Productivity and Performance Management – Managerial Practices in the Construction Industry

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Abstract

The purpose of this paper is to clarify the meanings of different terms related to productivity and to analyze the state of productivity in the Finnish construction industry at the macro level. This study reviews literature related to productivity and performance management; its aim is to form an understanding of prevailing habits and shortcomings. Based on a conducted macro level analysis, the research results show that the rate of productivity development in the Finnish construction industry has been moderate at best, leaving it behind the best industries in Finland and some of its international counterparts. A further review of the performance measure in the construction industry indicates that productivity is an inadequate measure for identifying improvement targets and control activities. The use of a more holistic set of measures is recommended in order to ensure more relevant and timely information. Finally, this study shows that a gap exists between the academic framework and practical action; this imposes difficulties in implementing modern measurement systems in organizations. This paper offers implications for managers in the construction sector aiming to refine their practices in order to improve their business performance.

Keywords: Productivity; Performance management; Construction industry.

1. Introduction

Because of its central importance to competitiveness and world prosperity, the topic of productivity has been a matter of interest since the beginning of industrialization. Productivity is perhaps one of the most important and influential basic variables governing economic production activities (Singh et al., 2000; Tangen, 2005). While high productivity can be a significant source of competitive advantage for companies (Grossman, 1993), it also contributes to the general well-being of a society. Due to the size of the construction industry, productivity trends in this industry have notable effects on national productivity and on the economy as a whole (Allmon et al., 2000). The increased pressure of global competition has forced companies and authorities to put

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even greater emphasis on productivity improvements. Widespread discussions have resulted in multiple interpretations of the concept of productivity; despite the fact that the term is commonly used by both academics and practitioners, it is often confused or used interchangeably with similar terms such as profitability and performance (Tangen, 2005). In fact, most managers do not know what productivity really means, how vital it is to success or how it can be measured, analyzed or improved (Bernolak, 1997; Stainer, 1997).

Many studies have been conducted that assess the performance of the construction industry, mainly from a labor productivity viewpoint (Allen, 1985; Allmon et al., 2000; Koskenvesa et al., 2010; Rojas & Aramvareekul, 2003; Abdel-Wahab et al., 2008). Although the results of productivity studies on different industries are often compared, a macro level analysis can only debate the possible reasons for variations; it cannot fully explain the results or the validity and reliability of those studies, aspects which are often questioned by both practitioners and the academic community (Teicholz, 2001; Rojas & Aramvareekul, 2003). This uncertainty regarding the usefulness of productivity data is perhaps the primary reason why discussing productivity often elicits defensive behavior among individuals and organizations alike, regardless of their type of industry.

The performance measurement in general has traditionally focused on metrics based on financial information. However, financial measures are historical in nature, reporting outcomes and the consequences of past actions (Kaplan & Norton, 2001); thus, they are of little use in improving current performance (Kagioglou et al., 2001). This situation has led to criticism of business environments that rely on lagging financial measures, since these measures result in short-termism, lack of strategic focus, local optimization and misleading signals for continuous improvement and innovation that are not externally focused on customers and competitors (Neely, 1998; Manoochehri, 1999; Bourne et al., 2000; Anderson & McAdam, 2004). Current business environments need more timely and proactive information that leads to an improvement in actual performance.

The need to improve overall performance, including productivity, is especially apparent in the construction industry. The purpose of this paper is to clarify the meanings of different terms related to productivity, and to analyze the state of productivity within the Finnish construction industry by using a macro level analysis based on publicly available information obtained from the EU KLEMS database. This paper also considers the consolidation of productivity development and performance management, and provides suggestions on how to improve managerial practices related to productivity and performance in the construction industry. In terms of objectives, this paper aims to answer the following research questions:

- **What are the main challenges of productivity management in the construction industry?**

- **How should managers view productivity and performance in the construction business?**
Before responding directly to these questions, this paper first explains the meaning of productivity and related terms. The characteristics of productivity measurement are then considered and tested by analyzing the state of productivity in the Finnish construction industry. This is followed by a brief review of the literature, which points to unimpressive productivity results. Subsequently, the performance measurement in the construction industry is reviewed; how the demands of the current business environment stipulate more forward-looking information than lagging financial measures have been able to offer is explained. Finally, this paper concludes by providing answers to the aforementioned research questions and suggesting proposals for future research.

