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Evaluation Of Gamification on Labour Productivity in Construction Sites in Abuja, Nigeria.

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Abstract- ***Labour productivity in the construction industry remains a global concern, especially in developing nations such as Nigeria, where inefficiencies, delays, and low worker engagement undermine project delivery outcomes. The problem of poor motivation and underutilization of human resources persists despite modern construction methods. This study aimed to identify approaches for integrating game-based elements into construction site practices and investigate the impact of gamification on labour productivity in construction projects. A quantitative research design was adopted using purposive sampling technique which is a non-probability technique. Data were collected from 60 construction professionals in Abuja through structured questionnaires. Data were analyzed using descriptive statistics such as frequencies, percentages, mean item scores, and standard deviations. The findings revealed that gamification approaches— daily challenges and task completion (MIS = 4.07), leaderboards (MIS = 4.03), and real-time feedback (MIS = 3.98) —significantly enhanced worker motivation, engagement, safety compliance, and knowledge retention. However, the study found that 'enhanced learning and development' (MIS = 4.12) was ranked as the highest potential impact of gamification. Virtual Reality safety drills, gamified quizzes and level-based skills modules improve workers ability even though with limited formal education. The study concludes that gamification is a promising, innovative, and human-centred approach for addressing productivity challenges in construction projects. It recommends integration of gamification into site management practices, starting with simple, low-cost strategies such as visual progress boards, peer recognition, and team competitions before scaling up to digital platforms,***

Keywords: Construction, Gamification, Labour Productivity, Project Delivery, Workers' Motivation

I. INTRODUCTION

The construction industry is one of the largest and most labour-intensive sectors globally, playing a vital role in economic growth and infrastructure development. However, the industry is persistently challenged by issues related to low labour productivity, inefficiencies, and poor worker motivation (Aliu et al., 2024). Despite the adoption of modern construction technologies and project management strategies, productivity levels in construction remain stagnantly low compared to other sectors such as manufacturing and information technology (Leeite et al., 2023).

Labour productivity on construction sites has been a long-standing concern for stakeholders due to its direct influence on project delivery performance. Studies have shown that issues such as poor motivation, lack of engagement, skill deficiencies, and fatigue contribute to underperformance among construction workers (Musonda & Pretorius, 2021 and Udeh et al., 2025). While traditional methods like monetary incentives and penalties have been employed to address these issues, they often fail to sustain long-term productivity gains.

In recent years, the intersection of psychology, technology, and human behaviour has introduced a novel concept known as gamification—the application of game-design elements such as point scoring, competition, levels, and rewards in non-game contexts. Gamification has gained traction in fields like education, marketing, and corporate training as an effective tool for enhancing user engagement, motivation, and performance (Iibeigi et al., 2023).

Although gamification has shown positive results in other sectors, empirical research on its application in construction projects—especially on-site labour productivity—remains sparse, particularly in developing economies like Nigeria. Understanding the effectiveness, challenges, and best practices for

gamifying construction tasks could offer a fresh lens through which the industry's productivity bottlenecks can be addressed (Oke et al., 2023).

Gamification offers an innovative, behaviourally driven alternative that leverages intrinsic motivation and positive reinforcement to stimulate productivity. However, the construction industry has been slow to adopt such people-centred innovations, possibly due to skepticism, lack of awareness, or unclear return on investment (Leeite et al., 2023).

There is a significant gap in empirical literature regarding how gamification strategies can be effectively integrated into construction environments, especially in terms of their impact on labour output, worker morale, and overall site efficiency (Aliu et al., 2025). Without concrete data and validated frameworks, project managers may be hesitant to explore gamification as a viable intervention. Thus, this study seeks to identify strategies for integrating game-based elements into construction site practices and investigate the impact of gamification on labour productivity in construction projects., providing empirical evidence and practical insights that could help shape future workforce management strategies.

II. THE CONCEPT OF LABOUR PRODUCTIVITY

In developing economies such as Nigeria, labour productivity challenges are compounded by socio-economic and institutional factors, including poor investment in workforce training, lack of modern equipment, low wages, and unstable working conditions (Adebowale et al., 2023). Studies consistently report issues such as weak motivation systems, high levels of worker fatigue, skill deficiencies, and poor engagement as significant barriers to sustained productivity growth (Musonda & Pretorius, 2021 and Udeh et al., 2025). These issues not only increase the risk of cost overruns and project delays but also affect worker morale and turnover rates, further exacerbating inefficiencies.

