**JoCEF**

**JOURNAL OF CIVIL ENGINEERING FRONTIERS**

# Unveiling the Driving Factors of Emerging Trends in the Ghanaian Construction Industry: An Evaluative Analysis of Push and Pull Factors

*Zakari Mustapha* [1,*], *Benjamin Boahene Akomah* [2], *Ofosu Emmanuel Kwaku* [3]

[1]*Cape Coast Technical University, Department of Construction Technology Management, School of Built and Natural Environment, Ghana, mustapha.zakari@cctu.edu.gh*
[2]*Cape Coast Technical University, Department of Construction Technology Management, School of Built and Natural Environment, Ghana, Benjamin.akomah@cctu.edu.gh*
[3]*Cape Coast Technical University, Department of Construction Technology and Management, School of Built and Natural Environment, Ghana, ofosuemmanuel13@gmail.com*

*Abstract*

**There is a significant change in the Ghanaian construction sector, driven by the convergence of emerging trends. The study investigated the underlying factors influencing these emerging trends in the Ghanaian construction industry, focusing on both pull and push factors. A mixed-methods approach was employed, combining survey data with qualitative analysis, to gain a comprehensive understanding of the drivers shaping the industry's development. The study was conducted within three cities (Cape Coast, Kasoa, and Winneba) in the Central Region of Ghana. Fifteen (15) construction companies were purposively selected based on their interest in technological advancements within the construction ecosystem. Five (5) categories of construction professionals, project managers, quantity surveyors, architects, structural engineers, safety officers, and site supervisors employed by the aforementioned fifteen (15) construction companies were considered for the study.**

**Data collected were analyzed utilizing SPSS software version 20. Push factors highlighted environmental degradation, technological innovation, and infrastructure renewal as significant motivators. Pull factors emphasized the industry's extrinsic motivations, including community development, cultural considerations, and economic growth. The analysis revealed that both push and pull factors play crucial roles in driving the trends within the industry.**

**Qualitative interviews conducted as part of the study provided deeper insights, identifying six key themes: regulatory compliance and market competition, technological advancements, skill development, economic considerations, leadership and strategic vision, and customer demand. These themes underscore the complex relationship between external pressures and internal motivations.**

**Correlation and regression analyses indicated significant relationships between trend recognition and both push and pull factors, emphasizing the interplay between external pressures and aspirational drivers in shaping industry trends. This study contributes to a deeper understanding of the dynamic forces driving change in the Ghanaian construction sector, offering substantial insights for stakeholders. These insights can help stakeholders navigate challenges and capitalize on opportunities for sustainable growth and development. The findings underscore the importance of balancing technological advancements with socio-economic goals to foster a robust and forward-thinking construction industry in Ghana.**

*Keywords: Ghanaian Construction sector, emerging trends, pull factors, push factors, technological advancements.*

## I. INTRODUCTION

The construction industry in Ghana is experiencing a significant transformation driven by a convergence of emerging trends that are reshaping its operational landscape and strategic direction [1]. Technological advancements, notably the adoption of digital technologies like Building Information Modeling (BIM), Artificial Intelligence (AI), and Internet of Things (IoT) are revolutionizing traditional construction processes [2]. Moreover, regulatory reforms are exerting a profound impact on the Ghanaian construction sector, driving changes in standards, practices, and compliance requirements. Government policies promoting transparency, accountability, and sustainability have led to the implementation of building codes, stringent environmental regulations, and initiatives supporting local content participation and skills development [3]. These innovations and reforms are streamlining project delivery, enhance safety, and mitigating risks, compelling

industry stakeholders to adapt to remain competitive. Despite the evident transformative potentials of these technological innovations and reforms, there remains a scarcity of comprehensive studies exploring their driving factors in the Ghanaian construction ecosystem [4,5,]. The push and pull ideology have been applied in several disciplines to provide a framework for understanding the complex interplay of factors that influence the movements and choices of individuals within an organization, and the construction industry in not an exceptional [6]. The study investigated the underlying factors influencing emerging trends in the Ghanaian construction industry, focusing on both pull and push factors. The preceding sections provide an overview the emerging trends in Ghana, the push and pull factors driving emerging trends in the Ghanaian construction industry.

## II.    THE EMERGING TRENDS IN GHANA

The construction sector in Ghana is witnessing remarkable expansion, with its revenue soaring from GHc10.4 billion (US$1.8 billion) in 2013 to GHc29.3 billion (US$5.2 billion) in 2021, reflecting a Compound Annual Growth Rate (CAGR) of 13.8% (source). This growth trajectory is propelled by governmental initiatives, private investments, and the promising prospects Maintaining the Integrity of the Specifications offered by the African Continental Free Trade Area (AFCFTA). The burgeoning demand for affordable housing and infrastructure development, coupled with population urbanization, presents lucrative opportunities for investors and businesses in the construction domain [7]. An emerging trend within the Ghanaian construction landscape is the escalating adoption of Building Information Modeling (BIM) technology across various projects.

BIM facilitates the creation and management of digital representations of both physical and functional aspects of buildings, fostering more efficient collaboration among stakeholders throughout the project lifecycle [7]. This trend is spurred by the imperative for enhanced project coordination, improved communication, and the optimization of resource allocation to minimize errors and rework [8,7]. The widespread implementation of BIM technology is anticipated to revolutionize construction methodologies in Ghana, resulting in heightened efficiency, cost-effectiveness, and enhanced project outcomes [7].

