CRITICAL SUCCESS FACTOR OF TREE-BASED ON FOUR INFLUENCING FACTORS

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ABSTRACT

Malaysia intended into as Garden Nation, various ideas and strategies have many plans as well as the campaign of planting a tree over the country. There are many programs organised to plant a tree with various agencies and community to spread the message. In landscape architecture, the plant is one of the essential elements in designing spaces. Commonly, soft-scape will create a better environment and enhance the beauty of the areas. However, issue of quality in landscape construction especially for soft-scape still needs to be duly addressed. Therefore, the aim of this study to develop a set of Critical Success Factor (CSF) of quality assessment elements for landscape works which is focusing on tree planting. The objective is to identify elements of assessment for tree planting works. In this study, four different influencing factors are taken due to failure to comply the specification during planting work which is defection on tree growth, duration of time consumption, level of cost incurrence and level of workload to rectify the element. Questionnaire surveys have been done to the get opinion from Landscape Architects through five ordinal value or Likert-type scale of every aspect. The result, the average mean of CSF based on four influencing factors shows that three elements that attained the highest mean are soil mixture, rootball size and planting hole. Meanwhile, three lower results have stated for finishing & treatment and trunk diameter, and the three lowest mean of CSF are indicated for trunk height, staking and mulching. It hoped that the findings would help in addressing quality assessment for landscape work. Besides, the final verdict can be a reference in the process of betterment the quality documents for landscape work in Malaysia.

Keywords: Landscape construction, Quality Assessment System, Critical Success Factor.

INTRODUCTION

Over the past decade, concerns have expressed on quality of construction products and processes (Roziya, 2009). According to the Malaysia Construction Development Board (CIDB, 2000), massive development experienced by the construction sector in Malaysia has led to a devastating compromise in quality. The problem in construction project primarily related to quality such as building does not comply with specifications and sub-standard are still exist (CIDB, 2000). Attainment of an acceptable level of quality in construction has long been a problem (Arditi and Gunaydin, 1997). Landscape construction, in general, is part of the total development and is not exempted from the same problem.

The findings of a survey conducted by jasasikin 2015 concluded that there is a need to attend landscape work quality issues in Malaysia. The results have revealed that the level of conformance to specification is considered as low. Majority of the respondents pointed out that the quality of the soft scape-construction in Malaysia not adequately controlled. This is explained by their opinion that most of the soft-scape construction work in Malaysia have not complied with the specification requirement. Furthermore, the findings have also recorded that about 80% of respondents concluded that more than 50% of landscape project that they involved undergone rectification work after completion. 24.5 % of respondent concluded that all the landscape project that they involved undergone rectification work after completion. The need to undergo rectification work caused by the failure to comply the specification requirement.

Many kinds of research had been carried out on the issues of managing construction quality (Abdul-Rahman, 2010; Abdul Hakim et al., 2006; Mat Naim, 2005). However, the research attended on the issues of construction as a whole. It is very seldom to find the studies that focus specifically on the quality landscape work in the context of construction. Undoubtedly, total management of construction is the basis of quality control in construction including landscape work. However, focus also need to be given on the area of implementation which plays an integral part in the construction. Realizing the important on quality control at the stage of implementation, CIDB in 2006 has established QLASSIC as an assessment tool for construction at the very construction stage. The instrument was successfully utilised and yields pleasing results on the construction work quality. Since QLASSIC only caters to a specific area of construction excluding landscape work, the effort to establish a version of QLASSIC to provide the space for landscape work particularly on tree planting works should be carried out.

For carrying out on landscape work, the elements should list from the existing specification and document in Malaysia which related to landscape work. The element was from the National Landscape Department guideline has been used as a standard landscape specification (NLD, 2008). The listed components for a tree that crucial in landscape work which is as following table 1.

Table 1: Elements for tree planting works

Trunk Height
Trunk diameter
Root ball size
Soil mixture
Planting hole
Staking
Mulching
Finishing & treatment

LITERATURE REVIEW

Ronald D. in 1961 was among the first experts who offered the critical success factors as the business guidance (Afshin and Gholamreza, 2012). Since then, many researchers have carried out the study on essential aspects of success (Muhammad et al., 2008; Syedsalehi, 2010; and Afshin and Gholamreza, 2012).