The concept of labour productivity in construction is multidimensional. It encompasses technical productivity (how effectively workers use tools, equipment, and materials), managerial productivity (how effectively supervisors organize and monitor labour), and behavioural productivity (the psychological and motivational aspects of worker performance). Recent literature highlights that while technological and managerial factors are critical, behavioural and motivational dimensions are often neglected, yet they hold significant potential for improvement (Oke et al., 2023).

Labour productivity in construction has fallen behind other industries in most of the world and has declined continuously for decades. Although several research projects have been conducted to savage the prevalent low labour productivity in construction, contractors in the construction industry have continue to grapple with the devastating impact of low productivity (Adebowale et al., 2023). As the industry continues to evolve, there is growing recognition that productivity cannot be addressed solely through mechanisation or stricter supervision. Human-centric approaches that integrate motivation, engagement, and well-being are increasingly emphasized. Gamification—a strategy that applies game-design elements such as rewards, challenges, and feedback to non-game contexts—has emerged as one such innovative approach to tackle the behavioural side of productivity. By leveraging intrinsic and extrinsic motivators, gamification has the potential to reshape workforce dynamics, improve engagement, and drive sustained improvements in labour efficiency (Oke et al., 2025).

III. GAMIFICATION STRATEGIES FOR ENHANCING LABOUR PRODUCTIVITY IN CONSTRUCTION ENVIRONMENTS

Use of Daily Challenges and Task Completion

Micro-tasking creates frequent opportunities for quick wins and immediate corrective action: supervisors can identify bottlenecks faster, and workers receive near-immediate feedback that sustains attention throughout the day (Oke et al., 2023). Implementation ranges from low-tech whiteboards and sticker systems to lightweight mobile check-ins that push micro-tasks to crews and capture completion evidence (Mustiningsih, 2020,). Careful design is required to tie daily challenges to quality and safety metrics (not just speed) so short-interval control raises throughput without encouraging unsafe shortcuts. In low-connectivity

sites, the approach can start with manual boards and roll into mobile solutions as infrastructure improves (Oke et al., 2023; Åliu et al., 2025).

Leaderboards to Rank Workers' Performances

Leaderboards make individual and team performance visible by ranking crews on multidimensional KPIs. In construction, crew-level leaderboards tend to be more effective than individual-only boards because they encourage mutual assistance across trades and decrease blame on single workers (Oke et al., 2023). Best practice is to design multi-category and time-limited leaderboards with transparent scoring rules and periodic resets, which mitigate winner-takes-all dynamics and demotivation among lower-ranked workers (Zhan et. al., 2022). Practical deployment should consider cultural fit—collectivist settings often prefer team-based rankings—and ensure that leaderboards reward behaviours aligned with safety and workmanship, not merely speed (Leeite et al.,2016:; Oke et al., 2023).

Reward Systems

Reward systems combine extrinsic incentives with intrinsic recognition (Iibeigi et al., 2022;). In construction, frequent small rewards for achievable behaviours (first-time-right work, safety reporting) sustain engagement, while periodic larger rewards (monthly or quarterly) recognise consistent high performance (Adebowale et.al., 2023). To be effective, rewards must be perceived as fair, attainable, and meaningful to workers: fairness and transparent criteria are essential to avoid resentment. Cost-sensitive strategies (pooled rewards, non-monetary perks) make programs feasible for SMEs; importantly, rewards should amplify feelings of competence and relatedness rather than operate as controlling stimuli that undermine intrinsic motivation (Aliu et al., 2024).

Badges and Titles for Milestones Achieved

Badges and tiered titles signal demonstrated skills or behaviours (for example, "PPE Champion," "Concrete Finisher Level 2") and can function as portable micro-credentials when verifiable metadata is embedded. On-site, badges are useful for onboarding, quality assurance and signalling who is authorised to perform specific tasks (Leeite et al., 2023). When employers and professional bodies recognise badges, they become career-building tools that motivate continuous learning and skill acquisition. Practical rollouts should ensure badges are linked to assessed competencies (practical sign-offs), not mere quiz completion, to preserve credibility and encourage meaningful upskilling (Udeh et al., 2025).