Another noteworthy trend in the Ghanaian construction sector is the integration of sustainable building practices and green technologies. With a growing consciousness regarding environmental issues and the imperative for sustainable development, construction firms in Ghana are increasingly embracing eco-friendly construction methods, materials, and technologies [9]. This entails the utilization of renewable energy sources like solar and wind power, the adoption of energy-efficient building designs, and adherence to green building certifications and standards [10]. Sustainability considerations are progressively becoming paramount in construction endeavors, driven by regulatory mandates, client preferences, and the industry's commitment to corporate social responsibility [11]. As Ghana endeavors to forge a more sustainable built environment, the adoption of green construction practices is poised to gain further momentum, fostering innovation and

shaping the trajectory of the construction sector in the country [12]. Additionally, the construction industry in Ghana is undergoing significant technological advancement and innovation, evident in the development of novel tools and techniques such as BIM and 3D printing [7]. These innovations hold promise for enhancing construction efficiency and sustainability in Ghana [9]. However, the uptake of new technologies and methodologies necessitates substantial investment in human capital and infrastructure, posing a challenge to the industry's adoption curve [13]. Government policies and regulations play a pivotal role in shaping the construction sector's landscape in Ghana [14]. Governmental interventions are crucial for ensuring adequate investment in the construction domain, particularly in response to the heightened demand fueled by the oil-driven expansion in construction and infrastructural development [15]. Regulatory oversight in areas like health and safety, environmental protection, and labor standards is indispensable for the industry's sustainable growth and development [16].

### A.    *Push and Pull Definition.*

In this study, pull factors refer to external pressures or forces that drive construction companies in Ghana to adopt new trends and technologies, such as regulatory changes, market competition, and customer demands. [17] Conversely, push factors are internal motivators that encourage innovation and trend adoption from within the organization, such as a company's strategic goals, leadership vision, and existing technological capabilities. Together, these push and pull factors shape the overall trend recognition and adoption process in the Ghanaian construction industry, influencing how companies respond to emerging industry developments [18].

### B.    *The push factors of the emerging trends*

Ghana's rapid urbanization, fueled by population growth and rural-urban migration, has led to a burgeoning demand for housing, infrastructure, and commercial facilities [16]. Policies promoting transparency, accountability, and sustainability drive firms to embrace digital tools and processes to comply with regulatory requirements. Mandates requiring the use of BIM for public projects has compelled construction firms to invest in digital technologies to enhance project management and coordination. Ghana's vulnerability to natural disasters, including floods and storms, necessitates resilient construction practices, such as the adoption of disaster-resistant technologies and materials to mitigate risks and enhance infrastructure resilience in the face of increasing climate-related challenges [2] The limited availability of skilled labour poses a significant challenge to the construction sector in Ghana [3] Technologies such as 3D printing and supply chain management software enable firms to mitigate the impact of cost fluctuations and material scarcity, enhancing project profitability and sustainability. Environmental degradation and sustainability imperatives are also driving forces behind the adoption of innovative practices in the Ghanaian construction industry [4] Pursuing international certifications enhances market competitiveness and fosters investor confidence in Ghana's construction industry.

### C. The pull factors of the emerging trends

The rapid urbanization and population growth in Ghana are significant pull factors, fueling the demand for housing, infrastructure, and commercial facilities as urban centers expand [16,4]. This demand creates opportunities for construction firms to capitalize on the burgeoning market and invest in innovative solutions to meet the needs of urban dwellers. Additionally, the increasing focus on sustainable development and green building practices is attracting attention from both investors and policymakers [4]. Sustainability has become a key consideration in construction projects, driven by environmental concerns, regulatory requirements, and consumer preferences. As a result, construction firms are drawn towards adopting eco-friendly materials, energy-efficient designs, and renewable energy solutions to align with global sustainability goals and enhance their market competitiveness. Furthermore, the push for digitalization and technological advancements in the construction sector is compelling firms to embrace innovative technologies such as Building Information Modeling (BIM), Artificial Intelligence (AI), and Internet of Things (IoT) to improve project efficiency, accuracy, and safety [3,15]. These technological innovations offer opportunities for firms to streamline processes, optimize resource utilization, and differentiate themselves in the market. Overall, the pull factors of emerging trends in the Ghanaian construction industry present promising opportunities for growth, innovation, and sustainability.

### III. METHODOLOGY

The methodology for this study involved a combination of quantitative and qualitative data collection techniques to ensure a comprehensive analysis of the emerging trends in the Ghanaian construction industry. [19] The primary data collection method was through the distribution of closed-ended questionnaires, complemented by a thorough review of relevant secondary sources.

### A. Closed-ended Questionnaires

The questionnaires were meticulously designed to capture specific information regarding the emerging trends in the construction industry. [20] They included a series of structured questions with predefined response options, allowing for standardized data collection and facilitating statistical analysis. The questionnaires were distributed to the identified respondents through both electronic and in-person means to maximize the response rate. Each respondent was provided with clear instructions and ample time to complete the questionnaire, ensuring thoughtful and accurate responses.

### B. Interviews

In addition to the closed-ended questionnaires and the extensive review of secondary sources, the study incorporated in-depth interviews as a qualitative data collection method. [21] The interviews were conducted with a select group of key informants from the fifteen construction companies involved in the study. These key informants included senior project managers, lead architects, chief quantity surveyors, and experienced site supervisors who possess in-depth knowledge and firsthand experience regarding the emerging trends in the Ghanaian construction industry.

