in the engineering, electrical engineering and automotive industries are modified and used in the construction industry as well.

The information which forms the basis for the analysis of the current situation in this area was ascertained through a questionnaire survey – and in some companies also through directed interviews – carried out in construction companies in 2006 and in 2014. This survey shows that standardisation and performance standards are considered to be an important part of internal databases in the construction companies.

3.1 Questionnaire Survey

There is a continuous exchange of information and knowledge between the faculty and construction companies. However, in 2006 and 2014, a detailed questionnaire survey was carried out, followed by an analysis of the situation in the areas of standardisation and remuneration of workers. For the purposes of this paper, the standardisation part was the key part of the survey. Overall, 73 filled-in questionnaires were processed in 2006 and 52 were processed in 2014, producing a sufficient amount of information to allow interesting conclusions.

The part of the questionnaire which concerned standardisation of work aimed to ascertain the behaviour and opinions of the companies through 6 questions. The questions concerned mainly the companies' knowledge of necessary standards and methods, importance of standardisation for the operation of the company, for which area of management they use standards and measurement of work, whether they have their own work measurement and waste department and, last but not least, whether they create their own work standards or use standards created by other companies.

When examining the companies' experience with standardisation, work rationalisation and introducing new perspectives on this topic, it was also important to ascertain the diversity of experience in relation to the size of the company. The data that we found can be seen in Figure 1. Most of the examined companies are small- or middle-sized (that is, up to 50 or 250 employees respectively). This almost wholly corresponds with the distribution of company sizes according to the statistical data of the Czech Statistical Office. [13]

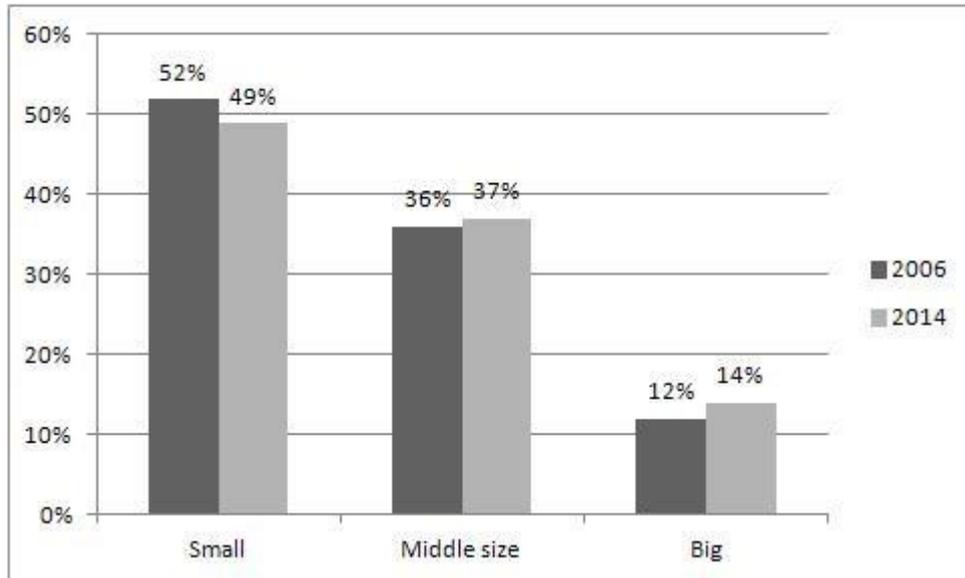


Fig. 1: Size Distribution of Companies

Another important information to be found out was the importance that the companies attached to using any standards (performance standards as well as material consumption standards etc.), established methods and analyses. The results showed that an overwhelming majority of the examined companies considers work standardisation to be essential (approx. 60%) or important (30%) in both 2006 and 2014. See Figure 2. This finding is pleasing, as one can see that most companies are aware that setting these standards is important for good management and also to prevent wasting both time and material. The small number of companies which answered this question in a disparaging way were the smallest companies with a handful of employees. And even these companies' answer to the follow-up questions usually was that they had information on the speed of work and rational use of material, they just did not have them recorded in calculations and analysis. Usually, the owner of the company supervised everything and did not consider the necessary information gained by practice in the field to be standards.

