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**Occupational Hazard Identification and Project Sustainability of Production Line
Installation by Bralirwa Company Rubavu, Rwanda**

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Occupational Hazard Identification and Project Sustainability of Production Line Installation by Bralirwa Company Rubavu, Rwanda



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Abstract

Purpose: This study investigated the effect of occupational hazard identification on project sustainability of the production line installation by Bralirwa Company, Rubavu, Rwanda. The research aimed to bridge the empirical gap between hazard identification and sustainable project outcomes, offering insights for policymakers, project managers, and industry leaders striving for safer and more sustainable industrial development.

Methodology: A mixed-methods approach was adopted, combining descriptive and correlational designs, where purposive sampling was used to select relevant departments, followed by random sampling within departments to ensure proportional representation. Data were collected from 101 respondents out of a sample of 109, drawn from a target population of 150 employees, using structured questionnaires, interviews, and document reviews. Data were analyzed using SPSS, applying descriptive statistics and linear regression analysis.

Findings: The findings revealed a positive and statistically significant relationship between occupational hazard identification and project sustainability (mean = 4.81; $F(1,99) = 49.99$, $p < .000$), explaining 33.6% of the variance. The results indicate that effective hazard identification during project planning and implementation minimizes operational risks and unforeseen stoppages, enhancing economic, social, and environmental sustainability.

Unique Contribution to Theory, Practice and Policy: It recommends digitizing hazard identification processes, investing in real-time monitoring technologies, and institutionalizing systematic hazard detection to promote sustainable industries.

Keywords: Occupational Hazard Identification, Project Sustainability, Production Line Installation

JEL Codes: J81, Q01, L6

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INTRODUCTION

Globally, occupational safety is recognized as a critical determinant of industrial project sustainability and long term success. The International Labour Organization (ILO, 2023) reports over 2.7 million annual fatalities from work related accidents, highlighting the urgent need for robust safety management systems that protect workers, reduce operational disruptions, and promote sustainable outcomes across economic, social, and environmental dimensions (Smith & Johnson, 2024; Martens & Carvalho, 2024). Embedding safety measures from the early stages of project planning enhances efficiency, minimizes risks, and fosters resilient and regenerative industrial practices (Joel, 2024; Zhao, 2022). Sector specific studies in breweries and manufacturing further underscore this point. For example, a study published in the Multidisciplinary Digital Publishing Institute (MDPI, 2023) employed digital human modelling and motion tracking technology to assess musculoskeletal risks in brewery operations, revealing that heavy manual loads and repetitive awkward postures posed major hazards. Interventions such as training, assistive devices, and ergonomic workstation design were recommended to improve both worker safety and operational sustainability. Similarly, research in Nairobi, Kenya, demonstrated that occupational health and safety practices including hazard control, safety training, inspections, and compliance with regulatory frameworks positively influenced employee performance and operational outcomes in beverage manufacturing firms (IR Library, 2021). In East Africa, a study of Tanzania Breweries Limited highlighted that while hazard assessment practices existed, inconsistent implementation and poor prioritization limited their effectiveness, emphasizing the need for institutionalized safety frameworks (repository.out.ac.tz, 2015).

In Africa, rapid industrialization, informal labor systems, and weak regulatory enforcement exacerbate workplace risks, hindering progress toward Sustainable Development Goal 8 on decent work and economic growth (Mwangi, 2023; African Development Bank, 2024). Limited adoption of structured occupational hazard identification practices remains a major constraint to achieving safe and sustainable project outcomes (WHO, 2023; ILO, 2022). In Rwanda, occupational safety has become a national strategic priority under Vision 2050, supported by regulatory instruments such as OSHA Rwanda and the Rwanda Labour Code, which guide employers on hazard identification, risk management, and compliance monitoring (RURA, 2023). The Bralirwa production line installation project in Rubavu District demonstrates how systematic hazard identification can enhance operational efficiency, safety performance, and overall project sustainability (Government of Rwanda, 2022). Nevertheless, challenges such as limited resources, inadequate training, and inconsistent monitoring persist (Niyonzima & Habimana, 2024). Collectively, these insights show that integrating technological and procedural approaches to hazard identification, along with compliance with national safety regulations, is essential for achieving long term sustainable industrial development.

