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Project manager attributes influencing project success in the South African construction industry

Abstract

The South African construction industry has suffered the loss of many qualified middle-management-level project managers in recent years. This has resulted in many young, inexperienced project managers being forced to manage large complex projects. In addition, senior project managers, who are still practising locally, are too busy to mentor and guide the younger project managers, due to the shortage of professionals in the local industry. This article reports on a study done to identify the most important attributes that influence project success in the South African construction industry, by extracting a list of factors identified in the existing literature and grouping these factors into six main categories. Each category contains six factors. A questionnaire was compiled and distributed via an online survey tool. The data was analysed using statistical methods including concordance and correlation. The results indicated that 'interpersonal factors' was considered the most important category, followed by 'application of theory'. 'Personal contribution' and 'personal character' were considered the least important categories. However, the most important attributing factors were 'communication skills' and 'leadership style', neither of which was listed under the top two categories. In general, a low level of concordance was achieved, confirming the belief that level of knowledge, experience and mutual agreement among participants in the industry is low.

Keywords: Project manager attributes, project experience, construction management, project manager profiles.

Abstrak

Die Suid-Afrikaanse konstruksiebedryf het in die afgelope paar jaar baie gekwalifiseerde middel-bestuursvlak projekbestuurders verloor. Dit het daartoe gelei dat baie jong, onervare projekbestuurders gedwing word om groot komplekse projekte te bestuur. Hierdie artikel rapporteer die resultate van 'n studie gedoen om die belangrikste faktore wat die projeksukses in die Suid-Afrikaanse konstruksiebedryf beïnvloed, te identifiseer. 'n Literatuurstudie is gedoen om die belangrikste suksesfaktore te bepaal en in ses kategoriëe te groepeer. Elke kategorie bevat ses faktore. 'n Vraelys is saamgestel en aanlyn gestuur aan moontlike deelnemers. Die data is ontleed met behulp

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van statistiese metodes, insluitend konkordansie en korrelasie. Die resultate het getoon dat die belangrikste kategorie was 'interpersoonlike faktore', gevolg deur 'toepassing van teorie'. 'Persoonlike bydrae' en 'persoonlike karakter' is beskou as die kategoriëe met die minste impak. Die belangrikste faktore vir projeksukses was 'kommunikasievaardighede' en 'leierskapstyl', waarvan beide nie onder die top twee kategoriëe verskyn nie. Oor die algemeen is 'n lae vlak van konkordansie bereik wat bevestig dat die vlak van kennis, ondervinding en eenstemmingheid tussen deelnemers in die industrie baie laag is.

Sleutelwoorde: Projekbestuurvaardighede, projekondervinding, konstruksiebestuur, projekbestuurprofiel

1. Introduction

Since the mid-1990s, the South African construction industry has witnessed a significant loss of qualified and experienced project managers to other countries, other sectors of the economy, and retirement (Lawless, 2007: 1). Notwithstanding the lack of experienced and skilled project managers, the South African Government has identified infrastructure development as a means to stimulate the economy (South Africa. National Planning Commission, 2011: 137). A survey conducted by Lawless (2007: 2) revealed that the number of graduates and the quality of education in all spheres of education was declining. This resulted in young and inexperienced project managers being deployed to manage large and often, complex projects. Apart from the inexperience, the shortage of qualified project managers also resulted in young project managers being overloaded with work.

As the key pin to all activities and relationships, the project manager contributes significantly to the success or failure of construction projects. Even though a number of international studies were done on the topic of project competence (Crawford, 2005; Muller & Turner, 2010; Dolfi & Andrews, 2007), limited knowledge exists regarding the key attributes required of project managers in the South African construction industry to deliver successful projects.

The problem statement for this research is: 'The most important project management attributes required for successful projects in the South African construction industry is unknown'.

Given the problem statement, the aim of this study was to identify those project management attributes that extend beyond formal qualifications in the construction industry. A second objective was to assess members of the construction industry's understanding and agreement of what the most important attributes are. In conclusion, the results should guide project managers, recruitment officers and organisations, in general, to assess their current status and approach

to project management development in order to improve the likelihood of developing and implementing successful projects.

