

The critical success factors for effective programme management: a pragmatic approach.

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Abstract

The current lack of clarity associated with the discipline and the practice of programme management in this no-one-knows-what-happens-next state of the global economy calls for a better understanding, insight and analysis of what is/are critical to successful construction programmes. A total of 119 usable questionnaires were received and analysed, 17 semi-structured interviews were conducted with programme management experts and critical literature review was conducted to establish, ascertain and document the factors that are critical to the success of implementation and the practice of programme management in the UK construction environment. The findings in this research are based on a theoretical and pragmatic synthesis of literature review, questionnaire survey and semi-structured interviews with programme management experts. The study seeks to provide a better understanding, insight and analysis of the factors critical that are critical to the success of any effective construction programme and the way forward.

Keywords: Critical success factors, effectiveness, programme management

Introduction

Programme management is not a synonym of project management (Pellegrinelli, 1997), but an integrated approach that can streamline the effective delivery of projects (Gray, 1997); Lycett *et al.* (2004) observe that the former has its roots in the latter and according to Milosevic *et al.* (2007) the two concepts are often confused. Therefore, it has been observed that organisations use the terms ‘project management’ and ‘programme management’ interchangeably (Ferns, 1991; GAPPS, 2008), whereas the two are completely different but directly related to one another (Reiss, 2003). For programme management to succeed there is need to define and differentiate its practices from those of project management to avoid leaving them to serendipity. Programmes tend to be dynamic in nature with intense cross-discipline and cross-project integration (OGC, 2003), in which the actions of one functional project affects, supports and reinforces the other project teams involved in the programme (Milosevic *et al.*, 2007; Thomsen 2008). On the other hand, programme management involves management of a group of projects (Ferns, 1991; Lycett *et al.*, 2004), while project management deals with the effective management of activities to deliver the project within the approved cost quality and time (Turner, 1993; Burke, 2003). The high level of synergy and integration in programme management requires the identification of certain CSFs that will facilitate efficient delivery (OGC, 2003; Milosevic *et al.*, 2007).

In programme management, critical success factors are identified to enable tracking the value of programme outputs; they should enable proper assessment of the few fundamental aspects of the programme that must be done well to achieve the objectives of the programme (Wren 2003). While the relationships project management and programme management are observed to be synergistic (Milosevic *et al.*, 2007), the CSFs for project management may be insufficient to those of programme management (Reiss, 2003). In the same manner that programme management emerges from project management (Ferns, 1991; Lycett *et al.*, 2004), the CSFs of the former may also be related or emerged from the latter; therefore, based on the above established relationships between projects and programmes, this research reviews, establishes and analyses the CSFs for effective programme management, which may have emanated from project management.

Rockart (1982) first used critical success factors (CSF) in the context of information systems and project management and a number of researches have been subsequently reported in this field. Rowlinson (1999) and Thomsen (2008) state that CSFs are those fundamental issues inherent in the project (s), which must be maintained in order for team working to take place in an efficient and effective manner. CSFs require day-to-day attention and operate throughout the life of the project. OGC (2007) believes that CSFs are limited in the number of areas that, if fully addressed, would ensure the successful completion of the programme. Identifying and communicating the CSFs ensures that everyone in the programme team is focused.

Background literature review

Tracing the roots of project management, Cooke-Davies (2002) draws an important distinction between *project success* (measured against the objectives of the project) and *project management success* (usually measured against the traditional measures of time, cost and quality). He further distinguishes between *success criteria* (the measures against which a success or failure will be judged) and *success factors* (the inputs that lead either directly or indirectly to the success of the project). In relation to those distinctions, this study aims to identify management inputs that lead to overall *programme success*, rather than on traditional measures of outturn performance.

Coulson-Thomas (2004) suggests that to shape the future, businesses need to establish and build relationships with customers; the winning business best practice is to identify the critical success factors of the business prior to making full commitment. According to Jaramillo and Marshall (2004) CSFs are tasks or attributes that should receive priority attention by management because they drive performance. CSFs have been defined as characteristics, conditions or variables that significantly drive business performance (Keck *et al.* 1995). The taxonomy of CSFs for effective project management is based on four increasing levels of criticality, which are factors linked to success by a known causal mechanism, factors necessary and sufficient for success, factors necessary for success and factors associated with success (Williams and Ramaprasad, 1996). Lim and Mohamed (1999) suggest that CSFs are extremely important factors which determine the success or failure of an endeavour – programme. Based on Williams and Ramaprasad's (1996) taxonomy, this research observes that parallels can be drawn and similar analogy can be adapted to the CSFs for effective programme management.

Abraham (2003) articulates that the traditional approach to success in the construction industry, both in academia and in industry, places great emphasis on the ability to plan and execute projects. In the past, companies completing projects in a timely manner within an established budget and meeting required quality considerations have been considered successful companies. Minimising the emphasis on management practices and organisational stability, companies with a track record of successful project completion have been

considered the top performers in the construction industry. In contrast, programme management in other industries focuses on management practices at a corporate level as an essential element of success.