2. **Productivity: an ambiguous concept**

Productivity is a commonly used but often poorly defined term that regularly appears in both academic and practical discussions. Definitions of productivity seem to be dependent on the reviewer’s point of view and the context in which it is used. Studies on technology, engineering and economics, three broad industry categories, all examine productivity from slightly different viewpoints (Ghoabadian and Husband, 1990). In general, verbal definitions of productivity aim to explain what the term means while mathematical definitions are used as a basis of measurement; in the latter case, the major objective is not to explain, but rather to improve productivity (Tangen, 2005).

According to Bernolak (1997) productivity means “how much and how good we produce from the resources used,” whereas The European Association of National Productivity Centres (EANPC, 2005) defines productivity as “how efficiently and effectively products and services are being produced.” Efficiency in this context can be seen as “doing things right” or utilizing resources to accomplish desired results (Grünberg, 2004). Effectiveness, on the other hand, is often described as “doing the right thing”; it refers to the extent to which customer requirements are met (Neely et al., 1995). Thus, effectiveness highlights the importance of reaching a desired objective, whereas efficiency focuses on the process or means involved.

In general, productivity is often defined as a relationship between output produced by a system and quantities of input factors utilized by the system to produce that output. Here, the output can be any outcome of the process, whether a product or service, while input factors consist of any human and physical resources used in a process. It follows that, in order to increase productivity, the system must either produce more or better goods from the same resources, or the same goods from fewer resources. Stated differently, productivity improvement refers to an increase in the ratio of produced goods or services in relation to resources used.

As the foregoing discussion indicates, the concept of productivity refers to a purely physical phenomenon and must therefore be defined as one, despite the difficulty that even such a definition imposes for the measurement of different quantities that do not correspond to the same standard. Productivity is closely related to the use and availability of resources as well as to value creation. This means that a company’s productivity is reduced if its resources are not properly used or if there is a lack of resources. On the
other hand, high productivity is achieved when activities and resources used in the process add value to the produced goods (Tangen, 2005).

2.1. Profitability

Profitability is often confused with productivity. The difference between these concepts is that profitability takes into account monetary effects, while productivity relates to a real process that takes place among purely physical phenomena. Like productivity, profitability is also seen as a relationship between output and input, but the relationship is monetary; thus the influence of price-factors is included (Tangen, 2005). In the long run, productivity is considered more suitable than profitability as a measure for monitoring manufacturing excellence since profits are influenced by many factors over the short term that can give a misleading indication of long-term success (Miller, 1984; Tangen, 2005). Nevertheless, profitability is a crucial indicator for a company because it shows whether the company is making money with its business.

Profitability is defined as output volume times output unit price, over input volume times input unit costs (Bernolak, 1997), or profitability = productivity + price recovery (Miller, 1984). Van Loggerenberg and Cucchiaro (1981) explain how changes in profitability are caused by changes in productivity, price recovery, or in both of these factors. A significant point to consider is that the profitability of a company can change for reasons that have nothing to do with productivity (Bernolak, 1997). A company can increase its profits and at the same time decrease its productivity because of market mechanism (Grunberg, 2004). This is illustrated in Figure 1.

Profitability does not have a direct impact on improvement purposes since it is a result of, rather than a contributor to, the actions and processes in operations. However, profitability is a good supplement to performance and productivity measures since it...
helps to identify the effects of monetary changes and distinguish them from “true” performance and productivity changes (Grünberg, 2004). An integrated analysis of profitability and productivity makes the application of productivity theory more practical for managers (Bernolak, 1997). Combining those two ratios can help to clarify the true reasons for increased profits (Tangen, 2005).

