Challenges facing construction site management in the Swaziland construction industry

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Abstract:
Site Management involves a mixture of activities that turn basic resources into a finished product. Construction is seen as the conversion of raw resource inputs into defined functioning output by means of a managed process. Therefore, the construction site is viewed as a key area where money is made or lost and where there is considerable scope for improving efficiency, productivity and quality. Achieving good site management on construction sites is imperative. Hence, this paper present research findings on the challenges affecting construction site management on construction sites in the Swaziland construction industry. The study was conducted with reference to existing theoretical literature and the use of a survey questionnaire distributed to 120 participants in the construction industry. The questionnaire survey participants include: construction professionals and contractors. The questionnaires were analysed through the use of multivariate statistics. To ascertain the validity and reliability of the results, the study made use of the Statistical Package for the Social Sciences (SPSS) version 22. Findings emanating from the study showed that there are several challenging and management problems that affects effective construction site management in Swaziland. The identified findings from the questionnaire analysis include: time, limited budget, planning, and non-adherence to specification which often cause defects, disputes and delays. The study findings contribute to the understanding of snags affecting effective construction site management in the Swaziland construction industry.

Keywords:
Construction industry, site management, Swaziland.

1. Introduction

Site management practice is defined as a fundamental integrating process used to achieve organised and purposeful results in the area where building or construction work is being carried out, whether it is within, adjacent to, or separate from an existing occupied building (Santos, A.D, 2002). Site management practices are a combination of activities which turn basic resources into a finished product. This can range from organisation of the materials, labour and other resources on the site to which control the flows of information and finance. Griffith and Watson (2004) define site management as a combination of four groups of inter-related components: preliminary works, site organisation, and site layout and welfare provision. Efficient site management practices

provide the foundation for a successful project by configuring, structuring and organising those temporary facilities needed to support the works on site. In order to achieve good site management on construction sites, Obiegbu (2012) asserted that the following areas have to be taken very seriously:

- Project drawings, specification and contract documents must be interpreted correctly;
- All the projects requirements must be fully understood;
- Resources for the project must be correctly determined and well allocated;
- Functional site layout must be assessed and provided;
- Execution of the work must be well planned and scheduled while not forgetting the establishment of quality control measures;
- Compliance to statutory regulations should be ensured;
- Planning and programming the execution of work should be ensured;
- Construction processes must be monitored and controlled and corrective measures taking when deviation occurs;
- Ensuring that the right calibre of professionals is engaged with clearly defined roles.

Bamisile (2004) indicated that effective site management requires the balancing of the following by the contractor's team:

- Right persons: It is very important for contractors handling building projects to ensure that the right people are appropriately placed.
- Communication: Formal lines of communication have to be clearly established from the beginning of a project and must be brought to the attention of all the parties involved in the project. This is the way to avoid misleading information circulating.
- Progressing system: This is the act of checking, measuring and recording of progress in comparison with planned requirements, and the expatiating on any items subject to delay or likely to be delayed, in order to meet up with the plan.

The effectiveness of managing the production process according to Bamisile (2004) cannot be economically achieved through the use of force but the creation of conditions that will encourage self-motivation and create team spirit which efficient to project execution. This paper aims to investigate the challenges of site management faced in the Swaziland construction industry.

Failure of site management on construction sites is mainly related to the problems and failure of communication and performance between the professional team and the contractor (Bamisile 2004). However, there are many reasons and factors which contribute to this problem. An increasing number of construction organizations are applying project improvement initiatives to improve their performance according to Mohammed and Anumba (2006). The fundamental objectives are to deliver construction projects to the required quality more quickly and improve project performance. Unfortunately, practice is not that simple as construction work has become more complex technically and administratively, and there are several challenging engineering and management problems that occur on the site. No research

has been conducted in Swaziland which shows the reasons for poor site management experienced in the construction workplace. The objective of this paper is to identify the problems affecting site management in Swaziland.

2. Literature Review

There are several challenging engineering and management problems that occur on construction sites. These problems affect the time, budget and plans, and specifications (Trauner, 1993) and often cause defects, disputes and delays (Clarke, 1988). According to Holroyd (1999) many construction site procedures and methods have not changed over the years and the same mistakes are being repeated. The main reasons are because the site management is characterised by high work overload, long working hours and many conflicting parties to deal with, including the management of the sub-contractors and liaison with the clients (Griffith and Watson, 2004). For instance, the problems identified within site management practices can be categorised into three main categories: management and administration problems; technical and engineering problems; and site communication problems.

