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ANALYSIS OF CONSTRUCTION-RELATED FACTORS AFFECTING THE EFFICIENCY OF CONSTRUCTION LABOUR

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ABSTRACT

Irrespective of significant relevance of construction industry to economic growth of developed and developing nations, labour efficiency in the construction industry remains relatively low and thus affects construction project delivery and client's satisfaction. This paper aims at exploring adverse construction related factors contributing to the shortfall of construction labour efficiency in the South African construction industry. The study adopts mixed methodological approach, administering closed ended questionnaires to construction professionals on Western Cape and Gauteng construction sites, while experienced construction site supervisors were interviewed to validate quantitative data obtained. Statistical Package for Social Sciences (Version 22) and content analysis were used respectively to analyse data obtained. Communication ability of site managers, construction skills of site supervisors and effective site planning ability of contractors were found as the predominant construction related factors affecting the efficiency of construction labour. This study is restricted to contractors, site supervisors and site managers' related factors affecting the efficiency of construction labour. Adequate application of findings presented in this study will significantly reduce the current prevalent construction time and cost overruns through an improved construction workforce performance. Enhanced construction productivity is a product of construction labour efficiency that ensures achievement of construction project objectives and heightens contribution to South African economic development.

Keywords: *Construction productivity, Construction team, Economic development, Labour efficiency, Project objectives.*

1. INTRODUCTION

The cost of employing construction workers on different construction projects varies widely: labour costs on large construction projects typically account for approximately 40% of direct capital cost (Kazaz, Manisali & Ulubeyli, 2008).

Regardless of this significant percentage of labour cost, the construction industry is generally characterised by poor productivity of construction labour.

However, "human resource of an organisation represents the most variable, uncontrollable, and important element of production".

This is an indication that employees in an organisation merit a higher level of concern, most essentially in relation to labour-intensive sectors like the construction industry. Employees are characterised as the most challenging resource for an organisation to manage. As a result, construction management is meant to be strategically used to improve the efficiency of construction employees and enhance overall construction performance during building production processes. The fragmented structure, itinerary nature, and challenging working environments of construction employees are arguably contributing factors to the comparative inefficiencies of the construction workforce. Nonetheless, considering the relevance of employees to organisational development, there is a need to devise an effective management system that can afford utilisation of the construction industry's human assets to improve performance on construction projects. Olomolaiye and Egbu (2004) support the notion that effective management of the construction workforce will enhance construction project performance. Therefore, construction workers' performance improvement, as an essential tool for improving construction project performance, requires industrial and academic interventions in the construction sector. The objective of this study is to explore construction related factors that adversely affect construction workers efficiencies and subsequently rank the factors to prioritize the severity of the factors.

2. CONSTRUCTION RELATED FACTORS AND CONSTRUCTION WORKERS EFFICIENCY

2.1 *Impact of contractors on construction workers performance*

The term "contractor" implies from a legal agreement or contract negotiated and executed between the client and the builder (Knutson et al., 2009). Contractors have significant roles to play in construction worker management aimed at enhancing overall construction productivity. Delay and loss of construction productivity may occur as a result of a contractor's inability to effectively utilise construction human capital (Haseeb, Lu, Bibi, Dyian & Rabbani, 2011). Unarguably, construction contractors are generally involved in most successful construction projects. Contractor organisations are generally one of the major parties in the construction production process that is majorly involved in planning stage. According to Harris and McCaffer (2001), a well-planned, effectively monitored and controlled project results in successful delivery of any contract and determines the contractor's profit. Therefore, the selection of construction contractors constitutes a major decision for clients and the professionals engaged by them (Palaneeswaran & Kumaraswamy, 2001). Considering only the construction cost can negatively affect the quality of construction during the production process. Wong (2004) suggested that contractor selection efforts should weed out incapable contractors at an early stage to prevent poor project performance. In the construction environment, contractors are responsible for developing strategies for successful construction projects, including planning for a sufficient and capable construction workforce, materials, machinery and sub-contractors (Mincks & Johnston, 2011).

According to Baloyi and Bekker (2011), contractor-specific factors responsible for cost and time overruns are; shortage of skill workers, poor resources and time planning, actions of sub-contractors, site management and poor labour productivity.

Assaf and Al-Hejji (2006) further opine that lack of effective planning and scheduling, shortage of a capable and sufficiently large construction workforce and difficulties in financing by contractors are the common causes of delay in construction projects. Under a single system of contract, construction clients award the execution of the entire project to a single prime or general contractor.