2.2. Characteristics of productivity measurement

Productivity can be measured at different levels: from broad economy and industry levels to very specific process or employee levels. At the macro level, productivity measures show how a nation or the major sectors of its economy are performing in comparison with their past performance, or in relation to other nations or sectors (Bernolak, 1997). Measuring productivity is a complex statistical process which includes numerous steps that aim at making data comparable over time and across enterprises and countries (O’Mahony & Timmer, 2009). At higher levels of analysis, interest in productivity has predominantly focused on labor productivity; in many cases, productivity is expressed and measured in monetary units per input as this seems to be the only practical way (Stainer, 1997). Various problems have been identified with productivity measurements that have led to doubts about the reliability and validity of measuring productivity at the macro level (Rojas & Aramvareekul, 2003). The following list of difficulties provides some indication of why data are often non-comparable for productivity purposes (O’Mahony & Timmer, 2009):

- Data collection differs at the national level.
- Labor input data do not cover all self-employed workers.
- Labor input data differ because of variations in terms of employment contracts.
- Multi factor productivity data differ depending on differences in the vertical integration of firms.

At lower levels, various methods are used to track productivity performance and identify opportunities for productivity improvement, but there is still a wide gap between productivity measurement and managerial behavior. An all-inclusive “total-factor” productivity measure is not a viable alternative to these methods, since no such factor exists that is meaningful for companies (Bernolak, 1997). The essence of performance measurement in general is the production of useful information with reasonable effort; the information produced should fulfill the criteria of validity, reliability and relevance (Hannula, 2002). In addition to the difficulty of meeting these criteria, practitioners implementing productivity measures always face the commensurability problem, wherein each variable in the process is not measurable against the same standard or in the same units (Broman, 2004). The reason is that most processes within a company are fed several types of input; thus, the basic definitions or ratios for productivity are regarded as too “wide” to be useful in actual practice. Finding an appropriate way to solve the commensurability problem has resulted in various types of productivity measures and ways to aggregate inputs and outputs, for example, by use of weightings (Tangen, 2005). The other problems that characterize productivity measurement include broadness, allocation, comparability, value and methods of measurement (Uusi-Rauva, 1997):
The problem of broadness involves determining which levels of input and output should be taken into account when evaluating productivity.

The problem of allocation occurs when deciding which input and output assets belong to the reviewing period.

The problem of comparability surfaces when comparing separate time periods.

The problem is how to eliminate the price effect to make, for example, two sequential years comparable to each other.

The problem of value is closely connected to the problem of comparability. It deals with the issue of intangible assets and how the values which customers perceive are reported by quantitative means.

The measurement problem deals with issues of selecting appropriate methods to achieve a high enough level of measurement accuracy.

Developing some form of indices is by far the most common procedure for assessing productivity changes (Singh et al., 2000). Although partial productivity ratios are also widely used in industry, as such they are too narrow to give a comprehensive picture of the productivity improvement at the business unit level (Hannula, 2002). In many cases, productivity is measured and indicated as labor productivity. This fact implies that industries characterized as labor intensive may not be treated equally in relation to low-labor intensive industries. Comparing only labor productivity may not reveal productivity development in other areas (e.g., capital, material and energy).

3. Productivity analysis of the Finnish construction industry

The EU KLEMS Growth and Productivity Accounts are financed by the European Commission to analyze productivity in the European Union at the industry level. The database has been largely constructed on the basis of data from national statistical institutes and is processed according to agreed procedures. It aims at moving beneath the aggregate economy level to examine productivity performance of individual industries and their contribution to aggregate growth (Timmer et al., 2007).

This study used publicly available data from the EU KLEMS database to analyze the state of productivity in the Finnish construction industry from the labor and total productivity viewpoints. The analysis was made by comparing the construction industry to other main industries in Finland as well as to its international construction counterparts. Industry classification is based on the EU KLEMS’ classification of the main industry segments. Countries selected for international comparison were chosen to represent the considerable players in Europe (Germany and the United Kingdom), Asia (Japan) and the United States. Denmark and Sweden were included to ensure a good comparison with Finland, because of their similar cultures and size.

3.1. Industry comparison in Finland

Figure 2 represents labor and total productivity development in the main industries in Finland over the years 1970-2007. Both measures are based on gross value added per
input. The input factor for labor productivity is hours worked, while for total productivity capital, labor, energy, material and service inputs are taken into account. All graphs are based on indices with year 1995 (= 100) as a base year.

![Figure 2. Labor and total productivity by industry in Finland, year 1995 = 100](image)

It appears that there are no large differences between labor and total productivity curves in any specific industry. Those industries that do well in labor productivity also have the best development rate in total productivity. Unsurprisingly, most of the industries have a positive productivity development trend and, since the curves are rather smooth, it seems that no single innovation has played a remarkable role in developing productivity. Instead, the development rates for every industry have stayed fairly constant over time, which indicates that improvements are gained through continuous, step-by-step practices rather than by revolutionary leaps.