Team-Based Competitions

Because construction work is highly interdependent, competitions that reward team-level outcomes align with existing workflows and cultural preferences for collectivism. Team competitions encourage peer coaching, accelerate diffusion of best practices, and incentivise cooperative problem-solving (Mustiniugsih et al., 2020). To avoid intra-site friction, winners should be asked to share techniques with other crews, thereby converting competition into structured peer-learning (Udeh et al., 2025). Evidence suggests team-oriented formats produce stronger buy-in and more sustainable behavioural change than purely individual contests (Adebowale et al., 2023).

Mobile Apps for Productivity Tracking

Smartphone apps are often the operational backbone for gamified systems: they deliver tasks, capture evidence (photos, checklists), update leaderboards, and push badges and notifications (Udeh et al., 2025). Integrated with project-management systems, BIM enables rewards and KPIs to be tied to live schedule and quality data. For contexts with limited bandwidth, designers should prioritise lightweight/offline-capable apps, SMS fallbacks, simple UIs (large icons, multilingual text), and minimal data usage(Oke et al., 2023). Adoption correlates strongly with ease-of-use and visible management support, so pilot programs that test usability with real crews before full deployment are recommended (Leeite et al., 2023).

Visual Progress Tracking Boards (on-site)

Visual boards-physical or electronic-externalise KPIs, create a shared locus of accountability. In practice, a whiteboard updated daily with stickers and brief comments can produce similar normative and motivational effects as a tablet dashboard (Zhan et al., 2022). Visual management supports quick decision-making by supervisors and reinforces social recognition of positive behaviours. Implementation

include placing boards in high-traffic areas (canteen, gate), keeping displays simple, and rotating metrics to maintain interest (Okanlawon et al., 2025).

Creating a Sense of Community

Building a sense of community on construction sites helps foster collaboration, teamwork, and mutual accountability. Gamification can achieve this by introducing mechanisms that encourage workers to view themselves as part of a collective rather than as isolated individuals (Iibeigi et al., 2022;). Workers feel motivated when their contributions directly benefit their team, which enhances morale and productivity. By strengthening social bonds, gamification creates a culture where workers support one another, share knowledge, and collectively strive toward project goals. This not only boosts productivity but also improves safety compliance, as workers are more likely to look out for one another (Aliu et al., 2024).

Virtual and Augmented Reality (VR/AR)

VR/AR enables immersive, gamified simulations of high-risk tasks (working at height, plant operation, confined-space entry) where trainees can practice, fail safely, and receive instant corrective feedback (Oke et al., 2024). Research shows VR/AR yields superior hazard recognition, procedural memory, and transfer of training to the field compared with lecture-based approaches—especially for complex or dangerous tasks. For implementation, start with high-risk, high-impact scenarios and measure transfer via follow-up on-site assessments (Adebowale et al., 2023). Cost-sharing arrangements or training hubs can make VR pilots affordable for local firms (Udeh et al., 2025).

Offering Training and Development Programs

Gamification enhances training by making learning interactive, engaging, and rewarding. Instead of relying solely on traditional lectures or manuals, workers can participate in micro-learning sessions, quizzes, or simulations where points and badges are awarded for progress. Training modules can also be designed at levels so that workers must complete to unlock higher certifications, encouraging continuous learning (Oke et al., 2025). On construction sites, gamified training ensures that workers quickly acquire new skills such as proper equipment handling, safety procedures, or quality control standards. By turning development programs into a game-like experience, workers become more motivated to participate, retain knowledge longer, and apply what they learn in practice, which directly impacts labour productivity (Iibeigi et al., 2023).

Providing Real-Time Feedback

One of the strongest motivators in gamification is immediate feedback. Construction workers benefit when they can see how their efforts contribute to project goals in real time. Through dashboards, scoreboards, or mobile notifications, workers can track their progress, receive instant recognition for achievements, and get corrective suggestions when mistakes occur (Zhan et.al., 2022). This keeps them focused, reduces errors, and allows them to adjust performance quickly. For instance, a real-time system that tracks completed tasks and quality checks can reward workers with points for accuracy or deduct them for errors, making feedback tangible and engaging (Leeite et al., 2023). Such mechanisms improve transparency, strengthen accountability, and ensure that productivity is continuously monitored and enhanced (Iibeigi et al., 2023).