General contractors bring together different elements and inputs under a single and coordinated system for project execution, in compliance with contract documents. In this system of contract, the contractor is completely responsible to the client. However, in a separate system of contract, several independent contractors work on the project without recourse to a single coordinated system. Each prime contractor is responsible for the allocated section of work, and directly responsible to the client (Sears et al., 2008). During construction project execution, the contractor plans and directs the workforce and other construction resources required for the project. Therefore, the contractor is directly responsible for monitoring progress and proactively planning for the present and future of construction operations (Harris & McCaffer, 2001). General contractors employ speciality contractors or sub-contractors to accomplish specific sections of each construction phase, such as: plumbing, electrical work, earthmoving etc. Knutson et al. (2009) state that speciality contractors on a project can number more than twenty and consequently represent the largest portion of workers on construction projects. A speciality contractor employed by the client to carry out a project may employ a general contractor who executes some portions of the project. The specialty contractor becomes the general contractor while the general contractor becomes the sub-contractor on the particular project (Nunnally, 2011). Hence, in this contractual system, the speciality contractor is responsible to the client for project completion within the specified time, budgeted cost and expected quality. Considering the impact of sub-contracted work on construction workforce productivity, Egbu, Ellis and Gorse, (2004) stress that contractors only have a direct influence over labour directly employed by each contractor, and indirectly control the workforce employed by sub-contractors. The construction contractor can make a substantial effort to afford favourable working conditions for the sub-contractor. However, the contractor's effort may not improve construction productivity unless the sub-contractor's own management themselves makes supportive efforts (Egbu et al., 2004).

2.2 Site manager's impact on the efficiency of construction workers

Building and civil engineering projects are complex, both in design and production processes (Shohet & Frydman, 2003). Therefore, the effectiveness of construction organisations is determined by the ability of site managers to manage this complexity and effectively control the construction work team (Egbu et al., 2004). Turner and Muller (2004) note that communication contributes to trust building on a construction project, and ineffective communication can result in a breakdown of trust. Unarguably, the construction site manager plays an important role in successful delivery of construction projects. Styhre and Josephson (2006) note that the success of a construction project significantly depends on the site manager, and the responsibility of the construction site manager extends beyond technical and production-oriented matters. Therefore, the site manager is required to be versatile in to afford attainment of project objectives.

Fraser (2000) suggested that construction organisations should consider training and professional development of site managers for performance improvement.

Consequently, due to the wide range of responsibilities of the construction site manager, production responsibility on site is becoming largely delegated to site supervisors, while construction site managers become more dedicated to construction planning, co-ordination, procurement activities, documentation and reporting (Styhle, 2006). Similarly, Egbu et al. (2004) maintain that planning, co-ordination and procurement ensures co-ordination of labour inputs, control of construction resources (materials, and plants) and ensures general efficiency of construction operations. Traditionally, the successful delivery of a construction project hinges on the performance of the project manager, who must consider delivery time, budgeted cost and expected quality (Pheng & Chuan, 2005).

Further, Walker (2007) claims that the title "project manager" contains a reserved implication, as, in construction, being a project manager implies managing the entire construction process. Considering the relevance of project managers in the construction process, they require good construction skills and capabilities in order to effectively fulfil their function. However, project manager with such abilities are rare (Zavadskas, Turskis, Tamosaitiene & Marina, 2008). A significant challenge confronting construction site managers is the difficulty of ascertaining the needs of construction project stakeholders, comparing those needs with the project objectives and deciding on the best strategy to fulfil those needs and objectives (Olander, 2007). Although the construction project manager's principal responsibility is to achieve project objectives in a particular contract, the objectives of construction projects are rarely accomplished as expected. Consequently, Pheng and Chuan (2005) argue that the causes of underperformance of a construction project manager is not restricted to inadequate skill on their part alone, but that a poor working environment can negatively impact the efficiency of a contractor's project manager. The actions of the construction client can also influence the performance of the client's project manager. Soham and Rajiv (2013) point out that the construction industry faces labour productivity challenges. The opinion is advanced by Levy (2008) that the efficiency of the construction workforce is a product of the scarcity of skilled workers and inadequate technical know-how on the part of construction managers. With the exception of design errors, most of the significant factors affecting construction workforce efficiency can be controlled by the day-to-day actions of the project manager and site supervisors (Dai et al., 2009). Hence, project managers are responsible for construction success and project quality, completion within specified cost and completion with the specified time (Sears et al., 2008). Pheng and Chuan (2006) opine that successful delivery of construction projects greatly depends on the project team members' ability to efficiently work together, since effective construction planning significantly reduces construction progress interruption (Ameh & Osegbo, 2011).

