Labour productivity in Zambia's construction industry: A multi-site qualitative investigation of workforce, organisational, and resource constraints

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ABSTRACT

Labour productivity in Zambia's construction sector is a continuous and complex challenge influencing project outcomes, budget management, and the development of national infrastructure. The construction industry contributes roughly 15.6% to the gross domestic product and serves as the main vehicle for implementing the Eighth National Development Plan (8NDP), yet it faces persistent productivity issues that lead to cost overruns, project delays, and reduced quality in both public and private undertakings. Despite its vital role, empirical research at the company level examining the specific factors affecting labour productivity in Zambia remains limited. This study was guided by two theoretical lenses, Human Capital Theory and Expectancy Theory, which together capture the capability and motivational dimensions of workforce productivity. The research explored workforce-related, organisational, and resource-availability factors that influence labour productivity in selected construction firms in Zambia. An interpretive qualitative multiple-case study design was adopted, involving four purposively selected construction firms operating in Lusaka and the Copperbelt Province. Eighteen semi-structured interviews were conducted with participants drawn from senior management, project management, site supervision, and skilled-worker categories, complemented by analysis of relevant organisational documents. Thematic analysis was conducted using a six-phase framework via NVivo 12, producing three main themes and nine sub-themes with 370 coded references. Three interrelated deficits hinder labour productivity in Zambia's construction sector: (1) a self-reinforcing human-capital underinvestment cycle perpetuated by limited TEVETA capacity, casual employment practices, and brain drain; (2) a client–contractor–worker payment cascade in which delays in client payments erode worker motivation, worsened by poor site planning that produces avoidable idle time; and (3) structural resource constraints, including material-procurement disruptions tied to currency depreciation and landlocked logistics, equipment downtime aggravated by a "landlocked maintenance trap" with spare-part lead times of four to eight weeks, and limited technology adoption constrained by daily load shedding. Project complexity emerged as a moderating factor that intensifies all three deficit categories. The study contributes three contextualised theoretical constructs, the human-capital underinvestment cycle, the payment cascade, and the landlocked maintenance trap, and extends Human Capital and Expectancy theories to landlocked Sub-Saharan African construction. The study provides evidence-based recommendations for construction firms, policymakers, and vocational training institutions.

Keywords: Construction Industry, Expectancy Theory, Human Capital Theory, Labour Productivity, Landlocked Economy, Resource Availability, Workforce Management

I. INTRODUCTION

Labour productivity within the construction sector plays a vital role in determining project success, organisational competitiveness, and national economic growth. Although the construction industry represents approximately 13% of global gross domestic product (GDP) and employs over 7% of the working-age population worldwide, productivity growth has been stagnant or declining in many economies over the past two decades (Kane & Lopez, 2023). The sector's productivity levels trail behind those of manufacturing and agriculture, primarily due to its inherent complexity, labour-intensive character, and the numerous interrelated technical, managerial, and logistical factors that must be coordinated simultaneously (Dai et al., 2009). In Sub-Saharan Africa, construction productivity deficits are exacerbated by structural issues such as persistent skill shortages, weak supply chains, ageing equipment, institutional capacity gaps, and macroeconomic instability, all of which depress labour output below what could be achieved under more favourable conditions. These constraints extend beyond economic inefficiency; they materially limit national governments' ability to develop essential infrastructure.

Zambia's construction industry occupies a critical role in this context. Contributing approximately 15.6% to GDP (Zambia Statistics Agency [ZSA], 2022), the sector is the principal vehicle for delivering the infrastructure priorities of the Eighth National Development Plan (8NDP), spanning roads, energy, housing, and public services. The National Council for Construction (NCC, 2021) has identified labour productivity as a strategic priority, noting that productivity-linked cost overruns are widespread in both public and private construction projects. However,

comprehensive firm-level investigations into the specific ways in which workforce, organisational, and resource factors interact to constrain productivity in Zambian construction firms remain scarce.

This study was guided by Human Capital Theory (Becker, 1964; Schultz, 1961) and Expectancy Theory (Vroom, 1964). Human Capital Theory frames productivity as a function of the knowledge, skills, and experience embodied in workers and accumulated through investment in education and training. Expectancy Theory explains productivity as a function of motivation, shaped by workers' beliefs that effort will produce performance, that performance will be rewarded, and that rewards will be valuable. Together, these frameworks capture both the capability and the motivational foundations of labour productivity and provide the theoretical scaffolding for the present investigation. This paper presents the results of a qualitative multiple-case study of four construction firms in Zambia. Section I introduces the study and sets out the problem statement, aim, objectives, and research questions. Section II reviews the theoretical framework and empirical literature. Section III describes the methodology. Section IV presents and discusses the findings. Section V provides the conclusion and recommendations.