According to Williams and Parr (2006), the core essence of programme management include activities such as the integrated planning of multiple projects, identification and understanding of dependencies, managing risks relating to complex interdependencies, maintaining focus on the overall business benefits, and coordinating large and often dispersed projects. OGC (2003) explains that effective programmes require and involve substantial commitment in terms of resources, sufficient budget, prolonged timescales, potential disruption of extant projects or programmes, and major business or organisational change. The CSFs discussed in this research were built from programme management literature, which include the following headings (OGC, 2003; Williams and Parr, 2006; Pellegrinelli *et al.*, 2007). Below are some of the factors that are considered as critical to the success of construction programmes:

Planning and establishing priorities

Planning is one of the most important critical success factors; Williams and Parr (2006) describe programme planning as the creation of a series of documents that facilitate a shared understanding among programme stakeholders and guide the execution and control of the programme. Baguley (1995) also suggests that successful projects require planning – they do not just happen. Planning must be capable of withstanding the buffeting of an increasingly unsettled environment in which the project is executed. Young (1993) describes planning as the function of establishing a predetermined course of action, including policies and procedures to reach some specific corporate objectives. Although planning a project does not equate to planning a programme (Thomsen, 2008), the success of a programme is dependant on the success of individual constituent projects and the adequacy of their planning (Reiss *et al.*, 2006).

Tullet (1996) suggests that the detail in which a project is planned and subsequently monitored and controlled through its various phases is a factor which is critical to its success. OGC (2003) sees programme planning and control as not simply project planning and control on a larger scale, rather it is a combination of various monitoring considerations. Reiss (2003) describes programme planning as the creation and editing of individual project plans on stand-alone PCs, either on PCs hooked up to a network or on terminals connected to a minicomputer. Although planning is an essential CSF to achieving effective programme management, Reiss *et al.* (2006) think it is advisable not to plan the programme in too much detail at an early stage, more detailed plans should be prepared later as each tranche and project are prepared.

On the other hand, establishing programme priorities is another essential CSF, Reiss *et al.* (2006) advise to concentrate on establishing the priorities, identify quick wins that can realise early benefits, dependencies between projects, and ensuring that project deliverables are clearly mapped to the benefits expected. OGC (2003) also explains that stakeholders, whatever their position and opinions need to know what is planned (in terms of priorities), why, and what they need to contribute. In the semi-structured interviews conducted with the programme management experts, a construction programme manager states that “it is essential for a construction programme team to establish its goals, objectives and strategies (priorities)” prior to the implementation of programme management. The statement indicates the criticality of establishing priorities to programme management success.

Strategic review and approach

According to OGC (2003 & 2007), strategic review is an essential CSF; while Thomsen (2008) observes that without a strategic purpose, programme management is not worth pursuing. This research observes the essence of a sound strategic review and understanding benefits and organisational objectives of programme management prior to its implementation and practice. The strategic review may however protect the organisation into plunging itself into a practice that they have no understanding of focus about.

The best overall approach for a programme will be a blend of the approach required to deliver each workgroup, the relationships between work groups and the organisation's capability to manage change (Reiss, 2003; OGC, 2003). A proactive approach to managing programmes will facilitate effectiveness, efficiency, time delivery and effective risk identification and management. The approach should be kept simple to understand and operate (OGC, 2003).

Simplicity and easiness of techniques

Programmes are known to be complex, dynamic, complicated, with intense pressure from the market forces, political atmosphere, and cross-project integration and activities (Milosevic *et al.*, 2007; OGC, 2007b). The required harmony and coexistence of multiple projects and stakeholders require organisations that are new to programme management to keep it as simple as possible to be effective and achieve successful programmes. According to OGC (2003), for organisations with limited experience of managing change (programme), the approach should be kept as simple as possible. The organisation should therefore structure the programme so that there is a strong bond between the work groups and functions and support each function by using experienced project and programme managers. According to one of the programme managers in the semi-structured interviews conducted in this research, the simpler the programme, the easier the organisation will find navigating through the learning curve to manage and achieve effective and successful delivery at the end of the operation (Lycett *et al.*, 2004).

In relation easiness of techniques, programme management may only be effective and successful if the target(s) of the programme is/are achieved (OGC, 2003). Programme management relies on planning, execution and control in order to succeed, while the trio is supported by certain aspects that require management, such as risk, supply chain, knowledge, financial, contingency, performance, quality release and benefit management (Williams and Parr, 2006). Whichever management approach is used to sustain the programme, OGC (2003) believes that using relatively simple, well understood, (financial) modelling techniques (unless you have the services of experienced appraisal specialists) is essential. It is highly recommended that simple and well understood tools and techniques are employed to avoid the unnecessary waste of time in order to apprehend how the tools/techniques work. As highlighted by Milosevic *et al.* (2007), programme management is not about solving complicated IT problems, but managing the entire programme's progress and success.

In contrast, an IT programme director who was interviewed warned that simplicity of tools and techniques does not always imply efficiency. Hence, the programme management organisations should be able to balance the conflicting relationship between the 'simplicity' and 'effectiveness' of the tools and techniques they use.

Learning and development

If an organisation has limited programme management, capability and experience, it must build time into its plans to allow for development and learning (OGC, 2003; Lycett *et al.*, 2004). Depending upon the nature of the organisational objectives and policies, effective learning and development require investment in time, attention, dedication and commitment (Thomsen, 2008).

This research observes that it is essential that a potential programme management organisation should map out the learning and development requirements based on the assessment of their true potentials to learn adopt and implement new systems. This, however, coincides with the recommendation of a public sector programme manager in the semi structured interviews, conducted in this research, and Thomsen (2008), who believes that learning and development are critical to building and enduring programme management.