The Critical Success Factors are indicative of subjects which could make the organisation successful; if there is a deficiency of lack in these fields, the organisation will fail in achieving its goals (Syedsalehi, 2010). The organisations should concentrate on the more decisive factors or so-called the critical success factors considering their restrictions (Afshin and Gholamreza, 2012). Ashley (1986) has identified seven Critical Success Factors for projects which are construction activities programming, design planning, project manager commitment to the goals, project team motivation, project manager technical capability, control system, and definition of work and its field.

Afshin and Gholamreza (2012) in their study on Par Garma Company found that it is evident that identifying and ranking the critical success factors of this excellent company. In which works in various fields for instance construction of dam, irrigation and drainage networks, road construction, bridge construction, tunnel excavation, construction of concrete and metal massive building, and mass construction of the residential buildings. It was in cooperation with Ministry of Defence, Roads and Urban Development, Energy, Oil, Social Security Organisation, Organisation of Construction Engineering and Tehran Municipality, could result in achieving reliability and more desirable record and lead to organisation's more successful.

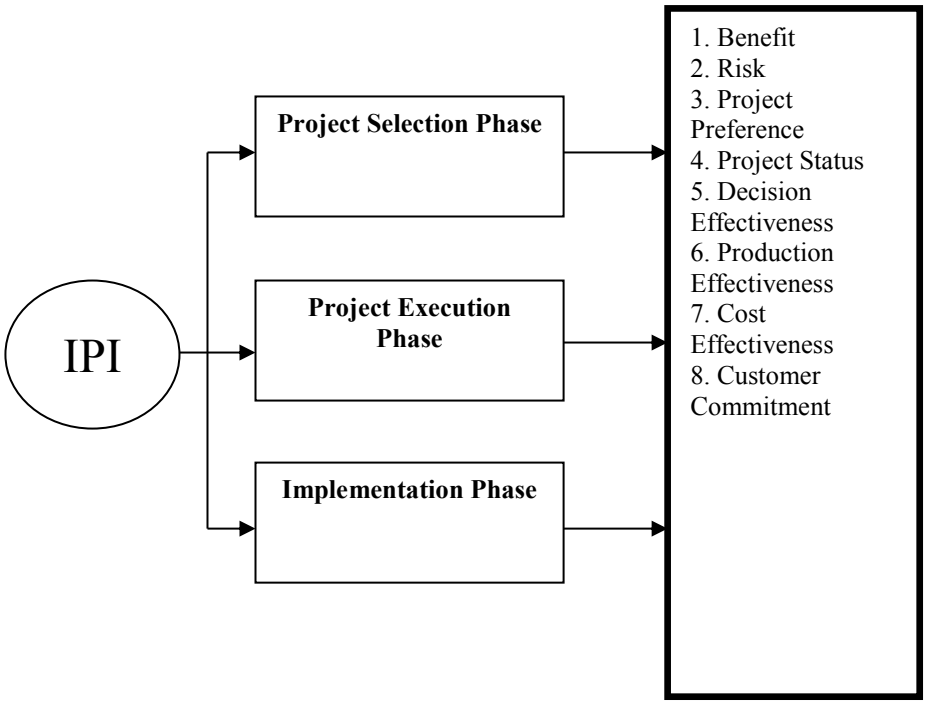
Quality Measurement System

In the manufacturing and construction industries, the performance measure is used as a systematic way of judging project performance by evaluating inputs, outputs and final project outcome (Takim et al. 2003). In their study synthesised Performance Measurement Model (PMM) that consists of Construction Project Performance Measurement Model (CPPMM), Construction Productivity Measurement Model (CPMM), Project Viability Measurement Model (PVMM) and Project Quality Measurement Model (PQMM).