Problem Statement

Globally, there is growing recognition that integrating occupational hazard identification into project management is essential for achieving sustainable outcomes. Effective hazard identification is the first step in ensuring occupational safety in industrial projects. Studies show that projects that systematically identify potential hazards prevent accidents, reduce financial losses, and maintain continuity, thereby supporting sustainable outcomes (ILO, 2023; Martens & Carvalho, 2024). In African industrial projects, however, the lack of structured

occupational hazard identification leads to preventable incidents. Weak regulatory enforcement, insufficient resources, and inadequate training mean that many hazards go unnoticed, negatively affecting worker safety and long-term project sustainability (Chinedu & Adebayo, 2023; Okoye & Okolie, 2023; Mwangi, 2023). In Rwanda, although national policies promote safety and sustainable practices, occupational hazard identification is rarely applied systematically in industrial projects. This operational gap limits project managers' ability to anticipate risks and implement preventative measures, thereby affecting both economic and social dimensions of sustainability (Tukesiga, 2022; WHO, 2023; Gunduz & Almuajebh, 2023). Bralirwa Company in Rubavu represents a leading industrial site in Rwanda's beverage sector, with complex production line installations that require substantial human, financial, and technological resources. As the largest brewery in Rwanda, Bralirwa exemplifies the challenges and opportunities of implementing occupational safety practices in a high-stakes industrial context. Its operations are representative of similar large-scale manufacturing projects in the country, making it a suitable case for examining how occupational hazard identification influences project sustainability.

Despite its prominence, empirical evidence on how occupational hazard identification affects economic efficiency, worker well-being, and long-term project success at Bralirwa is limited. Strengthening these practices is crucial to protecting workers, minimizing disruptions, improving operational efficiency, and aligning project execution with corporate and national sustainability objectives. Therefore, the core problem is that the extent and manner in which occupational hazard identification influences the sustainability of Bralirwa company production line installations remain underexplored and unquantified. Addressing this gap is critical to enhance workforce protection, ensure operational efficiency, reduce preventable project delays, and support the company's contribution to national and corporate sustainability goals.

LITERATURE REVIEW

Theoretical Review

This project research was built on contemporary theories relating to the integration of occupational hazard identification and project sustainability, specifically in the context of the production line installation by Bralirwa company in Rubavu, Rwanda. This framework connected project management principles with the evolving field of sustainable development and occupational hazard identification to ensure long-term project success.

Adaptive Safety Management Theory

Adaptive Safety Management Theory (ASMT), developed by Leistikow and Bal (2020) and Reiman, Rollenhagen, and Nybom (2015), shifts safety management from rigid, rule-based approaches (Safety-I) to flexible, learning-focused frameworks aligned with Safety-II and resilience engineering. It highlights the importance of human adaptability, variability, and proactive decision-making in maintaining high safety performance. ASMT through mixed-methods studies in industries like manufacturing, construction, and energy. Tools such as surveys, interviews, scenario-based assessments, and structural equation modelling examine safety culture, resilience, and leadership integration and decentralized control and frontline feedback are key to evolving safety policies effectively. Organizations that encourage learning, employee participation, and open communication report fewer accidents and more stable operations. Local decision-making and flexible systems enable rapid responses to unexpected

risks while maintaining compliance, promoting sustainable safety cultures, improved morale, and organizational knowledge (Kara & Zaitri *et al.*, 2023). Practically, ASMT embeds safety into daily operations rather than relying solely on strict rules. Implementation strategies include ongoing training, scenario-based planning, ergonomic design, and resilience-focused systems, enhancing both workplace safety and project sustainability (Adjekum *et al.*, 2023; Kara-Zaitri *et al.*, 2023; Leistikow & Bal, 2020; Reiman *et al.*, 2015).

In the context of Bralirwa Company, the principles of Adaptive Safety Management Theory can be practically embedded into production line operations to enhance both safety and sustainability. Bralirwa's management culture, which emphasizes continuous improvement, employee engagement, and structured operational workflows, provides a strong foundation for implementing ASMT. For example, frontline workers can be empowered to report potential hazards or near misses in real time, enabling supervisors to make adaptive decisions and modify processes proactively. Scenario-based safety drills, ergonomic workstation designs, and participatory training programs can be tailored to the brewery's production environment to reduce musculoskeletal risks and operational disruptions. Additionally, decentralized decision-making and regular feedback loops allow rapid responses to unexpected risks while ensuring compliance with national regulations such as OSHA Rwanda and the Rwanda Labour Code. By applying ASMT, Bralirwa can cultivate a resilient safety culture that integrates learning, adaptability, and proactive risk management into daily operations, ultimately supporting long-term project sustainability, operational efficiency, and workforce well-being.