Management infrastructure and understanding programme and its stakeholders

It is essential to establish an adequate infrastructure and put in place support tools, processes and procedures to manage the programme. These must be able to function within the current programme, but a bad infrastructure will almost guarantee failure (OGC, 2003; Williams and Parr, 2006). Management infrastructure can be a set of facilities or policies implemented by management to translate their strategy into action (OGC, 2007b). This is usually facilitated by the management system that is already in place within the organisation.

Understanding programme and its stakeholders is essential to ensure there is a good understanding of the attitude of all the stakeholders in the programme (Reiss *et al.*, 2006). For those whose stance is not where it needs to be (i.e. those who could jeopardise the programme's success) an organisation must develop a strategy to influence them and thus positively change their attitude. (OGC, 2003; Thomsen, 2008).

Clarity/consistency of vision and benefits focus

A programme typically involves significant change across many strands of business operation (Bartlett, 2002) and potentially across more than one organisation (Reiss, 2003; Reiss *et al.*, 2006). It may also involve change to individuals, groups or services that are outside the organisation(s) A clearly defined vision for the change will ensure that there is a good understanding of what must be designed and delivered in order that the desired outcomes are achieved (OGC, 2003& 2007).

Benefits focus is another CSF which considers that programmes usually evolve in an attempt to manage beneficial changes (Reiss, 2000 and 2003). Managing benefits from identification through to realisation takes time, costs money, and consumes resources. It is therefore important to retain an explicit, frequently revisited focus on the intended benefits of the programme to remain on track and achieve the desired outcome (OGC, 2007b). According to Thomsen (2008), setting up goals and a clear criterion for measuring success in programmes is a great way to mitigate disruptions that are the result of inevitable change. The programme's Business Case measures the balance between benefits, costs and risks; hence, it should be closely integrated with benefits management to ensure that the three are in equilibrium as desired from the outset (OGC, 2003; Milosevic *et al.*, 2006; Reiss *et al.*, 2006). This research, therefore, upholds that benefits focus is critical to the success of construction programmes.

Coordination of projects and managing the transition/changes

Successful programmes require careful and logical delineation of project boundaries and outputs, rigorous identification and management of inter-project dependencies, and a clear understanding of programme expectations against responsibilities (Ferns 1991; Lycett *et al.*, (2005). Programme management should focus on the bigger picture and should not take over the responsibilities of project management. However, clear direction should be agreed with projects and regular reviews held to verify continual alignment to the programme (Pellegrinelli, 2002; OGC, 2003; Bartlett, 2002; Milosevic *et al.*, 2006).

In relation to managing the transition/changes, Open University (1989) highlights that there are many forces that can act on organisations that may indicate the necessity of change for the survival or growth of those organisations. These changes may be technological, economical, legal, social or political. Managing the transition involves planning changes, preparing for their implementation, and then implementing them. However, the transition process should ensure business as usual is maintained while change is happening (OGC, 2003). Usually over the life of a programme, there is a transition of various stakeholders who are involved in the programme and its activities.

Reiss *et al.* (2006), observe that the factors listed below are critical to the success of effective programme management.

- The best overall approach for the programme will be a blend of the approach required to deliver each work group, the relationships between work groups and organisation functions, together with the organization's capability to manage change.
- For organisations with limited experience of managing change, the approach should be kept as simple as possible. Divide the programme so there is a strong bond between workgroups and functions (those functions will try harder) and support each function by using experienced project and programme managers.
- Use relatively simple, well-understood, financial modelling techniques, unless you have the services of experienced investment appraisal specialists.
- If your organisation has limited programme management capability and experience, you must build time into your plans to allow for development and learning.
- It is essential to establish an adequate infrastructure and put in place support tools, processes and procedures to manage the programme. These must be able to function within the current programme and project management capabilities of the organisation. A good infrastructure will not guarantee success for the programme, but a bad infrastructure will almost certainly guarantee failure.
- Make sure you understand the attitude of all of the stakeholders in the programme.

Having discussed the CSFs for effective programme management, these factors were listed into a questionnaire to analyse and assess their effects on successful programme management practice. To provide the exploratory and descriptive data analysis for CSFs for effective programme management, criticality, mean and Factor Analysis were employed in the statistical analyses.

Research methodology

The findings in this research are through the triangulation of literature review, industrial questionnaire survey and semi-structured interviews in the UK construction industry. In the survey, 1380 postal questionnaires were sent using a convenience sampling; the sampling was conducted as the target (programme management organisations) population was not known by the researcher as highlighted by (Denscombe 2007; Fellows and Liu 1997; Bryman and Bell 2003). A total of 119 usable completed questionnaires were received and analysed, the number implies that approximately 9% of the total sample contacted has participated in this study. According to Denscombe (2007), a survey rarely achieves a response from every contact made, but Fellows and Liu (1997) explain that given the increasing number of research projects, collecting data is becoming progressively more difficult. The respondents are being targeted with many requests for data and they are subsequently becoming unwilling to spend a lot of time on them and ultimately refusing to participate in academic surveys. Pathirage *et al.* (2008) assert that the dichotomy in allocating the blame for the poor responses in academic surveys appears to be cyclic and continuum between the academia and the industry. Olomolaiye (2007) highlights that lack of understanding of research area can also lead to poor participation; this however indicates the need for deeper understanding of the prerequisites of programme management, hence may justify the low response rate in this research.