2.1 Management and Administration Problems

Most site organisations have policies which lay down procedures for the site manager to observe regarding management and administration problems. These problems have to be addressed in order to ensure that project objectives are achieved. Additionally, there is a wide range of constraints which could occur on-site and for each the site managers should be prepared to deal with them in a systematic and efficient way (Mohamed, 2006). This can only normally be possible if the project managers or site managers have been forewarned, trained or educated on how to deal with the unexpected (Forster, 1989). The most common problems were:

- Poor information: The information passed on was often wrong or inaccurate (Barber, 1999),
- Inaccurate/inadequate planning: Wrong assumptions were made as to where the project was in terms of completion, low technological input, unfavourable clients' attitudes towards projects and lack support from top management (Barber, 1999);
- Training and education issues: The majority of personnel on site are skilled in one very narrow area and the teams had not become truly multi-functional (Barber, 1999);
- Motivation issues: The bonuses paid were still based on old efficiency-based performance measures rather than team performance (Barber, 1999; Ling 1991; and Ogunlana & Olomolaiye, 1989); and
- Shortage of skilled workers: Affected, by the cyclical nature of the UK construction industry (Mackenzie, 2000; Agapiou, 1995).

2.2 Technical Problems

Technical problems include plant, piling and existing services, which are discussed in detail below:

Plant problems: Maintenance of construction plant and plant management (Ogunlana & Olomolaiye, 1989). Many construction organisations tried to avoid these costs by providing the minimum of maintenance, which has often resulted in unexpected breakdowns, lost production and inefficient machinery (Harris & McCaffer, 2001).

Piling construction: Methods used for recording the pile information may duplicates effort and potentially places the integrity of the pile at risk. Data transfer errors made from the schedule and miscalculation during pile construction can result in nonconforming piles being constructed, leading to additional costs, delays, and client dissatisfaction (Ward et al., 2003) and;

Existing services: The utility services such as existing sewers, water distribution pipes, electricity cables, gas mains and telecommunications cables can disrupt construction works (Illingworth, 2000). Site managers should take necessary actions to prevent damages occurring during the construction works and to avoid unnecessary costs of rectifying the damaged existing services (Forster, 1989).

2.3 Communication Problems

The nature of the relationships was the main factor behind the poor communication; as a result of the historical development and fragmentation of trades, professions and responsibilities. In fact, top management often did not know what was happening on site (Tah & Carr, 2001; Barber, 1999). Communication difficulties often occur during the construction stage because it is here that the level of information available to all parties reaches its peaks. However, Emmit and Gorse (2003) suggest that as information is received from structural engineers, architect, mechanical engineers, and other consultants, discrepancies between drawings should be expected, and checks should be made to find where instructions are incompatible. Any problems must be reported to the contract administrator and meetings should be held with the aim of quickly resolving any differences (Mohamed, 2006).

3. Swaziland Construction Industry

The nature of this industry is a fragmented one, composed with a larger number of firms. In Swaziland, the industry is very small as compared to South Africa (Thwala & Mvubu, 2009).

3.1 Contractor Accreditation in Swaziland

A registration of accredited construction enterprises in Swaziland constitutes an essential tool for the industry transformation, for monitoring the performance of development programmes, and for ensuring compliance with the performance of public sector projects (Mvubu & Thwala, 2009).

In the Ministry, each department (Roads and Building) conducts its own accreditation or registration. The registration is an essential tool for the local industry transformation, in monitoring the performance of enabling environment programmes, and for ensuring compliance with the performance of public sector projects. It addresses; the operation of

a preference scheme, or approved public tender list; performance monitoring, enabling the promotion of improved contractors and ensuring compliance where standards are violated; and targeting of resources to emerging contractors which demonstrates progress and withdrawal of support from those which have graduated or have failed to progress (Ministry of Public Works and Transportation, 2012).

