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# PERFORMANCE MEASUREMENT APPLICATIONS WITHIN THE UK CONSTRUCTION INDUSTRY: A LITERATURE REVIEW

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**ABSTRACT:** The significance of performance measurement (PM) in any organisation is long being realised. As a result PM has been incorporated in the management agenda. PM can be defined as a “process which determine how successful organisations or individuals in achieving their objectives”. Limitations of traditional performance measures challenged their application in the modern business environment. This stimulated towards a new era of PM, leading the path to the development of many PM frameworks. Research done during the past decades, revealed many issues in the UK construction industry. Thus, the industry is under tremendous pressure to improve its performance. This paper provides a literature review on the current applications in PM, highlighting the limitations of traditional measures, features of good PM systems. Further, the problems in the UK construction industry and PM applications have been discussed with the aim of identifying the issues which are not addressed from the current PM applications.

**Keywords-** Construction industry, Performance measurement, Traditional performance measures

## 1 INTRODUCTION

The competition in the modern commercial sector is increasing day by day. This competitive environment demands continuous improvement of organisations to secure its market share. For not to be left behind, all organisations are keen on knowing where the organisation is now, where it is heading and whether it is heading towards the expected goals (Rose, 1995). To know the above information, organisations should have valid evidence or “measures of their performance” which can be obtained through measuring the performance of the organisation. Thus, performance measurement (PM) has become the “language of progress of an organisation” (Rose, 1995).

As continuous improvement in a business cannot be gained without measurement of its performance (Baldwin et al, 2001), this has been given a prominent place in any organisation. Therefore, the interest in PM is growing massively and parties such as executives, public policy makers, and government ministers search new methodologies to measure the performance in their organisations (Neely and Adams, 2000).

In this context, this paper is an attempt made to provide an insight to the PM literature and to identify the present and future applications of PM in the UK construction industry. Section 1 and 2 provide an overview of the PM in general terms. Section 3 and 4 identify the need of PM and its current applications within the UK construction industry respectively. Section 5 describes the identification of future areas of PM studies in the UK construction industry.

### 1.1 Definitions of Performance Measurement

Literally, PM is defined as the “process of quantifying the past actions, where measurement is the process of quantification and past actions determines current performance” (Neely, 1998a). Procurement executive association (1998) define PM as a “process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services (outputs), the quality of those outputs (how well they are delivered to clients and the extent to which clients are satisfied) and outcomes (the results of a programme activity compared to its intended purpose). A

similar definition has been given by Moxham and Greatbanks (2000) who state that PM ensures the attainment of goals and objectives of an organisation. Since PM systems encompasses supporting infrastructure, a wider definition has been given by Neely (1998a) as the quantification of efficiency and effectiveness of past actions by means of data acquiring, collection, sorting, analysing, interpreting and disseminating. Cain (2004) identifies PM as the first stage to any improvement process that benefits the end users with lower prices, and the organisations with higher profit margins whilst enhancing the quality of the product.

The significance of positioning the PM strategically has been well documented in the literature (Eccles, 1991; Kaplan and Norton 1992; Gregory, 1993; Neely et al 1997; Neely 1999). Performance measures can be used to translate the strategy of the organisation into set of goals and objectives and the results obtained through the measures reflect the successfulness of achieving the strategy (Eccles, 1991). Thus, PM directs the strategy formulation as well as monitors the implementation of the strategy (Handfield and Nichols, 1999; Lohman et al, 2004). Any gaps identified from the “actual” and “planned” results will help to challenge and adjust the goals and strategies of the organisation (Nanni et al, 1992).

Horonec (1993) identifies performance measures as “vital signs” of an organisation which help to recognise whether the activities of a process or the outputs of the process achieve the specified objectives. Further, these vital signs communicate what is important throughout the organisation through communicating the strategy from top management downwards to the organisation, results of processes from lower level upwards to top management and control and improvement within a process (Horonec, 1993).

