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Labour-related Causes Controlling the Construction Efficiency in Sri Lankan Building Projects: The Viewpoint of Site Supervisors

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Abstract

Background: Workforce efficiency has a significant impact on the profitability of construction companies. Construction industry in Sri Lanka has been facing a wide range of labour-related issues that reduce the efficiency and productivity of construction operations. The construction supervisors play a key role in managing a variety of project-level procedures. This study attempted to measure the effects of labour-related causes on the efficiency of construction operations in Sri Lankan building projects.

Methods: A comprehensive literature review was conducted to identify the significant labour-related causes that influence the efficiency of construction projects. Subsequently, a questionnaire survey was conducted among 64 building construction firms in Sri Lanka. The Relative Importance Index (RII) approach was used to determine the impact level of each element. Additionally, a number of industry consultative discussions were held to assess the key actions necessary in the construction site management processes, in comparison with the identified essential variables.

Results: A total of 27 causes were found to be critical, where the top five ranking labour-related criteria were found to be lack of thinking abilities, lack of knowledge in construction works, communication problems, lack of labour morale/commitment and labour discipline. Through statistical testing, the validity and reliability of the study findings were confirmed.

Conclusions: The study findings will substantially help to modernise the present industry procedures to increase the overall productivity and efficiency. Although the study findings are restricted to the Sri Lankan settings, some of them might be applicable to other developing nations also.

Keywords: Building Construction, Labour Efficiency, Sri Lanka, Supervisory Perspectives

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INTRODUCTION

The infrastructure development and facilities of a nation are greatly influenced by the construction sector. It significantly contributes to the growth of the economy of a country and creates a broad range of employment opportunities [1]. Since it integrates all other resources in different construction jobs, labour is the most valuable resource in the construction industry [2]. In a normal construction project, labour expenditures account for between 30% to 50% of the entire project costs [1]. Therefore, increasing the efficiency of labour is essential for long-term performance of construction enterprises [2]. The construction industry has been losing the efficiency of labour in many emerging nations, which hinders the physical pace of construction projects [3, 4-6]. Numerous studies claim that a variety of labour-related issues are the primary factors causing the low efficiency in building operations [7-12].

Construction companies have struggled with the lack of skilled labour, which has a negative impact on workers' performance and reduced construction output [2, 4-5, 10, 13-15]. According to previous studies, one of the main causes of labour skill shortages in the construction industry has been the lack of job experience among workers [5-6, 11-12, 16-17]. Poor educational backgrounds and inadequate training facilities for labourers have also been discovered to have a substantial impact on labour skills [6, 18-20]. Due to the lack of skilled labourers, many developing nations like Sri Lanka employ unskilled labourers to perform skilled labour operations [10, 21-22].

According to recent studies conducted in various countries, namely Iran [1], India [7, 14, 16], Vietnam [11], Indonesia [23] and Qatar [24], labourers' physical capabilities have an impact on the efficiency of work operations in many construction projects. The concerns with labourers' physical capabilities are attributed primarily to the age of the workforce [10, 14, 18, 20, 25]. Studies show that the increased burden on workers also has an impact on their physical capabilities [20].

Health issues and drug/alcohol usage among workers have been identified as the major causes affecting the labour efficiency in the Indian construction industry [20]. Notably, heavy alcohol and drug usage has been found to have a negative impact on how well Indonesian construction workers perform [23]. The labourers' capacity to adjust to changes in the workplace is significantly influenced by their health issues [3]. Further studies have revealed that labourers' performance in construction tasks is affected by their psychological and financial issues in India [16] and Turkey [26]. According to Shashank *et al.* [14], labourers' personal issues have a notable impact on their efficiency in construction sites.

In many nations, it has been discovered that workplace discipline needs to be enhanced among construction labourers [11, 16, 19]. The construction industry in India [22] and Nigeria [10] both have reported low labour morale and dedication. According to Hickson and Ellis [27], frequent unscheduled breaks, early departures and late arrivals have reported to cause a major negative impact on the efficiency of labour in numerous construction projects in Trinidad and Tobago. Furthermore, past studies reveal that Egyptian labourers waste a lot of time talking, eating and drinking, which has a substantial negative impact on labour efficiency in the construction industry [5, 28].

Overall, as indicated in Table 1, the current study has thoroughly analysed previous studies on labour-related issues affecting the productivity and the efficiency of construction operations in various developing nations.

