Second International Conference on Construction in the 21st Century (CITC-II)
"Sustainability and Innovation in Management and Technology"
10-12 December, 2003, Hong Kong

Development of a Blueprint "Performance Indicators system" to Support Control Processes for Project Management

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Abstract
This paper reports on a "Performance Indicators" system to support control processes of project management within a construction organisation. The purpose of Performance Indicators (PIs) is to enable measurements of project and organisational performance for benchmarking and control purposes. This paper explains what the principle of benchmarking represents for best practice, how it may be used in a construction organisation, and what it means to implement PIs in such an organisation.
In recent years a set of Key Performance Indicators (KPIs) is produced and used to assess performance of an organisation involved in a project or, more commonly, many projects. These KPIs provide targets for the Construction Industry against which performances can be measured. Though they appear to have had some success in improving the industry, they are too general and have little use for control of specific activities and processes within an organisation.
In this work an extensive study is carried out on how and what to measure when developing specific and self-defined PIs for organisation, project or process. A method for implementing indicators, which includes Information, Measurement and Action plans, is suggested.

Keywords
Key Performance Indicators (KPIs), Processes and systems in Benchmarking, Project Management

1. Introduction

In order to improve the Construction Industry within a changing environment, attempts are made to establish and measure the Construction Industry's performance over a range of its activities in order to meet a set of improvement targets. Benchmarking is such a management tool, which helps construction firms to understand how their performance measures up to their competitors and drive improvement up to "world class" standards (Construction Industry Task Force, 1998).
The purpose of PIs is to enable these measurements of project and organisational performance. This information can then be used for benchmarking purposes, and will be a key component of any organisation's move towards achieving best practice. Yet, the principle of benchmarking in the Construction Industry is not applied widely.

2. Background to the Problem of this Research

The Construction Industry is becoming more uncertain as the participants change roles, projects become more complex and the stakeholders demand more in a shorter time and for less money. The

control mechanisms that are required by the various stakeholders are therefore forced to change. In order to improve the industry within such a changing environment, attempts were made over the last few years in several countries to establish and measure the Construction Industry's performance over a range of its activities in order to meet a set of improvement targets.
Benchmarking is a technique that has been used in many industries for identifying measurable successes in one project or organisation and applying them to others. The benchmarking process compares practices, processes and outcomes to standards of excellence in a systematic way, against a number of KPIs.
There are ten Construction Industry KPIs currently in use to provide targets for Contractors operating in the Construction Industry in the UK and to a lesser extent in the rest of Europe. These are: (1)Client satisfaction – product, (2)Client satisfaction – service, (3)Defects, (4)Safety, (5)Predictability – cost, (6)Predictability – time, (7)Construction time, (8)Construction cost, (9)Productivity, and (10)Profitability. A guide pack provides a simple 7-step process to help decide which of these 10 Construction Industry KPIs to use, how to collect and manage the information, and how to report the results in order to benchmark the result. In this respect a number of reports have been published in a number of countries, reviewing and examining the state of the Construction Industry and how to improve its performance, like (Latham, 1994), and (Construction Industry Task Force, 1998). It contained the clear message that the industry would not significantly improve unless it embarked upon radical changes. This will involve a totally new approach to the delivery of the construction product. Each indicator shows the range of performance currently being achieved across the Construction Industry, with the average performance indicated. In future years this will enable an annual report to identify trends and changes in the industry's performance.

3. The Concepts

The principles of benchmarking and best practice in construction are based upon the assumption that there are usually a number of approaches to carrying out any task, and that these tasks involve certain processes. Thus, if any individual or group wishes to consider how it should attempt to improve the way it carries out any task(s), the best method is to look at how others do so. From there, it should then be possible to consider how current processes can be changed. However, how to know whether the changes have made any difference? This is why measurement is essential.
According to McGeorge and Palmer, benchmarking is: "*A process of continuous improvement based on the comparison of an organisation's processes or products with those identified as best practice. The best practice comparison is used as a means of establishing achievable goals aimed at obtaining organisational superiority"* (McGeorge and Palmer, 1997).
What stands out in this definition is that it uses the words "continuous improvement" right at the start; there can be no doubt as to their importance. Indeed, as McGeorge and Palmer explain, the main purpose of benchmarking is the "search for best practice", not, they suggest, merely to indicate that what you currently do is adequate. It is not a means for duplicating but a way of defining the best and moving beyond that standard to create a "world-class" system. Hence, a benchmark is a standard of excellence or achievement in practice: the "best in class" level of performance for a specific business process or activity, and is used as a reference for comparison and target-setting. However, the difficulty often encountered in the early stages is to know what best practice is, and more where it exists.
There are various ways of carrying out benchmarking which seek to discover best practice within an own organisation, in competitors, and in organisations whose products or services may be completely unrelated to:

3.1 Internal benchmarking

This activity is carried out inside the organisation. Because this does not require access to other organisations, it is unlikely that there will be any reason why best practice cannot be used to assist other departments. Moreover, the fact that departments are encouraged to communicate with one another will be highly likely to assist in enabling people to understand what goes on elsewhere. There

is a tendency for people to think that only their own task is important; how others do their tasks is their problem. The fact that in order to do their tasks they rely on the efforts of others does not seem important. The reality is more usually that overall improvement can only occur if every person/ department in an organisation collaborates and works as a team (McCabe, 2001). Moreover, as Bendell et al explains, "the boundaries of each part of the processes (are a) key element in the implementation of Total Quality Management" (Bendell et al, 1997).

3.2 Competitive benchmarking

Any business organisation which is in direct competition with others will be presumed to monitor what those others do, and more importantly, how. Clearly, if a competitor appears to have suddenly gained a competitive advantage -such as being able to sell its goods cheaper or to a higher specification- other companies will probably be forced to follow suit. Competitive benchmarking therefore is based on attempting to compare processes with organisations that produce and sell the same goods or services, particularly those with commercial advantages. Competitive benchmarking has certain problems: competitors are hardly going to tell you how you can beat them, and comparison against others in the same sector may not result in the belief that radical changes are required in own processes. In construction, it is rare for organisations to consider doing things very differently from their competitors.

3.3 Functional or generic benchmarking

This could be regarded as the form of benchmarking that is likely to result in most changes in an organisation's processes. The reason for this is that you are attempting to compare your processes against those of organisations, which are considered to be the "best in class". It is notable that organisations, which have achieved the accolade of being "world class", are prepared to share the secrets of their success. The reason for this is believed to be their confidence that they are so far ahead that even their direct competitors are not capable of catching up with them. The only problem is, knowing how to implement what you learn from these organisations in your own organisation. The main advantage is that the objective is to be inspired to attempt to do things differently if it will ensure improvement (McCabe, 2001).

4. Combining CSFs, KPIs, Processes and systems in Benchmarking

In every business -regardless of size or type of business- there will be processes going on day in, day out. They will be carried out in order to allow the organisation to achieve its aims. However, one of the biggest challenges that any organisation faces is being able to identify what all of the processes are, and how they interrelate. It is frequently the case that whilst individuals know what their own processes are, they do not know those that relate to other activities! The need to achieve quality assurance has meant that processes are now more likely to be formally documented than in the past. However, if improvement is to occur it may be necessary to consider changing some of the processes, or change the way that different processes interact with one another. As Bendell et al describes, benchmarking is likely to assist in providing guidance as to what changes should be initiated in an organisation's processes (Bendell et al, 1997). A crucial feature of the concept of benchmarking is the need to understand processes, and in doing so, seek alternative ways of carrying out the day-to-day activities which are fundamental to completion of the overall corporate objectives. Whilst measurement is probably the most essential part of carrying out benchmarking, it is important to understand what the measures are and how effective they might be in producing improvement. It is for this reason that attention needs to be drawn that the outputs of measurement should not be considered to be the only activity. There is a danger in thinking that merely because an organisation is better than others competing in the same sector, that will be enough.

In order to be successful in benchmarking, it is essential that the senior managers of an organisation decide upon their mission. It is crucial to provide all employees with a clear idea of the objectives to be attained. It should therefore be communicated to every person in the organisation in language that is clear and unambiguous.