### C. Secondary Data Collection

To supplement the primary data, the study incorporated an extensive review of secondary sources, including conference papers, academic articles, industry reports, and books. [22] This review helped in identifying existing trends, theoretical frameworks, and contextual background relevant to the Ghanaian construction industry. The secondary data enriched the analytical framework and provided a solid foundation for interpreting the primary data.

### D. Participant Selection

The participant selection process was carefully designed to ensure that the study included professionals with relevant experience and knowledge in the construction industry. The focus was on three key cities in the Central Region of Ghana: Cape Coast, Kasoa, and Winneba. These cities were chosen due to their cosmopolitan nature and geographical proximity to the researchers.

### E. Selection of Construction Companies

Fifteen construction companies were purposively selected based on their demonstrated interest in technological advancements within the construction ecosystem. These companies were identified through industry directories, professional associations, and recommendations from industry experts. The purposive selection ensured that the companies involved in the study were actively engaged in adopting and implementing new technologies, making them suitable subjects for examining emerging trends.

### F. Selection of Respondents

The study targeted specific professionals within the selected companies, including project managers, quantity surveyors, architects, structural engineers, safety officers, and site supervisors. [19, 21] These roles were chosen due to their direct involvement in the management and execution of construction projects, providing valuable insights into industry trends. Given the limited population size, a census sampling approach was adopted, involving all ninety (90) identified professionals from the fifteen companies. This approach ensured that every relevant individual was included, allowing for a comprehensive examination of the variables within the population. Within each company, participants were purposively selected based on their roles and responsibilities. This targeted sampling ensured that the data collected was relevant and provided a detailed understanding of the emerging trends from multiple professional perspectives.

### G. Data Analysis

The collected data underwent rigorous analysis using SPSS software version 20, employing various statistical techniques to ensure a thorough examination of the data. Initial analysis involved calculating descriptive statistics to summarize the demographic characteristics of the respondents and the general trends observed in the data. This provided a foundational understanding of the dataset. Although the primary data was quantitative, the inclusion of structured questions with predefined responses allowed for thematic analysis. This helped in identifying common patterns and themes across the responses, enriching the interpretation of the findings. To evaluate and

dissect the emerging trends, regression analysis was employed. This statistical technique helped in understanding the complex relationship between pull and push factors and their influence on the identified trends. The analysis clarified the driving forces behind the industry's evolution, providing insights into the dynamics of the construction industry in Ghana. The findings were presented comprehensively through tables and charts, enhancing the clarity and comprehension of the study's outcomes. Visual representations helped in effectively communicating the relationships and trends identified in the analysis. The data from the interviews were analyzed using thematic analysis, which involved identifying common themes and patterns across the responses. These themes were then integrated with the quantitative findings from the questionnaires and the insights from the secondary sources. This mixed-methods approach ensured a holistic understanding of the emerging trends, combining the breadth of quantitative data with the depth of qualitative insights. Incorporating interviews into the research methodology, the study was able to capture a richer and more detailed picture of the emerging trends in the Ghanaian construction industry. The insights gained from the interviews provided valuable context and depth, enhancing the overall robustness and credibility of the research findings.

## IV. FINDINGS

The demographic profile of the study participants reveals a significant gender disparity, with males constituting 84% of the sample compared to 16% females, reflecting the predominant male presence in Ghana's construction sector. Geographically, the majority of the construction companies (47%) were located in Kasoa, followed by Cape Coast (41%) and Winneba (12%). Among the participants, architects, project managers, safety managers, quantity surveyors, and engineers were represented, with engineers comprising the largest proportion at 36%. The majority of respondents (77%) reported having more than five years of experience in the construction industry, while 23% had less than five years. All participants had tertiary education qualifications, ranging from a minimum of an HND to a maximum of a Master's degree, indicating a high level of literacy and expertise among the sample population.

The data presented in the Table 1 shows the ranking of emerging trends in the Ghanaian construction sector based on the mean scores of respondents. The top five trends are cost-effective construction methods, innovative building materials, adoption of renewable energy, digital transformations (e.g., BIM, AI), and urbanization and mixed-used development. The results provide background for the trends in the Ghanaian construction sector. Raga (2023) posits that the Ghanaian construction industry is expected to grow by 6.8% in 2021 and at an annual average rate of 4.4% between 2022 and 2025. The industry expanded by 8.2% year on year in the first half of 2021, following a 2.9% growth in 2020. The growth is attributed to infrastructure investment and industrialization projects under the 'Ghana Beyond Aid' initiative, which aims to diversify Ghana's manufacturing base and overhaul its taxation structure. Ghana Construction Industry Trends and Opportunities Report 2021" from Research and Markets.com reports that the Ghana construction market size was $11.3 billion in 2022 and is projected to achieve an AAGR of more than 5% during 2024-

2027. The sector's growth over the forecast period is attributed to the recovery in real estate activities, along with public and private sector investments in affordable housing construction. The government's target to construct 60,000 affordable houses by 2030 for civil servants will further bolster this growth. The author [17] highlights the importance of the construction industry in Ghana, which has shown growth over the years, with its share of GDP increasing from 5% in 1975 to 15% by 2007.