The Sri Lankan Context

Only a limited number of studies have investigated the labour-related problems influencing the construction productivity and efficiency in Sri Lanka. Widanagamachchi

[33] has found that the main causes of the lack of motivation among Sri Lankan labourers in construction projects are their inability to understand technical drawings, temporary nature of the job, demanding atmosphere and the absence of social recognition. According to Praveen *et al.* [34], the labourers' poor material handling skills and inability to grasp drawings are the main issues among Sri Lankan construction contractors.

Table 1: Previous Studies that Investigated the Problems Associated with Construction Labourers in Different Countries

Country	Studies
India	2, 9, 12, 16, 20, 22,
Indonesia	23, 29
Iran	1, 4
Nigeria	10, 30
Palestine	31
South Africa	18-19
Sri Lanka	6, 8, 15, 17, 21
Trinidad & Tobacco	27
Turkey	25, 26
Turkmenistan	32
Vietnam	11
Zimbabwe	13

The Construction Industry Sector Council (CISC) of Sri Lanka has identified the poor cognitive and job-specific technical abilities of Sri Lankan labourers as the key obstacles in increasing labour productivity in the Sri Lankan construction industry [35]. According to Silva *et al.* [6], the main labour-related problems in the Sri Lankan construction projects are labour shortages, interpersonal conflicts among labourers, low motivation and morale, slow mobilization of labourers, inadequate experience and injuries.

A comprehensive investigation carried out by Manoharan *et al.* [36] has presented a wide range of labour-related factors that significantly affect the productivity and efficiency of construction operations in the Sri Lankan construction industry. Based on the state of the practices in the Sri Lankan construction sector, a total of 32 factors have been emphasized as shown in Table 2. The comparison of these elements with other studies from various international contexts is also shown in Table 2.

Overall, studies show how crucial it is for the building construction sector to address a variety of labour-related issues, in order to increase the efficiency of construction operations. Many construction companies invest more in the building construction than other sorts, while taking Sri Lanka's construction industry into account. On the other hand, the perspectives of construction supervisors are very important in the decision making on work site operations, as they are the human resources, who directly handle the labour operations [28]. Accordingly, this study intends to quantify the influence levels of labour-related causes on the efficiency of construction operations in the Sri Lankan building construction projects based on the perspectives of construction supervisors. This will facilitate the construction sector in many developing nations to modernize site practices to combat labour-related issues.

METHODOLOGY

Based on the viewpoint of construction supervisors, this study used quantitative methodologies to measure the influence level of each component (given in Table 2) on the efficiency of building construction operations. This study also used extensive methodologies to evaluate the accuracy and dependability of the results. These are covered in the sections that follow.

Questionnaire Survey

A questionnaire survey was conducted among 64 Sri Lankan construction companies, with one construction supervisory worker representing each company and answering questions based on their existing practices for undertaking construction projects.

The survey questions employed the Likert scale of five ordinal measurements, ranging from 1 to 5 (very low effect to very high effect) to assess the influence levels of

Table 2: Labour-related Causes Influencing Construction Labour Productivity and Efficiency Presented by Manoharan *et al.* [36]: Mapping with Other Past Studies from Different Countries

Code	Causes	Past Studies from Different Countries												
		India	Indonesia	Iran	Nigeria	Palestine	South Africa	Sri Lanka	Trinidad & Tobacco	Turkey	Turkmenistan	United Arab Emirates	Vietnam	Zimbabwe
L1	Lack of working experience	X		X	X	X		X	X	X	X		X	X
L2	Poor education background	X					X	X						
L3	Lack of knowledge in construction works	X					X	X				X		
L4	Poor ability of reading, understanding, speaking and writing	X					X	X						X
L5	Lack of thinking abilities	X				X	X	X	X					
L6	Physical ability and fatigue	X	X	X									X	
L7	Health problems	X												
L8	Use of alcohol and drugs	X	X											
L9	Lack of labour morale/commitment	X			X									
L10	Labour discipline	X	X				X						X	
L11	Ageing workforce	X			X		X			X				
L12	Psychological problems	X								X				
L13	Economic problems	X					X			X				
L14	Personal problems	X												
L15	Communication problems		X											
L16	Misunderstanding with other workers	X				X								
L17	Skill shortage	X	X	X	X			X	X			X		X
L18	Mixture of three levels (Skilled, Semi-skilled and Unskilled)	X		X	X			X						
L19	Late arrival, early quit and frequent unscheduled breaks								X					

Code	Causes	Past Studies from Different Countries											
		India	Indonesia	Iran	Nigeria	Palestine	South Africa	Sri Lanka	Trinidad & Tobacco	Turkey	Turkmenistan	United Arab Emirates	Vietnam	Zimbabwe
L20	Unnecessary talks													
L21	Work overload	X												
L22	Work dissatisfaction	X		X	X			X				X		
L23	Inability to understand drawings							X						
L24	Inability to adapt to changes in new environments													
L25	Improper material handling							X						
L26	Poor equipment/tool handling							X						
L27	Changing nature of career expectation	X	X									X		
L28	Skill drain/ emigration							X						
L29	Less job interest due to family and society	X		X				X						
L30	Other ways of earning money									X			X	X
L31	Labour absenteeism	X	X											
L32	Labour strikes		X											

each element. Cognitive interviews with a few construction supervisory workers supported the questionnaires that had been created. The snowball sampling technique was employed to identify the building contractors for this questionnaire survey, taking into account the challenges in determining the actual sample size with desired features.