Two types of CPPMM have developed, i.e. Integrated Performance Index (IPI) by Phillai et al. (2002) and Key Performance Indicator from Construction Industry Task Force in 1998. IPI was developed to deal with performance elements such as performance indicators or critical factors of performance. It was designed to measure quality performance of R&D projects. The model addresses three projects phases in R&D project which are project selection phase, project execution phase and implementation phase (Pillai et al. 2002). On top of that, they have listed eight prominent factors that involve in performance measurement of three stages, i.e. benefit, risk, project preference, project status, decision effectiveness, production preparedness, cost-effectiveness and customer commitment.

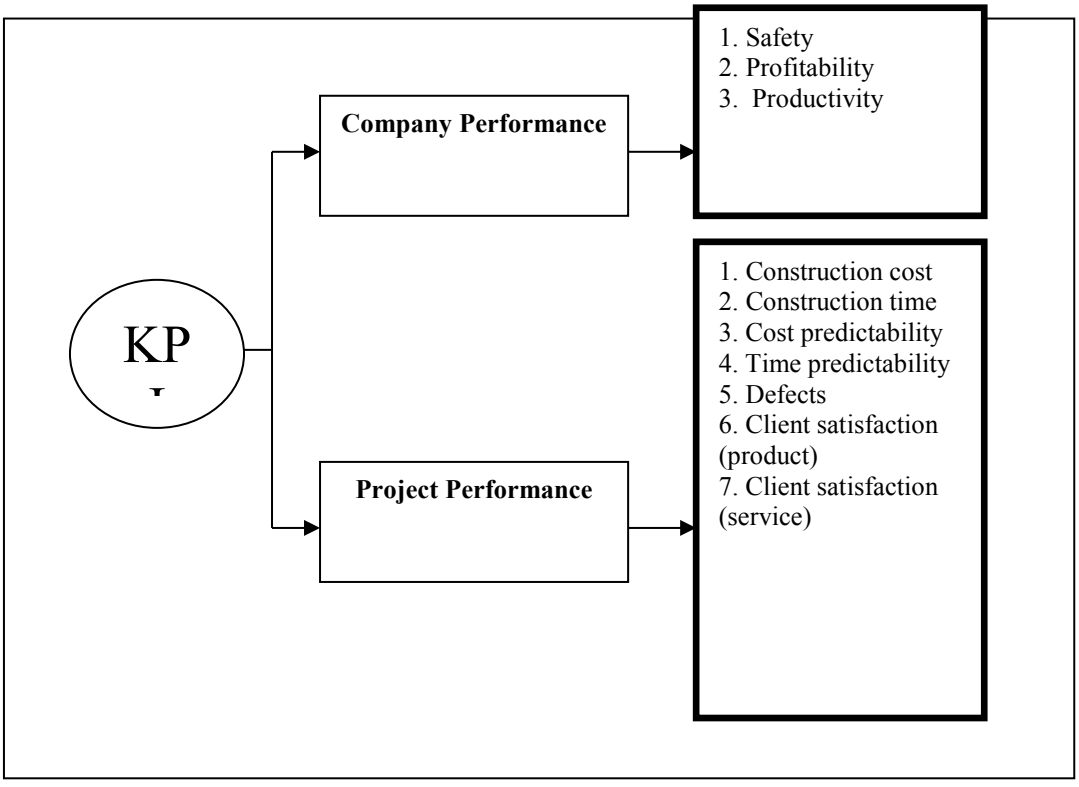
Takim et al. (2002) concluded that the strength of IPI is on the readiness of the model to be used at all project phases. However, they are of the opinion that the model lacks regarding clarity in the way the mathematical formulas are used to integrate the identified vital factors into an integrated index.

Figure 1: Diagram of Integrated Performance Index



Key Performance Indicators (KPIs) is the UK construction industry's response to Egan's report (Construction Industry Task Force, 1998) to measure project Performances based on ten identified parameters (Takim and Akintola, 2002). Seven parameters used for project performance indicators and three metrics for company performance indicators. Seven settings for project performance inclusive of construction cost, construction time, cost predictability (design and construction), time predictability (design and construction), and defects. Also, client satisfaction with the product and client satisfaction with the service and three company performance parameters are safety, profitability and productivity (Construction Industry Task Force, 1998). Takim et al. (2003) concluded that the strength of this model is that the overall concepts quickly understood and easily implemented by clients, designers, consultants, contractors and suppliers and one the weakness of the model is that the KPIs not compartmentalised along the phases.