The industry is a major employer and contributes substantially to the economy. The introduction of the Sustainable Development Goals (SDGs) has broadened the focus of the construction sector in Ghana, leading to a review of existing practices to make projects more sustainable. The emerging trends in the Ghanaian construction sector are related to cost-effective construction methods, innovative building materials, adoption of renewable energy, digital transformations, and urbanization and mixed-used development. These factors are ranked from 1st to 5th with mean value from 4.1609 to 4.0575 respectively. These trends are driven by the government's focus on infrastructure development, industrialization, and affordable housing construction, as well as the need to make projects more sustainable. The construction industry in Ghana is expected to grow in the coming years, driven by public and private sector investments.

TABLE 1: THE EMERGING TRENDS IN GHANAIAN CONSTRUCTION SECTOR

| | N | Mean | Std. Deviation | Ranking |
|---|---|---|---|---|
| Cost effective construction methods | 87 | 4.1609 | 0.88756 | 1st |
| Innovative building materials | 87 | 4.1609 | 1.09835 | 2d |
| Adoption of renewable energy | 87 | 4.1149 | 0.95753 | 3rd |
| Digital transformations e.g. BIM, AI | 87 | 4.1034 | 1.10005 | 4th |
| Urbanization and mix-used development | 87 | 4.0575 | 1.08216 | 5th |
| Circular economic practice e.g. to reduce waste | 87 | 4.0460 | 1.16047 | 6th |
| Green building project | 87 | 4.0345 | 1.14575 | 7th |
| Skilled development and training | 87 | 4.0230 | .99973 | 8th |
| Digitization of project management | 87 | 4.0115 | 1.05096 | 9th |
| Resilient infrastructure e.g. those that can withstand disaster | 87 | 4.0115 | 1.11537 | 10th |
| Smart building and IoT | 87 | 3.9885 | 1.00573 | 11th |
| Regulatory reforms e.g. stricter regulation reforms | 87 | 3.9885 | 1.03984 | 12th |
| Prefabrication and modular transformations | 87 | 3.9655 | 1.23372 | 13th |
| Collaborative project delivery | 87 | 3.9540 | 1.19988 | 14th |
| Infrastructure development e.g. roads and housing | 87 | 3.9080 | 1.17762 | 15th |

Figure 1 provides a clear visual appreciation of the emerging trends in the Ghanaian construction industry, the trends reflect the evolving landscape of the Ghanaian construction industry, with a strong emphasis on sustainability, innovation, and efficiency to address the challenges and opportunities presented

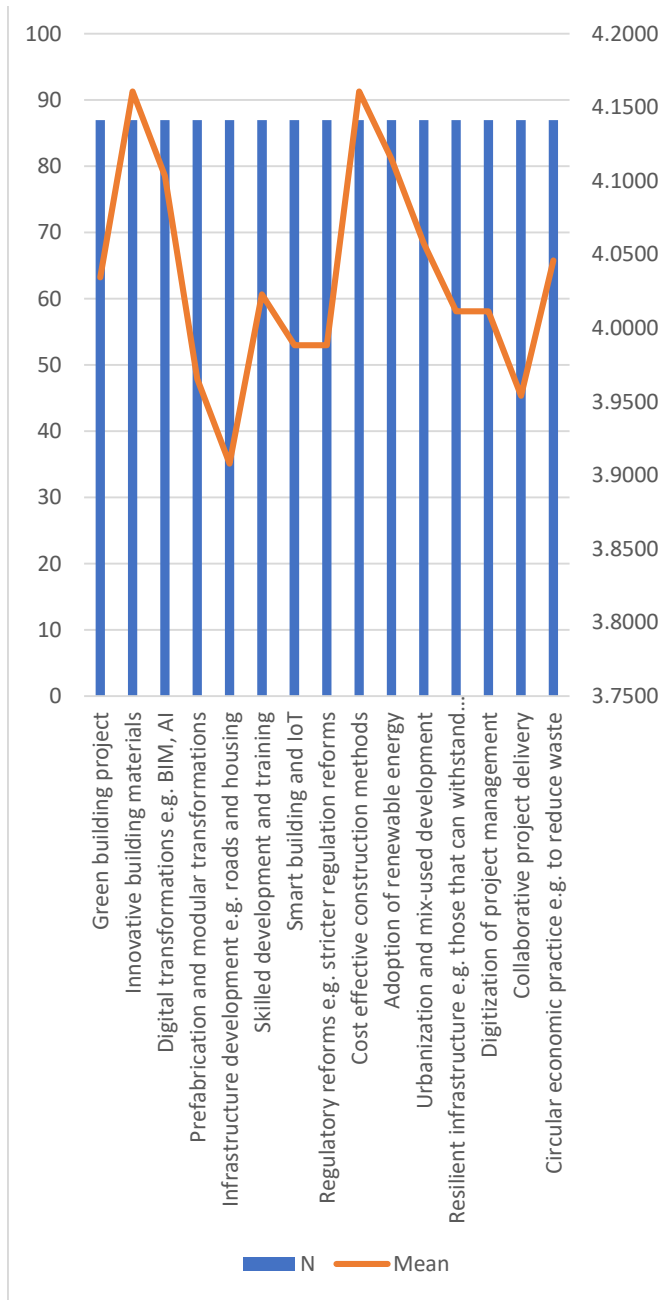by urbanization, environmental concerns, and technological advancements.