1.1 Statement of the Problem

In an ideal situation, construction labour productivity in Zambia would reflect a skilled and motivated workforce supported by effective management, adequate resources, appropriate technology, and supportive policy, leading to maximum output per worker, on-time project completion within budget, high-quality work, and stronger contributions to national infrastructure and economic progress. In practice, productivity in the Zambian construction sector falls well short of this ideal.

The empirical gap is compounded by a paucity of research: although recent Zambian studies have explored specific aspects of productivity standards (Ngoma et al, 2025) and trade-specific constraints in bricklaying and concreting (Ngoma et al, 2025), there is a notable absence of firm-level investigations that examine the complex interplay between workforce dynamics, organisational structures, and resource availability affecting labour productivity in formal construction enterprises in Zambia. Most existing productivity models are derived from developed or Asian settings and may not adequately reflect the distinctive institutional, infrastructural, and socio-economic conditions of Sub-Saharan Africa. The implications of this knowledge gap are significant: increased project costs that strain government budgets and private investment; delays in essential 8NDP infrastructure; reduced sectoral competitiveness; lost economic and employment opportunities; and constraints on Zambia's broader socio-economic development objectives. This research was therefore motivated by the urgent need for empirically grounded, contextually relevant solutions to these interconnected deficits.

1.2 Research Objectives and Questions

The primary aim of this study was to investigate the factors affecting labour productivity in selected construction firms operating in Zambia. This aim was pursued through the research objectives and questions summarised in Table 1.

Table 1

Research Objectives and Research Questions

Code	Research Objective	Research Question
RO1	To investigate workforce-related factors affecting labour productivity in selected construction firms in Zambia.	What workforce-related factors affect labour productivity in selected construction firms in Zambia?
RO2	To investigate organisational factors affecting labour productivity in selected construction firms in Zambia.	What organisational factors affect labour productivity in selected construction firms in Zambia?
RO3	To investigate resource-availability factors affecting labour productivity in selected construction firms in Zambia.	What resource-availability factors affect labour productivity in selected construction firms in Zambia?

II. LITERATURE REVIEW

2.1 Theoretical Review

Two complementary theories inform this study. Human Capital Theory explains productivity as a function of the knowledge, skills, and experience embodied in workers, while Expectancy Theory explains productivity as a function of motivation, shaped by workers' cognitive evaluations of effort, performance, and reward. Together, these theories frame productivity as the joint product of capability and motivation, both of which are shaped by organisational and environmental conditions.

2.1.1 Human Capital Theory

Human Capital Theory, developed by Becker (1964) and Schultz (1961), views labour efficiency as a function of the stock of knowledge, skills, and experience possessed by workers. This stock is augmented through investment in

formal education, vocational training, and practical work experience. The theory distinguishes between general human capital, which comprises universal skills applicable across contexts, and specific human capital, which is valuable mainly within a particular industry or organisation (Schultz, 1961). In the construction sector, specific human capital includes trade-specific expertise, familiarity with construction practices and regulations, proficiency with particular equipment, and knowledge of organisation-specific management processes. The theory predicts that deficiencies in formal training and skills development will produce lower worker productivity, higher rework rates, and reduced capacity to perform complex tasks (Afolabi et al., 2018).

2.1.2 Expectancy Theory

Vroom's (1964) Expectancy Theory posits that employee motivation, and therefore productivity, is a function of three cognitive evaluations: expectancy (the belief that effort will lead to performance), instrumentality (the belief that performance will yield rewards), and valence (the attractiveness of the reward). Applied to construction site management, the theory suggests that inadequate planning produces avoidable idle time that undermines expectancy; unreliable or delayed wages undermine instrumentality; and poor working conditions reduce the valence associated with productive effort (Kazaz et al., 2008; Dai et al., 2009).

2.2 Empirical Review

The empirical literature is reviewed below in line with the study's three research objectives: workforce-related factors, organisational factors, and resource-availability factors.

2.2.1 Workforce-Related Factors and Productivity

Empirical research consistently identifies worker skill levels, training, and experience as primary influences on construction labour productivity across varied settings. Enshassi et al. (2007) identified skill gaps as the single most important factor affecting productivity in Palestinian construction. Similar findings have been reported in Iran (Ghoddousi & Hosseini, 2012).

2.2.2 Organisational Factors and Productivity

Organisational factors, especially management quality, site supervision, compensation practices, and working conditions, shape productivity through their effects on worker motivation and the efficient coordination of work. Ghoddousi and Hosseini (2012) identify poor planning and weak supervision as principal productivity barriers in the Iranian construction industry. The adverse effects of compensation-related demotivation are well documented: Kazaz et al. (2008) report a direct link between payment problems and construction worker productivity in Turkey, while Enshassi et al. (2007) identify wage delays as the leading motivational barrier on construction sites in Gaza. Management quality emerges in the literature as a central determinant of productivity in Sub-Saharan African construction organisations, operating alongside welfare and compensation conditions. Evidence also suggests a productivity–welfare tension in which costs associated with poor welfare consistently exceed the investment required to improve it, yet competitive tendering pressures encourage firms to reduce welfare expenditure.