Setting Clear Goals

Gamification works best when goals are clear, measurable, and achievable. In construction, workers often struggle with vague instructions or shifting expectations, which reduces efficiency. By using gamification tools such as progress bars, achievement levels, or milestone-based rewards, objectives become more visible and motivating. For example, setting a daily or weekly target for block laying, plastering, or painting, and linking it with points or badges, makes goals concrete (Hamza et.al., 2022). Workers know exactly what is expected and can track their advancement toward those targets. Clear goals not only provide direction but also create a sense of accomplishment when milestones are achieved, leading to higher motivation and sustained productivity (Musonda & Pretorius, 2021; Iibeigi et al., 2022).

IV. GAMIFICATION ON WORKERS' MOTIVATION AND ENGAGEMENT IN CONSTRUCTION

Rewards Improve Site Workers' Engagement

Rewards—whether tangible, such as bonuses, vouchers, or tools, or intangible, such as badges, recognition, and verbal praise—remain the backbone of gamified interventions (Mustiniugsih, 2020). By linking rewards to task completion and positive behaviour, workers are incentivised to maintain focus and reduce idleness on site (Aliu et al., 2024). Unlike traditional incentive schemes that rely heavily on end-of-project bonuses, gamification distributes rewards more frequently, which sustains effort over time. For example, a crew that receives weekly recognition for meeting safety and productivity milestones will likely remain more consistently engaged than one waiting for a lump-sum payout at project completion (Iibeigi et al., 2022).

Gamification provides workers with visible markers of achievement through levels, milestones, and progress tracking dashboards. This creates a strong sense of advancement, even in repetitive or physically demanding tasks. Workers are more likely to persist when they can see their progress visualized-such as a progress bar for tasks completed or a ranking showing their improvement relative to past performance. The psychological satisfaction derived from this sense of progress fosters persistence and higher goal attainment (Oke et al., 2024).

Leaderboards encourage healthy competition in construction projects by ranking workers or teams based on performance metrics such as productivity, safety compliance, or quality outcomes (Iibeigi et al., 2023). This visibility motivates individuals to improve their standing and fosters accountability, pride, and persistence in task completion. When designed inclusively—such as featuring categories like "most improved" or "safest crew"—leaderboards prevent demotivation among lower performers and provide multiple avenues for recognition (Aliu et al., 2024). In contexts like Nigeria, team-based leaderboards are particularly effective as they promote collaboration, reduce absenteeism, and strengthen social cohesion, making competition constructive rather than divisive (Oke et al., 2025).

Badges, whether digital or physical, act as visible tokens of achievement that validate workers' effort and competence. They satisfy the psychological need for recognition by providing proof of skill mastery or consistent behaviour, such as safe tool use or punctual attendance (Oke et al., 2024). Unlike one-off rewards, badges accumulate over time, motivating workers to maintain consistency in performance. Research shows that badges in gamified systems enhance sustained engagement and build credibility when they are perceived as fair, meaningful, and aligned with workplace expectations (Udeh et al., 2025). However, they must avoid "badge inflation" by being tied to clear criteria and integrated into broader recognition frameworks.

Team-point systems link individual contributions to group performance, rewarding workers collectively for shared achievements such as meeting weekly targets or completing defect-free tasks (Leeite et al., 2023). This fosters accountability and cooperation, as workers are encouraged to support each other to maximise team outcomes. Studies highlight that team-based gamification strengthens collaboration, reduces destructive individual competition, and promotes social bonding within construction teams (Leeite et al., 2023 and Oke et al., 2024). However, if poorly managed, it may demotivate low-performing groups; hence, mechanisms such as rotating teams and recognising "most improved" groups are recommended to balance fairness and morale (Udeh et al., 2025).