For this survey, the higher-grade contractors of the Construction Industry Development Authority (CIDA) were taken into consideration. The CIDA is the authorised organisation in Sri Lanka that offers contractor registration with qualifications appropriate for the construction industry. According to CIDA's national registration and grading scheme, construction contractors are divided into 11 grades based on their financial stability, technical proficiency and practical experience. The minimum financial need to get the middle level of CIDA registration (grade C4) is 50 million Sri Lankan Rupees.

The Table 3 presents a complete profile of the respondents based on their CIDA grades and work experience in the building construction industry. The majority of the contractors were in the C4 grade (56%).

Notably, all the survey respondents had at least five years of work experience in the construction industry, with the majority having between five and ten years of experience (55%).

Quantitative Analysis

The Relative Importance Index (RII) approach was used to calculate the influence level of each listed cause on the efficiency of construction operations. As suggested by other studies [1, 11], RII values were calculated using Equation (1).

$$RII = \frac{\sum W}{A * N} \quad (1)$$

- W is the weight provided by the respondents to each element (1 – Very low, 2 – Low, 3 – Moderate, 4 – High, 5 – Very high).
- A stands for the maximum weight permitted (A equals 5).
- The total number of responses is shown as N.

The higher RII value shows that the corresponding component has a significant influence on the efficiency of construction operations. The associated element/cause had to have a minimum RII value of 0.7 to be determined as critical. The coefficient of variation (CV) values for all the listed causes were determined to assess the validity and reliability of the findings. The reliability of the outcome for each listed cause is guaranteed by a CV value of less than 0.3, according to Statistics Canada [37].

Additionally, construction specialists from different working categories convened for a number of meetings and workshops, and the outcomes were discussed to decide what mitigation steps should be implemented in the site procedures. The outcomes of these discussions also served as the means of validating the findings.

RESULTS AND DISCUSSION

Table 4 shows the degree of the influence of labour-related causes on the efficiency of construction operations, based on the viewpoint of construction supervisors. Considering the RII scores of the listed causes, 27 of those 32 causes were identified as being critical (more than 0.7). The top five ranking labour-related causes included, lack of thinking abilities, lack of knowledge in construction works, communication problems, lack of labour morale/commitment and labour discipline.

Table 3: Detailed Profile of Survey Respondents

Profile	Variables	No. of Responses	Percentage
CIDA Grade of Contractors (Financial Limit of the Projects - LKR in Million)	CS2 / CS1 (X > 1500)	00	00%
	C1 (1500 >= X > 600)	08	13%
	C2 (600 >= X > 300)	06	09%
	C3 (300 >= X > 150)	14	22%
	C4 (150 >= X > 50)	34	56%
Experience in the construction field	Less than 5 Years	00	00%
	5–10 Years	35	55%
	11–15 Years	18	28%
	16–20 Years	04	06%
	21–25 Years	05	08%
	More than 25 Years	02	03%

Table 4: Influence Levels of the Labour-related Causes Controlling the Efficiency of Construction Operations