2.2.3 Resource-availability Factors and Productivity

A substantial body of empirical work demonstrates that resource availability, including the supply of materials, the condition of equipment, and the presence of technological tools, is a key structural determinant of construction labour productivity (Dai et al., 2009; Durdyev, 2021). Material-procurement delays disrupt the continuous flow of work and create involuntary idle periods that directly reduce output per worker-hour (Enshassi et al., 2007). Equipment downtime is recognised as a major productivity constraint in developing countries, where weak maintenance systems and limited spare-part availability extend both the frequency and duration of equipment failures (Arashpour et al., 2018). The adoption of technology, particularly digital project-management tools and Building Information Modelling (BIM), has been identified as a productivity enabler (Oesterreich & Teuteberg, 2021; Gonzalez-Caceres et al., 2019); however, its realisation depends on reliable digital infrastructure that is often lacking in developing economies. The existing literature inadequately theorises the joint effect of landlocked economic geography on material and equipment supply chains in Sub-Saharan Africa. The interaction between currency depreciation and procurement-budget adequacy as a distinct productivity mechanism also remains underexplored. The present study addresses these gaps.

III. METHODOLOGY

3.1 Research Design

This study adopted an interpretivist philosophical stance, which holds that the experiences and meanings associated with productivity are socially constructed by individuals within their organisational and institutional contexts (Creswell & Poth, 2017). An inductive approach was used, allowing themes to emerge from participants' narratives

rather than imposing pre-existing theoretical categories on the data, consistent with the exploratory aim of contextualising established productivity models within the Zambian setting.

A qualitative multiple-case study design (Yin, 2017) was employed. The case-study approach was chosen because it permits an in-depth exploration of a phenomenon within its real-world context, producing rich, context-sensitive insights that are not obtainable through survey or experimental designs (Stake, 1995). Four construction firms were purposively selected to ensure meaningful variation in firm type, size, and specialisation: two internationally affiliated firms (Companies A and D, engaged in large civil and infrastructure projects) and two locally registered firms (Companies B and C, engaged in residential and commercial construction) operating in Lusaka and the Copperbelt Province.

3.2 Study Area

The study was conducted in Lusaka and the Copperbelt Province, the two provinces that together concentrate the majority of Zambia's formal construction activity. Lusaka, as the national capital, hosts the largest share of public infrastructure projects, commercial developments, and head offices of construction firms. The Copperbelt, historically the industrial heartland of Zambia, concentrates mining-related civil works, industrial construction, and associated residential and commercial development. Together, these two provinces provided a suitable geographic setting for examining productivity dynamics across both internationally affiliated and locally registered construction firms operating on substantial projects.

3.3 Target Population

The target population for this study comprised employees of formally registered construction firms operating in Zambia. Within these firms, the population of interest consisted of personnel whose work directly influences or is directly affected by labour productivity, namely senior managers, project managers, site supervisors and foremen, and skilled workers. These four occupational strata were chosen because together they span the organisational hierarchy through which productivity is planned, managed, supervised, and delivered on construction sites.

3.4 Sampling and Sample Size

Purposive sampling was used at two levels. At the firm level, four construction companies were selected to ensure variation in ownership structure (international versus local), project type (civil/infrastructure versus residential/commercial), and location (Lusaka and the Copperbelt). At the participant level, a maximum-variation purposive sampling strategy was applied to capture perspectives from across the organisational hierarchy. A total of eighteen participants were purposively selected across the four occupational strata: senior management (n=4), project managers (n=4), site supervisors and foremen (n=4), and skilled workers (n=6). Of twenty-two individuals approached, eighteen completed interviews, giving an overall response rate of 81.8% (Company A: 83.3%; Company B: 80.0%; Company C: 100%; Company D: 66.7%). Data saturation was considered to have been reached when no substantively new codes emerged from additional interviews. The descriptive profile of the participants is presented in Table 2.

Table 2

Descriptive Profile of Research Participants (n=18)

Characteristic	Category	n	%	Note
Role	Senior Management	4	22.2	
	Project Manager	4	22.2	
	Site Supervisor / Foreman	4	22.2	
	Skilled Worker	6	33.3	
Company Type	International	9	—	Companies A & D
	Local / Domestic	9	—	Companies B & C
Experience (years)	1–5	2	11.1	
	6–10	7	38.9	Mean = 10.6 yrs
	11–15	6	33.3	
	16+	3	16.7	
Gender	Male	16	88.9	Reflects sector demographics (ZSA, 2022)
	Female	2	11.1	
Qualification	Certificate / Diploma (Vocational)	8	44.4	
	Bachelor's Degree	5	27.8	
	Master's Degree	2	11.1	
	Informal / On-job Training Only	3	16.7	

3.5 Data Collection Tools and Procedure

Semi-structured interviews were the primary data-collection tool. Interview guides were designed to systematically address the three research objectives while allowing flexible probing of context-specific themes that emerged (Bryman, 2012). Interviews were conducted face-to-face at participants' workplaces between February and August 2024 and lasted 45 to 65 minutes each. With participants' informed written consent, interviews were audio-recorded and subsequently transcribed verbatim to support accurate analysis. To triangulate the interview data, document analysis (Bowen, 2009) was carried out on training records, human-resources policies, project progress updates, equipment maintenance logs, and procurement documentation obtained from the four participating firms.