## **1.2 Importance of Performance Measurement**

Lower benefits were gained by the organisations which lack the utilisation of PM systems and feed back into the improvement of management development programmes (Longenecker and Fink, 2001). According to Neely (1998b), managers measure for two main reasons namely to know their current position in the market and to influence the subordinate’s behaviour. From the manager’s perspective, PM assists them to move towards the correct direction, to revise the business goals and to re-engineer the business process (Van Hoek, 1998; Beamon and Ware, 2000; Kuwaiti and Kay, 2000). Neely (1998a) identifies seven reasons for PM to be included in the management agenda as changing nature of work, increasing competition, specific improvement initiatives, national and international quality awards, changing organisational roles, changing external demands, and the power of information technology.

Performance measures indicate the priority factors of the organisation and the way the employees should behave to give the maximum out come to the organisation (Neely et al, 2002). Thus, when the measures are aligned with the organisational strategy, they encourage the employee behaviours also to be aligned with the strategy. Hence, performance measures can be considered as a behavioural tool for the employees (Neely et al, 2002) as well as used as an employee motivating determinant (Locke et al, 1981; White and Flores, 1987; Amaratunga and Baldry, 2002).

Although the importance of PM has been highlighted by many authors, all these reasons fall under four main categories (Neely, 1998a), the four “CPs” of measurement namely;

- check position
- communicate position
- confirm priorities
- compel progress

Due to all these advantages of PM, the UK government white paper on competitiveness (ct. Neely et al, 2002) has mentioned that “to achieve sustainable business success in the demanding world market place, a company must use relevant performance measures”.

By considering the above arguments, it can be said that PM is an important aspect for any organisation to evaluate its actual objectives against the predefined goals and to make sure that the organisation is doing well in the competitive environment. Accordingly, Section 2 below tries to highlight the developments associated with the PM, followed by a discussion on characteristics of good PM systems.

## **2 PERFORMANCE MEASURES**

### **2.1 Development of Performance Measures and critics on traditional measures**

The PM systems have a long track record which can be traced to the use of U.S. railroads in 1860s and 1870s (Chandler, 1977; Kaplan, 1984) and a significant development of PM systems has been identified over the past decades (Neely et al 2002). According to Nani et al (1990), PM systems have been historically developed to monitor and maintain the organisational processes which help to achieve the goals and objectives of the organisations. Performance indicators have traditionally concentrated on financial measures such as return on investment, sales per employee, and profit per unit production (Kagioglou, 2001).

Ladrum et al (2000) argues that diversification, globalisation, and technological innovations are behind the rapid changes of the business organisations. Due to this, cost accounting systems have been replaced by the time accounting systems (Neely and Austin, 2000). Further, researchers argue that time is the new strategic performance measure that should be used to drive the improvements (Ghalayini and Noble, 1996). Therefore, the traditional performance measures which were based on the cost accounting systems (Ghalayini and Noble, 1996) become obsolete to measure the performance in the aforementioned environment and was identified they cannot be used as the sole criteria for assessing performance (Kennerley and Neely, 2002). Traditional performance measures are criticised for many reasons;

- encouraging short-termism (Banks and Wheelwright, 1979; Hayes and Garvin, 1982, Neely, 1999),
- lacking strategic focus (Skinner, 1974, Neely 1999)
- encouraging local optimisation (Hall, 1983; Fry and Cox 1989)
- encouraging minimisation of variance rather than continuous improvement (Johnson and Kaplan, 1987; Lynch and Cross, 1991)
- not being externally focused (Kaplan and Norton, 1992)
- do not accurately reflect the interest of stakeholders (Kaplan and Norton, 1996; Mbugua et al, 1999)
- lagging metrics (Ghalayini and Noble, 1997)
- over rely on financial aspects (Ernst and Young, 1998; Clark and Clegg, 1999; Olve et al, 1999)

These inadequacies of traditional measures to cater the current business needs led the path to look beyond them (Zairi, 1996; Olve et al, 1999; Frigo, 2000). Ultimately PM revolution which was predicted by Eccles (1991) became a reality.

### **2.2 Characteristics of good Performance Measurement systems**

In order to overcome the problems associated with the traditional measures and to facilitate the effective and efficient PM in the current business environment, new performance indicators have come into practice. Characteristics of such performance indicators have been identified by different authors (Kaplan and Norton, 1992; Lynch and Cross, 1995; Neely, 1999; Love and Holt, 2000; Neely and Adams, 2001).