Codes of Causes	Mean	RII	SD	CV	Ranking	Level of Impact
L5	4.53	0.91	0.16	0.18	1	High
L3	4.44	0.89	0.15	0.17	2	High
L15	4.41	0.88	0.14	0.16	3	High
L9	4.34	0.87	0.16	0.18	4	High
L10	4.34	0.87	0.16	0.18	4	High
L17	4.34	0.87	0.15	0.17	4	High
L2	4.33	0.87	0.15	0.17	7	High
L1	4.28	0.86	0.16	0.19	8	High
L31	4.22	0.84	0.15	0.18	9	High
L4	4.09	0.82	0.14	0.17	10	High
L8	4.06	0.81	0.12	0.15	11	High
L7	3.97	0.79	0.14	0.18	12	High
L6	3.91	0.78	0.15	0.19	12	High
L22	3.84	0.77	0.14	0.18	14	High
L12	3.77	0.75	0.13	0.17	15	High
L16	3.75	0.75	0.11	0.15	16	High
L13	3.72	0.74	0.12	0.16	17	High
L14	3.72	0.74	0.13	0.17	17	High
L21	3.69	0.74	0.12	0.16	19	High
L23	3.69	0.74	0.14	0.19	19	High
L18	3.67	0.73	0.1	0.14	21	High
L19	3.67	0.73	0.13	0.18	21	High
L25	3.67	0.73	0.12	0.16	21	High
L26	3.61	0.72	0.12	0.17	24	High
L24	3.55	0.71	0.14	0.20	25	High
L27	3.52	0.70	0.15	0.21	26	High
L29	3.50	0.70	0.14	0.20	27	High
L20	3.48	0.70	0.11	0.16	28	Medium
L11	3.36	0.67	0.12	0.18	29	Medium
L28	3.31	0.66	0.11	0.17	30	Medium
L30	3.25	0.65	0.14	0.22	31	Medium
L32	2.34	0.47	0.19	0.41	32	Low

Notably, the skill shortage, poor education background, lack of work experience, labour absenteeism and poor ability of reading, understanding, speaking and writing were the other labour-related resolve issues in the workplace. These are crucial life skills for forming connections, adopting perspectives and communicating. According to industry consultants, the main causes influencing how well construction workers can think to include mental impairments, a lack of confidence, social conditioning, work pressure and personal issues. Critical thinking skills are important for labourers to make wise judgments.

The experts also emphasized the importance of regular brainstorming sessions and meditation routines for labourers at construction sites to develop their cognitive skills. Workers' ability to think, read, learn, retain knowledge, pay attention, solve issues, remember tasks and make judgments depend on their cognitive abilities. The results of the

current study show that labourers' poor cognitive abilities have a major negative influence on their performance and productivity in numerous building construction projects in Sri Lanka. The cognitive abilities of Sri Lankan labourers in various technical operations (particularly concreting, bar bending, plastering, tiling, welding, electrical works and equipment handling) need to be greatly increased, according to the industry consultation specialists.

The cognitive skills of labourers in those categories require specific attention from construction training institutions, as stated by Manoharan *et al.* [38]. According to Praveen *et al.* [34], the slow progress of building construction activities in Sri Lanka was mostly due to the labourers' inadequate comprehension of blueprints and material management.

According to this study, labourers' inadequate communication skills are the main obstacle to their participation in teams and collaborative work in many building construction projects in Sri Lanka. According to the consultation with industry experts, this has led to worker miscommunication, job mistakes, rework and construction delays. The experts also emphasized the need of connecting the quality control efforts with the communication strategies of construction businesses because inadequate communication facilities lead to subpar work in construction operations. This study also emphasizes how crucial it is for workers to understand safety communication procedures in order to avoid unanticipated injuries during work operations. The construction delays in numerous construction projects in Sri Lanka were considerably exacerbated by occupational injuries [15].

The sense of accountability that a worker has towards the objectives and expectations of the company is known as labour morale or commitment. This has a big impact on raising labour productivity and efficiency in the building industry. However, the majority of Sri Lankan labourers' passion for their given tasks at work is insufficient. Manoharan *et al.* [38] underlined the critical need for strengthening the commitment of Sri Lankan labourers in construction by contrasting them with the Arabian, Chinese, Korean and Malaysian labour forces, who were the top foreign labour forces in the skill-based ranked list. The secondary education and vocational training institutions in Sri Lanka must pay attention to strengthening the soft skills and attitude domain components in their curricula, according to the industry consultation experts. The construction companies must also make sure the workplace is conducive to the increased level of labour engagement.

Worker discipline is crucial for carrying out work operations within a structure or framework. The majority of Sri Lankan labourers come from undereducated backgrounds and are not aware of the standards that must be upheld for behaviour and work performance. The professionals in the field emphasized how many building construction projects in Sri Lanka lack employee handbooks, standard operational procedures and employment agreements. Therefore, inadequate labour discipline has a big impact on how productive building operations are. Similar issues were also identified in other developing nations, including India [16], Indonesia [23], South Africa [19] and Vietnam [11].

According to the results of this study, the performance, productivity and quality of work operations in building construction projects in Sri Lanka are all negatively impacted by the labour shortage. The lack of labourers with the necessary skills and work experience has been a major issue for construction contractors in many nations, including Egypt [5], India [2, 12, 16], Iran [4], Nigeria [10], South Africa [18-19] and Zimbabwe [13]. The lack of emphasis on construction education in school curricula, especially in the Sri Lankan setting, may be

the main factor contributing to the skills gap among construction labourers [35]. Due to the lack of experienced labourers, many building construction projects in Sri Lanka employ unskilled labourers as skilled labourers. This hinders workers' ability to build their careers and get the necessary job experience, and it also leads to low-quality work outputs.