More surprisingly, there are two industries (education and health & social work) that have had negative trends over a relatively long time period. If productivity is defined as a physical phenomenon and monetary effects are eliminated from the measurement processes, how are these negative trends possible? Surely efforts to improve processes and daily practices have been made in these industries. While a reduction in material, energy, capital or physical efficiency might result in a long-term decline, it is hard to believe that such resources and efficiencies could be much worse now than in the past. These are the kinds of knowledge gaps that macro level analysis ignores, leading to questions about the reliability and validity of measurement results.

Changes that have occurred within a shorter time period can be explained with some accuracy. The rapid improvement of productivity in the Finnish construction industry from 1990 to 1994, for example, is explained by a deep recession that dramatically decreased the number of laborers, leaving just the best companies and crews in business (Koskenvesa et al., 2010). Although the industry restructured and improved, it soon fell back to its “normal” level as the business environment stabilized.

The newest of the industries, information technology, if separated from the class of transport, storage and communications, would supposedly outpace even the
manufacturing sector itself. The IT sector benefits from constantly evolving products and it can also make the most out of economies of scale. The value this sector provides to customers through their products and services can outmuscle the cost of used resources a hundredfold (e.g., in mobiles), which is currently not possible in construction. This, in turn, will cause profits to rise to expected figures if monetary terms are used to measure the total output of industry, since the industry only needs the emergence of new valuable products that divide market share again.

Mature industries where construction is included may need to adopt innovations from other industries to improve or regain their development rate. The construction, health and social industries probably need a big cultural change to occur before they will be able to increase their natural development rate. These industries would likely benefit if the default practices from manufacturing, flow thinking and process orientation were adopted. E-learning and new ways of distributing knowledge may bring huge benefits in the education industry, whereas better integration of various data systems will eventually benefit the health and social industry.

3.2. An international comparison of the construction industry

Figure 3 provides an international comparison of the construction industry’s productivity development. Since availability of data from each country differed slightly, some of the curves have different starting points. Input and output factors used are the same as in the above industry comparison. Both labor and total productivity were analyzed between the years of 1977 and 2006 with year 1995 (=100) again as a base year.

![Figure 3. Labor and total productivity in the construction industry, year 1995 = 100](image)

Productivity is a relative concept: it cannot be said to increase or decrease unless a comparison is made that focuses on a certain point in time, or on changes that have taken place over a period of time (Bernolak, 1997). This means that an analysis of the productivity in different countries can only compare rates of development occurring within a fixed time period; the country that is the best in terms of providing assurance of outstanding future performance cannot readily be identified and benchmarked. To date, the highest growth in labor productivity has been gained in the UK, which almost
doubled its labor productivity during the period under review (see Table 1). Sweden and Denmark are also doing well, but the most striking point is the long-term decline of the U.S., both in labor and total productivity.

Table 1. Average rates for yearly productivity development

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<tbody>
<tr>
<td>Finland</td>
<td>90</td>
<td>103</td>
<td>15 %</td>
<td>106</td>
<td>103</td>
<td>-3 %</td>
</tr>
<tr>
<td>Sweden*</td>
<td>66</td>
<td>99</td>
<td>50 %</td>
<td>NA</td>
<td>93</td>
<td>-7 %</td>
</tr>
<tr>
<td>Denmark*</td>
<td>73</td>
<td>104</td>
<td>42 %</td>
<td>NA</td>
<td>101</td>
<td>1 %</td>
</tr>
<tr>
<td>Germany*</td>
<td>95</td>
<td>100</td>
<td>5 %</td>
<td>NA</td>
<td>96</td>
<td>-4 %</td>
</tr>
<tr>
<td>UK</td>
<td>66</td>
<td>116</td>
<td>77 %</td>
<td>70</td>
<td>103</td>
<td>48 %</td>
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<tr>
<td>USA</td>
<td>119</td>
<td>77</td>
<td>-36 %</td>
<td>122</td>
<td>72</td>
<td>-41 %</td>
</tr>
<tr>
<td>Japan</td>
<td>88</td>
<td>101</td>
<td>15 %</td>
<td>105</td>
<td>96</td>
<td>-8 %</td>
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* Total productivity was calculated from 1995 (=100) to 2006

The unimpressive productivity results in the U.S. appear dubious and even impossible, considering that other industries have remarkably better trends in both charts. This further raises doubts about the reliability and validity of the data collection methods used. Only differences in working methods and data collection at the national level could explain such a variation. Alterations to the statistical procedures could explain some of the steep up and down turns, but they are unlikely to be the reason for long-term trends.