In the semi-structured interviews, to increase the depth and breadth of programme management knowledge, responses were also collected, analysed and synthesised from other non-construction programme management organisations. The sample of the population for the semi-structured interview was acquired by providing a column in the questionnaire for participants willing to be interviewed to provide their details; use of snowballing approach (Denscombe 2007) and referral by the programme management experts (Wisker 2008) were also employed to develop an adequate interview sample. At the end of the interview sessions, a total 17 interviews were conducted with programme management experts. All the interviewees selected, regardless of their sectors, demonstrated a reasonable level of understanding of the construction sector as a result of direct association, through their stakeholders or colleagues.

The data gathered from the semi-structured interviews was analysed using NVivo7, the software provides an avenue for flexible and rigorous analysis of qualitative data. The data was coded using conceptual approach; it has been indicated that the focus in conceptual content analysis is based on looking at the occurrence of selected terms within a text or texts, although the terms may be implicit as well as explicit (Webb *et al.*, 1966; Palmquist 2001; Busch *et al.*, 2005). The recurrence of certain terms provided an indication of their strength or weakness of those particular terms in the discussion with the experts.

The main focus of this research is the construction industry, but due to a lack of availability of contextual programme management knowledge and experience within this sector, the research also took the opportunity to learn from other sectors to gain a competitive advantage (Fernie *et al.*, 2003). The knowledge acquired from other sectors was then synthesised to develop an understanding of how to implement and practice programme management within the construction environment. In the semi-structured interviews, the other sectors contacted included IT, telecoms and others as a result of study conducted by the Association for Project Managers (APM),

titled APM introduction to programme management (Rayner 2007). The report indicates that programme management is more popular in the government sector and information technology programmes. Whereas, the most common programmes were operated in information technology, which constituted 54%, organisational changes 20%, civil engineering 8%, product development 5% and other types of programmes 12% of the overall total.

The semi-structured interview sample consists of a construction programme director working on a City Council's school projects, overseeing a network of contractors executing a six high school programme, while the three programme managers are involved in residential construction, commercial construction and construction civil engineering projects. The other construction interviewees include two project managers working in a programme management environment and a programme support manager (assisting a programme manager).

The results in the questionnaire survey were analysed using SPSS 15 and Microsoft Excel, the CSFs were analysed using *Criticality Index* and a comparison of the data was conducted using a t-test and Factor Analysis which reduced the CSFs into manageable groups. Prior to the data analysis, a Cronbach alpha reliability analysis was conducted $\alpha = 0.908$. The result of the analysis requires that the reliability should be $\alpha \geq 0.7$ as recommended (Pallant 2001; Yang and Peng 2008). Nunnally (1978) also suggests that, in the early stages of research on predictor (Cronbach alpha reliability) tests or hypothesised measures of a construct, reliability of $\alpha \geq 0.700$ or higher will suffice.

t-test analysis for CSFs

T-test is appropriate when there is a dichotomous independence, and wishes to test the difference of means in this case, to test mean differences between samples of the (construction) companies *practicing* and *not-practicing* programme management in the UK construction industry. As established, t-test may be used to compare the means of a criterion variable for two independent samples or for two dependent samples, or between a sample mean and a known mean (one-sample t-test) (Gardner 1975; Sapsford and Jupp 1996). Prior to the analyses of the responses, a t-test was conducted to compare the responses of the organisations practicing programme management and those that are not practicing programme management to detect any variation in the responses. However, in the questionnaire design, certain questions were asked to clarify the concept of programme management in question. These questions involve clear definitions of project and programme management terms within the context of the research to eliminate any ambiguities that the respondents will conceive. Based on the results of the t-test, there is no statistical variation in the responses of those organisations practicing and those not practicing programme management, hence the data was analysed as a homogeneous set of data. Appendix 1 presents the t-test and means index analysis results.

Criticality Index for critical success factors

Abdul Kadir *et al.* (2005) used the Importance index to evaluate the factors affecting construction labour productivity for the Malaysian construction projects. Kometa *et al.* (1995) used a relative importance index to analyse the attributes of clients' organisations, which may influence project consultants' performance. Odeh and Bettaineh (2002) used importance to determine causes of construction delay in traditional contracts. Chan and Kumaraswamy (1997) also applied a relative importance index in their comparative study of the causes of time overruns in Hong Kong construction projects; Cheng (2002) used Importance Index in discussing technology

foresight. As a result of its popularity and accuracy, this research also adapts *Criticality Index* in ranking the CSFs for effective programme management.

To determine the relative importance index of the listed skills and competencies, this research uses Odeh and Bettaineh's (2002) formula due to its clarity, simplicity of use, and the similarity between the data in this research and the data in their study. The analysis used the weighting used by Cheng (2002) as the values set for the Likert scale in this research aimed to add to a total of 1. Cheng used the weighting of the importance from 0.00, 0.25, 0.5, 0.75 and 1. In this approach, the weighting substitutes the position of the Likert scale. The maximum criticality index of any of the skills factor should not be more than 1, and any skills and competencies with the highest value between $0 \geq 1$ are considered important.

$$C = \frac{\sum_{i=1}^5 W_i X_i}{\sum_{i=1}^5 X_i}$$

Equation 1: Criticality index

Where:

C = Criticality Index.

i = responses category index = 1,2,3,4 and 5 (position on the Likert scale).

W_i = is the weight assigned to i th response = 0, 0.25, 0.5, 0.75 and 1 respectively (Cheng, 2002)

X_i = frequency of the i th response given as percentage of the total responses (Odeh and Bettaineh, 2002).