According to Schlesinger and Heskett (1991), a relationship exists between internal service quality, employee satisfaction, employee retention, external service quality, customer satisfaction, customer retention and profit. Due to this relationship, Hronec (1993) argues that PM should be a balancing tool. Kaplan and Norton (1992), reinforce this by stating that the PM systems should be balanced methods, addressing all the required aspects of an organisation.

The importance of deriving the performance measures from the strategy of the organisation has been recognised widely (Globerson, 1985; Skinner 1989; Parker, 2000; Kaplan and Norton, 2001, Tangen, 2002;) while McNair and Mosconi (1987), Drucker (1990) and Russell (1992) show that there is a need for alignment of financial and non-financial measures that fit within a strategic framework.

According to Bititcti et al. (2000) PM needs to have the following characteristics: being sensitive to changes in the external and internal environment of an organisation; reviewing and reprioritising internal objectives when the changes in the external and internal environments are significant enough; deploying the changes to internal objectives and priorities to critical parts of the organisation, thus ensuring alignment at all times; and ensuring that gains achieved through improvement programmes are maintained.

Due to the importance of PM, its application can be identified in various disciplines such as in facilities management, supply chain applications, human resources management, total quality management practices, just in time applications etc.

As discussed in Section 2.1 and 2.2, limitations associated with PM systems led the path to deploy new methodologies to measure the performance in organisations. However, the selection of appropriate performance measures, systematic application of them and evaluation of the performance are vital steps that organisations have to under take in order to gain success; where construction industry is not an exception. In this view, the section below highlights the need of PM to the UK construction industry by identifying its shortcomings and suggestions made by various authors in terms of its performance.

### **3 NEED OF PERFORMANCE MEASUREMENT TO THE CONSTRUCTION INDUSTRY**

The contribution of the construction industry towards the economy is significant in most of the countries and the UK construction industry is not an exception. Its contribution to the GDP is around 10%, and occupies approximately 1.5 million workforces (Cooper, 2004). In addition the industry produces, maintains, and adapts about 60% of fixed capital investment such as buildings, infrastructure which other economic activities depend on (Fairclough, 2002). Therefore, the influence from the construction industry towards the economy as well as towards the quality of the life of the general public is immense (Fairclough, 2002). Thus, Egan (1998) identifies it as one of the pillars in the UK economy and further states that the industry is “simply too important to be stagnated”.

Yet many studies have shown that the industry is behind its optimal performance (Kagioglu et al 1999; Lee et al 2000; Smith 2001). Latham (1994) reported that 30% of capital cost is consumed by unnecessarily cost due to the inefficiency of the industry. According to Nicholson (1999), industry has wasted over £1 billion due to errors and rework. Egan (1998) identified that the maintenance and running costs are also unnecessarily high in the industry. Hence, the UK construction industry is blamed for being “worst, wasteful, inefficient and ineffective” (Beatham et al, 2004) and suggest that it perceive as a “dirty, dangerous and old fashioned” industry (Fairclough, 2002).

### **3.1 Shortcomings identified in the UK construction industry**

The governmental and institutional reports draw attention to many inherent characteristics and issues that are inbuilt with the UK construction industry (Emmerson, 1962; Gyles, 1992; Latham, 1994; Egan 1998; Fairclough, 2002). According to Tay (1994), the activities in the construction industry are characteristic by four 'D's i.e. discontinuous, dispersed, diverse, and distinct. Further, fragmentation, (Latham, 1994; Egan, 1998; Fairclough, 2002; Chan and Chan, 2004), presence of large number of relatively small firms and construction projects, low barriers to enter into the industry (Fairclough, 2002) availability of temporary and short term work (Chan and Chan, 2004) have been highlighted as significant characteristics.