The registration of consultants firms falls on both departments of the Ministry, classified into Category A and B. The contractors are registered departmentally. In the department of roads the categories start from Category 6, as an entry point to Category 1, being the category for large contractors (Ministry of Public Works and Transportation, 2012). While in the department of building, where the study was of interest, the categories are classified into 'D', 'C', 'B', 'A', 'M1', to 'M'. Category 'D' being the entry point for the registration, and Category 'M' being the highest level, (being large contractors). The consultant's registry within the Ministry caters for both departments, category B, being the entry level and category 'A', as the higher level. In 2012, there were 56 consultant firms registered; fifteen (15) architects firms; eleven (11) quantity surveyors firms; seventeen (17) civil/structural firms, ten (10) electrical firms and three (3) project managers. The contractors were a total of 198, registered with the building department; 73 electrical; and 36 specialist firms, (Ministry of Public Works and Transportation, 2012).

Contractor grading in Swaziland is one of the tools that is used to regulate the construction sector. The categories start from category 1 to 6 as shown in the table below from the roads department, categories from M to D for building contractors and categories from M to C for mechanical/electrical subcontractors. The Tables below show the different categories in the construction sector.

Table 1: Civil contractor grading in Swaziland

Category	Contractors No.	Category Maximum Value (E)
Category 1	0	Locally and internationally funded construction project from100 Million to 20 Billion
Category 2	2	Locally and internationally funded construction project from100 Million to 200 Million
Category 3	8	Locally and internationally funded construction project from20 Million to 200 Million
Category 4	5	Locally and internationally funded construction project from 5 Million to 20 Million
Category 5	37	Locally and internationally funded construction project from 2 Million to 5 Million
Category 6	102	Locally and internationally funded construction project from 0 Million to 2 Million

Source: Ministry of public works and transportation, roads department: (2012)

Table 2 Building contractor grading in Swaziland

Category	Contractors No.	Category Maximum Value (E)

Category M	14	From 25 million to 120 million
Category M1	22	From 10 million to 25 million
Category A	11	From 5 million to 10 million
Category B	34	From 2 million to 5 million
Category C	44	From 0.5 million to 2 million
Category D	70	From 0 million to 0.5 million

Source: Ministry of public works and transportation, building department: (2012)

Table 3 Electrical and mechanical subcontractors grading in Swaziland

Category	Contractors No.	Category Maximum Value (E)
Category M	13	Locally and internationally funded construction project from 2 Million to 10 Million
Category A	13	Locally and internationally funded construction project from1 Million to 2 Million
Category B	12	Locally and internationally funded construction project from 0.5 Million to 1 Million
Category C	23	Locally and internationally funded construction project from 0.1 Million to 0.5 Million

Source: Ministry of public works and transportation, building department: (2012)

4. Research Methodology

The study was conducted with companies situated in Mbabane, Ezulwini and Manzini, which are towns located in Swaziland. This research adopted a quantitative design with the use of questionnaires to randomly selected construction companies. Exploratory factor analysis (EFA) using Statistical Package for the Social Sciences (SPSS) Version 22 using Varimax rotation was used to determine the correlation, validity and reliability of the factors affecting other management practices and the recommendations to improve them. Furthermore, normality tests were conducted using Kolmogorov-Smirnov and Shapiro-Wilk tests to determine the distribution of the factors and recommendations deduced from the study. To reduce the data being biased and Type 1 error, the variables under-go Bonferroni adjustments using the Mann-Whitney U tests.

5. Findings and discussions

The findings provided were in respect of the primary objective of the study, which was to investigate the challenges faced on construction sites in Swaziland, and some of the possible factors were mentioned in the literature review. It was found out that out of 86 respondents, (79%) were male and (21%) were female. The ethnicity that comprises the majority of the respondents was black Africans (93%), followed by (3.5%) whites and coloureds. (52.3%) of the respondents had diploma certificates, followed by (17.4%) with degree certificates, (14%) of the respondents had honours certificates, (11.6%) of the respondents had O-level certificates and (2.3%) for JCE and Post graduates certificates. About 58% of the respondents worked for private sector contractors, followed by (29%) respondents working for private sector consultants, (10%) of the

respondents worked for the public sector (Government) and (3%) of the respondents worked for private co-operation clients.

Figure: 1 revealed that out of the 86 respondents 79% were males and 21% were females.

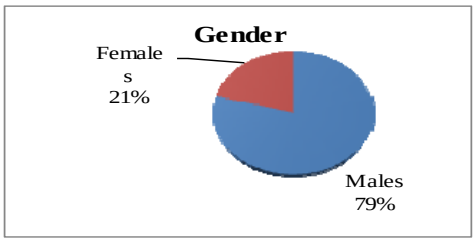

Figure 1: Respondents gender

Figure: 2 below indicated that most of the respondents worked in the private sector contractor with a total of 50 which corresponds to 58%. These comprise of your civil, building contractors. Private sector consultants followed with 25 respondents, which correspond, to 29%. It clearly shows that in Swaziland contractors dominate the construction industry, since most of the respondents worked on construction companies.