The CSFs are ranked in ascending order of their criticality based on the rating in the responses. Table 1 presents the criticality analyses and mean indices for the critical success factors for the successful practice of construction programme management in the UK construction environment.

Table 1: Critical success factors for effective programme management

Critical Success Factors	Total Responses	
	Criticality Index	Mean
Effective planning	0.870	4.478
Establishing programme priorities	0.839	4.357
Effective communication	0.817	4.270
Proper coordination of projects	0.791	4.165
Effective risk management	0.791	4.165
Effective time management	0.770	4.079
Effective performance management	0.764	4.057
Cross-discipline coordination	0.739	3.957
Strategic focus on programme	0.735	3.939
Effective budgeting	0.730	3.922
Cross-projects coordination	0.728	3.912
Clarity and consistency of vision	0.726	3.904
Smooth handover to business operation on completion	0.715	3.860
Cross-discipline problem solving	0.709	3.835
Clear benefits target	0.704	3.814
Effective change management	0.686	3.746
Effective management of transition	0.684	3.737
Effective quality management	0.670	3.681
Management infrastructure	0.660	3.640
Simplicity of programme	0.641	3.565
Easiness of techniques used	0.635	3.539
Understanding the stakeholders' attitude	0.627	3.509

According to Table 1, 'Effective planning' is the highest critical success factor with the Criticality Index of 0.870, then 'Establishment of programme priorities' 0.839. Programme planning is essential for the success of a programme (Bartlett, 2002; Reiss *et al.*, 2006); as a result, it may be directly linked to the success of the implementation and practice of construction programme management. Lycett *et al.* (2004) define programme planning as a range of activities organised in a way that accomplishes the programme's objectives to achieve benefits. Programme planning is a rational and analytical process and should be open and flexible to allow for emergent changes (Thiry, 2004). In the establishment of a programme's priorities, Pellegrinelli (1997) emphasises that it is essential for a programme to establish the priorities in setting up the programme

management organisation, rather than getting diverted by the other activities of that programme; he advised that programmes should be frequently updated to meet the ever-changing demand of business environments.

OGC (2007) advised that a programme's priorities must be reflected in the Business Case for the programme and be constantly updated with consideration to the organisational objectives and stakeholder interests. Lycett *et al.* (2004) observe that a key error in programme initiation hinges on the failure to clarify the direction and purpose of the programme. These two results do not contradict the 'best practice' in the programme management organisations, but do not mean that the requirements of all the organisations will remain the same. Some of the results may contradict current practice in some organisations, but it is up to the potential programme management organisation to assess the suitability of the factors and adapt them appropriately.

On the other hand, the '*Easiness of techniques of managing programme*' emerged second from last on the list of CSFs. Although, there is no existing body of literature that indicates the lack of importance of the simplicity of programme management tools and techniques, OGC (2003) explains that easiness of tools and techniques makes the practice of programme management easier. However, in the semi-structured interviews, one of the IT programme managers stated that:

“Easiness of programme management tools and techniques does not imply the efficiency or reliability of those tools and techniques. The easiest tool may not be the most efficient.”

Last on the list of criticality was, '*Understanding stakeholders' attitudes*'. This lowest critical success factor from the survey analysis contradicts the literature, where stakeholder management was viewed as an essential element in the successful practice of programme management. Lycett *et al.* (2004) observe stakeholder management needs to be inherently flexible and adaptable. Although the survey presented '*understanding of stakeholders' attitude*', not stakeholder management; however, in view of the importance of stakeholder management, this research believes that 'stakeholder management' is critical to the success of any programme management.

Factor analysis for critical success factors

To conduct a deeper analysis on critical success factors in order to help the potential programme management organisations reduce the list of the critical into more manageable principal factors, a factor analysis was conducted on the factors. The various factors that fall under a principal factor are deemed to be related; hence, the factoring and rotation methods bring them together (Field, 2005). The Kaiser-Meyer-Olkin (KMO) statistic of the critical success factors is 0.863, which, according to Kaiser (1974), is satisfactory for factor analysis. Bartlett's test of Sphericity tests the hypothesis that the correlation matrix is an identity matrix. In this case, the value of the test statistic for Sphericity is large (Bartlett's Test of Sphericity = 0 378) and the associated significance level is small ($p = 0.000$), which suggests that there is no need to eliminate any of the variables for the principal component analysis (see Appendix 2).

Appendix 3 presents the initial and rotated solutions (Eigenvalues) for all the factors in the critical success factor for effective programme management in the UK construction industry. In the rotation sums of square loadings, 63.313% of the total variance is attributable to the first five factors. The Scree Plot also indicates five components as shown in Appendix 4. The remaining 17 factors together account for the 36.867% of the variance

as highlighted by Li (2003); thus, a model with five factors adequately represents the data (see Appendix 3). From Appendix 4, it can be seen that there are five factors above the shoulder of the Scree plot.

Naming the principal factors

Naming the principal factors was done in line with Hart's (2008) recommendations, which suggests that the factor names should be brief (one or two words) and communicate the nature of the underlying construct. This was done by looking for patterns of similarity between items that load on a factor. In addition, looking at what items do not load on a factor, to determine what that factor is not. Also, try reversing loadings to get a better interpretation (Field, 2005).