As a consequence of the fragmented nature, the industry is lacking a clear strategic vision regarding its responsibilities towards the society and the way it should serve to the customers and other stakeholders (Fairclough, 2002). Egan (1998) claims that the low profitability, lack of investment in capital, insufficient training provided for the workforce as some issues in the industry. Further reinforcing the findings of Egan (1998), Fairclough (2002) also identifies the inadequate investment on Research and Development work in the industry. Expectations from the construction projects such as value for money, free from defects, reasonable running costs, satisfactory durability etc. are not gained by clients (Latham, 1994) and due to the unpredictability of delivery of the product in terms of time, cost, quality parameters, clients are dissatisfied regarding the performance of the industry (Egan, 1998). Further, the complexity of the design stage and lack of coordination of the industry is documented in Nisbet (1993).

The aforementioned inherent characteristics and issues affect the efficiency and effectiveness of the construction industry and there by hinder its performance. Therefore, the UK construction industry is under tremendous pressure both internally and externally to re-examine and improve its performance (Anumba et al., 2000). These pressures are not only to increase the profitability of the industry, but also to provide the value for money (Fairclough, 2002).

### **3.2 Solutions suggested to overcome the problems associated in the construction industry**

In order to improve the performance of the construction industry various authors have suggested solutions. In his report Latham (1994) identifies improving the efficiency and competitiveness of the industry through reforms in contracting, tendering, design process, quality management, training, education etc. Furthermore, Egan (1998) identifies the significance of improving the productivity, profits, quality, safety and project performance to upgrade the construction industry.

In the year 2002, Fairclough made certain suggestions for the construction industry in his report titled "Government R and D Policies and Practices". These suggestions include investment on construction industry research and development, to increase more multi disciplinary teams, recruit and retain research staff etc.

Importance of moving from the traditional procurement methods to the integrated methods, especially to the supply chain management practices, improving the process thinking rather than the functional thinking, getting the involvement of the specialised contractors and suppliers from the design stage, creating long term strategic supply side partnerships are some other suggestions made to improve the efficiency and effectiveness of the industry (Egan, 1998; Bourn, 2001; The strategic forum for construction, 2002).

The report Better Public Buildings, which was written to highlight the importance of quality designs, has addressed issues regarding the design aspects of the UK buildings. In his forward, the UK Prime Minister Tony Blair has argued that "good designs provide a host of

benefits” (DCMS, 2000). The report listed out aspects that should be eliminated to achieve better buildings. Those include regarding good designs as an optional extra, treating lowest cost as best value, valuing initial cost as more important than the whole life cost, imagining that effectiveness and efficiency are divorced from design. Furthermore, the report (DCMS, 2000) recognises good practices that the construction industry should adopt such as appointing integrated team focusing on the whole life impact and performance of a development, encouraging long term relationships with integrated project teams as part of long term programmes, continuous review of the performance, using whole life costing in the value for money assessment of buildings.

Respect for people working group (2002) highlights the need of commitment for the workforce and claims that the construction industry does not recognise the “people factor” as the greatest asset. Furthermore, Raynsford (1999 ct., Respect for people working group, 2002), the Minister for Construction challenged the industry to radically improve its performance on people issues. For the better attainment of objectives of the industry without facing to supply side constraints, shortage in the skilled workforce and to minimise the increased costs, construction industry has to recruit the right people to do the right job at the right working environment (Respect for people working group, 2002).

More importantly Egan (1998), Fairclough (2002) emphasis the need of PM in the construction industry while the strategic forum for construction (2002) highlights creating a culture of continuous improvement based on PM. Further, establishing clear measurable objectives and to use quantifiable targets and performance measures have been identified (Respect for people working group, 2002). Last but not least Fairclough (2002) emphasises the need of the construction industry and its stakeholders to look ahead with a better strategic vision.

Accordingly, shortcomings and suggestions to overcome such shortcomings within the UK construction industry context are briefly visited above. It is clear from this brief literature review that construction industry needs to be transformed into a culture of “continuous improvement” based on measuring performance. In this context, Section 4 highlights the current PM practices within the UK construction industry, leading to the discussion in Section 5 which explores new PM applications that would add value to construction as a whole.