With the exception of the U.S., labor productivity has increased to some extent in all countries. Total productivity, on the other hand, has only really developed in the UK, although it flattened out in the early 1990s after the coincidental publication of influential reports by Latham (1994) *Constructing team* and Egan (1998) *Rethinking construction*. The true causes for the lack of development in total productivity can only be conjectured; however, after experiencing rapid increases in both energy and material prices during the last two decades, it is hard to believe that market effects have been properly eliminated from the original data.

### 3.3. The state of productivity in the Finnish construction industry

Based on the above findings, it can be said that the productivity of the Finnish construction industry has shown a steady positive curve like many other industries, but it cannot match the development rate of the best ones. Internationally, productivity development in the Finnish construction industry has been moderate at its best. In general, productivity development in the construction industry has stagnated during the 21st century. The development rate of labor productivity in Finland has been less than 1% a year during the last 30 years and it has been negative for total productivity, indicating that everything is not right within the industry.

It is true that the construction industry has its own peculiar characteristics, such as unique projects, site production, temporary organizations and regulatory intervention of authorities (Koskela, 1992). But in general, the construction industry still puts too much emphasis on costs associated with materials and labor. In projects that are split into smaller and smaller pieces to be contracted out, this has eventually led to obvious sub-
optimization. No final conclusions should be made based on these results. Instead, one ought to keep in mind the nature and limitations of macro level analysis. This seems to be the point made by O’Mahony and Timmer (2009), who stated: “...it should be emphasized that growth accounting is useful as a descriptive tool but that it is merely accounting and says nothing about causality.”

A lot has been said about the reasons for slow or declining productivity in the construction industry. An interesting point made by Allen (1985) concerns a change that the industry has experienced. The outputs are changing and the emphasis is now on different kinds of outputs as compared to those from previous decades (Allen, 1985). Projects are becoming more complex all the time, and it may be more worthwhile and enlightening to measure different sectors rather than the construction industry as a whole (Teicholz, 2001). Also, many firms that construct prefabricated units are classified as manufacturing firms which, in turn, skews the overall development of the construction industry.

Many authors have contributed to identifying the causes behind productivity development; a reduction in skilled labor, management capability, procurement, regulation and technology are only some of the factors identified and discussed. One factor that often comes up is the quality of construction work. It has been mentioned that design problems constitute almost half of the construction defects when measurement is done with the principle of “cost to correct.” The other half is split almost equally between supervision and workmanship problems (BCSPT, 2009). Nevertheless, guidelines in construction set only to the minimum level for quality, which is opposite to the “zero defects principle”, are utilized in the best and most ambitious manufacturing firms. Such artificial acceptable quality levels are counterproductive and can only be stripped away via cultural change towards perfect quality. The focus of productivity management in construction organizations should be on identifying and understanding the impact of variation and the relationships between various resource inputs to outputs. This is where performance measurement comes into question.

4. Performance

Performance is another concept that is often confused with productivity. Whereas productivity is a fairly specific concept related to the ratio between output and input, performance is a broader concept that covers both the economic and operational aspects of an industry. Performance refers to excellence, and includes profitability and productivity among other non-cost factors, such as quality, speed, delivery and flexibility. Figure 4 explains how all of these concepts relate to one another. The two terms, efficiency and effectiveness, are somewhat cross-functional in regard to performance, profitability and productivity (Tangen, 2005). They measure and compare the actual amount of used resources to the minimum level that is theoretically required, and view the actual output in relation to the expected output respectively (Grünberg, 2004).
The generic areas of performance that most companies aim to improve are cost, speed, quality, flexibility and dependability (Slack et al., 1998). These areas relate to a company’s ability to compete and meet customer expectations; they provide some insights into the overall performance of a company.

