Human Capital Development and Organizational Performance:

Management, Strategy, Learning, and Sustainability Perspectives

Edited by

Prof. Dr. Teena SINGH

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PREFACE

In an era characterized by rapid technological change, intensifying competition, and growing sustainability imperatives, organizations increasingly recognize human capital as a critical driver of organizational performance and long-term success. The effective development, management, and alignment of human resources with strategic objectives have become central concerns for both scholars and practitioners across diverse industries and institutional contexts.

This edited volume, Human Capital Development and Organizational Performance: Management, Strategy, Learning, and Sustainability Perspectives, brings together a collection of empirical and conceptual studies that explore contemporary challenges and practices related to human capital and organizational effectiveness. The chapters examine a wide range of topics, including employee performance, leadership styles, workload and burnout, learning agility, training and development, knowledge management, digital adoption, green human resource management, and sustainability-oriented business ecosystems.

By presenting evidence from various sectors—such as retail, mining, manufacturing, financial services, and small and medium-sized enterprises—this book offers multidimensional insights into how human capital strategies influence organizational outcomes. Several contributions also highlight the role of organizational commitment, social capital, innovation, and policy frameworks in shaping employee performance and sustainable organizational practices.

This volume aims to contribute to the growing literature on human capital and organizational performance by providing rigorous analysis, practical implications, and policy-relevant insights. It is intended for academics, graduate students, policymakers, and practitioners seeking to better understand the complex interplay between people, strategy, learning, and sustainability in today’s organizations.

Prof. Dr. Teena SINGH
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December 2025

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Marketing and Communication Strategy in the Development of the Halal Food Station: An Operational Approach to Local Sustainability

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ABSTRACT

As the world's largest Muslim nation, Indonesia bears strategic responsibility to lead a halal food ecosystem contributing to the global Muslim ummah's welfare. This study aims to design an operational framework for the Smart Halal Food Distribution Center (SHFDC) in Rancamaya, Bogor, integrating halal supply chain management with local community empowerment while strengthening Indonesia's position in the regional Islamic economy. Through qualitative approaches with in-depth interviews of key stakeholders from BAPPENAS, KADIN, universities, and the Ministry of SMEs, the research reveals multi-layered strategies encompassing three primary product lines: meat (beef, chicken, fish). Critical findings indicate the need for solid institutional coordination mechanisms, with BAPPENAS as G2G funding coordinator, KADIN for commercial partnerships, and universities for product research. Main constraints include regulatory fragmentation, minimal fiscal incentives, and limited long-term financing requiring Public-Private Partnership (PPP) models for sustainability. The research recommends establishing a Southeast Asian Muslim nations consortium for halal standards harmonization, integrated distribution network development, and collective marketing strategies strengthening regional halal food sovereignty. Successful implementation requires integrated marketing communications balancing commercial viability with social sustainability, supported by strong institutional partnerships and regional cooperation oriented toward the ummah's welfare.
Keywords: Halal Food Station, Halal Supply Chain, Community Empowerment, Public-Private Partnership, ASEAN Regional Cooperation, Islamic Economy.

1. INTRODUCTION

1.1 Background

The development of agricultural infrastructure through value chain equity represents a strategic effort to improve farmers' bargaining position in Indonesia's food supply system. As the world's largest Muslim-majority nation with over 230 million Muslims, Indonesia possesses both the responsibility and opportunity to lead the global halal food ecosystem. However, agricultural infrastructure policy challenges persist, particularly in fair price intervention mechanisms, purchasing agricultural products when prices are unfavorable for farmers yet high for consumers. These regulatory gaps necessitate innovative breakthroughs through technology-driven agricultural infrastructure that can function as a controller of supply and demand flows while ensuring halal integrity throughout the value chain.

The Smart Halal Food Distribution Center (SHFDC) development in Rancamaya, Bogor, represents a strategic response to these challenges, leveraging the city's position as a hub between DKI Jakarta and its supporting producer areas. This initiative transforms the Rancamaya Agribusiness Sub-Terminal into an economic center carrying the smart business concept, aligning with Bogor's regional vision to build a Smart City. The project optimizes regional assets through program synergy with the National Economic Recovery (PEN) policy while addressing the critical need for modern distribution infrastructure supported by digitalization, technology implementation, and comprehensive halal certification.