Figure 2: Diagram of Key Performance Indicator



METHODS

The survey has been done on Landscape Architects as listed in ILAM directory. Respondents of the study are among Landscape Architects listed in ILAM directory 2008/209. There are 543 Landscape Architects listed in ILAM directory 2008/2009 (ILAM, 2009). 225 from 543 respondents successfully responded to the survey conducted. The number of respondents is sufficient based on a statistical formula by Yamane's formula whereby the number of respondents from a population of 500 should be at the minimum of 222 (Yamanae, 1973).

In the findings on the status of respondents, it revealed that 53.8% of the total respondents were non-ILAM corporate members while 46.2% were ILAM corporate members. Distribution of respondents based on types of organisations showed that 47.6% of respondents were landscape consultants, followed by 22.7% serving in government agencies, 9.8% were contractor while the other 3.6% were developers and 16.4% from educational institutions. Regarding the organisation group, 60.9% of the respondents were from the private domain, and 16.9% of the respondents come from the educational institution and 22.2% were from government agencies. Concerning the distribution of respondents based on genders, 58.7% respondents are male, and 41.3% are female.

ANALYSIS AND DISCUSSION

The data analysis using the Statistical Packaging for Social Science SPSS version 14.0 was used to analyse data. Demographic distribution was investigated through descriptive analysis using SPSS version 14.0. The results have been tabled out to reveal the respondent demographic characteristic. Meanwhile, Chi-square analysis was also performed to find the significant level of relationship between the respondents from different types of organisations with their response to the open-ended questions on the issues of quality of soft-scape construction work.

CRITICAL SUCCESS FACTORS (CSF) OF TREE PLANTING

This section presents the analysis of CSF rating. The review began with the rating given to assessment elements in general without the present of influencing factors. Respondents have provided the rate to the assessment elements based on a general assumption of the critical level of every aspect. The analysis continued with the mean comparison of assessment elements based on influencing factors. There are four different influencing factors taken into account in this analysis due to inability to meet the specification during planting work. The for altering elements are the defection on tree growth, duration of time consumption, level of cost incurrence on correction and level of workload.

CSF OF TREE PLANTING BASED ON GENERAL PERCEPTION

Respondents were requested to rate the weight of the elements using the scale from 1 which is least critical to 5 which is most vital (refer appendix 2, section F) to considered in planting work quality control.

The findings show that soil mixture, planting hole and trunk diameter were among the three highest ranking regarding critical level in planting works quality control. These elements would be integral to the perspectives of the respondents in this study. Meanwhile, staking and mulching is two elements which considered as two lowest critical in planting works quality control. Refer Table 2.

Table 2: The mean of CSF based on general perception

No.	Elements	mean
1	Trunk Height	3.86
2	Trunk diameter	3.95
3	Root ball size	3.82
4	Soil mixture	4.19
5	Planting hole	4.08
6	Staking	3.57
7	Mulching	3.36
8	Finishing & treatment	3.88

CSF OF TREE PLANTING BASED ON LEVEL OF DEFECTION

Respondents were requested to rate the level of defection on the tree growth due to the failure to comply the specification. This section was developed to look into the level of desertion on the tree growths due to the inability to meet the specification of construction. Table 3 illustrates the level of defect on a tree will be high if the contractor failed to fulfil the specification on soil mixture, planting hole and root ball size. In turn, the level of defect may be at the moderate level if the contractor failed to comply the specification for staking, mulching and finishing & treatment. Trunk height and trunk diameter considered have the least impact on tree growth.

