

An Assessment of Productivity Measurement Tools -Effectiveness, Satisfaction and Problems: The Florida Construction Industry Experience

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Abstract

Productivity, especially in the construction industry, has always been very difficult to measure. Tools available for measurement are not effective. Through a questionnaire survey perception about effectiveness of currently available productivity measurement tools was assessed & it was found that tools available are not meeting the needs of the construction industry because majority of the respondents perceived that they have to develop their additional tools for compilation & extrapolation of the productivity data. So there is a need for improvement in currently available productivity measurement tools, further an interesting fact was established that majority of the people believed that their response to questions would have changed if their role in the construction industry would change. So it's an important fact that separate surveys should be performed for project managers, engineers, owner, architects and other stakeholders. Using separate survey pools would yield a more accurate representation of the metrics being investigated.

Keywords

Productivity Measurement Tools, Effectiveness, Construction Industry, Perception

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).

But measuring construction productivity is considered a challenging issue due to the ineffectiveness of measurement tools as on one hand, industry stakeholders (such as building owners and managers) expects easy answers to complicated questions that are made available through task-level metrics, while on the other hand, industry leaders, academics, etc. demands complicated data-intensive metrics to assess national and industry-wide trends and challenges facing this critical sector of the economy (Huaung et. al, 2009).

Despite the existence of well-developed frameworks within academic economics for thinking about productivity, there appears to be no consensus amongst industry researchers about how to investigate productivity performance in construction. (Paul and Bernard, 2006)

Further productivity measures are limited because they do not take always take into account factors adding value such as: The effectiveness of management, the quality level reached, innovations. (Flanagan et. al, 2005)

2. Literature Review

Construction productivity is measured by comparing input and output and has become an increasingly important issue (Allmon et. al, 2000). In the construction industry, two productivity concepts, labour productivity (LP) and multi-factor productivity (MFP), are adopted in early research. LP is usually measured as the value added per worker, and MFP is measured as the value-added labour capital productivity. However, LP and MFP are misleading when applied to the measurement of construction productivity performance at the industry level because the role of materials in productivity improvement is ignored (Chau and Walker, 1988; Construction Industry Development Board, 1992; Zhi et al., 2003).

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 and 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 and 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.

A common view is that: productivity measures do not deal adequately with the impact of technological change, or with factor substitution, where capital and equipment may be substituted for labour (Flanagan et. al, 2005).

One of the major limitations in the currently available productivity measurement tools is that most of these methods are manually intensive, resulting in relatively outdated information and expensive data collection systems (McCullough, 1997; Cheok et. al, 2000).

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 and Timmer, 2009). From above facts it can be believed that tools available to measure productivity are not effective.

3. Scope and Objectives

The present study is limited to the assessment of perception of professionals applying themselves within the Florida building construction industry. The present study was initiated with following objectives in mind.

- To assess the usage of tools for productivity analysis in the Florida construction industry.
- To assess the need of development of new tool(s) addressing the short comings in the existing available tools.
- To assess the impact of change of role on the overall outlook of productivity analysis.

4. Methodology

The following steps were taken to achieve the desired objectives:

- After relevant literature collection, literature review was conducted to gain detailed knowledge about the effectiveness of available productivity tool.
- The measuring instrument was a questionnaire/survey which was created and published using a trial version of Zoomerang available at www.zoomerang.com. For sampling, non-probability survey sampling technique was used.
- Responses were analyzed to draw conclusions. Informal discussions and interviews conducted with construction project managers provided major contributions towards collecting invaluable data that was rather consistent with the results from the survey.

5. Data Sampling & Collection

The sample frame used judgment sampling from the combined professionals in different roles in the Florida construction industry. 32 questionnaires were distributed among selected professionals while 20 responses were received. After scrutinizing 15 responses were found valid.

Table 1: Response Rate

No. of Questionnaires Distributed	No. of Questionnaires Received	Valid No. of Questionnaires	Response rate
32	20	15	47%

6. Data Analysis

In data analysis, the main statistics used was descriptive statistics. Results of data analysis are shown in subsequent sub-sections.

6.1 Respondents' Information

An analysis of the responses showed that the respondents were being in various roles within the construction industry as shown in the Figure 1. But majority was in the role of construction manager that is 62% because mostly they are dealing with productivity analysis.