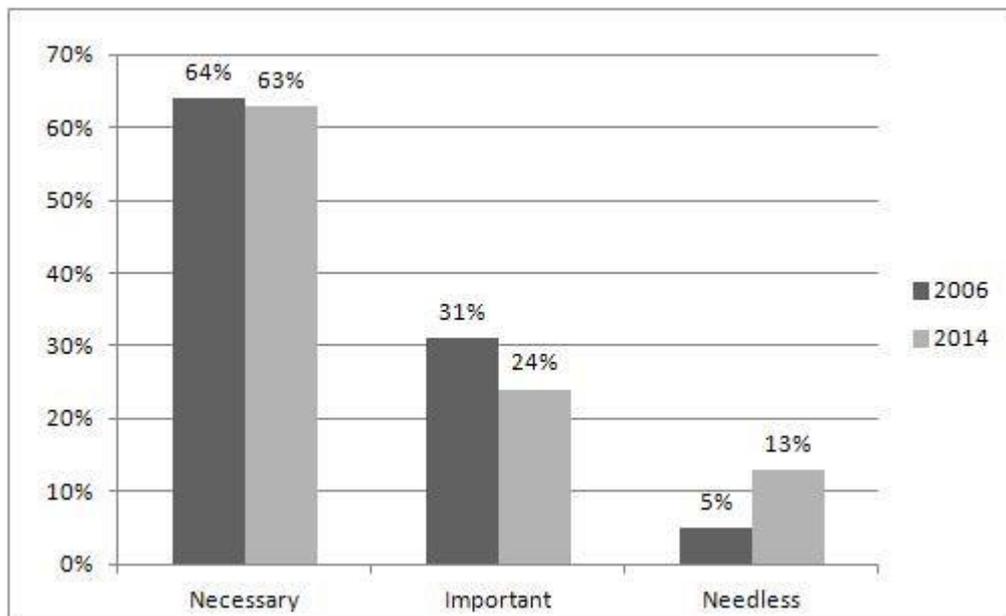


Fig. 2: Companies' View on the Use of Standards

To answer the next question – which activity they use the standards for – the companies were able to choose one or more answers, as you can see in Figure 3. In this case, almost identical data were gained in both examined periods. The standards are most often used for cost calculation and for setting the prices (approx. 70% of companies) and for work scheduling or planning (approx. 70%). It is clear that performance standards are important even today and that their creation and management is often a benchmark of the success of the company, as they are an important pillar of the profit of the company. The paradox here is that even though many companies rated standardisation and rationalisation of work as important, only a minority of them had an employee or a department assigned specifically with these tasks. However, this can be attributed to the current demands of decreasing the costs of company management. For this reason, many companies assign these tasks to people in charge of other economic activities, such as budget preparation and various financial planning tasks. In our opinion, the current economic crisis should lead to a higher pressure on a more economical use of resources. Currently, the companies lay off their employees and decrease the quality of construction instead of using modern methods to streamline all production processes.