3.6 Data Analysis

Thematic analysis was conducted using Braun and Clarke's (2006) six-phase framework: (1) becoming familiar with the data through repeated reading of the transcripts; (2) generating initial codes; (3) searching for candidate themes by clustering related codes; (4) reviewing themes against the full data set; (5) defining and naming themes; and (6) producing the thematic report. NVivo 12 (QSR International) was used to support consistent coding, theme development, and maintenance of a clear audit trail. Node frequencies, in terms of the number of sources and references coded to each node, are reported as quantitative indicators of theme prominence within the qualitative data set.

3.7 Ethical Consideration

Ethical clearance was obtained from the University of Zambia, Graduate School of Business Research Ethics Committee prior to data collection. All participants provided written informed consent after receiving an explanation of the study's purpose, procedures, risks, benefits, and their right to withdraw at any time without penalty. Anonymity and confidentiality were protected through the use of coded identifiers in place of names and firm identifiers (for example, SM-A1 denotes the first Senior Manager from Company A; SW-C4 denotes the fourth Skilled Worker from Company C). Recordings and transcripts were stored on password-protected devices accessible only to the research team. Trustworthiness was assessed using Lincoln and Guba's (1985) four criteria: credibility was pursued through data-source triangulation (interviews and documents) and member checking with selected participants; transferability through thick description of the research context; dependability through strict adherence to the six-phase analytic protocol documented in NVivo; and confirmability through reflexive journalling and an explicit audit trail.

IV. FINDINGS & DISCUSSION

4.1 Findings

This section presents the findings of the thematic analysis and discusses them in relation to the study's theoretical framework and the reviewed empirical literature. The findings are organised by the three research objectives that guided the study. Thematic analysis produced three overarching themes and nine sub-themes, with a total of 370 coded references across 18 sources. The NVivo node summary is presented in Table 3. Verbatim participant quotations are reported in italics and are cited by participant code and interview date.

Table 3

NVivo Thematic Node Summary: Themes, Sub-Themes, and Coding Density

Theme / Sub-Theme	Sources (n)	References (n)	Research Objective
THEME 1 — Workforce-Related Factors			RO1 / RQ1
1.1 Skills Deficits	16	47	
1.2 Training Inadequacy	15	39	
1.3 Experience & Adaptive Capacity	14	32	
THEME 2 — Organisational Factors			RO2 / RQ2
2.1 Management & Site Supervision	17	54	
2.2 Compensation & Payment Delays	16	48	
2.3 Working Conditions & Safety	13	29	
THEME 3 — Resource-Availability Factors			RO3 / RQ3
3.1 Material Procurement Delays	17	52	
3.2 Equipment Failures & Maintenance	15	41	
3.3 Technology Adoption Barriers	12	28	
TOTAL	**18**	**370**	

4.1 Workforce-Related Factors (RO1)

The first research objective examined workforce-related factors affecting labour productivity. Three sub-themes were identified: skills deficits, training inadequacy, and experience and adaptive capacity.

4.1.1 Skills Deficits

Skills deficiencies were identified as the most widespread workforce barrier to productivity, reported by 16 of 18 participants across 47 coded references. Participants reported acute shortages of formally trained workers in essential construction trades, including bricklaying, reinforced-concrete work, electrical installation, and heavy-equipment operation. These shortages were consistently associated with two productivity outcomes: slower task completion and higher rates of rework. SM-A1 observed that workers without formal training

> *"Are unable to read blueprints, do not possess the skills to calculate quantities, and require constant oversight."* (SM-A1, Interview, 14 February 2024).

PM-C2 estimated rework rates of between 10% and 20% on projects predominantly staffed by informally trained workers and attributed these to misinterpretation of project specifications. SS-B3 illustrated the productivity differential concretely:

> *"A qualified bricklayer can lay 600–700 bricks a day, but an untrained worker may only manage 200, and a good portion of those will have to be removed and redone."* (SS-B3, Interview, 19 March 2024).