2. Factors influencing project performance in the construction industry

In various research outputs, Belassi & Tukel (1996) found that there was a great deal of variation among different types and sectors of projects. The construction industry have seen project performance research focusing on individual countries, contribution of stakeholders such as clients, contractors and consultants, as well as technical aspects such as, among others, level of design accuracy, constructability and safety.

Baloyi & Bekker (2011: 62) conducted research on the causes of cost overruns and project delays on the 2010 FIFA World Cup Stadia in South Africa. From a contractor's perspective, one of the most significant causes for cost overruns was the lack of skilled labour. However, for project delays, the contributing factors were again the lack of skilled labour, poor planning and scheduling, as well as labour disputes and strikes.

Ahadzie, Proverbs & Olomolaiye (2007: 684) investigated the critical success criteria for building projects in Ghana and concluded that the "current and future success of an enterprise is a reflection of the effectiveness of the senior team, their vision and leadership, and the combined knowledge and skills of the organisation's workforce". Project leadership and supervision featured as key factors in the research conducted by Odusami (2003: 525) on Nigerian construction projects. This study tested the effect of a team leader's professional qualifications, profession, leadership style and project team composition on the overall success of construction projects. The results indicated that the project leader's qualification significantly affected project performance. Muller & Turner (2007: 22-23) investigated the interaction of the project manager's leadership style with project type and the effect of these two factors on the overall success of the project. Project managers' leadership styles were modelled in terms of intellectual, emotional and managerial competence and compared to the success of their most recent projects. Seven traits of effective project managers were identified: problem-solving ability; results orientation; energy and initiative; self-confidence; perspective; communication, and the ability to negotiate.

Chua, Kog & Loh (1999: 148-149) listed ten critical success factors for construction projects. Apart from technical requirements, the list also

included project manager attributes such as competency as well as commitment and level of involvement. Crawford (2000: 13-14) studied the profile of a competent project manager. She presented an analysis of research-based literature concerning the criteria whereby project success is determined, the factors that contribute to the success of projects, as well as the project managers' knowledge, skills and personal attributes that are expected to lead to the achievement of successful project outcomes. In a follow-up study, Crawford examined senior management's perceptions of a project manager's competence. The results suggested different perceptions and expectations of project management competence between project managers and their supervisors or senior management. She defined competence as "an underlying characteristic that is causally related to criterion-referenced effective and/or superior performance in a job or situation" (Crawford, 2005: 8, 15).

3. Categorising project manager attributes

Schultz, Slevin & Pinto (1987: 34) created two broad categories, namely 'strategic' and 'tactical' requirements. Bellasi & Tukel (1996: 142-143) grouped the success factors into five areas, namely factors related to the 'project', 'project manager', 'project team members', 'corporate organization', and 'external factors'. Ahadzie *et al*. (2007: 684-687) found four clusters of criteria, namely 'project environment', 'customer interaction and satisfaction', 'product quality', and 'value and time'. Crawford (2005: 12) contended that competence could be inferred from attributes, which included knowledge, skills and experience, personality traits, attitudes, and behaviours.

In reviewing the above literature and studying the specific traits in the defined categories of the mentioned authors, with specific reference to the findings by Crawford (2005: 12-15), the following six categories for project manager attributes were identified: interpersonal factors, application of theory, personal character factors, personal contribution factors, personal skills, and practical application. Each category was further divided into six factors, as explained in Table 1.

Table 1: Categories for project manager attributes

Category 1 – Interpersonal factors (attributes concerning interaction with team members)	
1.a	Supervision of project team
1.b	Ability to delegate authority
1.c	Ability to motivate team members
1.d	Sense of teamwork

1.e	Stakeholder management (parent organisation)
1.f	Stakeholder management (client)
Category 2 – Application of theory (professional qualifications and application of theoretical planning , controlling and monitoring tools)	
2.a	Professional qualifications
2.b	Monitoring and controlling (time)
2.c	Planning (integrative)
2.d	Monitoring and controlling (integrative)
2.e	Monitoring and controlling (cost)
2.f	Planning (time)
Category 3 – Personal character (personal motivation and character traits)	
3.a	Leadership style
3.b	Emotional intelligence
3.c	Results orientation
3.d	Energy and initiative
3.e	Self-confidence
3.f	Optimism
Category 4 – Personal contribution (management actions taken to achieve project success)	
4.a	Ability to determine cost – time trade-offs
4.b	Level of involvement in the project
4.c	Ability to determine quality – time trade-offs
4.d	Ability to establish an appropriate organisational structure
4.e	Commitment to meet cost, time and quality constraints
4.f	Desire to achieve success and recognition
Category 5 – Personal skills (managerial skills to apply to projects)	
5.a	Communication skills
5.b	Technical skills
5.c	Organising skills
5.d	Coordinating skills
5.e	Negotiating skills
5.f	Decision-making and problem-solving skills
Category 6 – Practical application (practices to implement during projects)	
6.a	Ability to implement an effective safety programme
6.b	Ability to implement an effective quality assurance programme
6.c	Relevant work experience
6.d	Control of subcontractors' work
6.e	Adaptability to changes in the project plan
6.f	Define and follow strategic direction