Project managers of construction firms are not only required to concentrate on building technologies and management of material resources, but also must pay significant attention to the construction workforce itself, an entity whose behaviour cannot be easily predicted (Lill 2008). With regard to the achievement of improved worker efficiency, Kazaz et al. (2008) opined that the qualifications held by construction managers, as well as the experience of site supervisors, are important elements that determine the level of construction labour efficiency. Lill (2008) further argues for the necessity of creating a balance between construction project requirements and the needs of workers in the construction industry.

Fapohunda and Stephenson (2010) note the need for training and personal development of construction managers, especially on new technologies that could improve effective and efficient utilisation of construction resources.

Jarkas and Bitar (2012) suggest that a high level of technical skill and extensive knowledge of contractual arrangement on behalf of the construction manager are important factors if the construction manager is to anticipate future hazards and avoid missing important construction details. Therefore, successful delivery of construction projects is significantly dependent on the competence of project manager's skills and ability (Zavadskas, et al., 2008).

2.3 Site supervisors and construction workers productivity

In the construction context, the terms "site supervisors" and "foremen" are used interchangeably. Usage depends on the individual construction firm (Dingsdag, Biggs and Sheahan, 2008). The site supervisor represents the link between management and construction labour (Serpell & Ferrada, 2007; Uwakweh, 2005).

In other words, construction site supervisors are directly responsible for directing the activities of labours on the construction site. This makes the supervisors' impact on workers' productivity significant (Uwakweh, 2005). Similarly, Serpell and Ferrada (2007) report that "Construction site supervisors direct the execution of basic construction work operations, as well as communicating project objectives and goals to workers". Therefore, the construction site supervisor becomes the most active leader on site and is generally perceived by workers as "the most visible people on site" (Dingsdag et al., 2008). However, from the standpoint of communication, Serpell and Ferrada (2007:588) posit that communication management on building construction sites is relatively poor. However, Kines, Andersen, Spangenberg, Mikkelsen, Dyreborg and Zohar (2010) contend that there is regular communication between supervisors and workers, although there is a need to improve on the effectiveness of the message. Achievement of construction project objectives and general performance of construction crafts is the responsibility of the construction site supervisor, which is termed "labour critical function" (Serpell & Ferrada, 2007). Hence, the site supervisor's adoption of an appropriate channel of communication is a significant tool for effective labour performance. Kines et al. (2010) note that the attitude of site supervisors to construction safety significantly influences the safety behaviour of junior construction workers. Serpell and Ferrada, (2007) summarise the primary site supervisor-related challenges confronting construction performance as follows:

- Lack of formal training to ensure site supervisors' efficiency in supervisory responsibilities.
- Deficiency in site supervisor training results in increase in cost of construction, due to poor work planning and inefficiency in communication with subordinates.
- Insufficient formal training programmes that could afford the construction industry the required number of qualified site supervisors.
- Inappropriate selection processes adopted by supervisory personnel.

3. RESEARCH METHOD

The study identified eleven contractor's-related factors, ten trade supervisor's-related factors and nine factors that are related to construction site managers.

Due to vast growth of construction activities in Gauteng and Western Cape provinces in South Africa, the study was undertaken in the two provinces. Data collected in each province were separately analysed and the factors in both provinces were compared.

Subsequently, data obtained from both provinces were combined for analysis to identify the factors efficiency relationship in the provinces. The research adopts convenient and purposive sampling techniques. Considering that the complex nature of construction operations leads to busy schedules of project participants, questionnaires were administered to construction professionals in Gauteng and Western Cape provinces base on accessibility to construction sites and availability of construction professionals on sites. Strung and Stead (2007) expressed convenient sampling as a sampling technique adopted on the basis of availability and accessibility of respondents. However, construction site supervisors interviewed were purposively selected on the basis of the direct working relationship between site supervisors and construction labour. For the purpose of the interview, three construction sites were selected with two participants' site supervisors on each construction sites. The participants' site supervisors were experienced in construction operations, with adequate years of supervisory responsibilities in the construction sector. The experience of the site supervisors is arguably a helpful instrument to assess the validity of data obtained from construction professionals. The research questionnaire design adopts structured questions utilising a five-point scale.