Subsequent to the mission having been decided upon, it is necessary to translate it into what are known as Critical Success Factors (CSFs). CSFs provide a focus for what people will be aiming to achieve in order to ensure that the mission is successful within the assigned period. Corresponding with CSFs are Key Performance Indicators (KPIs). KPIs are measures that are used to provide targets against which progress towards achievement of CSFs can be assessed. As such, the development of KPIs should be achieved in consultation with those people who are directly involved in the carrying out of processes. In order to ensure that the improvement effort can be operationalised, it is essential that each CSF and the KPIs associated with it are considered with direct respect to the day-to-day processes that are carried out. Unless what happens within the processes can be changed and made to occur more effectively, the likelihood of being able to show that the KPIs associated with the CSFs have improved will be reduced. As a result, it is necessary to consult those people who have direct involvement with the sub-processes, activities and tasks. In order to assist the exploration of the process, sub-process, activities and tasks, it is recommended that a technique called process mapping should be used. This technique requires that rather than describing what goes on, a pictorial representation is used. As a consequence, it should be simpler to identify boundaries and potential areas that can be improved.

5. Steps to Successful Benchmarking

In order to make the process of benchmarking more likely to succeed, it is necessary to be aware of a number of things. This section will describe issues that have emerged from the author's experience, executed case study, and several other case studies derived from literature and Internet that have attempted to use benchmarking in order to create improvement. In doing so, they should be regarded as obstacles to be encountered. The heart of the matter of good leadership -concerning implementing indicators- is charted in the Table 1.

Table 1: Leadership by implementing indicators

Limiting conditions: Employees have faith in management, are familiar with organisation's objectives, and are informed about environmental developments of the organisation. Management supplies information, is open about the use of indicators and provides education which is aimed on problem analysis and decision-making. Management stands for improvements in all parts of organisation, and making results visible. Attention of management does not slacken.
Pitfalls: Indicator leads to pursue short-notice-success. Indicators are formulated by higher hand or (external) expert. Management uses performances for judging individual employees. Every benchmark should aim to improve performance in an area that is critical to success. Benchmarks should be regularly reviewed and changed as necessary. Be precise in defining what you want to measure and improve but don't try and benchmark too many things to begin with but gradually add others over time.
Tips: Develop indicators with people concerned and propagate indicators as own tool and not as imposed control tool. Make sure the objective is influential and motivating and keep in mind the objective: control and/or improvement of quality. Try not to develop to many indicators: rather 4 than 12 indicators. Do not blame, but look for improvements.

The Construction Best Practice Programme has determined in their report "An Introduction to Benchmarking" five key steps to successful benchmarking. These steps are (CBPP, 1998):

Step 1: Plan. Clearly establish what needs to be improved – make sure it is important to the organisation and their customers – and determine the data collection methodology to be used.
Step 2: Analyse. Gather information and determine the current performance gap -against a competitor, the industry or internally- and identify the reasons for the difference.
Step 3: Act. Set performance targets, then develop and implement improvement plans to meet them.
Step 4: Review. Monitor performance against the performance targets.
Step 5: Repeat. Repeat the whole process – benchmarking needs to become a habit for the organisation if they are serious about improving their performance.

McCabe has formulated a much more extensive approach to successful benchmarking. McCabe has determined a three-phase (Preparation, Execution, and Post execution)- fourteen-step model for successfully implementing benchmarking (McCabe, 2001).

6. Developing specific PIs

In this work, a more extensive view about how to define exactly what to measure, when developing "self-defined" PIs specific for organisation, project or process, is developed. This specific method includes criteria for "good" indicators. Indicators should be: Simple, visible & exploratory, Motivating & influenceable, Part of the policy of company, Programmed with persons concerned, and Stimulate client satisfaction. This specific method for implementing indicators, without taken into account benchmarking against other companies, includes an "Information plan", an "Measurement plan", and an "Action plan" (Kerklaan et al, 1994), and (Torremans, 1998).

6.1 Information plan

An Information plan consists of a set of formulated "Attention Areas", which will be charted with indicators later. The plan makes sure that the designed indicators are significant, and only those performances are charted, which are essential for effective management of the organisation. It should be noted that these so-called Attention Areas corresponding to the Critical Success Factors mentioned before. After a quick pre-diagnose has been made on the ruling problematic and the dominant style of management in the organisation, an approach will be chosen, which fits the organisation best. Every method has its own strengths, weaknesses and ways of implementing it. When all information is gathered and from this information the Attention Areas are formulated, the whole information plan needs to be tested. Therefore a checklist is used.