The structural drivers of the skills deficit were consistently linked to limited TEVETA capacity, with graduates of vocational institutions often lacking site-ready practical competencies. Brain drain to South Africa, Botswana, and regional mining labour markets was reported as a compounding factor at three of the four firms, as skilled workers exit for higher-paying opportunities in nearby markets, depleting the skilled labour pool available to Zambian construction employers. These findings are consistent with Enshassi et al.'s (2007) identification of skill gaps as the leading productivity constraint in Palestinian construction and with similar evidence from Iran (Ghoddousi & Hosseini, 2012).

4.1.2 Training Inadequacy

Training opportunities across all four firms were uniformly judged inadequate (15 sources; 39 references). A director at Company C explained the scheduling constraint:

> *"We understand that training improves productivity, but projects cannot be put on hold. It is not feasible to pause a site for two weeks to train employees and still meet our timeline."* (SM-C1, Interview, 9 April 2024).

This observation highlights a scheduling mechanism by which tight project timelines and competitive pricing systematically crowd out formal training investment. Informal (casual) employment arrangements further weaken the incentive for training investment. SM-D1 described the investment risk:

> *"What is the point of training someone for three months if their contract is only for six, and they can take those skills to another company?"* (SM-D1, Interview, 22 May 2024).

This reflects a self-reinforcing underinvestment dynamic: employers incur training costs while facing a high probability that trained workers will exit to competitors, lowering the expected return on training below the threshold that would justify the investment. This finding extends Mwela et al. (2021) identification of skills shortages as a productivity barrier in Zambia by articulating a specific contractual mechanism, casual employment, through which underinvestment is sustained, an explanation largely absent from prior quantitative studies.

4.1.3 Experience and Adaptive Capacity

Worker experience emerged as an important compensatory resource for formal-training deficits (14 sources; 32 references). Experienced workers displayed adaptive capacity, an ability to improvise and solve practical problems under the specific operational conditions of Zambian sites. Examples included substituting materials in response to procurement delays, improvising temporary equipment repairs, and scheduling work around load shedding. Participants repeatedly noted that experienced workers' output on complex tasks was two to three times that of their less experienced counterparts. PM-A2 commented:

> *"An experienced foreman can keep a gang productive through a whole day of interruptions that would stop a less experienced team for hours."* (PM-A2, Interview, 6 June 2024).

Consequently, the exit of experienced workers to neighbouring labour markets imposes a productivity loss that substantially exceeds a simple numerical reduction of the workforce, reinforcing the importance of retention-focused human-capital strategies.

The Human-Capital Underinvestment Cycle: Taken together, the three workforce sub-themes suggest a self-reinforcing human-capital underinvestment cycle that operates as a long-run structural brake on Zambian construction labour productivity. The cycle operates through four interlocking mechanisms: (i) limited TEVETA capacity produces an inadequately skilled workforce; (ii) the resulting skills deficit generates elevated rework (10–20%), extended project durations, and increased supervisory burden that together erode firm margins; (iii) tighter margins constrain the budgets firms can allocate to training; and (iv) casual employment reduces firm-level returns on training investment, further suppressing training spend. Brain drain simultaneously depletes the pool of experienced workers who might otherwise compensate for formal-training shortfalls. This conceptualisation extends Human Capital Theory (Becker, 1964;

Schultz, 1961) by foregrounding the institutional and contractual conditions, TEVETA under-capacity, casual employment, and regional brain drain that prevent market mechanisms from resolving the underinvestment equilibrium. It implies that firm-level actions alone are insufficient to break the cycle: systemic reforms in vocational training provision and in the regulation of employment contracts are required.

4.2 Organisational Factors (RO2)

The second research objective examined organisational factors affecting productivity. Three sub-themes emerged: management and site supervision, compensation and payment delays, and working conditions and safety.

4.2.1 Management and Site Supervision

Ineffective site-management practices produced the highest coding density of any sub-theme in the data set (17 sources; 54 references). PM-A2 estimated that poor planning accounted for up to 60% of total productivity losses on his projects. The pattern was characterised by reactive scheduling, ambiguous task assignment, and inadequate supervision that left workers without clear guidance. Participants identified specific mechanisms generating idle time: materials not staged in advance, delays in clarifying drawings, and cascading gang-level delays in which upstream interruptions produced idle time for dependent downstream trades. SM-B1 captured this directly:

> *"You see workers standing watching lorries unload materials they should have had the day before."* (SM-B1, Interview, 27 March 2024).

Supervision quality emerged as a within-theme moderator: firms employing formally trained supervisors (Companies A and D) exhibited markedly more structured planning and lower reported idle time than Companies B and C. This finding provides within-study evidence for an extension of Human Capital Theory to the supervisory role itself, where managerial human capital operates as productive capital. The result resonates with Ghoddousi and Hosseini's (2012) identification of poor planning and weak supervision as principal productivity barriers and with Dai et al.'s (2009) framing of managerial quality as a key productivity determinant. From an Expectancy-Theory perspective, the mechanism operates through expectancy: unclear task assignments and frequent interruptions weaken workers' belief that effort will translate into meaningful output, reducing motivation.