Fig. 1. Visual appreciation of the emerging trends in the Ghanaian construction industry

Table 2 highlights several key Push factors driving trends in Ghana's construction sector. At the forefront is the imperative to address environmental degradation and embrace sustainable practices, as indicated by the highest mean score (4.2414). This underscores a growing awareness within the industry of the need to minimize environmental impact and promote eco-friendly construction methods. Additionally, technological advancements and innovation emerge as significant drivers with a mean value of 4.0805, reflecting a concerted effort to modernize construction processes and adopt cutting-edge

technologies. This push towards innovation aligns with global trends in the construction industry, where digitalization and automation are increasingly becoming essential for improving efficiency and productivity.

Furthermore, aging infrastructure and the pressing need for maintenance underscore the importance of infrastructure renewal and investment with a mean score of 4.0690. This factor indicates a recognition of the challenges posed by outdated infrastructure and the urgency to address them. Similarly, the pressure to meet international standards and certifications reflects the industry's aspiration for quality and competitiveness on a global scale. These push factors collectively shape the trajectory of Ghana's construction sector, driving initiatives towards sustainability, technological advancement, and quality assurance. Understanding and effectively addressing these factors will be paramount for fostering sustainable growth and development in the construction industry.

TABLE 2: PUSH FACTORS

| | N | Mean | Std. Deviation | Ranking |
|---|---|---|---|---|
| Environmental Degradation and Sustainability Imperatives | 87 | 4.2414 | 0.90175 | 1st |
| Technological Advancements and Innovation | 87 | 4.0805 | 0.99087 | 2nd |
| Aging Infrastructure and Maintenance Needs | 87 | 4.0690 | 1.13908 | 3rd |
| Adoption of Green Building Practices and Energy Efficiency Measures | 87 | 4.0690 | 0.99759 | 4th |
| Pressure to Meet International Standards and Certifications | 87 | 4.0690 | 1.06523 | 5th |
| Advancements in construction technology and digitalization | 87 | 4.0575 | 1.03829 | 6th |
| Government infrastructure development initiatives | 87 | 4.0575 | 1.01565 | 7th |
| Escalating urbanization rates and population growth | 87 | 4.0230 | 1.12039 | 8th |
| Rising Construction Costs and Material Shortages | 87 | 4.0230 | 1.04522 | 9th |
| Demand for modern and innovative building designs | 87 | 4.0115 | 1.05096 | 10th |
| Addressing the challenges of climate change and natural disasters | 87 | 4.0000 | 1.16139 | 11th |
| Rising environmental concerns and sustainability mandates | 87 | 3.9885 | 1.09432 | 12th |
| Limited Availability of Skilled Labor | 87 | 3.9885 | 1.11537 | 13th |
| Rapid Urbanization and Population Growth | 87 | 3.9540 | 1.13001 | 14th |
| Implementation of regulatory reforms and building codes | 87 | 3.9425 | 1.14482 | 15th |
| Increasing demand for affordable housing | 87 | 3.9425 | 1.11393 | 16th |
| Increasing Frequency of Natural Disasters | 87 | 3.9425 | 1.00413 | 17th |
| Economic Growth and Investment Opportunities | 87 | 3.9425 | 1.06046 | 18th |
| Introduction of incentives for renewable energy integration | 87 | 3.9310 | 1.13908 | 19th |
| Government Regulations and Mandates | 87 | 3.9195 | 1.11249 | 20th |
| Competitive market dynamics and globalization | 87 | 3.9195 | 1.11249 | 21st |
| Growing focus on safety and risk management | 87 | 3.9080 | 1.16771 | 22nd |

| | N | Mean | Std. Deviation | Rankings |
|---|---|---|---|---|
| Changing Consumer Preferences and Demands | 87 | 3.9080 | 1.13744 | 23rd |
| Expansion of transportation networks and utilities | 87 | 3.8966 | 1.14155 | 24th |
| Changing consumer preferences towards eco-friendly construction | 87 | 3.8851 | 1.22404 | 25th |
| Competition and Market Dynamics | 87 | 3.8621 | 1.19273 | 26th |
| Infrastructure Development Initiatives | 87 | 3.8391 | 1.18982 | 27th |
| Urban Renewal and Redevelopment Projects | 87 | 3.8046 | 1.17966 | 28th |
| Requirements for compliance with international standards and certifications | 87 | 3.8046 | 1.24675 | 29th |
| Pressures to improve efficiency and productivity | 87 | 3.7356 | 1.24321 | 30th |

Table 3 shows that the Pull factors identified in the data shed light on the attractive aspects driving trends in Ghana's construction sector. Topping the list is the emphasis on community development and social impact initiatives with a mean value of 4.1954, indicating a strong societal focus within the industry. This underscores a commitment to addressing community needs and fostering positive social change through construction projects. Additionally, factors such as cultural considerations, sustainability goals, and infrastructure development with mean values of 4.1149 each respectively, reflect broader aspirations for holistic development and progress. These pull factors highlight the intrinsic motivations that inspire construction activities, beyond purely economic considerations. Furthermore, the pull factors differ from the push factors in their orientation and nature. While push factors typically stem from external pressures or challenges that drive change within the industry, pull factors are more aspirational and opportunistic. Pull factors represent the attractive forces that draw stakeholders towards certain activities or initiatives, driven by opportunities for growth, development, and positive impact. Unlike push factors, which often arise from constraints or challenges that need to be addressed, pull factors reflect the proactive pursuit of goals and aspirations. The pull factors identified in the data underscore the aspirational drivers shaping the trajectory of Ghana's construction industry, highlighting opportunities for innovation, collaboration, and societal impact.