The closed-ended questions provide factors affecting construction workforce efficiency, as explored from the review of literature produced by previous research and exploratory studies conducted at the early stage of the study. Majority of the questionnaires were hand-delivered to respondents and the remainder were administered through electronic mail. Sixty-two (25.3 %) questionnaires were retrieved and analysed with Statistical Package for the Social Sciences (SPSS) version 22. The underlying purpose for selecting construction professionals (architects, quantity surveyors, site engineers, project managers, contract managers and site managers) as participants for the quantitative part of the study relies on the extensive experience of professionals concerning factors affecting the delivery of construction projects while that of site supervisors is based on their working relationship with construction labour. Quantitative data obtained from the structured questionnaire design was analysed with descriptive statistics, while qualitative data gathered from interviewees was analysed with qualitative content analysis. The underlying purpose is to validate quantitative data and ensure reliability of research findings while validity of the result was achieved through testing of quantitative data obtained from construction professionals, with qualitative interviews conducted with construction site supervisors. Reliability was ensured by testing scaled research questions with Cronbach's alpha coefficient in SPSS (Version 22) software. Majority of the study respondents (87.1%) work with contractor's firm, 3.2 % work with architectural firm, 8.1 % with project management firm and 1.6 % work with quantity surveying consultant firm. The study respondents are male dominant with 82.3 % male and 17.7 % female. 21 % of survey participants are below 26 years of age, 50 % are between 26 and 35 years while 29 % are 36 years and older. 48.8 % respondents have one to five years' work experience in the construction industry, 22.6 % have six to ten years construction work experience and 30.6 % respondents have eleven to forty years' experience. 6.5 % respondents are architect, 12.9 % are quantity surveyors, 17.7 % are site managers, 21 % are project managers, 11.3 % are contract manager and 30.6 % are site managers. Majority of the respondents (72.6 %) have been working in this position between one to five years while 27.4 % between six to forty years.

Table 1: Reliability of research instrument

	Number of items	Cronbach's alpha coefficient values
Contractors factors	11	0.78
Site supervisors factors	10	0.86
Site managers factors	9	0.89

The scaled questions used in the study were tested by Cronbach's alpha coefficient using Statistical Package for Social Sciences software (version 22) to ensure the reliability of research questions. Table 1 presents the summary of reliability tests conducted on scale questions. The results of the Cronbach's alpha co-efficient tests are found satisfactory in term of the requirements of reliability test.

4. RESULTS AND DISCUSSION

Table two presents the findings of factors affecting construction labour efficiency in Western Cape Province and Gauteng province as separately analysed. Supervision delay by trade supervisors emerges the most severe factor affecting the efficiency of construction workforce in Western Cape Province with a mean value of 4.80 (Table 2). Serpell and Ferrada, (2007) supported that training of site supervisor's will improve supervisors supervisory responsibilities on construction sites.

Site planning ability, rework due to construction error, inadequate co-ordinating ability of workforce and site manager's coordinating skills have the same level of adverse impact on construction workforce efficiency in Gauteng province with the mean value of 4.47. However, Fraser (2000) noted that construction organizations should consider training and professional development of construction site managers for performance improvement. The most severe factor affecting the performance of construction workers in Western Cape Province differs from the top four factors with the same adverse impact in Gauteng province (table 2). Communication ability of site manager, level of literacy of site managers and site manager's co-ordinating skill are identified in Western Cape as the second, third and fourth factors affecting construction workforce efficiency respectively. This indicates significant contribution of construction managers to poor performance of construction workers in the Western Cape Province. However, rework due to unclear instructions from supervisor, planning ability of site managers and communication ability of site managers are rated as the fifth factors with the mean value of 4.41 in Gauteng province.

Kines et al., (2010) contended that there is a regular communication between supervisors and workers on construction projects. Nonetheless, communication barrier between supervisors and construction labour, planning ability of site manager, and construction skill of trade supervisors have the same impact on construction workers efficiency in Western Cape Province with the mean value of (4.31). Serpell and Ferrada, (2007) noted the significance of construction site supervisors as being responsible for directing the execution of basic construction work operations, and communicating project objectives and goals to construction workers. Kines et al., (2010) emphasized the need to improve the effectiveness of site communication.