6.2 Measurement plan

The Measurement plan consists of agreements about what exact to measure and how this should be done for each Attention Area. Therefore, each Attention Area is analysed, and lodged in the Measurement plan. The "Measurement plan" is established by making an overview of the following aspects per Performance Indicator:
Standard: the characteristics of the subject to be measured, like: length, moisture, time span etc what is to be counted, compared or determined. In reality it occurs that for every subject (Attention Area) a lot of standards are possible. One should choose a standard, which is easy to measure and relevant.
Norm: the value, which appoints the indicator to be "red" or "green". The norm can also function as a target: "the norm is not yet feasible, but should be on the long term." Besides "good-and-wrong" limits, also norm-gradations are applicable: "good", "better", "best".
Measure- and registration system: how are data collected and visualised? Data collecting is possible by hand or by computer. It is important to agree upon the responsibility; who sets up the indicator periodically? For this registration a number of techniques are available, see (Kerklaan et al, 1994).
Agreement about reporting: for whom is the indicator intended: what happens with the output and how frequent is the indicator to be updated. The composition of the indicator needs special attention: it has to have a striking presentation, which keeps the indicator "alive".

6.3 Action plan

The action plan consists of proposed future control- and improvement activities, structured with the help of the Deming PDCA- control cycle (Plan-Do-Check-Act), see **(**Kerklaan et al, 1994**)**. The steps in this cycle are followed in order to control and improve the indicators on basis of their performances. In the beginning, this set of PIs will have some start-up problems. In the course of time, the set of indicators will be adjusted on basis of experiences. This "growth" of indicators can be represented in three big steps: Start-up, Control, and Improvement.
The process needs to be controlled, in order to ensure that the fluctuations occur within the desired bandwidth. As the process gets on the way, the desired performance might be adjusted higher and one

might concentrate on the improvement of the performance. Adjusting the norm higher, or reducing the tolerance can achieve this (Torremans, 1998). The control- and improvement activities can be structured with the help of using the PDCA-cycle as indicated below.

Check: an indicator delivers a signal. Is the process running well or not? Does the output satisfy the norms? Are the deviations within the bandwidth? How is the development in the trend?
Act: when an indicator shows "red", one should look for the problems and causes underlying. Why doesn't the process run as planned? When the indicator shows "green" the control of the process still should be increased more.
Plan: when the causes of the problems or possibilities for improvements are determined, actions to be undertaken should be decided upon. What kind of actions are significant and worth the effort? The actions and goals, working-method, executives and planning are recorded in the Action plan.
Do: the chosen actions are executed. Next, the cycle starts again. The results of the executed actions can be concluded from the new value of the indicator. Does the action supply the desired result, or does the action have no effect? In both cases, the cycle shows the way for continuous control and improvement.

7. Conclusions

Benchmarking is a management tool that allows any organisation to consider what it does and how it achieves it, in comparison to any other organisation, regardless of the fact that it may operate in a sector which is entirely unrelated to construction. If there is a desire to improve the capability of an organisation radically the most effective way of doing this will be to compare it against the "best in the business". A construction organisation should not simply aim to be as good as any other construction organisation, but should aim to use benchmarking as a tool to drive improvement up to 'world class' standards.
It has been found that a crucial feature of the concept of benchmarking is the need to understand processes, and seek alternative ways of carrying out day-to-day activities.
Benchmarking can lead to too general PIs. To make an indicator effective, it is important to develop an indicator with person(s) involved; relate the indicator to responsibilities. Such system requires continuous improvements.
PIs should not be used as an individual judgment tool. When PIs really judge individual employees, the motivating influence of it will quickly disappear, and be a prey to manipulation. In this case, the PI can not fulfill its function anymore: the true performance will be obscured. The "owner" and "administrator" (responsible) of an indicator should be the employee concerned in the process, not management!
The set of indicators should be looked upon as a whole. Judging the performance of a single indicator may lead to misinterpretation.

8. References

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