Table 3: The mean of CSF based on the level of defection

Elements	mean
Trunk Height	2.65
Trunk diameter	2.69
Root ball size	3.49
Soil mixture	4.01
Planting hole	3.62
Staking	2.77
Mulching	2.75
finishing & treatment	3.23

CSF OF TREE PLANTING BASED ON TIME CONSUMPTION

Respondents were inquired to rate the level of time consumption for rectification of the elements in tree planting works due to the failure to comply the specification. Table 4 illustrates the means about time consumption in rectifying the planting work's elements. Respondents have rated rootball size, soil mixture, trunk diameter and trunk height as the elements that consume the longest time to rectify should the contractor failed to comply specification for planting works. Meanwhile, the parts that took up the shortest time to be remedied were mulching and staking. Conclusively, the time consumption for rectification for all elements has fallen under moderate time consumption.

Table 4: The mean of CSF based on the level of time consumption.

Elements	mean
Trunk Height	3.35
Trunk diameter	3.35
Root ball size	3.44
Soil mixture	3.42
Planting hole	3.2
Staking	2.63
Mulching	2.6
Finishing & treatment	3.07

CSF OF TREE PLANTING BASED ON COST INCURRENCE

All respondents were asked to rate the level of cost incurrence on rectification of the elements of tree planting due to failure to comply the specification by respondents. This section was developed to measure the level of cost incurrence on the rectification works of the elements due to the inability to meet the specification made available. The cost incurrence in rectifying all these elements remains to be relatively moderate. The highest cost incurrence in rectification works should the contractor failed to comply specification is trunk diameter, followed by trunk height, root ball size, soil mixture, planting hole, planting hole finishing& treatment, staking and mulching. Refer Table 5.

Table 5: The mean of CSF based on the level of cost incurrence

Elements	Mean
Trunk Height	3.58
Trunk diameter	3.59
Root ball size	3.53
Soil mixture	3.52
Planting hole	3.28
Staking	2.79
Mulching	2.64
Finishing & treatment	3.13

CSF OF TREE PLANTING BASED ON LEVEL OF WORKLOAD

The respondents filled the rate of level of workload to rectify the elements below due to the failure to comply the specification. The finding further highlights that the workload to remedy the soil mixture peaks at a high level. Meanwhile, the workload

needed to rectify the other elements namely trunk height, trunk diameter, rootball size, planting hole, staking, mulching and planting hole & finishing & treatment were noticeably at a moderate level. Refer Table 6.

Table 6: The mean of CSF based on the level of workload

Statements	mean
Trunk Height	3.42
Trunk diameter	3.45
Root ball size	3.56
Soil mixture	3.67
Planting hole	3.53
Staking	2.77
Mulching	2.65
Finishing & treatment	3.12

THE AVERAGE MEAN OF CSF

The average mean of CSF based on four influencing factors shows that threes elements that attained the highest mean are soil mixture, rootball size and planting hole. The result showed three lower mean stated for finishing & treatment and trunk diameter and the three lowest mean of CSF are indicated for trunk height, staking and mulching. Refer Table 7.

Table 7: The average mean of CSF based on four influencing factors

Elements	Mean
Trunk height	3.25
Trunk diameter	3.27
Root ball size	3.50
Soil mixture	3.66
Planting hole	3.41
Staking	2.74
Mulching	2.66
Finishing	3.14

CONCLUSION

The findings found that the hierarchy of scoring the average mean of CSF based on four influencing factors. Soil mixture, planting hole and root ball size ranked with the highest mean. The result has shown three lower mean stated for finishing & treatment and trunk diameter and the three lowest mean of CSF are fixed for trunk height, staking and mulching.The critical level of the elements should refer as guidance to all organisation that involve in landscape works in controlling the quality of work on site. Without compromising the low ranked elements, emphasis should be given to the high ranked elements as they could cause significant defect and cost for the project. All elements in tree planting works are vital to the process of establishing reliable sets of weightage soft-scape construction elements. The finding will help in addressing quality assessment for landscape work. Also, the discovery can be a reference in the landscape construction industry in the process of the betterment of quality in tree planting works. This study only covers tree out of other soft-scapes which are palm, shrub, climber and groundcover. Other studies should be done to complete the whole soft-scape.

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