By looking for patterns of similarity between items that load on a factor, particularly when seeking to validate a theoretical structure, it is possible to use the factor names that already exist in the literature. Otherwise, names that will communicate conceptual structure to others are used. Looking at what items do not load on a factor to determine what that factor is not (Hart, 2008). In line with recommendation of Hart (2008), to name the factors for this research, a questionnaire was sent to five programme management experts to validate the naming of the principal factors. The respondents of the naming survey all agreed with the names as the suitable representation of the principal factors. Takim (2005) observes that there is no 'rule of thumb' in making factors to fall within the same group as this taken care of by the rotation technique used.

Principal factors

This section presents a discussion on the five principal factors for the critical success factors, and a discussion on the CSFs for successful practice of construction programme management as follows (details are provided as Appendix 5):

Programme Coordination

This principal factor accounts for 19.229% of the total attractive variances and contains eight factors. The eight factors form the programme coordination component for the critical success factors for the effective practice of programme management in the UK construction industry. These factors are: '*Cross-discipline coordination, Cross-discipline problem solving, Cross-project coordination, Effective risk management, and Effective change management, Effective management of transition, Effective communication and Proper coordination of projects*'.

Higher loadings are made of '*Cross-discipline coordination*' (Sig = 0.826) and '*Cross-discipline problem solving*' (Sig = 0.774). This indicates that '*Cross-discipline coordination*' is the most important success factor under the programme coordination principal factor. Milosevic *et al.* (2007) state that programmes are multi-organisational affair, where integrated supply chain and stakeholder management can help in the smooth operation of programmes. According to Blomquist (2006), coordination involves the balance of time and resources to allow all projects in a programme to be completed within the planned timeframe. Therefore, a proper coordination of different disciplines involved in a programme can be seen as a critical success factor; hence, this factor also ranked as important in the importance index analysis. The second highest loading was

'*Cross-discipline problem solving*'; this factor is related to cross-discipline coordination. The programme should be able to solve any problems between different parties, disciplines and stakeholders.

According to Llewellyn (2008), managers ignore the important aspect of the programme and focus on specific areas of its management. '*Effective communication*' is an essential aspect of successful programme management, but is loaded as second last under this component. Programmes succeed in the timely delivery of their functional projects if they are properly aligned and coordinated. The factor '*proper coordination of projects*' has the lowest loading but ranked as important in the importance index analysis.

Programme priority focus

This principal factor accounts for 11.593% of the total attractive variance, and consists of three programme priority focus factors: '*Effective planning*, '*Establishing programme priorities* and '*Effective performance management*'. These factors are associated with the programme priority focus aspects of construction programme management. All the three factors have loaded very high under this principal factor '*Effective planning*' (Sig. = 0.730), '*Performance management*' (Sig. = 0.707) and '*Establishing programme priorities*' (Sig. 0.687). Effective planning is regarded as one of the most crucial factors in the practice of programme management. The high loading reaffirms the importance of effective planning to the success of construction programmes. In essence, potential programme management organisations are advised to invest in up-to-date planning tools and techniques and planning efforts in the programme. To achieve these, the project plans should tie in with the programme plans.

The performance management requirement of programme management made a high loading (Sig. = 0.707) which indicates the importance of controlling the performance of a programme. This can be done by comparing the performance of the programme against a set target. Chittenden (2006) highlights that performance baselines are required to measure benefits realisation; the 'before stage' should be measured. Without the 'before stage', there is no means of assessing whether there is any improvement or not. Therefore, performance management is considered as an essential CSF.

The lowest loading is '*Establishing programme priorities*' (Sig. = 0.687). According to OGC (2007a), priorities are the key factors influencing programme scheduling and deliverables. It is essential for a construction programme to establish its priorities such as procurement, supply chain management, prerequisites for future projects, resource requirements (skills that may be scarce) and early benefit realisation that can endanger the continued commitment and enthusiasm for the programme. In this regard, the factor loaded high which indicates the importance of setting the programme's priorities. This research concludes that setting up priorities should be done at the initial stage of the programme and kept as an ongoing activity throughout the programme lifecycle.

Programme vision

From the literal definition of vision, it can be seen as elaborate and systematic plan of action; this stage can lead to the formulation of the appropriate strategy to achieve the vision. Programme vision accounts for 11.0827% of the total attractive variance, and consists of four programme visions of CSFs: '*Clarity and consistency of vision*, '*Understanding the stakeholders' attitude*, '*clear benefits target* and '*Strategic focus on programme*'. These factors are associated with programme vision. Higher loadings are '*Clarity and consistency of vision*' (Sig. =

0.743) and *easiness of techniques used* (Sig. = 0.641). *Clarity and consistency of vision and Understanding stakeholders' attitude* are regarded as the most critical success factors for adopting and practicing programme management in the UK construction industry OGC (2004; 2007a). The result supports the literature and practice where clarity and consistency of vision have been advised for any programme that wishes to be successful. Stakeholders and their management are important to the success of programme management (Reiss *et al.*, 2006). Hence, a proper management of stakeholders smoothes the path and supports the organisation to consolidate the benefits of programme management. It has been established in the semi-structured interview that the benefits of programmes are not limited to the organisation, but extend to clients and other stakeholders in both financial and non-financial terms. This research advocates the view that, to manage a stakeholder, knowledge of the stakeholders' attitude towards the programme is essential.

Two lower loadings are *strategic focus of a programme* (Sig. = 0.598) and *management infrastructure* (Sig. = 0.504). The recommendation by OGC (2004) and importance ranking indicate the importance of these factors. A great deal has been discussed about the focus of the programme in connection to its success. It is important to understand that management infrastructure and strategic focus are two essential factors that link the organisation to success. If the strategy is designed, there is need for the infrastructure to deliver and/or support it.