4.2.2 Compensation and Payment Delays

Wage-payment delays were the most fully documented motivational barrier in the data set (16 sources; 48 references). Participants consistently traced the root cause to a sequential chain involving clients, contractors, and workers: delays in client payments to contractors produce cash-flow shortfalls that, in turn, delay worker wages. SW-D4 (Equipment Operator) described the resulting motivational effect:

> *"When your salary is delayed for a month, you come to work but you lack motivation. You only do the bare minimum because you are uncertain when you will be paid."* (SW-D4, Interview, 11 July 2024).

This experience maps directly onto an instrumentality failure within Expectancy Theory: the worker's belief that effort and performance will reliably yield reward is undermined by payment uncertainty, producing a measurable reduction in discretionary effort. Casual employment amplifies the motivational impact of payment delays: without formal contracts guaranteeing fixed pay periods and dispute-resolution channels, casual workers have limited recourse when wages are delayed. SS-B3 reported a particularly severe outcome, namely workers abandoning a site after six weeks of unpaid wages, requiring a further four weeks to rebuild the workforce, an unrecoverable productivity loss for that project phase. This finding corroborates Kazaz et al.'s (2008) Turkish evidence of a direct link between payment problems and construction productivity and Enshassi et al.'s (2007) identification of wage delays as the leading motivational barrier on Gaza construction sites. It extends that literature by articulating the full client–contractor–worker cascade, thereby locating the phenomenon as a structural industry feature rather than an isolated firm-level failure.

4.2.3 Working Conditions and Safety

Working conditions, including welfare facilities, provision of personal protective equipment (PPE), on-site safety measures, and cleanliness, were frequently described as inadequate across all four firms (13 sources; 29 references). SM-A1 captured the motivational mechanism:

> *"Employees who feel appreciated and secure are more productive than those who feel replaceable."* (SM-A1, Interview, 14 February 2024).

This observation articulates the valence component of Expectancy Theory. PPE shortages, particularly for trades requiring respiratory or fall-protection equipment, operated as both safety and productivity barriers: workers tended to avoid hazardous tasks in the absence of proper protection, producing lost productive time. Poor sanitation and lack of shaded areas were cited at all four firms as factors discouraging sustained effort during Zambia's hot season. Notably, Companies A and D allocated more resources to welfare facilities than did Companies B and C, and employees at the

former reported appreciably higher morale and productivity, providing within-study evidence of a welfare–productivity link.

The Client–Contractor–Worker Payment Cascade: The organisational findings jointly reveal and conceptualise a structured client–contractor–worker payment cascade that links upstream client-payment delays to downstream worker-motivational deficits and, ultimately, to measurable productivity loss. The cascade operates mechanically: client delays produce contractor cash-flow shortfalls that propagate to delayed worker wages; delayed wages undermine the instrumentality component of Expectancy Theory; reduced instrumentality depresses discretionary effort. This cascade clarifies why wage-payment problems (Ngoma et al., 2025) in the Zambian context are structurally persistent rather than the product of isolated managerial lapses, implying that firm-level compensation reforms, while valuable, cannot resolve motivation and productivity deficits without complementary reforms to client-payment discipline and contractual-payment enforcement at the industry level.

4.3 Resource-Availability Factors (RO3)

The third research objective examined resource-availability factors. Three sub-themes emerged: material-procurement delays, equipment failures and maintenance, and technology-adoption barriers.

4.3.1 Material-Procurement Delays

Material-procurement delays were the most frequently cited resource constraint (17 sources; 52 references). Work stoppages due to material unavailability were described as routine rather than exceptional at all four firms. Participants identified four interrelated causes: (i) import logistics delays associated with Zambia's landlocked status and the time required for materials to travel from ports to project sites; (ii) depreciation of the kwacha, which erodes the effective purchasing power of approved budgets, making it impossible to procure the planned quantities at current exchange rates; (iii) dependence on a limited pool of suppliers, producing delays whenever preferred suppliers experience capacity constraints; and (iv) poor procurement planning, with orders placed too late relative to project demand. The currency-depreciation mechanism is context-specific and theoretically consequential. SM-D1 explained:

> *"When you approve the budget in January and the kwacha drops by 15% by March, suddenly the cement you intended to buy costs 15% more than what you have. You then have to wait for a budget revision that takes four to six weeks, during which time the site comes to a halt."* (SM-D1, Interview, 22 May 2024).

This mechanism, in which approved budgets become inadequate for purchasing the planned quantities as exchange rates move between contract award and procurement execution, is a distinctly Zambian productivity constraint that is underdeveloped in the international construction-productivity literature. It contextualises and extends Dai et al.'s (2009) general accounts of material-procurement delays by documenting currency depreciation as an independent causal channel.