Digital Enabled Occupational Safety Theory

The Digital-Enabled Occupational Safety Theory, proposed by Dodoo, Al-Samarraie, Alzahrani, and Lonsdale (2022), examined how digital technologies enhance occupational safety and health (OSH) in high-risk industries. Based on a systematic review of 48 studies published between 2017 and 2022, the theory highlights the role of digital tools such as wearable devices, AI, AR/VR, and navigation systems in minimizing workplace hazards. Wearable devices monitor workers' vital signs and environmental risks, AR/VR systems provide immersive hazard training, AI predicts potential dangers and recommends preventive actions, and navigation systems ensure safe movement through hazardous areas. While these innovations offer significant benefits, challenges like high costs, limited infrastructure, workforce resistance, and the need for ongoing training were identified. The theory emphasized that effective implementation requires collaboration among policymakers, organizational leaders, and employees to foster a digital safety culture. By integrating these technologies, organizations can enhance worker safety, reduce accidents, improve productivity, and promote project sustainability, supporting long-term operational goals in risky industrial settings (Dodoo *et al.*, 2022).

In the context of Bralirwa Company, Digital-Enabled Occupational Safety Theory can be applied to enhance both worker safety and project sustainability across its production line installations. For instance, wearable devices could monitor employees' vital signs and exposure to heat, noise, or chemical risks in real time, allowing supervisors to take immediate preventive actions. Augmented and virtual reality (AR/VR) systems can provide immersive safety training tailored to Bralirwa's production processes, ensuring that workers understand potential hazards before performing critical tasks. Artificial intelligence tools can analyze production line data to predict operational risks and recommend preventive measures, while digital navigation systems can guide workers safely through complex and high-risk areas of the facility.

Implementing these digital safety solutions at Bralirwa not only reduces workplace accidents and operational disruptions but also promotes a culture of proactive risk management and continuous learning. Despite potential challenges such as initial investment costs, infrastructure requirements, and workforce adaptation, integrating these technologies aligns with Bralirwa's strategic goal of improving operational efficiency, safeguarding employees, and achieving long-term project sustainability, thereby supporting both corporate objectives and national industrial safety standards.

The Safety Driven Sustainability Theory

The Safety-Driven Sustainability Theory by Hassan & Othman (2021) emphasized that occupational safety was a key driver of sustainable project outcomes, integrating health and safety practices with economic, social, and environmental goals. Their study involved 120 project managers and safety officers across various industries in Southeast Asia, complemented by detailed case studies of 25 companies known for integrating sustainability and safety measures. Data sources included annual sustainability reports, safety audits, and project documentation from 2016 to 2020. The findings showed that robust safety management reduced accidents, delays, and cost overruns while improving employee morale, productivity, and stakeholder trust. By fostering a safety-oriented culture, investing in training and technology, and embedding safety into daily operations, organizations enhanced resilience, preserved human capital, and achieved sustainable, socially responsible, and environmentally conscious project performance (Hassan & Othman, 2021).

In the context of Bralirwa Company, the principles of Safety-Driven Sustainability Theory can be directly applied to enhance the sustainability of production line installations. By embedding robust safety management practices into daily operations, Bralirwa can reduce workplace accidents, minimize project delays, and avoid unnecessary cost overruns. For example, integrating safety-oriented training programs, routine safety audits, and monitoring systems ensures that employees are well-prepared and risks are proactively managed. Aligning occupational safety initiatives with economic, social, and environmental objectives can also improve employee morale, foster trust among stakeholders, and enhance operational efficiency. Moreover, by investing in both human capital and safety technologies, Bralirwa can cultivate a culture that prioritizes proactive hazard management while supporting environmentally responsible and socially sustainable practices. Applying this theory allows Bralirwa to not only protect its workforce but also strengthen long-term project resilience and contribute to broader corporate and national sustainability goals.

Empirical Review

This section reviewed previous but recent studies and real-world evidence on the effect of occupational hazard identification on project sustainability, highlighting findings relevant to industrial settings similar to Bralirwa company production line installation in Rubavu, Rwanda.