Programme strategy

While programme vision deals with elaborate plan of action, strategy involves carrying out such a plan(s) devised. Programme strategy (principal factor 4) accounts for 10.998% of the total attractive variances and contains four factors. The factors constitute the programme strategy for critical success factors in the effective practice of programme management in the UK construction industry.

Highest loading are '*Simplicity of programmes*' (Sig. = 0.852) and '*Easiness of tools and techniques used*' (sig. = 0.800). Lycett *et al.* (2004) believe that programmes often develop incrementally rather than in a 'big bang' manner. This can accommodate the concept of 'simplicity' of programme. OGC (2003) explains that simple programmes give members the ability to gradually understand the programme's objects and gradually mature into it. In the same light, one of the business development managers interviewed advised on the need to keep programmes simple from the beginning and gradually develop them into more mature and complex ones if the need arises. However, the importance ranking does not indicate the factor as very important (see Table 1).

The lowest loading (Sig. = 0.502) is for '*management infrastructure*'. Management infrastructure covers accessibility to the higher management, and communication and information facilities available in the programme to support the team members (Kor and Wijnen, 2000). Bartlett (2002) believes that efficiency of management infrastructure can no doubt bring management closer to the organisation. This factor ranks as important in the importance index analysis but ranks low in the component of factor analysis. This research, therefore, recommends that any potential programme management organisations should carefully assess the situation and adapt appropriately.

Programme planning

While programme vision concentrates on the high-level management plans towards implementation of programme management, programme planning focuses on planning the coordination of projects in the

programme and ultimately to the organisational objectives. This principal factor accounts for 10.410% of the total attractive variances and contains three factors. The three factors constitute the programme planning for critical success factors in the effective practice of programme management in the UK construction industry.

The highest loading is by '*Effective time management*' (Sig. = 0.789). A great deal has been discussed about the importance of planning; this section discusses the planning of programmes in relation to time management. Milosevic *et al.*, (2007) highlight that programmes usually have a high level of synergy between the functional projects; good time management will not only affect one but all of the projects in a programme. They explain that, due to the level of interdependency between projects in a programme, a problem in one project can affect the rest of the projects in the programme. The importance of effective time management in programme management cannot be overemphasised. This factor also ranks high in the importance index analysis (see Table 1).

The lowest loading (Sig. = 0.661) was made by '*Smooth handover to business operations on completion*'. According to Chittenden (2006), before closing a programme, it is essential to release the programme back to business as usual. It is important that this is planned properly and a 'release plan' is set in place (Reiss *et al.*, 2006; OGC, 2007). This research believes that smooth transition in releasing projects from a programme avoids losing the opportunity to capture and document the knowledge acquired, and smoothes the closure of a programme. This factor ranks as important in the importance analysis.

The way forward

Having seen what has been discussed, this research observes that keeping the CSFs at the forefront of the implementation and practice of programme management agenda can be essential to the programme's success. In terms of CSF for effective implementation of programme management, it has been observed in the semi-structured interviews that an IT programme director highlights the need to implement programmes in an evolutionary (gradual manner); this however, supports the recommendation of Lycett *et al.* (2004) for evolutionary and gradual implementation and practice of effective programme management.

It is imperative that programme management and project management be considered as two synergistic approaches that one can immensely benefit from one another, rather than being seen as two antagonising approaches. While programme management cannot be successful without the support of effective project management, the latter can be enhanced and effectively improved by the former; hence the relationship between the two approaches is mutual and beneficial.

Conclusion

It has been observed that the need to understand the prerequisites of effective programme management has brought with it the requirement to understand the differences between programme and project management. The former has its roots in the latter, but the two are not the same; hence the two are related; their CSFs may also be related, but may never be the synonymous. To successfully manage construction programmes, the programme management teams are expected to closely examine and establish those factors that are critical to the success of their programmes. A reasonable amount of effort will surely help to shed light on the priorities of the

programme. The CSFs presented in this research are by no means the only ones that programme management organisations should pay attention to as the factors may differ from one organisation and programme to another.

The reduction of the factors will provide the educators, organisations and consultants with more clear and relevant groups, rather than being burdened with a long list of factors. However, the organisations can adapt and generate other groups based on the nature and requirements for the critical success factors provided in this study, rather than a heuristic approach to the requirements.

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Appendix 1: t-test results for critical success factors

Critical Success Factors	t-test results		
	Mean		Sig.(p)
	Practice	Not Practice	
Effective planning	4.432	4.515	0.526
Establishing programme priorities	4.318	4.412	0.466
Effective communication	4.341	4.191	0.314
Proper coordination of projects	4.159	4.162	0.986
Effective risk management	4.250	4.118	0.391
Effective time management	4.140	4.044	0.488
Effective performance management	4.053	4.109	0.684
Cross-discipline coordination	4.045	3.882	0.252
Strategic focus on programme	4.227	3.809	0.009**
Effective budgeting	4.000	3.868	0.392
Cross-projects coordination	3.864	3.940	0.586
Clarity and consistency of vision	4.250	3.706	0.001**∞
Smooth handover to business operation on completion	3.767	3.926	0.382
Cross-discipline problem solving	3.841	3.809	0.817∞
Clear benefits target	3.886	3.773	0.494
Effective change management	3.818	3.687	0.415
Effective management of transition	3.837	3.676	0.250∞
Effective quality management	3.614	3.773	0.319
Management infrastructure	3.545	3.716	0.250
Simplicity of programme	3.273	3.765	0.007**
Easiness of techniques used	3.477	3.618	0.400
Understanding the stakeholders' attitude	3.682	3.403	0.180