TABLE 3: PULL FACTORS

| | N | Mean | Std. Deviation | Rankings |
|---|---|---|---|---|
| Emphasis on community development and social impact initiatives | 87 | 4.1954 | 0.87390 | 1st |
| Cultural Factors | 87 | 4.1149 | 0.99329 | 2nd |
| Sustainability Goals | 87 | 4.1149 | 1.10417 | 2nd |
| Infrastructure Development | 87 | 4.1149 | 1.11465 | 2nd |
| Access to Resources | 87 | 4.0920 | 1.04138 | 5th |
| Increasing demand for modern and sustainable building solutions | 87 | 4.0805 | 1.01407 | 6th |
| Expansion of urban areas and development of smart cities | 87 | 4.0575 | 1.06046 | 7th |
| Economic Growth | 87 | 4.0345 | .99356 | 8th |
| Market Demand | 87 | 4.0230 | 1.12039 | 9th |
| Regulatory Support | 87 | 4.0230 | .96421 | 9th |
| Adoption of innovative technologies and digitalization in the sector | 87 | 4.0230 | 1.08881 | 11th |
| Education and Training | 87 | 4.0115 | 1.00573 | 12th |
| Growing consumer awareness and demand for high-quality construction | 87 | 4.0115 | 1.08364 | 12th |
| Globalization | 87 | 4.0000 | 1.01156 | 14th |
| Collaboration with international partners and stakeholders | 87 | 4.0000 | 1.14119 | 14th |
| Development of public-private partnerships for infrastructure development | 87 | 4.0000 | 1.08906 | 14th |
| Government Initiatives | 87 | 3.9885 | 1.12575 | 17th |
| Favorable government policies supporting the construction industry | 87 | 3.9885 | 1.16633 | 17th |
| Potential for job creation and employment opportunities | 87 | 3.9770 | 1.09944 | 19th |
| Technological Advancements | 87 | 3.9770 | 1.18102 | 19th |
| Foreign Investment | 87 | 3.9310 | 1.16931 | 21st |
| Urbanization | 87 | 3.9080 | 1.20688 | 22nd |
| Social Impact | 87 | 3.8966 | 1.22032 | 23rd |
| Demographic Shifts | 87 | 3.8966 | 1.25785 | 23rd |
| Availability of skilled labor and technical expertise | 87 | 3.8736 | 1.18914 | 25th |
| Adoption of green building practices and renewable energy solutions | 87 | 3.8506 | 1.18644 | 26th |
| Focus on improving infrastructure resilience to natural disasters and climate change | 87 | 3.8506 | 1.15667 | 26th |
| Access to funding and financial incentives for construction projects | 87 | 3.8391 | 1.17011 | 28th |
| Integration of sustainable design principles into construction projects | 87 | 3.8391 | 1.06611 | 28th |
| Opportunities for economic growth and investment in infrastructure projects | 87 | 3.8391 | 1.13991 | 28th |

### A. Regression Analysis

The regression model examined the relationship between trend recognition (TR) and two predictors, namely pull factors and push factors. The overall fit of the model was assessed using several statistics. The coefficient of determination (R-squared) was found to be 0.299, indicating that approximately 29.9% of the variance in trend recognition could be explained by the predictors included in the model. The adjusted R-squared, which considers the number of predictors in the model, was slightly lower at 0.282. The standard error of the estimate was 0.30494, representing the average distance between the observed values of trend recognition and the values predicted by the model. The Durbin-Watson statistic, used to detect the presence of autocorrelation in the residuals, was calculated to be 1.696. This value falls within the range of 1.5 to 2.5, suggesting that there is no significant autocorrelation present in the residuals. Overall, the regression model provides a statistically significant explanation of the relationship between push factors, pull factors, and trend recognition in the Ghanaian construction industry.

TABLE 4: MODEL SUMMARY

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|-----|----------|-------------------|----------------------------|---------------|
| 1 | .547a | .299 | .282 | .30494 | 1.696 |

*a. Predictors: (Constant), pull factors, push factors*

*b. Dependent Variable: TR*

### B. Impact of the Driving factors on the emerging trends

The descriptive statistics provide valuable insights into the central tendency and variability of the variables under study in the Ghanaian construction industry. The mean TR=trends score of 4.0353 suggests a relatively high level of overall trend recognition among respondents, with a narrow standard deviation of 0.35988, indicating a relatively small amount of variability around the mean. In comparison, the mean scores for push factors (3.9605) and pull factors (3.8510) indicate slightly lower levels of influence on the emerging trends, with push factors exhibiting slightly higher mean scores than pull factors. However, both variables have relatively low standard deviations (0.34351 for push factors and 0.31306 for pull factors), suggesting a consistent perception of these factors among respondents. These findings imply that while there is general recognition of the emerging trends in the Ghanaian construction industry, push factors may exert a slightly stronger influence than pull factors.