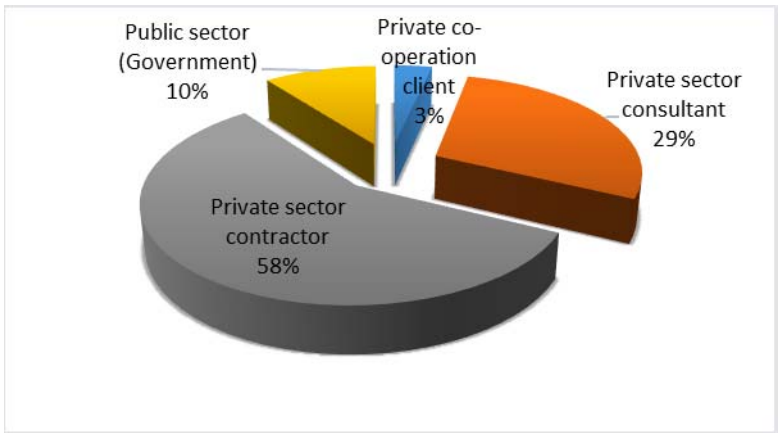

Figure 2: Respondent's employment organisation type

Figure 3 shows that the majority of the respondents were those having diplomas or certificates. 29 respondents, which include degree level and upwards had the second highest then high school education, which consists of grade 10, and grade 12 certificates had few respondents of about 12 when combined. The qualification data play a vital role as later the study compares how the respondents according to their qualifications answered in other sections of the questionnaire.

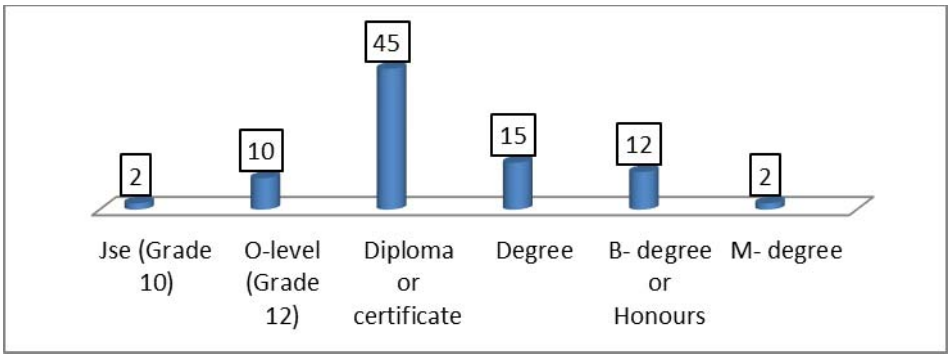

Figure 3: Respondents qualification

Based on the objective to identify the problems affecting site management in Swaziland, the challenges encountered on construction sites in Swaziland were categorised into three, client caused problems, consultant problems and contractor problems.

5.1 Contractor Factors

Based on the mean item score (MIS) in Table 4 (see page 92), it is evident from the findings that contractor factors had the highest ranked statements affecting site management practices in Swaziland. The statements were as following: ‘making use of inexperienced supervisors (MIS=3.894, R=1); ‘non-compliance with specification (MIS=3.744, R=2); ‘Wrong selection of materials (MIS=3.744, R=3); ‘late delivery of materials (MIS=3.706, R=4); ‘insufficient material (MIS=3.686, R=5); ‘unqualified labour force (MIS= 3.651, R=7); ‘inability to read and understand or interpret drawings (MIS=3.640, R=8); ‘inadequate motivation of the labour force (MIS=3.581, R=9); ‘Employing of unqualified supervisors (MIS=3.506, R=12); ‘lack of site supervision (MIS=3.477, R=14). From these statements, it was found that they were the results from management problems within the contractor and this agrees with what Mahommed 2006 and Griffith & Watson 2004 found, that problems in the construction site were categorised into management problems, technical and communication problems. Statements from the contractor factors such as; ‘lack of proper equipment (MIS=3.671, R=6); ‘poor working conditions (MIS= 3.581, R=10); ‘few storage facilities (MIS=3.518, R= 11); ‘making use of defective or damaged formwork (MIS= 3.500, R=13); ‘wrong curing procedures (MIS= 3.453, R= 15); ‘stripping formwork too early (MIS=3.312, R=16). These statements of contractor factors were found to be the result of technical problems experienced within the contractor.