Appendix 2: KMO and Bartlett's Test for critical success factors

Test		Result
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.866
Bartlett's Test of Sphericity	Approx. Chi-Square	1019.839
	df	231
	Sig.	.000

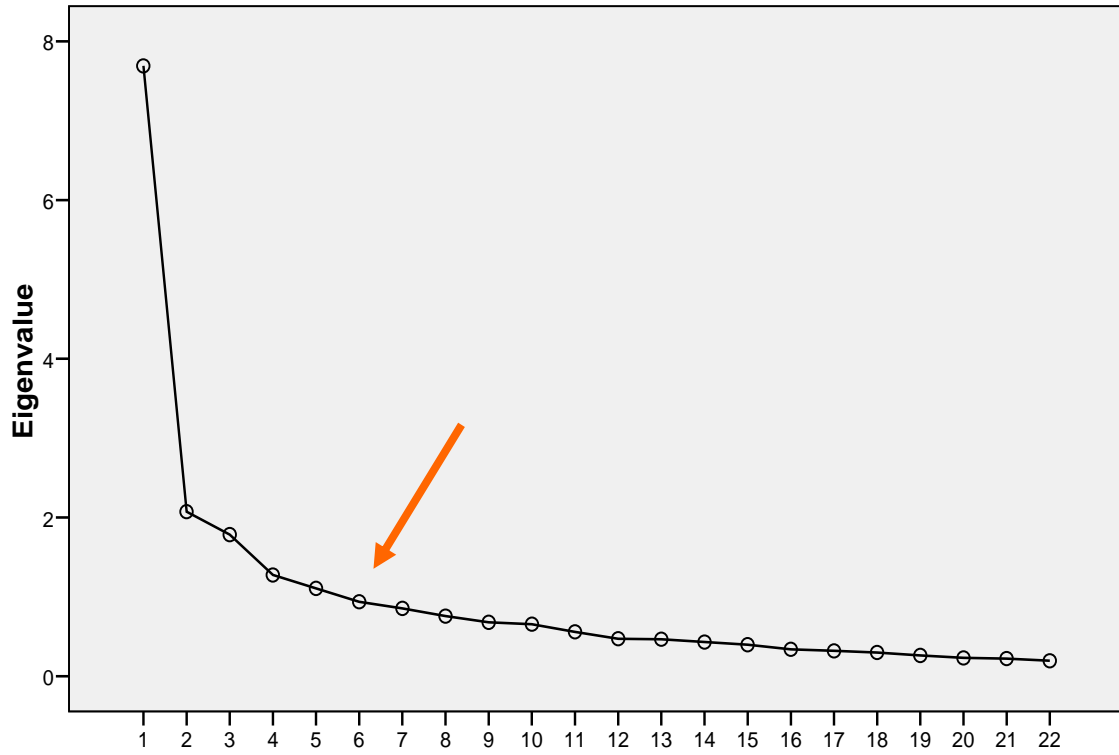
Appendix 3: Initial and rotated factor matrix of critical success factors for effective programme management

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	Variance (%)	Cumulative (%)	Total	Variance (%)	Cumulative (%)
1	7.691	34.957	34.957	4.230	19.229	19.229
2	2.072	9.419	44.377	2.550	11.593	30.821
3	1.783	8.106	52.483	2.438	11.082	41.904
4	1.276	5.798	58.282	2.420	10.998	52.902
5	1.107	5.031	63.313	2.290	10.410	63.313
6	.937	4.259	67.572			
7	.854	3.881	71.453			
8	.757	3.442	74.895			
9	.679	3.089	77.984			
10	.655	2.978	80.962			
11	.559	2.541	83.503			
12	.472	2.146	85.649			
13	.466	2.118	87.766			
14	.431	1.958	89.725			
15	.396	1.802	91.527			
16	.338	1.537	93.064			
17	.319	1.449	94.513			
18	.299	1.358	95.871			
19	.262	1.190	97.061			
20	.230	1.046	98.107			
21	.222	1.008	99.115			
22	.195	.885	100.000			

Extraction Method: Principal Component Analysis.

Extraction Methods: Principal Component Analysis for critical success factors.

Scree Plot



Appendix 4: Scree plot for critical success factor for effective programme management

Appendix 5: Rotated factor matrix (Loading) of CSF to effective programme management variables

Critical success factors		Component				
		1	2	3	4	5
Programme Coordination	Cross-discipline coordination	.826				
	Cross-discipline problem solving	.774				
	Cross-project coordination	.725				
	Effective risk management	.655				
	Effective change management	.605				
	Effective management of transition	.597				
	Effective communication	.564				
	Proper coordination of projects	.555				
Priority Focus	Effective planning		.730			
	Effective performance management		.707			
	Establishing programme priorities		.687			
Programme Vision	Clarity and consistency of vision			.743		
	Understanding the stakeholders' attitude			.641		
	Clear benefits target			.625		
	Strategic focus on programme			.598		
Programme Strategy	Simplicity of programme				.852	
	Easiness of techniques used				.800	
	Effective quality management				.628	
	Management infrastructure				.502	
Programme Planning	Effective time management					.789
	Effective budgeting					.753
	Smooth handover to business operation on completion					.661

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalisation

Rotation converged in 6 iterations.