Table 2: Construction-related factors affecting construction workers efficiency Western Cape Province against Gauteng Province

WESTERN CAPE CONSTRUCTION SITES			GAUTENG CONSTRUCTION SITES		
Factors	Mean	Rank	Factors	Mean	Rank
Supervision delay by trade supervisors	4.80	1	Supervision delay by trade supervisors	4.18	12
Communication ability of site managers	4.47	2	Communication ability of site managers	4.41	5
Level of education of site managers	4.40	3	Level of education of site managers	4.18	12
Site manager's coordinating skill	4.36	4	Site manager's coordinating skill	4.47	1
Communication between supervisors and construction labour	4.31	5	Communication between supervisors and construction labour	4.18	12
Planning ability of site managers	4.31	5	Planning ability of site managers	4.41	5
Construction skill of supervisors	4.31	5	Construction skill of supervisors	4.29	10
Technical skill of site managers	4.27	8	Technical skill of site managers	4.06	21
Decisions of site managers	4.27	8	Decisions of site managers	4.35	8
Inadequate instructions from supervisors to labourers	4.27	8	Inadequate instructions from supervisors to labourers	4.18	12
Poor coordination of workers by supervisors	4.22	11	Poor coordination of workers by supervisors	4.12	17
Recruitment of competent supervisors	4.22	11	Recruitment of competent supervisors	4.18	12
Site managers relationship with project team	4.22	11	Site managers relationship with project team	4.00	22
Contractors construction experience	4.22	11	Contractors construction experience	4.35	8
Relationship between supervisors of different trades on site	4.20	15	Relationship between supervisors of different trades on site	3.94	25
Administrative experience of site managers	4.18	16	Administrative experience of site managers	4.12	17
Inadequate instructions of site managers	4.18	16	Inadequate instructions of site managers	4.29	10
Effective site planning ability	4.18	16	Effective site planning ability	4.47	1
Relationship with sub-contractors	4.16	19	Relationship with sub-contractors	4.00	22
Inadequate co-ordinating ability of workforce	4.13	20	Inadequate co-ordinating ability of workforce	4.47	1
Rework due to construction error	4.07	21	Rework due to construction error	4.47	1
Trade supervisors absenteeism	4.07	21	Trade supervisors absenteeism	4.12	17
Method of construction	4.02	23	Method of construction	3.94	25
Contractors delay of instruction to employee	3.98	24	Contractors delay of instruction to employee	4.00	22
Rework due to unclear instruction from supervisor	3.96	25	Rework due to unclear instruction from supervisor	4.41	5
Inadequate facilities for construction workers	3.87	26	Inadequate facilities for construction workers	3.82	27
Access to construction sites	3.82	27	Access to construction sites	3.29	29
Poor relationship of supervisor with employer	3.82	27	Poor relationship of supervisor with employer	4.12	17
Contractor financial problems	3.80	29	Contractor financial problems	3.59	28
Profit intention of contractors	3.76	30	Profit intention of contractors	3.29	29

Contractor construction experience and decision of site manager are ranked the eight factors with the same level of impact in Gauteng province, while the factors are ranked the eleventh and eighth factors in Western Cape Province respectively.

The latter factor has the same impact on the efficiency of workers in the two provinces. Inadequate instructions from trade supervisors to laborers and technical skill of site managers are both ranked eighth in Western Cape Province. However, inadequate instructions from trade supervisors to laborers is ranked twelfth and technical skill of site managers have a low effect (ranked twenty one) in Gauteng province.

Considering the least factors with minimal impact on the performance of construction workers in the two provinces, profit intention of contractors is perceived by respondents as the least factor that affects the performance of construction employee in the Western Cape Province. Contractor profit intention and assess to construction sites are the two least factors affecting labour efficiency in Gauteng province. Hence, profit intention of contractors has the least effect on construction labour performance in Western Cape and Gauteng construction firms. Contractor's financial problem is ranked twenty-ninth in Western Cape Province. Comparatively, contractor financial problem with a mean value of (3.59) is ranked the twenty-eighth factor in Gauteng province. From the table two above, it is apparent that the most severe factors affecting the performance of construction labour on Western Cape construction sites are significantly different from the most severe factors on Gauteng construction sites. The analysis of the combined data obtained from the two Provinces is presented in Tables 3, 4 and 5.

Table 3: Contractor-related factors

Factors	N	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean value	S.D	Rank
Effective site planning ability	62	0	1.6	11.3	46.8	40.3	4.26	0.71	1
Contractor's construction experience	62	0	3.2	12.9	38.7	45.2	4.26	0.81	2
Inadequate co-ordinating ability of workforce	62	0	4.8	8.1	46.8	40.3	4.23	0.80	3
Rework due to construction error	62	1.6	4.8	17.7	25.8	50.0	4.18	1.00	4
Relationship with sub-contractors	62	0	3.2	19.4	40.3	37.1	4.11	0.83	5
Method of construction	62	0	3.2	25.8	38.7	32.3	4.00	0.85	6
Contractors delay of instruction to employee	62	0	8.1	22.6	32.3	37.1	3.98	0.97	7
Inadequate facilities for construction workers	62	1.6	12.9	19.4	30.6	35.5	3.85	1.10	8
Contractor financial problems	62	4.8	3.2	33.9	29.0	29.0	3.74	1.01	9
Access to construction sites	62	8.1	6.5	17.7	45.2	22.6	3.68	1.14	10
Profit intention of contractors	62	6.5	4.8	27.4	41.9	19.4	3.63	1.01	11