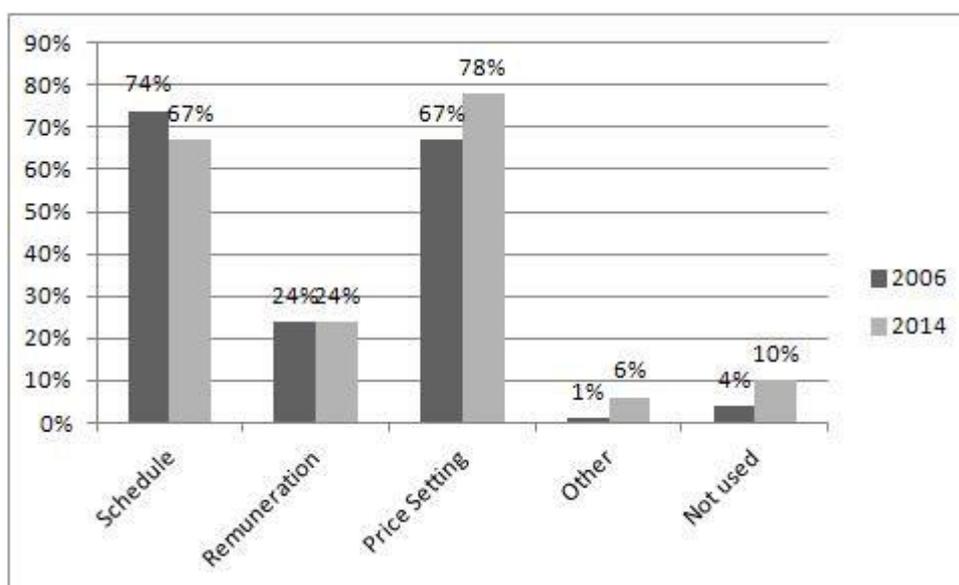


Fig. 3: Areas Where Standards are Used in Companies

Furthermore, the survey found out that the most often used performance standards are standards taken from the ÚRS's *Sborník potřeb a nákladů* (*Collection of Needs and Costs*) and collections of *Základní výkonové normy* – these are standards created more than thirty years ago. As you can see in Figure 4, more than a half of the respondents use these norms. There are also many companies who use standards created by another company, mostly the RTS (approx. 30%); however, their standards are also based on the ÚRS company standards. In comparison with 2006, there is a noticeable positive shift in the area of companies creating their own standards (from 2% in 2006 to 10% in 2014). We hope that this is caused by the fact that companies are aware of the need to react to changes in the market and to gain a competitive advantage. A more detailed research found out that companies with their own standards are usually the smallest or the largest companies. This is caused by the need to constantly react to changes in the market (in case of the smallest companies) or by the overall strategy of the largest companies (with more than 1,000 employees) to introduce new trends related to company management. This is also supported by the statistical survey of the Czech Statistical Office, see [14].

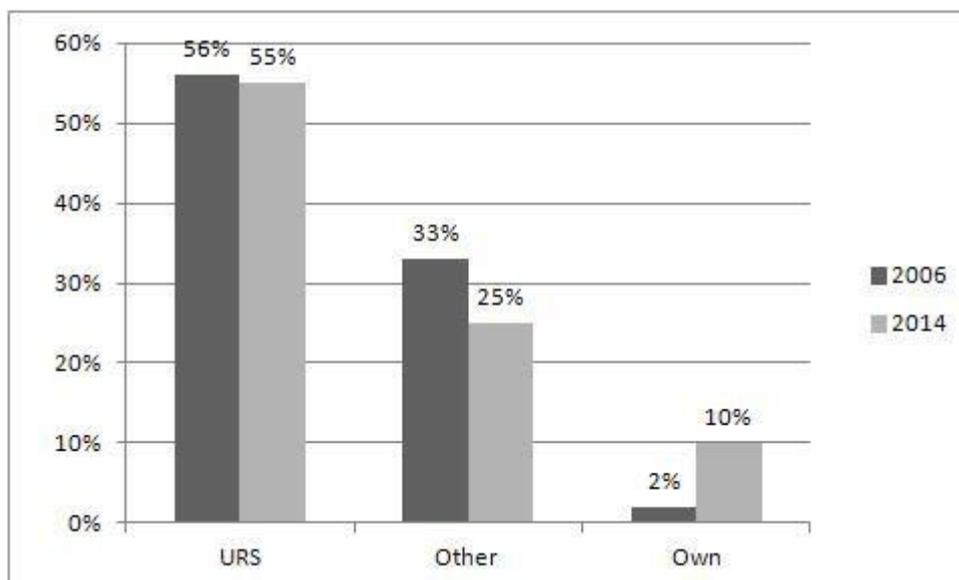


Fig. 4: The Standards in Use

3.2 Evaluation

In 2006 and in 2014, a questionnaire survey was conducted among several scores of Czech construction companies. Afterwards, an analysis of the development in the areas of standards and the measuring of work and material and machinery consumption was carried out. The results showed an ongoing stagnation in the development of new performance standards and in the introduction of new methods for streamlining both work and production processes in most construction companies. Based on these findings, we suggest examining the currency of selected standards and creating an expanded database system by adding new standards of new technologies.

4 CONCLUSION

The objective of this paper was to give information on a research conducted in 2006 and in 2014, i.e. before and during the current economic crisis. As can be seen from the results, each construction company is an individual enterprise that makes its own way in life, is governed by its own rules and does everything it possibly can to succeed in the market and gain the most profitable contracts. It is surprising that there was no significant development in almost any of the areas of manufacture management. Most of the companies are struggling on the verge of their capabilities and are not able to invest more funds and time into making their processes more efficient. This is in contrast with the modern way of company management in other branches of the industry – especially the automotive or electrical engineering industries.

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