According to Chatty, Harrison, Ba-Sabaa, Faludi, and Murnane (2022), a case study at an engineering consultancy firm examined factors influencing the integration of sustainable design practices into product development and aimed to create a flexible framework for selecting suitable sustainable design methods and tools (SDMTs). The study used a human-centered, participatory approach, with the first author embedded as an intern, collecting data through interviews and group discussions to understand challenges in applying sustainability principles. Iterative collaboration led to the co-creation of a modular framework that improved

engagement, usability, and application of life cycle assessment (LCA) tools. Findings showed that practitioner involvement enhanced framework adaptability, helped identify environmental hotspots, and promoted broader adoption of sustainable practices. The study concluded that integrating sustainable design effectively requires participatory, context-sensitive approaches, iterative assessments, and sharing of success stories to foster a culture of sustainability in engineering and design.

According to Tukesiga (2022) investigated the effectiveness of occupational health and safety (OSH) practices in Rwanda's construction sector, focusing on how adherence to national safety regulations influences overall site safety performance. Using a descriptive cross-sectional approach, the study combined quantitative and qualitative methods, collecting data from construction workers, supervisors, and safety officers through questionnaires, interviews, and field observations. The results indicated that, although OSH laws and policies exist, their practical implementation remains weak due to poor enforcement, limited training, and a generally low safety culture within the industry. Most construction companies lacked structured OSH management systems, and safety compliance tended to be reactive rather than preventive. These findings align with global trends that associate the construction sector with high accident and health risk rates. The author concluded that the ineffectiveness of OSH practices in Rwandan construction industry stems from inadequate enforcement mechanisms and insufficient awareness among stakeholders.

The authors Mutuyimana, Nshimiyimana, and Twagiramungu (2023) evaluated occupational safety and health (OSH) performance in Rwanda's construction sector, focusing on how safety policies, regulations, and on-site practices affect safety outcomes. Using a mixed-methods design that combined surveys, interviews, and a review of existing legislation, the study revealed inconsistent enforcement of safety standards and weak coordination among industry stakeholders. Limited resources, poor supervision, and low safety awareness were identified as key barriers to effective OSH implementation. The authors concluded that improving OSH performance requires stronger regulatory enforcement, enhanced training, and regular inspections to promote safer and more sustainable construction practices in Rwanda.

The authors Habimana, Uwizeye, and Niyonkuru (2022) examined the effectiveness of occupational safety and health (OSH) policies in Rwanda's construction sector, focusing on how legal and institutional frameworks influence workplace safety. Using a descriptive design that combined surveys, interviews, and a review of OSH legislation and prior studies, the researchers found that although Rwanda's safety policies align with international standards, enforcement and compliance remain weak. Most construction sites lacked formal safety programs, adequate training, and sufficient resources. The study concluded that improving institutional capacity, increasing stakeholder awareness, and enforcing regular inspections are essential to strengthen OSH performance and support sustainable construction development.

Mukamana, Bizimana, and Nsengiyumva (2024) examined strategies to enhance occupational safety and health (OSH) in Rwanda's construction sector, focusing on interventions to reduce accidents and strengthen safety culture. Using a mixed-methods approach with questionnaires, interviews, and site observations, the study found that inconsistent use of PPE, limited safety awareness, and weak managerial supervision contribute to poor safety performance. The authors concluded that mandatory PPE use, ongoing safety training, and stricter enforcement of OSH regulations are essential to minimize risks, improve compliance, and foster a proactive safety culture across construction projects.

A recent study by Uwitonze and Habiyaemye (2025) examined the impact of occupational health and safety (OHS) practices on employee sustainability at Sulfo Rwanda. Using questionnaires, interviews, and correlation analysis, the study found that effective OHS measures such as occupational training, occupational hazard identification, and provision of protective equipment positively influence employee productivity, motivation, and job satisfaction. The authors concluded that implementing comprehensive safety programs and continuous monitoring is essential for reducing workplace risks, enhancing employee engagement, and promoting long-term organizational performance.

Summary of Research Gap Identification

Despite advances in occupational safety and health (OSH) research, significant gaps remain, particularly in industrial production contexts. Most studies in Rwanda and the wider East African region have focused on the construction sector, leaving limited empirical evidence on brewery or manufacturing production lines, such as those at Bralirwa Company. While existing research emphasizes safety policies, training, and regulatory enforcement, few studies have systematically examined how hazard identification directly impacts project sustainability, including economic, social, and environmental outcomes.