The study reveals effective site planning ability of construction contractors as being a notable concern with regard the efficiency of construction labour (Table 4.5). The capability and effectiveness of the contractor when planning construction operations will unarguably facilitate construction operations and prevent unnecessary delay of construction activities during production processes on construction sites.

Harris and McCaffer (2001) posit that, a well-planned, effectively monitored and adequately controlled project ensures construction delivery efficiency and determines contractor's profit.

Assaf and Al-Hejji (2006:351) further support the notion that lack of effective contractor planning and scheduling are contributory factors to delays in construction projects. As presented in Table 4.5, the experience of the contractor is a significant factor, having the same mean value (4.26) as the site planning ability of contractors. Site planning ability, however, is considered more significant, because response tends to be more concentrated on site planning ability (S.D=0.71) than contractor construction experience (S.D=0.81). In an effort to prevent poor project performance, Wong (2004) contends that the contractor selection process should identify incapable contractors at an early stage and disqualify incompetent contractors in order to ensure that only qualified contractors tender for construction projects.

Also, inadequate coordination of the workforce is indicated as a significant factor contributing to poor performance of the construction workforce (Table 4.5). Rework due to construction error is also identified as a factor affecting construction labour efficiency. The review of literature reveals that inability of contractors to effectively utilise human resources in construction may result in delays and loss of construction productivity (Haseeb, et al., 2011). Further, Table 4.5 indicates the relationship of contractors with sub-contractors as a challenge to the efficiency of construction workforce. Egbu et al., (2004) posit that the contractor's efforts to improve worker efficiency should be supported by sub-contractors' management personnel.

Table 4: Site supervisors-related factors

Factors	N	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean value	S.D	Rank
Construction skills of supervisor	62	0	4.8	4.8	45.2	45.2	4.31	0.78	1
Communication between supervisors and construction labour	62	0	0	19.3	33.9	46.8	4.27	0.77	2
Inadequate instructions from supervisors to labourers	62	0	3.2	14.5	37.1	45.2	4.24	0.82	3
Recruitment of competent supervisors	62	0	3.2	12.9	43.6	40.3	4.21	0.79	4
Poor coordination of workers by supervisors	62	0	0	17.7	45.2	37.1	4.19	0.72	5
Relationship between supervisors of different trades	62	0	3.2	17.7	41.9	37.2	4.13	0.82	6
Trade supervisors' absenteeism	62	1.6	4.8	19.4	32.3	41.9	4.08	0.9	7
Rework due to unclear instruction from supervisor	62	3.2	8.1	8.1	38.7	41.9	4.08	1.06	8
Supervision delay by trade supervisors	62	0	1.6	19.4	56.5	22.6	4.00	0.9	9
Poor relationship of supervisor with employer	62	1.6	4.8	22.6	43.5	27.5	3.9	0.9	10

The construction skill of site supervisors is considered a paramount tool for improving the efficiency of construction labour (Table 4.6). The study undertaken by Olomolaiye et al. (1987), Kaming et al. (1997), Jarkas and Bitar (2012) found supervision delays to significantly contribute to construction labour efficiency challenges. Serpell and Ferrada (2007); Uwakweh (2005) report that construction site supervisors are the link between managers and construction labour, and

adequate levels of skill (construction and supervisory) are required by construction site supervisors.

Communication between supervisors and construction labour is a significant factor in improving the efficiency of labour in the South African construction sector (Table 4.6). Despite the relevance of effective communication on construction sites, Serpell and Ferrada (2007) posit that communication management on construction sites is significantly poor. Conversely, Kines et al. (2010) contend that there is regular communication between site supervisors and construction labour, but there is a need to improve on the effectiveness of the message. Kine et al. (2010) further stress that inadequate instructions from supervisors to labour constitute one of the major challenges to construction workers' efficiency. Findings reveal that there is a need to involve competent supervisors in construction process (Table 4.6 & 4.22), since construction site supervisors are the most noticeable people on sites and direct the execution of basic construction operations, as indicated in the literature. Poor coordination of workers by supervisors, as indicated in Table 4.6, is an important factor affecting the efficiency of construction labour.