4.3.2 Equipment Failures and Maintenance

Equipment downtime was identified as a major, systematically underestimated productivity barrier, particularly on the large civil-engineering projects of Companies A and D (15 sources; 41 references). The study identified a 'landlocked maintenance trap': when equipment breakdowns require imported spare parts, the resulting downtime is disproportionately long because of 4–8 week regional-logistics lead times. SM-D1 summarised the economics:

> *"A machine remains unused for six weeks waiting for a component that costs less than the productivity lost in a single day."* (SM-D1, Interview, 22 May 2024).

The large gap between spare-part cost and lost productivity points to a basic market failure: the absence of local spare-part inventories generates externalities that no single firm has sufficient incentive to address. Equipment age compounded the problem: participants at three firms reported fleets predominantly aged 12–15 years, with failure rates rising sharply with age. Companies B and C lacked systematic preventive-maintenance programmes, relying instead on reactive maintenance that produced longer and more frequent downtimes than the proactive programmes of Companies A and D. The 'landlocked maintenance trap' extends Arashpour et al.'s (2018) classification of equipment failures, which distinguishes operational (maintenance-related) from strategic (asset-management) failures, by adding a third, logistical category that arises specifically from geographic insularity.

4.3.3 Technology-Adoption Barriers

Technology adoption across the four firms lagged significantly behind international benchmarks (12 sources; 28 references). Companies A and D employed basic digital project-management tools, whereas Companies B and C relied predominantly on paper-based documentation. None of the four firms had implemented Building Information Modelling (BIM). The principal structural barrier to adoption was the prevalence of load shedding, averaging approximately eight hours per day during the data-collection period. PM-C2 observed:

"It is impossible to operate a BIM model on a laptop that is without power for eight hours each day. Even charging devices is a challenge." (PM-C2, Interview, 30 April 2024).

This observation identifies an infrastructure-specific barrier to construction-technology adoption that receives limited attention in the international literature, which tends to assume reliable digital infrastructure. A clear gap also emerged between internationally affiliated and locally registered firms: the better-capitalised internationally affiliated firms invested in backup generators, which partially mitigated load-shedding impacts and enabled somewhat greater adoption of digital tools. This divergence indicates that the technology-adoption gap is jointly determined by financial capacity and infrastructural reliability.

The Landlocked Maintenance Trap and Currency-Depreciation Channel: The resource-availability findings propose and conceptualise two context-specific mechanisms. The landlocked maintenance trap captures the disproportionate equipment downtime that arises when equipment breakdowns intersect with 4–8 week spare-part lead times, generating loss ratios (lost productivity to spare-part cost) that cannot be corrected by individual firm action. The currency-depreciation channel captures the way in which exchange-rate movements between contract award and procurement execution erode the adequacy of approved budgets, converting a monetary phenomenon into a physical work stoppage. Both mechanisms extend the resource-availability literature (Durdyev, 2021; Arashpour et al., 2018) by specifying the geographic-logistical and macroeconomic channels through which resource constraints translate into lost productive time in Sub-Saharan African landlocked construction.

4.4 Project Complexity as a Moderating Variable

Project complexity emerged as a cross-cutting moderator that amplifies the productivity impact of all three deficit categories. On complex infrastructure projects, skills deficits are more costly because tolerances are tighter and rework is more expensive; motivational deficits are more damaging because complex coordination across trades requires sustained commitment that is corrosively eroded by casual employment and payment uncertainty; and resource interruptions produce more severe cascading consequences because delays at a single point propagate through numerous dependent activities. This moderating role carries clear policy implications: the very projects that form the core of Zambia's 8NDP agenda, large civil works, roads, and energy infrastructure, are precisely those in which current productivity constraints bite most deeply.

4.5 Alignment of Findings with Theoretical Framework and Literature

Table 4 summarises the alignment of key findings with the theoretical framework and reviewed empirical literature, specifying the contextual contributions of the study.

Table 4

Alignment of Findings with Theoretical Framework and Literature

Key Finding	Theoretical Grounding	Literature Support	Contextual Contribution
Skills deficits generate rework (10–20%) and slow task completion	Human Capital Theory (Becker, 1964; Schultz, 1961)	Enshassi et al. (2007); Afolabi et al. (2018).	TEVETA capacity gap and brain drain theorised as systemic perpetuators of the human-capital underinvestment cycle
Casual employment creates self-reinforcing training-underinvestment cycle	Human Capital Theory — casual employment reduces training ROI	Ngoma et al. (2025)	Project-schedule crowding-out mechanism identified as specific driver absent from prior quantitative studies
Client–contractor–worker payment cascade undermines motivational instrumentality	Expectancy Theory (Vroom, 1964) — instrumentality failure	Kazaz et al. (2008); Enshassi et al. (2007)	Full cascade architecture from client-payment delays to worker motivation theorised for the first time
Poor site management creates avoidable idle time (up to 60% of productivity loss)	Expectancy Theory (expectancy); Human Capital Theory (managerial HC)	Ghoddousi & Hosseini (2012); Dai et al. (2009)	Idle-time creation identified as primary mechanism; supervisory human capital as within-theme moderator
Currency depreciation and landlocked logistics compound material-procurement delays	Resource-based empirical literature	Dai et al. (2009)	Currency-depreciation mechanism documented as an independent procurement-delay channel specific to Zambia
'Landlocked maintenance trap': 4–8 week spare-part lead times create disproportionate equipment downtime	Resource-based empirical literature	Durdyev et al. (2020); Arashpour et al. (2018)	Original concept third (logistical) category of equipment failure added to Arashpour et al.'s operational/strategic typology