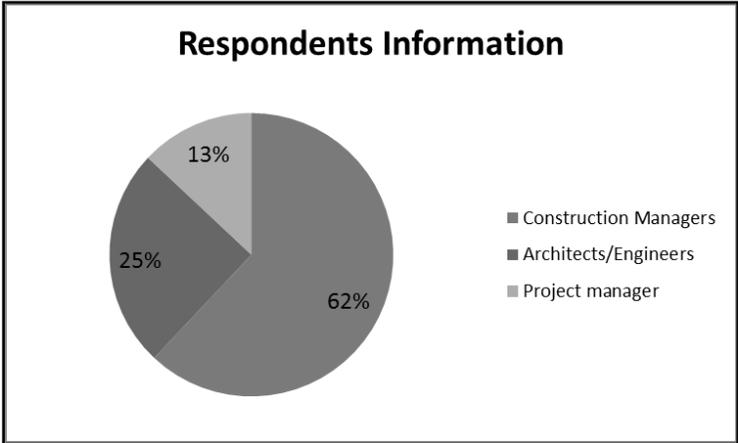


Figure 1: Respondents' Role in Project Team

6.2 Respondents' Construction Sector Detail

As shown in Figure 2 majority of the respondents were from private & public sector of heavy industrial/Civil category that are 85% while 15% were from private commercial sector. These are the sectors in which heavy construction is done. Since significant amount of resources are used in such type of construction so productivity analysis is important in these sectors.

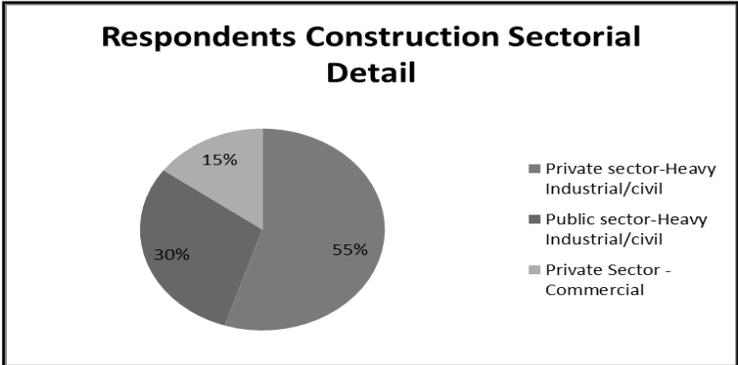


Figure 2: Respondents' Construction Sector Detail

6.3 Currently Available Productivity Measurement Tools

As shown in Figure 3 majority of the respondents that are 62% perceive that currently available productivity measurement tools are not effective thereby failing to provide the industry with the information required making an accurate assessment. It can be concluded that most of the people in construction industry face problems while measuring productivity in their projects with available tools so there is a room for improvement in these tools.

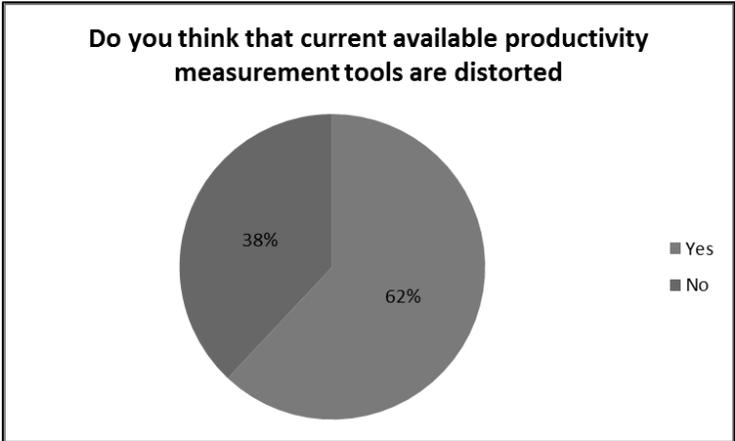


Figure 3: Currently Available Productivity Measurement Tools

6.4 Need for Development of New Tools

As shown in Figure 4, further it was asked from respondents that do they/their company have to develop their additional computations to compile & extrapolate productivity data. Majority of the respondents that are 60% revealed that they have to develop their customized tools for productivity measurement. This fact confirms the above conclusion that currently available productivity measurement tools are inadequate because majority of the respondents are agreeing that they have to modify currently available tools for productivity measurement.