Improved coordination of construction labour can be attained by providing site supervisors with adequate construction and managerial skills in supervisory work and also augmenting the skills of the available supervisors. Difficulty in the recruitment of skilled construction supervisors has a considerable impact on the efficiency of construction operations (Lim & Alum, 1995; Enshassi et al., 2009). Construction site supervisor absenteeism is identified by Lim and Alum (1995); Kaming et al. (1997), and Makulsawatudom, et al. (2004) as a contributory factor to poor labour efficiency in the construction industry. This study, however found that this factor was regarded as one of the least significant site supervisor-related factors affecting the performance of construction labour.

Table 5: Site manager-related factors

Factors	N	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean value	S.D	Rank
Communication ability of site managers	62	0	1.6	3.2	43.5	51.6	4.45	0.64	1
Site manager's coordinating skill	62	0	1.6	11.3	33.9	53.2	4.39	0.75	2
Planning ability of site managers	62	0	1.6	6.5	48.4	43.5	4.34	0.67	3
Level of education of site managers	62	0	1.6	6.5	51.6	40.3	4.34	0.67	3
Decisions of site managers	62	1.6	0	6.5	51.6	40.3	4.29	0.73	5
Inadequate instructions of site managers	62	0	4.8	4.8	54.8	35.5	4.21	0.75	6
Technical skill of site managers	62	1.6	1.6	11.3	45.2	40.3	4.21	0.83	6
Site manager's relationship with project team	62	0	1.6	19.4	40.3	38.7	4.16	0.79	8
Administrative experience of site managers	62	0	1.6	6.5	48.4	43.5	4.16	0.79	8

Findings reveal the communication ability of site managers to be an important factor in the efficiency of construction labour (Table 4.7 & 4.22).

Turner and Muller (2004) note that communication contributes to trust building on construction projects and ineffective communication can result in breakdown in trust. The ability of site managers to communicate project objectives to project teams is significant to the performance of construction projects.

Also, coordination of construction teams by site managers, as indicated in Table 4.7, is important to efficient labour performance (Table 4.22). Fraser (2000) suggests that construction organisations should consider training and professional development of site managers for performance improvement. Further, the planning ability of site managers was found to be an essential factor for improving the efficiency of construction workers (Table 4.7). Adequate planning and co-ordination ensures proper organisation of construction resources and overall efficiency of construction operations (Egbu et al., 2004). Significantly, the level of education of site managers was found to be a challenge to the discharging of site manager responsibilities on construction sites (Table 4.7). Kazaz et al. (2008) note that the proper qualifications of construction managers are essential to construction workers performance while Fapohunda and Stephenson (2010) identify the need for training and personal development of construction managers, especially on new technology for improved utilisation of construction resources. The decisions of site managers on construction projects are found to be of considerable importance to the efficiency of construction labour (Table 4.7).

Olander (2007) claims that a significant challenge confronting site managers is the difficulty of ascertaining the needs of construction project stakeholders, comparing these needs with the project objectives and deciding on the best decisions to adopt.

5. INTERVIEW REPORT

The first interview was conducted with a site supervisor on May 13, 2014 at 12h17min in the construction site office during the lunch break. The site supervisor interviewed had twenty-five years of site supervision experience in the construction industry. The interview session lasted for about forty-five minutes, as the interviewee responded to each question after a reading by interviewer from a printed copy. The site supervisor stated that, based on past experience, site managers communicated well on site but quite often there was misinterpretation of messages. The respondent indicated that site manager coordination on construction sites was good, based on experience, but could be improved. The site supervisor stated that the site supervisor's skill was satisfactory on construction sites. The site supervisor added that communication problems like language barriers, and inclement weather conditions, were issues that affected the efficiency of construction workers. The second interview was conducted with a site supervisor on May 14, 2014 at 12h05min in the worker's common room during the lunch break. The site supervisor interviewed had sixteen years of site supervision experience in the construction industry. The interview session lasted for about thirty-five minutes, the respondent noted that some of the construction managers he had worked with communicated well, while the communication skill of some managers was insufficient. The respondent further expressed that communication effectiveness depends on the competence of site managers on a particular project. The site supervisor stated that strikes affect construction workers' efficiency, because labour does the actual work. He indicated that the coordination efforts provided by construction site managers were not satisfactory on sites, particularly on the site in question. The site supervisor also noted that the efficient performance of site supervisors depends on their construction experience and educational background. The respondent stated that the construction skill of the site supervisor was fair.