TABLE 5: DESCRIPTIVE STATISTICS

| | Mean | Std. Deviation | N |
|---|------|----------------|---|
| TR | 4.0353 | 0.35988 | 87 |
| Push factors | 3.9605 | 0.34351 | 87 |
| Pull factors | 3.8510 | 0.31306 | 87 |

### C. The relationship between trends and the driving factors using correlation analysis

The correlation analysis reveals significant relationships between the variables in the study. Firstly, there is a positive and moderately strong correlation between TR (trend recognition) and push factors (r = 0.516, p < 0.001), indicating that as the recognition of trends increases, so does the perceived influence of push factors on those trends. Similarly, there is a positive and moderately strong correlation between TR and pull factors (r = 0.490, p < 0.001), suggesting that as trend recognition increases, so does the perceived influence of pull factors on those trends. Moreover, there is a strong positive correlation between push factors and pull factors (r = 0.701, p < 0.001), indicating that construction industry professionals perceive a significant intersection between the factors driving trends in the sector. This suggests that both push and pull factors are influential in shaping emerging trends in the Ghanaian construction industry.

TABLE 6: CORRELATIONS

| | | TR | Push factors | Pull factors |
|---|---|-----|--------------|--------------|
| Pearson Correlation | TR | 1.000 | 0.516 | 0.490 |
| | Push factors | 0.516 | 1.000 | 0.701 |
| | Pull factors | 0.490 | 0.701 | 1.000 |
| Sig. (1-tailed) | TR | | .000 | 0.000 |
| | Push factors | 0.000 | | 0.000 |
| | Pull factors | 0.000 | 0.000 | |
| N | TR | 87 | 87 | 87 |
| | Push factors | 87 | 87 | 87 |
| | Pull factors | 87 | 87 | 87 |

### D. The Influence of the driving factors (Push and Pull factors) on trends using ANOVA

The ANOVA table indicates that the regression model, which includes predictors pull factors and push factors, is statistically significant (F = 17.891, p < .001). This implies that the model as a whole significantly predicts the dependent variable TR (Trend Recognition). The regression model explains a significant portion of the variance in TR, as evidenced by the sum of squares for regression (3.327) compared to the residual sum of squares (7.811). The F-statistic of 17.891 suggests that the variance explained by the model is significantly greater than what would be expected by chance. Therefore, both pull factors and push factors contribute significantly to the prediction of TR in the Ghanaian construction industry.

TABE 7: ANOVAa

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|----------------|-----|-------------|-----|------|
| Regression | 3.327 | 2 | 1.664 | 17.891 | .000b |
| Residual | 7.811 | 84 | .093 | | |
| Total | 11.138 | 86 | | | |

*a. Dependent Variable: TR*

*b. Predictors: (Constant), pull factors, push factors*

### E. Driving Factors of Emerging Trends in the Ghanaian Construction Industry

The qualitative interviews conducted as part of this study provided a deeper understanding of the driving factors behind emerging trends in the Ghanaian construction industry. Through thematic analysis, six recurring patterns and themes emerged:

- **Regulatory Compliance and Market Competition (Push Factors):** Respondents frequently highlighted the role of government regulations and competitive pressures as significant external forces driving the adoption of new trends. Compliance with evolving building codes and standards was seen as crucial, while

competition in the market pushed companies to innovate to stay ahead.

- **Technological Advancements and Innovation (Pull Factors):** Many interviewees discussed the importance of embracing new technologies to improve efficiency and project outcomes. Internal motivations, such as the desire to integrate advanced construction methods and digital tools, were identified as key pull factors.

- **Skill Development and Workforce Training:** The need for continuous professional development and training emerged as a critical theme. Companies recognized that equipping their workforce with new skills was essential to leverage emerging trends effectively, indicating a strong internal drive towards capacity building.

- **Economic and Financial Considerations:** Both push and pull factors were influenced by economic conditions and financial constraints. Respondents noted that economic stability and access to funding facilitated trend adoption, while economic downturns and budget limitations hindered it.

- **Leadership and Strategic Vision:** Leadership commitment and strategic vision were repeatedly mentioned as vital internal drivers. Companies with forward-thinking leaders who prioritized innovation and long-term planning were more likely to adopt and benefit from emerging trends.

- **Customer Demand and Market Needs:** Respondents highlighted the increasing influence of customer preferences and market demands on their operations. Meeting client expectations and adapting to changing market needs were identified as significant push factors compelling companies to adopt new trends.

These themes provide a richer context to the quantitative findings, illustrating the complex relationship between external pressures and internal motivations in shaping the adoption of emerging trends in the Ghanaian construction industry. The qualitative insights underscore the necessity of addressing both push and pull factors to foster sustainable growth and innovation.

## V. CONCLUSION

Despite the robust findings, the study has some few limitations that may affect the generalizability of its results. First, the study was geographically limited to the Central Region of Ghana, focusing specifically on Cape Coast, Kasoa, and Winneba. While these cities were selected for their cosmopolitan nature and proximity to the researchers, the findings may not be representative of the entire Ghanaian construction industry. Different regions may exhibit distinct trends and driving factors due to variations in economic, social, and regulatory environments. Secondly, the purposive selection of construction companies and the targeted sampling of specific professionals within these companies, while ensuring relevant and informed responses, may introduce selection bias. The chosen companies and professionals were those with a

demonstrated interest in technological advancements, potentially skewing the findings towards a more progressive segment of the industry. Moreover, the cross-sectional nature of the study provides a snapshot of the current state of trend recognition and its predictors but does not account for changes over time. Longitudinal studies would be beneficial to observe how trends and their driving factors evolve.