Taken together, the analysis indicates that labour productivity in Zambian construction is jointly suppressed by a capability deficit (skills), a motivational deficit (instrumentality failure through payment and planning), and a physical-resource deficit (materials, equipment, and technology), with project complexity amplifying all three. These deficits interact multiplicatively rather than additively, producing compounded productivity losses that exceed the sum of the individual effects. The comparison between internationally affiliated firms (Companies A and D) and locally registered firms (Companies B and C) provides within-study evidence that meaningful productivity improvement is feasible in Zambia when supportive conditions (better training, more reliable compensation, more disciplined maintenance) are in place.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This study set out to investigate the workforce-related, organisational, and resource-availability factors affecting labour productivity in selected construction firms in Zambia. Drawing on Human Capital Theory and Expectancy Theory, and using a qualitative multiple-case study of four firms and eighteen participants in Lusaka and the Copperbelt Province, the study reached the following key conclusions.First, Zambia's construction industry is caught in a self-reinforcing human-capital underinvestment cycle, driven by limited TEVETA capacity, casual employment arrangements, and the exodus of skilled workers to regional labour markets. Skills deficits generate rework rates of 10–20% and protracted task completion, while the resulting pressure on firm margins constrains training investment, perpetuating the skills gap across successive project cycles. Worker experience partially compensates for formal-training shortfalls through demonstrated adaptive capacity, making the retention of experienced workers a priority for productivity improvement.

Second, organisational productivity is systematically undermined by a client–contractor–worker payment cascade in which client-payment delays propagate through contractors to workers, producing instrumentality failures that directly reduce motivation and discretionary effort. Poor site management, characterised by reactive planning, ambiguous task assignment, and weak supervision, generates avoidable idle time that participants estimated accounts for up to 60% of productivity loss on some projects. Inadequate working conditions further erode the valence attached to productive effort. Third, resource availability is constrained by a set of structural mechanisms that are specific to, or amplified by, Zambia's landlocked, import-dependent economy. Material procurement is disrupted by currency-depreciation gaps between contract award and execution, equipment downtime is lengthened by a 'landlocked maintenance trap' with 4–8 week spare-part lead times, and technology adoption is constrained by load shedding averaging approximately eight hours per day.

Finally, these three deficit domains interact with project complexity to produce compounded productivity losses that exceed the sum of their individual effects, with the greatest impact felt on the large infrastructure projects central to the 8NDP. In the absence of integrated strategies that simultaneously address capability, motivation, and resource availability, Zambia's infrastructure-delivery ambitions will remain exposed to persistent cost overruns and schedule slippage attributable to construction labour productivity shortfalls.

5.2 Recommendations

Flowing from the conclusions above, the study recommends a coordinated response involving construction firms, public institutions, and vocational-training providers. Construction firms should institutionalise pre-project skills-needs assessments aligned with TEVETA competency frameworks in order to convert reactive skills-gap management into proactive workforce planning, and should form inter-firm training partnerships through industry associations to pool training costs, share trained workers, and internalise the returns on training investment beyond the individual firm. At the organisational level, firms should formalise site-planning protocols, invest in supervisor training, strengthen preventive-maintenance regimes, and, where feasible, secure backup power to reduce both idle time and equipment downtime. Policymakers, the National Council for Construction (NCC), and TEVETA should prioritise a systematic expansion of TEVETA programme capacity with curricula deliberately aligned to site-ready construction competencies and with performance metrics linked to post-training site productivity outcomes. In parallel, regulators should enact contractual-payment enforcement mechanisms, mandating client-payment timescales with penalties for late payment that cascade through subcontractors to workers, in order to reform the payment culture that sustains the cascade mechanism at industry level. Standardised labour-productivity benchmarks, developed by the NCC and tailored to Zambia's institutional and infrastructural realities, would enable firms, clients, and regulators to identify productivity gaps and to assess the effectiveness of interventions against objective baselines. Finally, future research should complement the present qualitative study with mixed-methods designs that quantitatively validate the productivity losses identified here, longitudinal studies that assess the effects of TEVETA and payment-enforcement reforms over time, and comparative work across other landlocked Sub-Saharan African construction sectors to test the generalisability of the mechanisms identified.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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