Moreover, there is a lack of investigation into technology enabled safety solutions, such as wearable devices, artificial intelligence, and augmented or virtual reality, for improving hazard detection and operational efficiency in industrial settings. Institutional and managerial factors, like enforcement mechanisms, stakeholder coordination, and participatory safety culture, remain underexplored, as does the role of workforce engagement and proactive reporting in preventing hazards and sustaining projects. Addressing these gaps would provide critical insights into strategically leveraging occupational hazard identification to enhance both safety performance and long term project sustainability in Rwanda and similar industrial contexts.

METHODOLOGY

Accordingly, this study aims to assess the effect of occupational hazard identification on the project sustainability of the production line installation at Bralirwa Company, Rubavu, Rwanda. The study contributes to bridging the empirical gap between occupational hazard identification on project sustainability, offering practical insights for policymakers, project managers, and industry leaders striving to achieve safer and more sustainable industrial development (Arezes *et al.*, 2023).

A mixed methods approach was used to capture both quantitative and qualitative insights, employing descriptive and correlational designs to describe patterns and explore associations between occupational hazard identification and project sustainability. Descriptive statistics such as frequencies, means, and standard deviations were computed, while inferential statistics, particularly linear regression, were used to analyze relationships among variables (Umeokafor, Bamidele & Adebiya, 2024).

The target population consisted of 150 employees directly involved in the production line installation, including project managers, consultants, safety supervisors, engineers, technicians, and production staff. This population ensured that findings would be representative and generalizable (Creswell & Creswell, 2023). From this population, a sample of 109 respondents was derived using Slovin's formula at a 95% confidence level and 5% margin of error (Verma & Priyam, 2020). Purposive sampling was first used to select relevant departments, followed by random sampling within departments to ensure proportional representation (Kish, 2020).

Data collection employed both primary and secondary sources. Structured Likert-scale questionnaires were distributed to employees, supervisors, and safety officers, complemented by interviews to obtain qualitative insights. Document review of safety reports, training records, and sustainability plans provided triangulated evidence of existing occupational safety practices (Kuphanga, 2024). Data collection took place both online through Google Forms and in person interview, with statistical data analyzed using the Statistical Product and Service Solutions (SPSS) software (Walliman, 2021).

The reliability and validity of the research instruments were carefully addressed. Reliability was tested using internal consistency (Cronbach's alpha), test-retest, and split-half methods to ensure the stability of measurement results (Chhetri & Khanal, 2024; Field, 2015). Validity was achieved through expert review, pilot testing, and triangulation, ensuring that instruments accurately captured the constructs under study (Desai & Peter, 2020; Suhartini, Widodo & Prasetyo, 2021). Data analysis followed systematic cleaning and preparation, with missing data handled through imputation or exclusion, and outliers tested to prevent skewed outcomes. Descriptive statistics summarized the data, while linear regression analysis identified the influence of hazard identification, risk mitigation, and safety training on project sustainability (Saunders, Lewis & Thornhill, 2023).

FINDINGS AND DISCUSSIONS

In this research out of 150 targeted population, the sample size of 109 respondents was calculated and questionnaires were prepared and sent to respondents where only 101 respondents were returned responses out of sample size of 109.

Response Rate

Table 1 : Participant Consent Frequency

Administered questionnaires	Responded questionnaires	Response rate (%)
109	101	92.7

Source: Study Data (2025)

The data displayed in Table 1 shows that out of one hundred nine (109) questionnaires sent only one hundred and one (101) respondents gave feedback equal to 92.7% consented to participate in the study. This overwhelmingly high agreement rate suggests that participants were generally willing to engage with the research conducted at production line installation by Bralirwa company Rubavu, Rwanda, all in all it's a result of clear and ethically sound consent process. The low rate of non-consent of eight respondents equal to 7.3% minimizes the risk of participation bias and supports the credibility and reliability of the data collected.

Descriptive Analysis

This section presents the research findings on occupational hazard identification and project sustainability of the production line installation at Bralirwa Company Rubavu, Rwanda. Descriptive analysis summarizing respondents' opinions using frequencies, percentages, means, and standard deviations.