Table 4. Contractor factors

Contractor Factor	MIS	Rank
Making use of inexperienced supervisors	3.894	1
Non-compliance with specification	3.744	2
Wrong selection of materials	3.744	3
Late delivery of materials	3.706	4
Insufficient material	3.686	5
Lack of proper equipment	3.671	6
Unqualified labour force	3.651	7
Inability to read and understand/interpret drawings	3.640	8
Inadequate motivation of the labour force	3.581	9
Poor working conditions	3.581	10
Few storage facilities	3.518	11
Employing of unqualified supervisors	3.506	12
Making use of defective or damaged formwork	3.500	13

Lack of site supervision	3.477	14
Wrong curing procedures	3.453	15
Stripping formwork too early	3.312	16

Source: Author's questionnaire survey analysis

Looking at the correlation matrix results from SPSS version 22 of the contractor factors it was found that there were no coefficients below 0.3 and above 0.9 apart from the independent variables. This means that the statements given to the respondents on contractor factors were all appropriate to be stated as problems affecting site management practices caused by contractors on site. This is evident by the strong link each statement had (Kaiser-Meyer-Oklin= 0.912) shown in Table 5 below.

Table 5. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.912
Bartlett's Test of Sphericity	Approx. Chi-Square	1494.034
	df	120
	Sig.	.000

Source: Author's questionnaire survey analysis

5.2 Consultant Factors

According to the findings from the study, the consultant factors had the second highest ranked statements for affecting site management practices in Swaziland. There were eleven statements given to the respondents (see Table 6). It was noted that respondents felt that the problems caused by consultants in the industry had a negative effect on site management.

Table 6. Consultant factors

Consultant Factors	MIS	Rank
Conflicting details on drawings	3.600	1
Lack of details on sections of drawings	3.565	2
Delay of instructions or information	3.558	3
Inadequate or wrong drawings provided by the architects	3.477	4
Lack of site inspection	3.453	5
Non implementation of corrective actions during the construction process	3.417	6
No approvals of inspection authority	3.314	7
Offences and penalties	3.291	8
Inaccurate measurement by the quantity surveyor	3.279	9
Notification of construction work	3.221	10
Testing of soil not carried out especially in high rise buildings	3.186	11

Source: Author's questionnaire survey analysis

Findings from the correlation matrix further revealed a strong link between the statements (Table 7) which means that the statements classified under consultant factors were indeed appropriate to be used as statements causing problems done by the consultants.

Table 7. Correlation matrix for consultant factors

Correlation	B14.2.1	B14.2.2	B14.2.3	B14.2.4	B14.2.5	B14.2.6	B14.2.7	B14.2.8	B14.2.9	B14.2.10	B14.2.11
B14.2.1	1.000	.822	.747	.738	.743	.641	.587	.723	.687	.630	.663
B14.2.2	.822	1.000	.646	.719	.786	.654	.557	.727	.754	.630	.639
B14.2.3	.747	.646	1.000	.811	.640	.764	.648	.609	.605	.687	.733
B14.2.4	.738	.719	.811	1.000	.830	.722	.506	.623	.662	.578	.598
B14.2.5	.743	.786	.640	.830	1.000	.758	.508	.671	.815	.582	.571
B14.2.6	.641	.654	.764	.722	.758	1.000	.831	.699	.757	.760	.765
B14.2.7	.587	.557	.648	.506	.508	.831	1.000	.778	.621	.654	.677
B14.2.8	.723	.727	.609	.623	.671	.699	.778	1.000	.664	.665	.594
B14.2.9	.687	.754	.605	.662	.815	.757	.621	.664	1.000	.681	.645
B14.2.10	.630	.630	.687	.578	.582	.760	.654	.665	.681	1.000	.910
B14.2.11	.663	.639	.733	.598	.571	.765	.677	.594	.645	.910	1.000

Source: Author's questionnaire survey analysis

Definition:

- B14.2.1 Lack of site inspection
- B14.2.2 Non implementation of corrective actions during the construction process
- B14.2.3 Inaccurate measurement by the quantity surveyor
- B14.2.4 Inadequate or wrong drawings provided by the architect
- B14.2.5 Delay of instruction or information
- B14.2.6 Notification of construction work
- B14.2.7 Offences and penalties
- B14.2.8 Conflicting details on drawings
- B14.2.9 Lack of details on sections of drawings
- B14.2.10 Testing of soil not carried out especially in high rise buildings
- B14.2.11 No approvals of inspection authority

Furthermore, non-parametric analysis was done on the consultant factors and a significant in males and females was noted (U=426.50, z=-1.975 and p=0.048). This means that males viewed the problems or statements caused by consultants with a more positive aspect compared to females.

5.3 Client Factors

Results from the mean item score (Table 8) ranked the client factors statements the least. The highest ranked statement with (MIS= 3.547) was 'lack of leadership skills' and the least ranked with (MIS= 3.036) was 'number of non-compliance to regulations'. From the findings made on this aspect, it means that though the client factors do contribute in problems affecting site management practices, respondents felt that they

had a very minimal effect on site management compared to consultant and contractor factors.

Table 8. Client factors

Client Factors	MIS	Rank
Lack of leadership skills	3.547	1
Disputes between owner and project parties	3.488	2
Less information co-ordination between client and project team	3.442	3
Less speed and unreliability of service from client	3.424	4
Making use of inexperienced consultants by the client	3.407	5
Making use of unqualified consultants by the client	3.400	6
Dispute management between client and professionals	3.384	7
Too many projects	3.329	8
High cost of compliance to regulators requirements	3.143	9
Low quality and unavailability of regulator documentation	3.105	10
Number of non- compliance to regulation	3.036	11

Source: Author's questionnaire survey analysis

Furthermore, results from the non-parametric results showed that the respondents had different opinions or views based on their level of education for the client factors. To see where the difference was, the study did the Bonferroni adjustment. From the results it was noted that though the non-parametric results showed a difference in the opinions of respondents with high school certificate compared to technical certificate and university degree but with further testing, it proved that there was really no difference. To test the reliability of all three factors identified from the study, the reliability test was conducted and it was found that for client, consultant and contractor factors, the Cronbach's alpha was above the cut-off-alpha of 0.70 (Table 9). This means that the results based on the problems discovered from the study were reliable to conclude this aspect of the research question.

Table 9. Cronbach's Alpha results

Empirical	Theoretical	No. of items	Cronbach's alpha
Client Factors			
Internal client factors		8	0.923
External client factors		3	0.827
	Client factors	11	0.916
	Consultant factors	11	0.959
Contractor Factors			
Contractor knowledge factors		8	0.948
Contractor application factors		8	0.945
	Contractor factors	16	0.959

Source: Author's questionnaire survey analysis

In summary, findings resulting from the study found that indeed there were challenges facing the management of construction sites. Clarke (1988) and Trauner (1993) said that these problems affect the time, budget and plans, and specifications which lead to defects, disputes and delays. From the study, it was further noted that the problems were caused by management, technical and site communication problems within the

responsible project team being the client, consultants and the contractors. This relates with what Mahommed (2006) and Griffith & Watson (2004) noted that the problems faced on the construction sites can be categorised into three as the ones mentioned by the findings made for this study.

6. Conclusion

Literature revealed that there are several challenges that occur on construction sites. The reasons are because the site management is characterised by high work overload, long working hours and many conflicting parties to deal with including the management of sub-contractors and liaison with clients. Literature also revealed that many construction site procedures and methods have not changed over the years thus repeating the same mistakes. Further literature showed that the problems identified with site management practices can be categorised into management and administration problems, technical and engineering problems and site communication problems.

From the survey results obtained from the respondents revealed that Swaziland construction sites also faced numerous problems. The most common problems being poor information (information being passed on being wrong or inaccurate), inadequate or inaccurate planning, shortage of skilled workers, plant management problems, poor materials management, conflict between parties. Furthermore the findings showed thirty eight statements which lead to the problems affecting site management practices in Swaziland. The study categorised the problems into client factors, consultant factors and contractor factors. Findings further revealed that these problems caused delays in the projects undertaken; meaning that site management in Swaziland faces lots of problems which have a negative effect on the performance. These problems can be avoided or reduced by the implementation of approaches discovered from literature.

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