The third interview was conducted with a site supervisor on May 15, 2014 at 10h05min in the construction site office. The site supervisor interviewed had twelve years of site supervision experience in the construction industry. The interview session lasted for about thirty minutes, with the respondent answering questions after the interviewer read them from a printed copy.

It was the opinion of the respondent, based upon person experience, that the construction site manager's communication skills were not good enough and needed to be improved. The respondent believed that site manager coordination was important to achieve good production standards, and was of the opinion that the site manager's coordination skills were average for the industry. Based on personal experience, the respondent felt that the majority of site supervisors had adequate construction skills but that there were other factors that affected labour efficiency, like factors that were beyond the control of site supervisors. The respondent stated that construction sites experienced shortage of construction materials, but not on a regular basis. The fourth interview was conducted with a site supervisor on May 15, 2014 at 12h23min in the construction site office. The site supervisor interviewed had ten years of site supervision experience in the construction industry. The interview session lasted for about thirty-five minutes. The interviewee responded to questions read from a printed copy by the researcher. Missing information in architectural drawings was perceived to occur quite often on construction sites. The site manager's communication skill needed improvement because it was important to project performance on sites. The site supervisor expressed the opinion that the communication skills of site manager were not good enough on construction sites. The site supervisor stated that the coordinating skill of the site manager was mostly fair, but sometimes unsatisfactory.

The skill of the construction site supervisor was sometimes poor, and this affected the output of labourers. The respondent indicated that sometimes there were shortages of construction materials on sites, but that this was an infrequent occurrence. The fifth interview was conducted with a site supervisor on May 16, 2014 at 11h15min in the construction site office. The site supervisor interviewed had twenty-eight years of site supervision experience in the construction industry. The interview session lasted for about thirty minutes while the interviewee responded to the questions read from a printed copy. The site supervisor stated that the communication ability of construction site managers on construction sites had not been encouraging. Based on the respondent's personal experience, the site manager's coordinating skill needed to be improved on this construction project. The respondent stated that the site supervisor's construction skills were good, but could be improved upon. The sixth interview was conducted with a site supervisor on May 16, 2014 at 12h22min in the construction site office, during the lunch break. The site supervisor interviewed had eight years of site supervision experience in the construction industry. The interview session lasted for about thirty-five minutes, as the interviewee responded to each question after a reading by the interviewer from a printed copy. The site supervisor stated that the construction site manager communicated effectively on sites, but sometimes the message was not understood by the recipient. The site managers on this site tried his best to coordinate well, but needed to upgrade his skills. Many site supervisors had labour skills; construction skill of supervisors was satisfactory, as it was company practice to attend skill development programmes once a year. The respondent added that labour absenteeism and faulty equipment also slowed down construction operation.

6. CONCLUSIONS AND RECOMMENDATIONS

The objective of the study evaluates the impact of construction-related factors on the efficiency of the construction workforce. All the identified factors in the study attract more than 50% agreement rate from respondents.

Therefore, it could be safely concluded that the majority of the identified construction-related factors significantly affect the efficiency of construction labour on sites. Nonetheless, the most significant factors affecting construction labour efficiency on this subject are essential to be noted, if improvement of construction labour efficiency is to be achieved. It is found that the communication ability of site managers, site managers' coordination skills, construction skills of site supervisors and communication between supervisors and construction labourers on construction sites are essential factors to improving the efficiency of construction labour. The study also reveals shortage of construction materials, inclement weather conditions on construction sites and challenges associated with construction site planning as some of the factors affecting the efficiency of construction labour.

The success of construction projects significantly hinges on the efficiency of construction site managers and individual site supervisors. Work experience of construction managers and site supervisors is insufficient to ensure successful delivery of construction projects. The ability of site managers and site supervisors to effectively communicate project objectives to project teams and effectively coordinate construction labour is affected by variables other than working experience in the construction industry. Construction site managers and site supervisors are required to integrate practical knowledge acquired in the industry and management skills to effectively communicate project objectives to construction teams. Irrespective of the working experience of site managers and site supervisors in the construction industry, management training that includes communication, skills development and site coordination principles is recommended for construction site managers and site supervisors on consistent basis on construction projects in Gauteng and Western Cape Provinces. This will go a long way in solving current defective communication system on construction sites.

ACKNOWLEDGEMENT

We acknowledge the Faculty of engineering, Cape Peninsula University of Technology and department of Construction Management and Quantity Surveying for the financial supports provided that ensured the possibility of this study.

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