It can be argued that all the attributes identified and summarised in Table 1 are important. However, some attributes might be more important than others in the South African construction industry. To find the "perfect" project manager remains an elusive goal, but

guidance in selecting the best candidate should help improve the likelihood of project success.

Based on the attributes identified, a questionnaire was designed and distributed to potential participants in the South African construction industry, with the aim to identify the most important attributes required for project managers in the industry.

4. Research methodology

The required attributes, skills and competencies for project managers have been well researched. This research aims to identify those attributes that are most important for the South African construction industry.

In order to identify the most important attributes from a given selection, the rank Kendall *W* concordance method was selected (Legendre, 2005: 227). The Kendall *W* method analyses ordinal values and is a normalisation of the Friedman test. For this research, the absolute value of each attribute is the main value of significance, with agreement among participants secondary. For this reason, the Kendall *W* method is sufficient as opposed to Friedman or even Spearman rho testing.

Primary data was created through the distribution of a questionnaire to construction project managers. The instrument took the form of a self-administered questionnaire containing multiple-choice questions related to the respondent's personal details as well as six categories of six attributes each of project managers to be completed in a rank order from one being the most important[1] attribute to six being the least important attribute.

The process and equations of analysing the ordinal rank-order data with the Kendall W method is given below.

If attribute *i* is given the rank $r_{i,j}$ by respondent number *j*, with *n* attributes and *m* respondents, then the total rank given to attribute *i* is:

$$R_i = \sum_{j=1}^{m} r_{i,j}$$

1 The evaluation criteria assigning one as the most important was clearly set as such and communicated to the participants.

The mean value of the ranks is then calculated as:

$$\bar{R} = \frac{1}{n} \sum_{i=1}^{n} R_i$$

The sum of the squared deviations *S* is then calculated as:

$$S = \sum_{i=1}^{n} (R_i - \bar{R})^2$$

Kendall *W*, also known as the Kendall coefficient of concordance, is then calculated as:

$$W = \frac{12S}{m^2(n^3 - n)}$$

The value *W* provides an indication of the degree of unanimity among the respondents. If *W* is 1, then all the respondents are unanimous about their views, whereas a value of 0 indicates no agreement. Intermediate values indicate the lesser or greater degree of agreement.

All surveys were complete anonymously. A request was posted to the South African Institute of Civil Engineering South Africa (SAICE) to forward the questionnaire to their members via email. A bulk email was sent; but the exact number of successful recipients could not be confirmed, due to email not being delivered or no longer existing. It is estimated that approximately 5,000 questionnaires were emailed; this also included emails to project management companies, engineering consulting firms, engineering contractors, and government departments such as the Department of Public Works and the Department of Water Affairs. A total of 163 responses were received, giving an approximate response rate of 3.3%. Even though the response rate was low, the number of responses was satisfactory.

4.1 Analysis of data and interpretation of findings

The data received was entered into a database and analysed using Microsoft Excel.

The demographic profile of the respondents was significant. A total of 53.4% of the respondents had between one and ten years' experience. Only 20.3% of the respondents had over 20 years' experience, with only 18% aged over 50 years. This confirms the observation by Lawless (2007) that the current workforce is fairly young. The respondents were well educated, with 67% of them

completing Bachelor's Degrees and 18% Masters degrees. The majority of the respondents (87%) were from consulting companies, with the remainder evenly split between construction and owner organisations. The gender response was 69% for males and 31% for females; this is a fair reflection of the industry profile.