## **4 APPLICATION OF PM WITHIN THE UK CONSTRUCTION INDUSTRY**

### **4.1 Application of the three traditional performance measures**

According to Robinson et al (2002), construction organisations have shown interest in PM. It is argued that the evaluation of performance in construction is more oriented towards the project level (Love and Holt, 2000; Kagioglou et al, 2001) and mainly focuses on the “tangible” or “hard” factors while neglecting the “intangible” or “soft” factors (Love and Holt, 2000). Further, the utilisation of the three traditional performance indicators; time, cost, and quality have been identified as the common approach of measurement (Ward et al, 1991; Kagioglou et al, 2001) where the performance is measured mainly in terms of achieving the client’s objectives (Ward et al, 1991). However, considering the attainment of clients objectives as the sole PM criteria is been criticised as it would not take into consider the nature of the business environment, structure of the organisations, level of technology used etc (Ward et al, 1991). Therefore, Love and Holt (2000) identify the need of focusing the PM towards the broader aspects of the corporate strategy of the organisation, business process and customer needs rather than concentrating on narrow and reactive measures.

#### **4.2 Influence of the structure of construction project team towards performance**

Construction projects expose to a large number of “unexpected change events” such as uncertainties, design amendments, crises (Loosemore, 1999). According to Rosenthal (1998), less attention has been paid in analysing the influence of the “structure” of a project team towards the project performance. Therefore, to identify the influence of the “structure” towards the “performance”, a study has been carried out. Performance of team members in a fully integrated design and built project have been evaluated in terms of facing to unexpected change events (Moore and Dainty, 1999). The study concluded that teams’ performance has been adversely affected by the traditional professional cultures and roles of the industry which has weaken the team integration.

#### **4.3 Performance Measurement in construction managers**

Labour intensity of the construction industry demands higher degree of human resources thus effectiveness of it has a large impact on the performance of the industry. Construction managers can be considered as one of the main segments of the human resource in the industry. Mustapha and Naoum (1998) support this by saying that the “construction site managers stand at the heart of the building process”. However, management of construction projects are becoming difficult and the construction managers are under tremendous pressure in meeting the set objectives of the projects. This is due to the complex nature of the construction industry in terms of new technological innovations, change of social attitudes, contractual procedures, and high involvement of clients (Mustapha and Naoum, 1998). Further, effective managers need to manage number of relationships with individuals and groups affected by their actions and behaviours and be aware of the expectations of their superiors, peers, subordinates and other organisations that they deal with (Fraser and Fraser 2003). Therefore, it is important to study the performance of construction managers, as it would affect the overall performance of the organisation. Several studies have been carried out by evaluating the performance of construction managers (Bresnen et al. 1987; Fraser and Fraser 2001; Fraser and Fraser 2003).

#### **4.4 Performance Measurement in construction logistics**

For the success and progressive improvement of the industry, performance monitoring and measurement is required based on subcontractors and material utilisation (Wegelius, 2001). PM of the construction logistics is another area which can be identified in the literature (Wegelius, 2001).

#### **4.5 Use of Performance Measurement frameworks**

The use of various frameworks to evaluate the performance of the construction industry can be identified in the literature. Key Performance Indicators, Balance Score Card and EFQM Excellence model have been noted as the widely used PM frameworks (Robinson et al, 2002). Research indicates that, the aforementioned frame works are been modified specifically to suit to the requirements of the construction industry (Kaigioglu et al, 2001; Bassioni et al, 2004).

Apart from the above studies, measuring the progress of construction work in terms of the actual and planned schedule and cost using a framework called the “Earned Value Management” (Alvarado et al, 2004), measuring the performance of Engineer Procure and Construct projects through a frame work called the “Blue print” (Stevens, 1996) can be identified.



## 5 DISCUSSION

Research findings summarised above indicate the positive intention of PM in the UK construction industry. Yet, it can be suggested that the application of PM within the construction industry is inadequate to address the shortcomings and the suggestions made by various authors in terms of its performance. In this regard, the application of PM practices carried out in other industries can be used for the benefit of the construction industry and Latham (1994) suggested that such transfer of theories and practices from other sectors would help to enhance the development of the industry.