Narrative-driven gamification embeds construction tasks within missions or storylines, making work feel purposeful and engaging. Storylines foster immersion and focus by giving otherwise repetitive tasks a meaningful context (Iibeigi et al., 2023). Research has demonstrated that story-driven gamification enhances intrinsic motivation, problem-solving, and knowledge retention in workplace training (Oke et al., 2024).

Time-bound challenge encourage workers to reduce idle time, manage resources efficiently, and stay focused on deadlines. When designed responsibly, these challenges can boost productivity without compromising quality or safety (Musonda & Pretorius, 202). Evidence suggests that time-based gamification enhances task completion rates, particularly when linked with real-time tracking tools and balanced with quality checks (Udeh et al., 2025).

Gamification introduces timers, streaks, and time-bound goals that make workers more conscious of deadlines and punctuality. This fosters discipline and reduces downtime, which is critical for projects operating on tight schedules (Olanrewaju et al., 2024). Gamified interventions introduces variety into daily routines. These moments of novelty and enjoyment reduce monotony, lighten psychological load, and promote overall well-being. By reframing demanding tasks as enjoyable challenges, gamification alleviates stress and creates a healthier work environment (Musonda and Pretorius, 2021; Udeh et al., 2025; Oke et al., 2025).

Gamified systems transform work into a more engaging and rewarding experience, improving job satisfaction and loyalty. When workers feel consistently recognised and motivated through gamification, they are more likely to remain with the organisation, thereby reducing recruitment costs and the disruption of frequent staff replacement (Olanrewaju et al., 2022 and Adebowale et al., 2023).Tools such as VR safety drills, gamified quizzes, and level-based skills modules allow workers to learn through practice and immediate feedback (Aliu et al., 2025). Studies confirm that gamified learning environments improve knowledge retention, hazard recognition, and skill transfer in construction more effectively than traditional lectures (Hamza et al., 2022).

V. METHODOLOGY

This study adopts a constructivist research philosophy, emphasizing interpretation and synthesis of existing knowledge. A quantitative design was considered appropriate because it allows data to be collected in numerical form and subjected to statistical analysis, which provides objectivity and precision in addressing the research objectives (Creswell, 2014). Purposive sampling technique which is a non-probability technique was adopted for data collection in this study. According to Chong and Reinder (2021) the selection of purposive sampling technique depends on its ability to provide a representative sample of the elements based on certain specified criteria, such as the possession of defined knowledge required by the study. A total of seventy questionnaire was self-distributed to respondents of which sixty was returned making a response rate of 85.7%. The study employed descriptive statistics methods in analyzing quantitative data by using Mean Item Score (MIS) and standard deviation. The population of this study consisted of construction professionals (Architects, Quantity Surveyors, Engineers, and Contractors, and consultant) in Abuja, who are actively engaged in project planning, execution, and supervision.

VI. DATA ANALYSIS AND FINDINGS

This section examined the respondents' background which was the academic qualification and working experience of respondents as presented in Table 1. Result on respondents educational qualification, demonstrates that holders of Bachelor degree and higher diploma was above 85% as reflected in the table 61.7%, 18.3% and 6.7% for Bachelor degree/higher diploma, Masters and PhD respectively. This indicates that respondents are knowledgeable and competent to provide the required information for the study. Result on respondent's working experience revealed that 30% of the respondents had worked for 6-10 years, while 26.7% respondents had worked for 11-15 years. 10% respondents had work experience of more than 16 years, while those with less than 5 years' experience were 33.3% in number. This implies that the respondents could be considered well informed as they should have the necessary knowledge of gamification on labour productivity.

Table 1 Educational Qualification and Years of Experience of Respondents

Parameter	Frequency	Percentage(%)
ND	8	13.3
HND	10	16.7
B.SC/B.Tech	27	45.0
M.sci/M.Tech	11	18.3
PHD	4	6.7
TOTAL	60	100%
1 – 5 YEARS	20	20
6 – 10 YEARS	18	30.0
11 – 15 YEARS	16	26.7
16 – 20 YEARS	4	6.7
ABOVE 20 YEARS	2	3.3
Total	60	100%

Effectiveness of gamification approaches on labour productivity in construction.