4.1.1 Ranked attributes for each category

The results of the ranked attributes are given in Table 2. Although the coefficient of concordance *W* was low in all the studies, the sample for all the questions was statistically significant at both the 95% and the 99% levels.

Table 2: Ranked attributes for each category

Categories and associated attributes		*Rank frequency*						$\bar{R}$	*Rank*
		1	*2*	*3*	*4*	*5*	*6*		
Category 1 – Interpersonal factors									
1.a	Supervision of project team	44	36	33	23	8	19	2.83	1
1.c	Ability to motivate team members	21	31	39	32	30	10	3.3	2
1.f	Stakeholder management (client)	35	31	22	14	29	32	3.41	3
1.b	Ability to delegate authority	23	27	30	43	23	17	3.41	4
1.d	Sense of teamwork	35	18	22	32	27	29	3.52	5
1.e	Stakeholder management (parent organisation)	5	20	17	19	46	56	4.53	6
Category 2 – Application of theory									
2.c	Planning (integrative)	54	39	31	21	12	6	2.48	1
2.f	Planning (time)	36	50	24	15	19	19	2.93	2
2.b	Monitoring and controlling (time)	14	30	40	49	24	6	3.35	3
2.d	Monitoring and controlling (integrative)	12	16	36	40	36	23	3.87	4
2.e	Monitoring and controlling (cost)	10	13	28	28	58	26	4.16	5
2.a	Professional qualifications	37	15	4	10	14	83	4.21	6
Category 3 – Personal character									
3.a	Leadership style	81	32	25	12	10	3	2.06	1
3.b	Emotional intelligence	31	38	31	27	21	15	3.09	2
3.c	Results orientation	16	35	43	29	21	19	3.37	3
3.d	Energy and initiative	14	30	28	54	23	14	3.52	4
3.e	Self-confidence	18	22	23	26	62	12	3.79	5
3.f	Optimism	3	6	13	15	26	100	5.18	6

Category 4 – Personal contribution									
4.b	Level of involvement in the project	47	31	28	23	25	9	2.85	1
4.a	Ability to determine cost – time trade-offs	27	42	38	40	12	4	2.88	2
4.e	Commitment to meet cost, time and quality constraints	45	27	21	19	38	13	3.1	3
4.c	Ability to determine quality – time trade-offs	9	24	48	35	39	8	3.58	4
4.d	Ability to establish an appropriate organisational structure	19	23	17	39	39	26	3.82	5
4.f	Desire to achieve success and recognition	16	16	11	7	10	103	4.77	6
Category 5 – Personal skills									
5.a	Communication skills	78	37	25	16	3	4	2.02	1
5.f	Decision-making and problem-solving skills	43	47	29	10	10	24	2.81	2
5.b	Technical skills	23	34	29	26	25	26	3.45	3
5.c	Organising skills	11	24	43	44	29	12	3.56	4
5.d	Coordinating skills	5	16	25	46	47	24	4.14	5
5.e	Negotiating skills	3	5	12	21	49	73	5.01	6
Category 6 – Practical application									
6.f	Define and follow strategic direction	66	31	21	9	14	22	2.63	1
6.c	Relevant work experience	42	19	32	23	25	22	3.22	2
6.b	Ability to implement an effective quality assurance programme	20	32	39	30	32	10	3.32	3
6.e	Adaptability to changes in the project plan	15	47	28	27	29	17	3.36	4
6.a	Ability to implement an effective safety programme	18	22	19	38	31	35	3.9	5
6.d	Control of subcontractors' work	2	12	24	36	32	57	4.56	6

The first category evaluated was "interpersonal factors". This group consisted of factors describing project managers' interaction with other project role-players. It gauged the importance of the project managers' interaction with the project team, client and parent organisation. The factor 'supervision of project team' was chosen well ahead of all the other factors for this question. This selection seems logical, since the project manager remains the ultimate responsible person and occupies a leadership role. The majority of the respondents ranked the factor 'stakeholder management (parent organisation)' very low; it had one of the worst average ratings in the entire study. With a great deal of emphasis on stakeholder management in recent publications such as the *Project Management Body of Knowledge*

(2013: 391) and the British Standards Institution's *ISO 21500* (2012: 6) this low ranking was surprising. The remaining factors had a very small spread in the middle of this group. The coefficient of concordance *W* calculated for this question was 0.089, which means that the general agreement among participants was low.