Occupational Hazard Identification**Table 2: Occupational Hazard Identification**

Occupational Hazard Identification	SD	D	N	A	SA	Mean	Std. Dev.
Safety hazard identification plan is implemented at the project site.	1 (1.0%)	1 (1.0%)	3 (3.0%)	17 (17.0%)	78 (78.0%)	4.70	0.674
Hazard identification is conducted before initiating any new task.	2 (2.0%)	1 (1.0%)	9 (8.9%)	16 (15.8%)	73 (72.3%)	4.55	0.854
Emergency response plans are clearly communicated to all workers.	1 (1.0%)	1 (1.0%)	8 (7.9%)	17 (16.8%)	74 (73.3%)	4.60	0.763
Fire and emergency drills are regularly conducted.	—	—	6 (5.9%)	27 (26.7%)	68 (67.3%)	4.61	0.600
All workers strictly follow established safety protocols.	—	2 (2.0%)	4 (4.0%)	17 (16.8%)	78 (77.2%)	4.69	0.644
Non-compliance with safety rules is penalized appropriately.	—	1 (1.0%)	1 (1.0%)	24 (23.8%)	75 (74.3%)	4.71	0.535
Safety considerations are integrated during the planning phase.	—	—	2 (2.0%)	15 (14.9%)	84 (83.2%)	4.81	0.441
Tools and systems are designed to minimize exposure to hazards.	—	1 (1.0%)	1 (1.0%)	20 (19.8%)	79 (78.2%)	4.75	0.518
The project uses a formal risk rating system to assess safety hazards.	—	—	3 (3.0%)	23 (22.8%)	75 (74.3%)	4.71	0.516

Note. SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly

Source: Study Data (2025)

Based on Table 2 descriptive statistics, the author concludes that occupational hazard identification, as an independent variable, significantly influences project sustainability by embedding proactive safety measures into every phase of project execution. Supported by high mean scores ranging from 4.55 to 4.81 and strong agreement levels of 94.7% across nine key indicators including safety planning, emergency preparedness, protocol adherence, and risk assessment the quantitative data reveals a deeply rooted safety culture. These findings are reinforced by qualitative evidence from interviews and document reviews, which confirm the existence of formal safety policies, updated occupational hazard identification, and clearly communicated emergency procedures. Together, this integration of data demonstrates that occupational safety practices are not only implemented but institutionalized, serving as a cornerstone for minimizing risks, preventing incidents, and ensuring the long-term viability of construction of production line installation by Bralirwa company Rubavu, Rwanda. Thus, robust occupational hazard identification is essential for achieving and sustaining project success.

Table 3: Project Sustainability

Project Sustainability	SD	D	N	A	SA	Mean	Std. Dev
Does occupational hazard identification affect project sustainability?	–	–	–	6 (5.9%)	95 (94.1%)	4.94	0.238

Source: Study Data (2025)

Inferential Statistics

The inferential statistical analysis examined the effect of occupational hazard identification on project sustainability of the production line installation at Bralirwa Company, Rubavu, Rwanda. Using regression analysis, the study tested whether proactive identification of occupational hazards significantly influences economic, social, and environmental dimensions of project sustainability.

Table 4: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.579 ^a	.336	.329	.195
Occupational Hazard Identification				

Source: Study Data (2025)

The data displayed in the Model Summary of Table 4 indicate that the predictor variable, implementation of an occupational hazard identification at the project site, accounts for approximately 33.6% of the variance in the dependent variable, as shown by the R Square value of .336. The adjusted R Square of .329 suggests a slightly lower but still substantial proportion of explained variance after accounting for model complexity. The R value of .579 indicates a moderate positive correlation between the predictor and the outcome variable. The standard error of the estimate is .195, suggesting a relatively low average deviation of observed values from the regression line, indicating a good model fit.

Table 5: The Analysis of Variance (ANOVA)

ANOVA ^a						
Model		Sum of Squares	Df	Mean Squares	F	Sig.
1	Regression	1.894	1	1.894	49.990	.000 ^b
	Residual	3.750	99	.038		
	Total	5.644	100			
Project Sustainability						
Occupational Hazard Identification						

Source: Study Data (2025)

The Table 5 displayed the Analysis of variance (ANOVA) results shows that the regression model predicting project effectiveness in addressing key sustainability criteria based on the implementation of occupational hazard identification is statistically significant, $F(1, 99) = 49.99$, $p < .000$. This indicates that the predictor variable significantly explains variance in how well the project meets sustainability goals such as increased production and efficiency, reduced workplace accidents, long-term workforce stability, and project reputation.