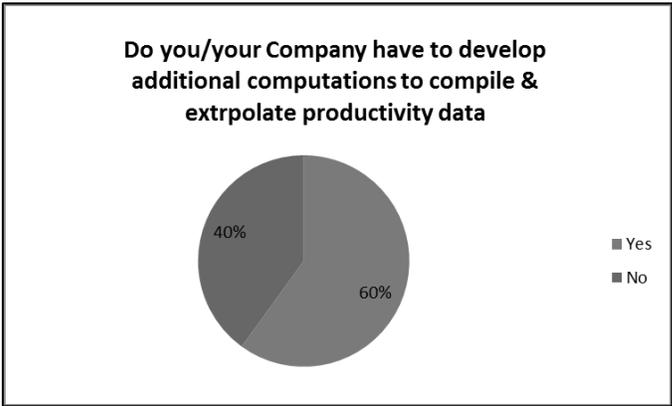


Figure 4: Need for Development of New Tools

6.5 Effectiveness of Currently Available Productivity Measurement Tools

As shown in Figure 5 majority of the respondents that are 69%, perceived that the productivity measurement tools currently available are somewhat effective, it's another confirmation about the above established fact that there is a need for improvement in currently available tools for measurement of productivity. It can be also established that people face difficulties in measurement of productivity that's the reason majority of the respondents perceived that the currently available tools are somewhat effective.

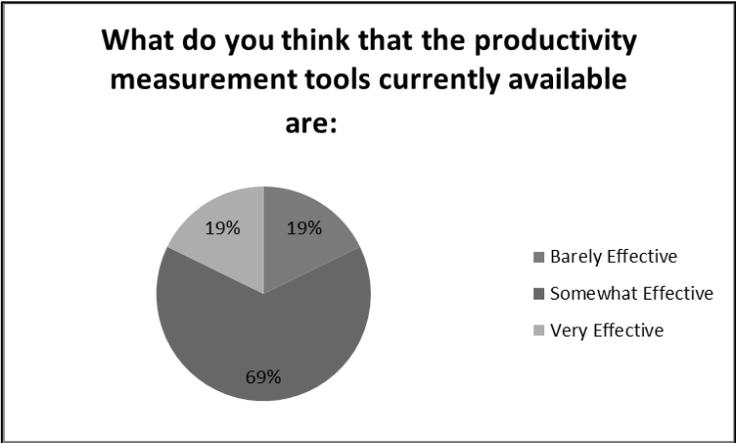


Figure 5: Effectiveness of Currently Available Productivity Measurement Tools

6.6 Change of Response with Change of Role

As shown in Figure 6, survey results demonstrate 56% of the participants believed their role in the company may have affected their respective responses. Based on this statistic, it can be concluded that for future research and analysis the surveys should be evaluated based on the participant's role within the construction company. Separate surveys should be performed for project managers, engineers, owner, architects and other stakeholders. Using separate survey pools would yield a more accurate representation of the metrics being investigated.

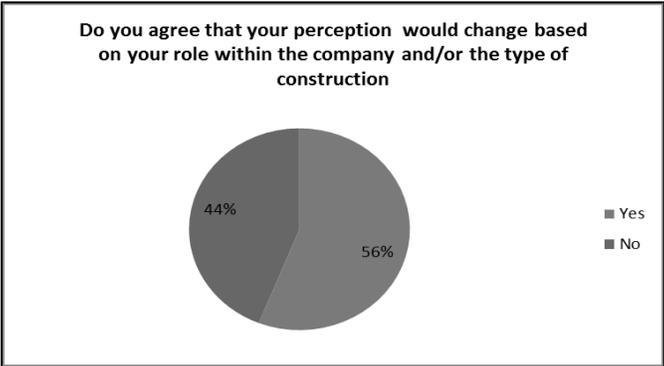


Figure 6: Change of Response with Change of Role within the Company and/or Type of Construction

7. Conclusions & Recommendations

It can be also concluded from above facts that productivity measurement tools are still in its infancy and deserves further testing prior to industry integration. 60% of the participants believe that their respective companies have to develop additional computations to compile and extrapolate productivity data. Only 19% of the respondents rated the productivity measurement tools used by their respective companies as “very effective.” This is just further evidence that productivity measurement in construction industry requires a lot of improvements. The use of quantitative markers aided by technological advances could prove to be a great contribution in developing successful productivity tools. Further survey results demonstrate 56% of the participants believed their role in the company may have affected their respective responses. Based on this statistic, it can be concluded that for future research and analysis the surveys should be evaluated based on the participant’s role within the construction company. Separate surveys should be performed for project managers, engineers, owner, architects and other stakeholders. Using separate survey pools would yield a more accurate representation of the metrics being investigated.

Following conclusions and recommendations can be summarized from the study at hand:

- There is a perception that currently available tools for productivity analysis are not so much effective.
- There is a need for improvement in the currently available productivity analysis tools in the Florida construction industry.
- Majority of the respondents perceive that their responses would change as their role in the construction industry would change.
- It’s an important fact that separate surveys should be performed for different roles in the construction industry for measurement of any metrics.
- From this study it can be concluded that there is no agreed upon definition of productivity in the construction industry as change of response can be expected with change of role of an individual.
- There must be an integrated definition of productivity for different roles in the construction industry.

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