The "application of theory factors" category dealt with the theoretical base from which project managers operate. It describes the project managers' ability to plan, monitor and control cost and time parameters as well as the integration of various activities in running projects. The effect of the project managers' qualifications on the success of projects is also included in this group. The factor 'planning (integrative)' was chosen ahead of all the other factors for this question. The majority of the respondents ranked the factor 'professional qualification', followed closely by 'monitoring and controlling (costs)', very low. The remaining factors were approximately evenly spread in the middle of this group. The coefficient of concordance *W* calculated for this question was 0.141.

The "personal character" category encompassed the innate psychological make-up of project managers. It consisted of attributes that are generally developed over the life of an individual rather than those that can be thought in a class. The factor 'leadership style' was chosen well ahead of all the other factors and, in fact, had the best average rating of all the factors in the study. The majority of the respondents ranked the factor 'optimism' very low. It had the worst average rating in the entire study. This is in contradiction to the findings of the study by Dolfi & Andrews (2007: 681) who found that optimism was an important attribute for successful project managers. The remaining factors had a minimal spread in the middle of this group. The coefficient of concordance *W* calculated for this question was 0.29.

The "personal contribution" category examined how the project managers physically contributed to the success of the project by their involvement and decision-making on a daily basis. Management of cost, time and quality parameters played a major role in influencing this group. The factors 'involvement in project' and 'ability to determine cost/time trade-offs on project' were chosen as the two most important factors in this group. The majority of the respondents ranked the factor 'desire for accomplishment/success/recognition' very low. It had one of the worst average ratings in the entire study. The remaining factors had a minimal spread in the middle of this group. The coefficient of concordance *W* calculated for this question was 0.15.

The "personal skills" category combined attributes related to the project manager;s talents. These are factors for which some project managers may have a predilection ahead of other project managers, despite them all receiving the same training. The factor 'communication skills' was chosen well ahead of all the other factors for this question. The majority of the respondents ranked the factor 'negotiating skills' very low. It had one of the worst average ratings in the entire study. The remaining factors had a reasonably large spread in the middle of this group. The coefficient of concordance *W* calculated for this question was 0.305.

The "practical application" category consisted of those 'hands-on' attributes related to actually running a project. It considered strategic elements of project execution, safety and quality as well as controlling external factors and the relevant work experience of the project manager. The factor 'ability to define and follow a strategic direction in projects' was ranked most important, with the factor 'control of subcontractors' work' ranked least important. The remaining factors had a very small spread in the middle of this group. The coefficient of concordance *W* calculated for this question was 0.124.

This final question required the respondents to rank the six categories of factors relative to each other (Table 3). The category 'interpersonal factors' was ranked as the most important. This observation supports the findings by Ahadzie *et al*. (2007: 684) and Odusami (2003: 525). The 'personal contribution' factor group was ranked as least important by a large margin. The remaining factor groups had a very small spread.

The coefficient of concordance *W* calculated for this question was 0.073. This means that there was a great deal of disagreement among respondents. Again, the concordance of the sample for this question was significant at both the 95% and the 99% levels.

Table 3: Overall ranking of categories

		Rank Frequency							
		1	*2*	*3*	*4*	*5*	*6*	$\bar{R}$	*Rank*
Category 1	Interpersonal factors	57	28	32	18	15	13	2.66	1
Category 2	Application of theory	23	44	26	24	18	28	3.33	2
Category 5	Personal skills	25	26	28	32	28	24	3.52	3
Category 6	Practical application	36	26	16	20	22	43	3.58	4
Category 3	Personal character	16	27	30	34	29	27	3.7	5
Category 4	Personal contribution	6	12	31	35	51	28	4.21	6

Some interesting observations were noted when viewing the results in terms of the demographic information.

Although the majority of the respondents were male, no notable differences could be observed in the responses from males and females.

The male and female subsets ranked the same factors as being the most important for all the groups, with the exception of the 'personal contribution' category. In the 'personal contribution' category, the males ranked 'involvement in project' as the most important factor, whereas the females ranked 'ability to determine cost/time trade-offs' as most important. Similarly, for the least important factors in each category, all but one group was ranked the same by the male and female subsets. In the 'application of theory' category, the males ranked 'monitoring and controlling (costs)' as least important, whereas the females ranked 'professional qualifications' as least important. Since the margins of differences were almost negligible, no significant conclusion could be made from these observations.