Table 6: Regression Coefficient

Model	Coefficients ^a		Standardized Coefficients Beta	T	Sig.
	Unstandardized Coefficients				
	B	Std. Error			
(Constant)	3.125	.258		12.135	.000
Occupational Hazard Identification	.375	.053	.579	7.070	.000
Project Sustainability					

Project Sustainability

Source: Study Data (2025)

The Table 5 displayed the regression analysis data shows that the implementation of a safety hazard identification plan at the project site significantly predicts the effectiveness of the project in addressing key sustainability criteria, $\beta = .579$, $t(99) = 7.07$, $p < .001$. The unstandardized coefficient ($B = 0.375$) indicates that for every one-unit increase in the implementation of occupational hazard identification, the project sustainability effectiveness score increases by 0.375 units, holding other factors constant. The intercept (constant) value of 3.125 is also significant, suggesting that when the predictor is zero, the baseline level of sustainability effectiveness is moderately high.

Discussion

The research findings confirm that occupational hazard identification is a crucial and strategic factor for project sustainability in the production line installation at Bralirwa Company in Rubavu, Rwanda. Descriptive statistics indicate an extremely high consensus among participants regarding the effectiveness of the company occupational hazard identification, with mean scores peaking at 4.81 out of 5. This strong agreement highlights a deeply embedded, proactive safety culture, particularly in integrating safety measures early during the planning phase and employing systematic tools like formal risk rating systems. These practices reflect an approach that aligns with expert recommendations for embedding safety early in the project lifecycle to enhance long-term social sustainability.

Inferential statistical analysis quantitatively supports this link, demonstrating a significant and moderate positive relationship. Regression analysis revealed that occupational hazard identification accounts for 33.6 % of the variance in project sustainability. The model was highly significant $p < .000$, with a strong standardized coefficient of $\beta = 0.579$, which confirms that robust occupational hazard identification directly and substantially contributes to better sustainability outcomes. These results align with the Safety-Driven Sustainability Theory, suggesting that effective safety systems avoid costly delays and improve budget control, which are essential components of sustainable project delivery.

Bralirwa company comprehensive approach integrates occupational hazard identification into a broader sustainability strategy that mirrors the Triple Bottom line (TBL) framework. Economically, early hazard detection reduces rework and saves costs; socially, it fosters a safer and more engaged workforce; and environmentally, it mitigates potential incidents that could harm ecosystems. The practice of continuous, rather than one-off, risk assessments exemplifies a doer mentality and aligns with the principles of Life cycle Thinking and the Adaptive Safety Management Theory, which advocates for continuous learning and flexibility. In conclusion, the robust empirical evidence confirms that occupational hazard identification is not merely a

compliance task but a strategic imperative that underpins the company's economic efficiency, social well-being, and long-term project integrity.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study explored the relationship between occupational hazard identification and project sustainability during the production line installation at Bralirwa Company in Rubavu, Rwanda. The findings revealed that proactive and systematic safety interventions greatly contribute to project sustainability across economic, social, and environmental dimensions. Current research further supports these results, highlighting consistency with modern sustainability and safety management frameworks such as Life Cycle Thinking and the Behavior-Based Safety model. The study found that occupational hazard identification had the most substantial impact on sustainable project outcomes. Integrating occupational hazard identification early in project planning enhances production efficiency, reduces accidents, and promotes long-term workforce stability and consistent. This study sum up that occupational hazard identification at Bralirwa company are not merely about compliance but serve as strategic tools for sustainable project delivery. The hazard identification enhances efficiency, worker well-being, and environmental protection. Embedding these proactive safety measures throughout all project phases is crucial for achieving long-term sustainability in industrial environments.

Recommendations

Bralirwa Company should improve occupational hazard identification by digitizing and standardizing training, investing in real-time hazard monitoring technologies, and integrating safety measures across all project phases based on Life Cycle Thinking to enhance sustainability and efficiency. The Government of Rwanda should enforce stronger occupational hazard identification national benchmarking system as a safety regulation to be complied. Companies and community associations should engage local communities in safety awareness, create regional safety clusters for knowledge sharing, and develop joint safety agreements to promote environmental protection and social well-being. Future research should explore how emerging digital technologies can further strengthen the link between occupational hazard identification and project sustainability.

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