4.1. Performance measurement

Neely et al. (1995) refer to the performance measurement system as “… a set of metrics used to quantify both efficiency and effectiveness of actions.” Performance measurement has two main aims: to connect company goals and objectives to improvements and to set targets for improvement activity (Grünberg, 2004). Indicators are defined in order to check the feasibility of the company’s strategy and the kinds of goals that should be used on a daily basis. Measurement enables increased visibility of the quality and progress of a certain task and helps to justify, manage and evaluate quality and productivity improvement programs at the operations level. The point has been made that proper measurement goals are those that focus as much on communication as on evaluation and targets (Haapasalo et al., 2006).

In order for a company to succeed, it is critical that the company can control and manage its operations effectively. The better the controllability is, the better the company’s ability to react to changes will be. In order to have good controllability, a company must have access to indications of past, present and future trends from the operative environment (Haapasalo et al., 2006). Opportunities for creating value are shifting from the management of tangible assets to the management of knowledge-based strategies that develop an organization’s intangible assets (Anderson & McAdam, 2004). These intangible assets are important elements when developing lead measures for a proactive performance measurement system.
Traditionally, performance measures and performance measurement systems have been designed and managed according to accounting and finance functions within organizations. This has caused organizations to manage most of their projects on the basis of outdated costs and lagging finance-oriented measurements (Anderson & McAdam, 2004). The main problem with financial metrics is that the information they provide describes the outcome of managerial actions after they have occurred in at least one reporting period (Bassioni et al., 2004). Conventional measures do not present a complete picture of organizational performance, hence the development of lead measures. Non-financial measures are described as timelier, measurable, precise, meaningful, strategy consistent, flexible and more dynamic than financial ones (Medori & Steeple, 2000).

4.2. Performance measurement system design

An organization cannot have an effective performance management system if the metrics used do not relate to its strategic objectives; for any results coming out of a performance management system used to evaluate the extent to which these objectives have been met, the system will need to have strategy as its main input (Kagioglou et al., 2001). An in-depth consideration of the organization’s strategic goals is essential, as is an understanding of the revenue logic and processes involved in developing a measurement system and its metrics (Haapasalo et al., 2006).

The Performance Pyramid (Judson, 1990; Lynch & Cross, 1992) and the Goal Question Metric (Basili et al., 1994) are examples of linking strategy and operations by translating strategic objectives from top down to practical metrics. Likewise, the Balanced Scorecard (BSC) (Kaplan & Norton, 1996) is a framework that takes into account the chain of cause-and-effect relationships among objectives, activities and results (Figure 5). The other recognized framework, The EFQM Excellence Model, is designed to allow companies to assess whether they are on “the path of excellence.” The model enables a comprehensive, systematic and regular review of an organization’s activities and results referenced against criteria that are internal to the model (Beatham et al., 2004).

![Figure 5. The chain of cause-and-effect relationships from the BSC perspective](image-url)
The desirable characteristic of a performance measurement system is that the measures should be derived from the strategy (e.g., Kaplan & Norton, 1992; Singh et al., 2000; Bassion et al., 2004). The purpose of each measure should be made explicit, and measures should form a balanced unity. Modern frameworks try to limit the number of measures used to avoid information overload. This can also help to explain which methods of measurement should be clarified along with the procedure for data collection. Those measures selected should take account of the organization, and the whole design process should be easy to revisit, enabling changes in measures as circumstances change. It is further important that performance measurement is not bureaucratic and inflexible or too supervisory from the employee perspective. The information produced should fulfill the criteria of validity, reliability, relevance and practicality, meaning that information or measurement should be worth the effort expended (Neely et al., 2000; Hannula, 2002; Tangen, 2004). The use of a holistic set of non-financial lead measures is strongly recommended to provide a balanced view of overall performance (Kaplan & Norton, 1992).

Performance measurement frameworks have been criticized because of the lack of guidance they provide in identifying appropriate metrics and designing actual performance measurement systems (Medori & Steeple, 2000; Neely et al., 2000; Tangen, 2004). Thus, the major challenge with non-financial measures is determining which measures to use. Finding the correct metrics, defining causal connections and securing the commitment of top management are the key problems to overcome, and various authors have highlighted the point that the process of searching and finding is actually more important than the outcome (Neely et al., 2000; Haapasalo et al., 2006).