A total of 85% of the respondents had a Bachelor's Degree or higher, and 15% had a technical or matriculation qualification. This may have introduced bias into the study, as it is not representative of the construction industry in South Africa.

The two subsets of respondents ranked the same factors as being the most important in that category for all the groups. On the final question, in which respondents were required to rank the categories, the subset with the higher qualifications ranked 'interpersonal factors' as the most important category, whereas the subset with the lower qualifications ranked 'application of theory factors' as most important. For the least important factors in each category, all but one group was ranked the same by the two subsets. The attribute 'professional qualification' in the 'application of theory' category had a significant discrepancy in terms of the rating and was ranked more important by the subset with 10 years' experience or less. This suggests that, as a project manager gains experience in the construction industry, the perception that having the highest formal qualifications may not guarantee the project management capabilities. This, however, contradicts the findings of Odusami (2003: 519), namely that the project leader's qualification significantly affects project performance.

The results indicate some disparity among the levels of qualifications; however, in general, there seems to be overall agreement.

With respect to years of experience, respondents with less than 10 years' work experience and the subset with more than 10 years' work experience had the closest split of all the stratified data in terms of relative size of the subsets, with 60% and 40% of the sample, respectively.

The two subsets ranked the same factors as being the most important for all the categories, with the exception of the 'personal contribution' category. In the 'personal contribution' category, the subset with more than 10 years' work experience ranked 'ability to develop an appropriate organisational structure' as the most important factor. The subset with 10 years' work experience or less ranked 'ability to determine cost/time trade-offs' as most important. Similarly, for the least important factors in each category, all but one group was ranked the same by the two subsets. In the 'application of theory' category, the subset with 10 years' work experience or less ranked 'monitoring and controlling (costs)' as least important, whereas the other subset ranked 'professional qualifications' as least important.

One factor stands out for its extreme rating score, namely 'leadership style' in the 'personal character' category, with an average rating of 1.85 from the subset with 10 years' work experience or less. This is the lowest average rating of any factor for any subset of the sample in the study.

5. Conclusions and recommendations

The ten most important relative factors across the six categories are given in Table 4.

Table 4: Top ten ranked attributes across categories

Categories and associated attributes		*Rank Frequency*						$\bar{R}$	*Rank*
		1	*2*	*3*	*4*	*5*	*6*		
5.a	Communication skills	78	37	25	16	3	4	2.02	1
3.a	Leadership style	81	32	25	12	10	3	2.06	2
2.c	Planning (integrative)	54	39	31	21	12	6	2.48	3
6.f	Define and follow strategic direction	66	31	21	9	14	22	2.63	4
5.f	Decision-making and problem-solving skills	43	47	29	10	10	24	2.81	5
1.a	Supervision of project team	44	36	33	23	8	19	2.83	6
4.b	Level of involvement in the project	47	31	28	23	25	9	2.85	7
4.a	Ability to determine cost – time trade-offs	27	42	38	40	12	4	2.88	8
2.f	Planning (time)	36	50	24	15	19	19	2.93	9
3.b	Emotional intelligence	31	38	31	27	21	15	3.09	10

In reviewing the top ten relative factors, it is notable that the first seven factors are all related to the project manager's managerial and personal behaviour, as opposed to his/her technical skills. Factors ranking high are associated with leadership, strategic direction, communication, problem-solving and supervision. This observation highlights the fact that peers continue to view the project manager as an authoritative figure who needs to be able to lead the team through a project. These observations support the findings of Odusami (2003: 525) as well as of Muller & Turner (2007: 22-23). With technical capabilities also among the top ten out of 36 factors, the importance of a balanced skills set for project managers is once again confirmed and should be considered when designing project management training and skills development programmes.

Despite the various sources, the relatively low number of potential respondents, and the potential of some bias in this study, the findings are interesting and may ultimately still be representative of the South African construction industry. The results of this research and the low level of concordance, to some extent, support the general findings by Lawless (2007) that the civil engineering and construction industries are currently in disarray. The relative disagreement of what should be expected from project managers can cause potential tension during the recruitment and appointment of personnel. It is, therefore, critical that a common understanding be developed among stakeholders of what key attributes are required for project managers in the construction industry.

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