Despite these limitations, the study offers valuable insights into the dynamics of trend recognition within the Ghanaian construction industry. Understanding the interplay between push and pull factors can help industry stakeholders, including policymakers, construction firms, and professionals, to better navigate and influence the adoption of emerging trends. The findings suggest that both internal drivers (push factors) and external pressures (pull factors) significantly impact trend recognition. This highlights the need for a balanced approach in fostering innovation and adoption of new technologies. For instance, companies could invest in training and development to enhance internal capabilities, while policymakers could create supportive regulatory frameworks and incentives to encourage technological adoption. Furthermore, the methodological approach of combining quantitative and qualitative data provides a comprehensive perspective that could be applied to similar studies in other regions or industries. Future research could expand on this work by including a more diverse sample across different regions and exploring additional factors that may influence trend recognition. In conclusion, while the study has limitations that may affect the generalizability of its findings, it provides a significant contribution to understanding the factors driving trend recognition in the Ghanaian construction industry. The insights gained can inform strategic decisions and policy formulations aimed at enhancing the industry's innovation and competitiveness.

## REFERENCES

[1] P. I. Korah, "Emergent new cities and spatial transformation in Ghana's Greater Accra Region: Exploring the drivers, governance and consequences of growth," Unpublished doctoral dissertation, Griffith University, 2021.

[2] E. Agyekum, P. Osei-Kyei, and D. Owusu-Manu, "Exploring the adoption of Building Information Modelling (BIM) in Ghana: A systematic review," Journal of Building Engineering, vol. 28, p. 101752, 2021.

[3] E. Ankomah and V. Adinyira, "Building sustainability in the construction industry through firm capabilities, technology, and business innovativeness," Journal of Cleaner Production, vol. 254, p. 120530, 2020.

[4] N. Abidjan, P. Osei-Kyei, and A. P. Chan, "Sustainability in construction projects: A systematic literature review," Journal of Cleaner Production, vol. 228, pp. 1174-1188, 2019.

[5] K. Tetteh, "The new middle class and urban transformation in Africa: a case study of Accra, Ghana," Unpublished doctoral dissertation, University of British Columbia, 2016.

[6] M. Chanem, F. Hamzeh, O. Seppanen, L. Shebab, and E. Zankoul, "Front. Built Environ., Sec. Construction Management," vol. 8, 2022, doi: 10.3389/fbuil.2022.98023.

[7] E. Papadonikolaki, C. van Oel, and M. Kagioglou, "Organising and Managing boundaries: A structurational view of collaboration with Building Information Modelling (BIM)," International Journal of Project Management, vol. 37, no. 3, pp. 378-394, 2019.

[8] M. Habibi and S. Kermanshachi, "Phase-based analysis of key cost and schedule performance causes and preventive strategies: Research trends

and implications," Engineering, Construction and Architectural Management, vol. 25, no. 8, pp. 1009-1033, 2018.

[9] A. Ebolor, N. Agarwal, and A. Brem, "Sustainable development in the construction industry: The role of frugal innovation," Journal of Cleaner Production, vol. 380, p. 134922, 2022.

[10] Y. Lu, Z. A. Khan, M. S. Alvarez-Alvarado, Y. Zhang, Z. Huang, and M. Imran, "A critical review of sustainable energy policies for the promotion of renewable energy sources," Sustainability, vol. 12, no. 12, p. 5078, 2020.

[11] F. Mbilima, "Extractive industries and local sustainable development in Zambia: The case of corporate social responsibility of selected metal mines," Resources Policy, vol. 74, p. 101441, 2021.

[12] O. A. Oguntona and C. O. Aigbavboa, Biomimicry and Sustainable Building Performance: A Nature-inspired Sustainability Guide for the Built Environment. Taylor & Francis, 2024.

[13] S. Vahdat, "The role of IT-based technologies on the management of human resources in the COVID-19 era," Kybernetes, vol. 51, no. 6, pp. 2065-2088, 2022.

[14] A. Dansoh, D. Oteng, and S. Frimpong, "Innovation development and adoption in small construction firms in Ghana," Construction Innovation, vol. 17, no. 4, pp. 511-535, 2017.

[15] N. S. Chipangamate and G. T. Nwaila, "Assessment of challenges and strategies for driving energy transitions in emerging markets: A socio-technological systems perspective," Energy Geoscience, vol. 100257, 2023.

[16] N. O. Addae, K. Poku, and J. A. Agyemang, "Effect of Urbanization on Housing in Ghana," Journal of Building Construction and Planning Research, vol. 7, no. 2, pp. 66-76, 2019.

[17] N. C. Parkins, "Push and pull factors of migration," American Review of Political Economy, vol. 8, no. 2, 2010.

[18] C. Dawson and A. Henley, "'Push' versus 'pull' entrepreneurship: an ambiguous distinction?" International Journal of Entrepreneurial Behavior & Research, vol. 18, no. 6, pp. 697-719, 2012.

[19] S. Oduro, "Exploring the barriers to SMEs' open innovation adoption in Ghana: A mixed research approach," International Journal of Innovation Science, vol. 12, no. 1, pp. 21-51, 2020.

[20] C. J. Auriacombe, "Survey research: critical considerations for questionnaire construction," Journal of Public Administration, vol. 45, no. 3-1, pp. 473-488, 2010.

[21] O. A. Adeoye-Olatunde and N. L. Olenik, "Research and scholarly methods: Semi-structured interviews," Journal of the American College of Clinical Pharmacy, vol. 4, no. 10, pp. 1358-1367, 2021.

[22] J. Hair Jr, M. Page, and N. Brunsveld, Essentials of Business Research Methods. Routledge, 2019.