5. Performance measurement in the construction industry

Mohamed (1996) presented a three-level framework on how the concept of benchmarking could be related and adapted to construction, providing insights as to why and at what level the benchmarking and performance measurement should occur.

- **Internal benchmarking** is the examination of an individual organization’s current processes and practices for the purpose of identifying improvement targets that relate to how the organization does business and how its customers evaluate their services.
- **Project benchmarking** measures the performance of projects in which the organization is involved; its aims are meeting customer requirements, measuring productivity rates, and validating and maintaining its estimating databases.
- **External benchmarking** is mainly concerned with the selection and implementation of managerial and technological breakthroughs developed by other industries, in order to generate significant improvement in construction.

5.1. The dispute regarding performance indicators

Since the construction industry is mostly project-oriented, interest has focused on project performance. However, project success means different things to different people.
Traditionally, three indicators have been used to evaluate the success of construction projects: cost, time and quality. Kagioglou et al. (2001) contend that these measures are insufficient, and that many other factors exist that can influence customer satisfaction and the client’s willingness to pursue a given procurement route in the future. It has been proposed, for example, that project success should also take into account the project’s psychosocial outcomes, which refer to satisfaction of interpersonal relations with project members. Also the absence of criteria related to legal claims has recently been highlighted (Chan & Chan, 2004). The memories of other people involved and impressions of harmony, goodwill and trust or, conversely, of arguments, distrust and conflict, linger long after financial success or early completion has been attained (Ward et al., 1991; Kagioglou et al., 2001; Bassioni et al., 2004).

The traditional measures known as the “iron triangle” provide an indication of the success or failure of a project, but they do not provide a balanced view of the project’s performance. Usually they are apparent only at the end of the project and should therefore be classified as lagging indicators of performance (Kagioglou et al., 2001). The general revolution on performance measurement that has taken place over the past several years has focused on a more comprehensive approach to assess project success. Performance measurement frameworks have been proposed where project success is divided into dimensions, and where project success is considered during the different stages of a project as well as from various perspectives (Chan & Chan, 2004).

The Balanced Scorecard and EFQM Excellence Model are two internationally recognized and used frameworks for performance measurement. In addition to these measures, other frameworks (see Kagioglou et al., 2001; Bassioni et al., 2005; Yu et al., 2007) have been developed to measure the performance of construction projects. However, many of the proposed frameworks are impractical and are missing the data collection methods that have been built into existing operational systems.

5.2. Key performance indicators: an evaluation

Egan (1998) identified specific targets for improvements in terms of productivity, profits, quality, safety and project performance; he emphasized the importance of ambitious targets and the role of performance measurement in delivering improvements. As a result, in 2002 the Construction Best Practice Program launched 12 headline key performance indicators (KPIs) for performance measurement (CBPP, 2002). These KPIs provide the following information on project performance: construction cost and time, predictability of cost and time, defects, and client satisfaction regarding products and services. Company performance is measured from the perspectives of safety, profitability and productivity.

The CBPP was very successful in introducing the subject of performance measurement to the construction industry and numerous authors, companies and organizations have developed their own sets of KPIs since then. But the main problem is that industry has not been able to differentiate between KPIs (indicators of the future performance of processes), KPOs (key performance outcomes) and perception measures.
(individual judgments). In addition, KPIs have been criticized as lagging indicators with limited use for internal management decision making since they do not give insight into how performance can be improved, nor do they provide opportunities for change (Bassioni et al., 2004; Beatham et al., 2004). Furthermore, KPIs are rarely aligned to strategy or business objectives, or incorporated into a proper performance measurement system. In fact, they are more suited for cross-industry benchmarking purposes and are mostly used as a marketing tool rather than as an integral part of business management within an industry (Beatham et al., 2004).

For an efficient project benchmarking process, a measurement system needs to be developed and introduced to capture project performance at selected stages of the project’s lifetime, regardless of its size, budget, type, location, etc. Furthermore, any designed set of measures should be simple enough to be built into the process, allowing accurate and representative measurements to be taken. Throughout the different stages of the project, the organization must attempt to meet customer expectations, contract specifications and its own goals. Thus each value-adding activity within the process has to have a well-defined customer who sets the measures for the process performance; the organization should also trace the performance against its own expectations and initial estimations (Mohamed, 1996).