Fragmentation has been identified as one of the main shortcomings of the construction industry. Thus moving from traditional procurement methods towards the integrated methods; especially towards the supply chain management has been well documented in the literature (Egan, 1998; Latham, 1994; Bourn, 2001; DCMS, 2000). Despite, lack of research was evident regarding the PM applications in the construction industry supply chain. In contrast, number of PM applications in supply chain management is found in other disciplines.

Especially the industries like manufacturing has identified the importance of creating long term strategic partnerships with both upstream and down stream partners such as suppliers, customers, and logistics service providers and the need of integrating and managing the multiple processes within and beyond the boundaries of individual organisations of the supply chain (Lambert and Cooper, 2000). This has been done not only to sustain in the business under the pressures from the competitors but also to add new value to end user (Chan and Qi, 2003).

The research done in other industries revealed that PM in supply chain facilitates the inter-understanding and integration between the supply chain members and the results indicate the effects of strategies and potential opportunities (Chan et al, 2003). Furthermore, aligning the performance measures with the corporate strategy of the organisation have been well experienced by the PM studies in supply chain management in other disciplines as it would make sure that the supply chain processes are delivering the value to the customers and acting as a core competency of the organisation (Campbell et al., 1995). Moreover, PM of the whole supply chain and all of its entities has been identified as a strategic issue by many industries (Dasgupta, 2003). Thus, similar studies can be carried out to fill the paucity of research in the construction industry supply chain management practices.

Construction industry is under the way of moving towards developing its processes, products etc., due to the critics made by the past researchers (Respect for people working group, 2002). However, all the improvements and challenges can only be met through the work force of the industry. It has been highlighted the need of respect to the people factor of the industry and measuring the performance of the workforce. The studies in other disciplines show the PM evaluations focused on human resource, which covers top management as well as the shop floor workers. The importance of human resource performance evaluation systems to organisations in general (Boice and Kleiner, 1997; Longenecker and Fink, 1999) has been highlighted by many human resource researchers. Further, the need of aligning the human resource management applications of the firm with other management activities, creating a positive relationship between the organisational performance and the human resource practices focused on employee commitment are being well accepted in the studies done in other disciplines (Soltani, 2003).

In terms of the construction industry, performance evaluation of construction managers can be identified. Yet, studies on the performance of shop floor workers are rare. However, the significance of shop floor worker comments towards upgrading the processes and customer satisfaction (CIMA, 1993), the importance of getting the involvement of shop floor workers towards the performance improvement of the organisation have been identified in the

research done in other disciplines specially in the manufacturing industry (Ahmed, 2004). Therefore, studies based on the PM in shop floor work force of the construction industry will have a better scope in addressing the “people’s issues” while contributing to the lack of research in this area.

Due to the emphasis made by various authors (Egan, 1998; Latham, 1994), a new culture has been embarked in the UK construction industry towards measuring the performance (Robinson et al, 2002). However, more emphasis has been focused on the performance of the physical process neglecting PM during the design stage (Gann et al, 2003). Thus the worst scenario can be unattractive and ill functioning buildings with reduced time and cost. Quality of designs have been identified as an important dimension of buildings (Tang, 2001; Gibson and Gebken, 2003; DCMS, 2000). To cater the need of measuring the performance during the design stage, development of new frameworks as “design quality indicator” can be identified (Gann et al, 2003). Due to lack of studies regarding PM during the design stage much scope exists for further research.

The above section identified the possibilities of adopting PM applications in other disciplines for the benefit of the construction industry, as means of overcoming shortcomings of the construction industry that are pointed out by various authors.

## 6 CONCLUSION

The paper has provided a literature review on the application of PM in general and within the UK construction industry in particular. Significance of PM as an important topic which attracts the attention of the business organisations of various disciplines is emphasised together with the limitations of traditional measures in catering the modern business requirements. It is argued that this forms the basis for a “PM revolution” particularly with a focus of performance measures at the strategic level.

Further, paper highlights that due to the inherent characteristics of construction, it is at a lower level to its optimal performance, leading to a situation where the industry is under pressure to improve its performance.

Within the context of PM application in other business sectors, gaps in PM applications in construction are highlighted which the authors argue will lead the path for future research in the area of PM application in the construction industry.

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