Twelve gamification approaches were identified in the study, the result of the weighting by the surveyed respondents were presented in Table 2. The study found that the highest-ranked gamification approaches includes daily challenges and task completion (MIS = 4.07), leaderboards (MIS = 4.03), and real-time feedback (MIS = 3.98). This aligns with Mustingiusih (2020), Zhan et al., (2022), Leeiti et al., (2023), Aliu et al., (2025) all acknowledged that careful design is required for the daily challenges, leadership boards to reward behaviours aligned with safety and workmanship and a real-time feedback so workers can track their progress.

Table 2: Gamification Approaches

S/N	Approaches	MIS	Rank
1	Use of daily challenges and task completion	4.07	1st
2	Leaderboards to rank worker's performances	4.03	2nd
3	Providing real-time feedback	3.98	3rd
4	Setting clear goals and objectives	3.97	4th
5	Team-based competitions	3.97	5th
6	Offering training and development programs	3.95	6th
7	Visual progress tracking boards (on-site)	3.93	7th
8	Using virtual reality and augmented reality	3.93	8th
9	Creating a sense of community	3.93	9th
10	Reward systems (e.g., bonuses, points, gifts)	3.92	10th
11	Mobile Apps for productivity tracking	3.92	11th
12	Badges or titles for milestones achieved	3.88	12th

Impact of Gamification on Labour Productivity

Twelve potential impacts were identified in the study, the result of the weighting of the impacts by the surveyed respondents were presented in Table 3. The study found that 'enhanced learning and development' (MIS = 4.12) was ranked as the highest potential impact of gamification. This result corresponds with the findings of Hamza et al., (2022) and Aliu et al., (2025) who acknowledged that tools like Virtual Reality safety drills, gamified quizzes and level-based skills modules improve workers ability even though with limited formal education. 'Increased creativity and innovation' (MIS = 4.08) were ranked as the second highest potential impact. Zhan et al., (2022) and Oke et al., (2023) affirmed that gamification encourages workers to suggest innovative approaches to completing task more efficiently. The third impact 'Rewards improve site workers' engagement' (MIS = 4.03). This is in consonance with the findings of Mustiniugsih (2020); Iibeigi et al., (2022); Aliu et al., (2025) who confirmed that by linking rewards to task completion and positive behaviour, workers can maintain focus and reduce idleness on site.

Table 3: Impact of Gamification

S/N	Impacts	MIS	Rank
1	Enhanced learning and development	4.12	1st
2	Increased creativity and innovation	4.08	2nd
3	Rewards improve site workers' engagement	4.03	3rd
4	Reduce stress and burnout	4.00	4th
5	Improved employee retention	4.00	5th
6	Team points build collaboration	3.97	6th
7	Better time management	3.95	7th
8	Levels and ranks create a sense of progress	3.92	8th
9	Leaderboards encourage healthy competition	3.87	9th
10	Time-based challenges boost output speed	3.87	10th
11	Badges build recognition and motivate consistency	3.85	11th
12	Storyline-based tasks increase focus and engagement	3.77	12th

VII. CONCLUSION

The present study aimed to evaluate gamification on labour productivity in Abuja, Nigeria and the objectives of the study were to identify approaches

for integrating game-based elements into construction site practices and the impact of gamification on labour productivity in construction site. The study concludes that gamification is a promising, innovative, and human-centred approach for addressing productivity challenges in construction site. Unlike traditional incentive systems that focus primarily on monetary rewards, gamification integrates both intrinsic and extrinsic motivators, daily challenges and task completion, leaderboards, real-time feedback, thereby appealing to workers' need for recognition, progress, and belonging. When carefully designed and supported by organizational culture and leadership, gamification can transform repetitive site tasks into engaging activities, strengthen collaboration among workers, and improve overall site performance. The findings underscore the importance of aligning gamification systems with workforce characteristics, infrastructure readiness, and project objectives to achieve sustainable results. Construction firms should integrate gamification into site management practices, starting with simple, low-cost strategies such as visual progress boards, peer recognition, and team competitions before scaling up to digital platforms, Capacity-building programs should be organized to enhance digital literacy and ensure workers understand and effectively engage with gamification tools. Gamification approaches must be tailored to the Nigerian construction environment, considering worker demographics, cultural preferences, and motivational patterns, productivity, motivation, and safety compliance across different project phases.

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