The Sri Lankan construction sector's labour training facilities need to be improved, according to the Industry Sector Skills Councils (ISSC) of Sri Lanka. ISSC also claimed that many public sector training programmes in Sri Lanka do not adequately address the needs of the industry [35]. The weak cognitive and job-specific technical skills of the Sri Lankan labourers are the other areas where ISSC stands out.

According to this survey, labour absenteeism has also been a major issue for the building construction contractors in Sri Lanka. Notably, it also caused delays in the Sri Lankan building construction sector [15]. According to the experts' debates, labourers' low levels of job interest, motivation, dedication and work satisfaction were found as the main causes of labour absenteeism in many building construction projects in Sri Lanka. The experts revealed that salary delays, lack of proper incentives, no labour rewarding mechanisms, improper promotion opportunities, lack of job security for labourers, fewer welfare facilities for labourers and other ways of earning money are the major elements contributing to Sri Lankan labourers' decreased motivation, lack of job interest and work dissatisfaction.

According to the study findings, the majority of labourers in the Sri Lankan building construction industry have poor job performance due to their weak reading, understanding, speaking and writing skills. This has been a significant obstacle for the labourers to handle the difficulties in their workplace. The development of the labourers' cognitive, transferable and self-management skills depends greatly on their ability to acquire new things relevant to job operations. The above-mentioned poor skills of Sri Lankan labourers may be specifically caused by their lack of early schooling. Past studies that looked at labour forces working on construction projects in India [12, 16], South Africa [18-19], Turkey [26] and Zimbabwe [13] have all revealed similar issues.

This study clearly states that labourers' workload intensity affects how well they perform throughout construction operations. The mood and behaviour of employees are impacted by their workload, which also results in poor mental focus, low motivation and difficulties focusing on job duties [39]. Relationships with co-workers and managers may be strained as a result. According to Semaksiani *et al*. [39], an excessive workload also lowers employee morale and motivation, which results in work tiredness. The experts' discussions highlighted that the main causes of the excessive workload of labourers in Sri Lankan building construction projects are the unrealistic project timetables and sequences of construction jobs.

A well-planned project schedule increases productivity and ensures that resources are distributed efficiently, which lowers costs and speeds up the process. The experts' discussions further revealed that the primary causes of unrealistic project schedules include disagreements in subcontractors' schedules, delays in subcontractors' work and delays in acquiring permits/approvals from necessary authorities. Additionally, conversations among experts found that inadequate time management skills of supervisors and a dearth of trained labourers employed are other reasons contributing to the high workloads of labourers.

Overall, the CV values of each cause guarantee the accuracy and dependability of these results. The CV values of all the causes with the exception of 'labour strikes (L32)' were within the permissible range, as per the

range of CV values listed in the Labour Force Survey Guide 2020 of Canada [37]. Since only a small number of projects may be affected by the labour strikes, the influence levels of L32 may greatly differ amongst projects. Furthermore, the L32 comes in last on the list. The high CV value of L32 may also be impacted by the low mean value. Therefore, it cannot be said that the CV value emphasises the lower level of precision for the result of L32. Additionally, the outcomes from the discussions with industry representatives ensured the authenticity of the results of this study.

CONCLUSIONS

Based on the perspectives of construction supervisors, this study has identified the crucial labour-related causes that influence the progression of construction operations in Sri Lankan building projects. The influence levels of the causes demonstrate how much consideration should be given to each aspect of labourers in order to increase the productivity and efficiency of construction operations.

Overall, the study has shown significant labour-related causes that the construction site management should pay attention to increase the productivity and efficiency of construction operations. The study also emphasised the urgent need to improve the nation's vocational training programmes in order to improve the cognitive, interpersonal and task-specific abilities of construction labourers. This study highlights that future studies should concentrate on methods for enhancing labour skills in the construction industry. The overall study findings are anticipated to significantly alter site management practices and policies in the direction of the construction industry's long-term sustainability. The study findings are restricted to construction procedures in Sri Lankan building construction. However, some of these might also be tested in comparable circumstances in other developing nations.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

AUTHORS' CONTRIBUTIONS

KM: Conceptualized, designed the research, carried out the investigation, performed data curation and analysis, and wrote the manuscript. PD: Supervised the study and reviewed the manuscript. CP: Supervised the study and reviewed the manuscript. DD: Supervised the study and reviewed the manuscript. RS: Supervised the study and reviewed the manuscript.

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