Since most of the current performance indicators have been product and outcome focused, there is a skeptical attitude towards key performance indicators. However, in recent years, performance indicators related to processes have started to emerge. These indicators include: planned percent complete (PPC), waste, safety and quality process improvement, Habanova and Al-Jibouri have further identified key performance indicators for the pre-project, design and construction phase of a project. These factors are likely to improve practices by enabling managers to focus on controlling the main sub-processes and thus increasing the chance of project success measured by the following end-project goals: meeting financial, scheduling and functional requirements; ensuring client satisfaction; health and safety; and building quality (Habanova & Al-Jibouri 2009, 2010a, 2010b).

Finally, in order to make effective use of the results of performance measurement, an organization must be able to make the transition from measurement to management since it is the latter which provides the opportunity to refine and improve activities. There must be a methodology in place to use information to help set performance goals, allocate and prioritize resources, communicate with management either to confirm or change current policy or to set directions for meeting these goals, and report on the success of the company’s objectives (Amaratunga & Baldry, 2002).

6. Conclusions

In general, productivity development in the construction industry has been slow for a long time, leaving much room for improvement. This paper first explains the meaning of productivity and related terms. The characteristics of productivity measurement are then considered and tested by analyzing the state of productivity in the Finnish
construction industry. The empirical data are collected from the EU KLEMS database. In addition, the performance measurement in the construction industry is reviewed.

The results of the theoretical review indicate that productivity is an ambiguous concept. At a macro level, productivity can be used to explain the national growth; however, it does not explain the productivity differences across industry sectors. Consequently, productivity is an inadequate measure of industry success and should be used solely to identify improvement targets and control activities at a micro level, that is, within companies and at the level of their internal processes. Productivity is too rigid and slow to be useful as a measure for proactive management and improvement; if used as a management tool it will lead only to the partial optimization of processes or tasks. Unfortunately, reliance on productivity is far too common in the construction industry.

One of the main problems in measuring productivity relates to the difficulty of determining which inputs and outputs should be included in analyses. In addition, comparability is a problem, since a reference point in time is required for making comparisons. In practice, the traditional ways of working in the construction industry do not acknowledge material waste, idle periods of personnel, accidents and employee well-being among other aspects that are currently ignored by analyses that concentrate only on task productivity and transformations.

According to the results of this study, productivity development in construction should be approached by identifying and understanding the impact of variations in relationships between various resource inputs and outputs. The traditional narrow view of analyzing only productivity, namely input versus output, is inadequate since it does not acknowledge resource waste and other factors that influence business success. Usually, improvement efforts have focused on making value-adding work ever faster and more efficient. A better approach would be to critically analyze those activities that can be considered non-value adding. Productivity improvement does not necessarily mean working harder, but rather working smarter.

In the construction business, the current share of non-value adding activities is surprisingly high and thus could be substantially reduced. Performance should be measured from multiple perspectives because high productivity is the outcome of many well-executed aspects. Developing a measurement system that links company objectives to operations and gives relevant information about the business environment, points out the right areas for improvements. Process-oriented performance indicators suit well with the project nature of the construction business and help to ensure that the requirements set by customers are met.

The construction industry still lacks a practical framework for performance measurement that takes into account both organization and project dimensions, and utilizes in-built process-oriented indicators and data collection methods. This paper provides implications for managers in the construction sector aiming to refine their practices in order to improve their business performance. Construction managers should avoid an overemphasis on productivity as there are several performance areas and metrics that are more indicative of success than productivity. Managers should
understand that, in practice, the greatest economic benefits in the construction sector can potentially be obtained by streamlining non-value adding activities, rather than by working faster.

Official statistics show that the productivity of the construction sector is worse than that of many other sectors. This research analyzes the related literature to clarify the reasons for this problem. However, this research is not without limitations. In particular, there is room for more in-depth empirical analyses that would confirm the present findings. In addition, further research might aim to develop a practical framework for performance measurement since no functional and comprehensively documented performance measurement systems seem to exist.

Reference