1.2 Problem Statement

The successful implementation of SHFDC extends beyond infrastructure and operational systems to encompass strategic marketing and communication dimensions that are critical for market penetration and stakeholder engagement. In the context of halal food distribution, marketing strategy must address the dual challenge of building consumer trust in halal integrity while communicating the value proposition of operational excellence, fair pricing, and supply chain transparency. The digitalization and technology implementation embedded in SHFDC operations function not merely as efficiency tools but as powerful communication instruments that enable real-time information sharing, traceability verification, and market intelligence dissemination to both producers and consumers.

Despite the strategic importance of integrated marketing communications in halal food distribution centers, limited research examines how operational transparency can be leveraged as a marketing differentiator, particularly in B2B contexts where purchasing decisions depend on documented compliance, consistent quality, and supply reliability. Furthermore, the literature lacks comprehensive frameworks for positioning halal distribution centers as trusted intermediaries committed to local sustainability through equitable economic redistribution, employment generation, and environmental stewardship.

1.3 Research Objectives

This study aims to:

1. Design a comprehensive marketing and communication strategy framework for SHFDC development that integrates halal supply chain management with local community empowerment.
2. Identify differentiated value propositions and communication approaches for diverse B2B market segments.

3. Analyze stakeholder coordination mechanisms and institutional partnerships required for successful marketing strategy implementation.
4. Examine how operational excellence and digital transparency can be leveraged as primary marketing differentiators.
5. Develop recommendations for regional halal food marketing cooperation strengthening Indonesia's position in the ASEAN Islamic economy.

2. LITERATURE REVIEW

2.1 Marketing Strategy in Halal Food Distribution

The halal food industry requires integrated marketing approaches that balance commercial objectives with religious compliance and social responsibility (Wilson & Liu, 2011). Effective marketing in halal supply chains must address three critical dimensions: trust-building through certification transparency, value communication through differentiated positioning, and stakeholder engagement through multi-channel strategies (Ali et al., 2017). Unlike conventional food marketing, halal food distribution demands heightened attention to supply chain integrity, with consumers increasingly scrutinizing not only product certification but entire value chain processes from farm to table (Bashir, 2019).

The B2B context of halal food distribution presents unique marketing challenges, as organizational buyers require comprehensive documentation of halal compliance, cold chain integrity, and traceability systems that satisfy both religious requirements and operational standards (Tieman, 2011). Marketing strategies must therefore integrate operational capabilities as core value propositions, transforming compliance systems and quality assurance processes into marketable assets that differentiate suppliers in competitive procurement environments (Ngah et al., 2017).

2.2 Integrated Marketing Communication Framework

Integrated Marketing Communication (IMC) in distribution centers functions as both operational tool and market positioning instrument (Kotler & Keller, 2016). Digital platforms enable real-time information dissemination, traceability verification, and stakeholder coordination, critical for B2B markets where purchasing decisions depend on operational reliability and compliance documentation (Fill & Turnbull, 2016). The IMC approach emphasizes consistency across multiple communication channels while adapting messages to specific stakeholder needs, creating synergies between advertising, public relations, digital marketing, and relationship management (Shimp & Andrews, 2013).

In the context of halal food distribution, IMC extends beyond promotional activities to encompass operational transparency as a communication strategy. Real-time dashboards, traceability systems, and digital documentation become communication tools that build trust with both producers seeking market visibility and buyers requiring supply assurance (Abdul-Talib & Abd-Razak, 2013). This operational transparency transforms conventional marketing claims into verifiable facts, addressing the credibility gap that often undermines halal marketing efforts (Wilson & Liu, 2010).

2.3 Local Sustainability and Marketing

Sustainability-focused marketing creates competitive advantage when operational practices authentically demonstrate environmental stewardship and community

empowerment (Kumar & Christodoulopoulou, 2014). Consumer awareness of ethical sourcing and fair-trade principles increasingly influences purchasing behavior in food markets, particularly among Muslim consumers valuing ummah welfare principles (Elseidi, 2018). The integration of local sustainability into marketing strategy requires moving beyond superficial "green washing" to embed sustainable practices into core business models, enabling authentic storytelling that resonates with socially conscious buyers (Pomering, 2017).

For halal food distribution centers, local sustainability encompasses economic, social, and environmental dimensions: fair pricing mechanisms that redistribute wealth to producers, employment policies prioritizing local hiring, procurement strategies strengthening regional supply networks, and environmental practices preserving natural resources (Zailani et al., 2015). Marketing communications that transparently demonstrate these impacts, supported by quantifiable metrics and third-party verification, create defensible market positions in increasingly competitive halal food sectors (Ali & Suleiman, 2016).

2.4 Research Gap

While existing literature addresses halal marketing principles and sustainability communications separately, limited research examines how operational excellence in halal distribution centers can be strategically leveraged as integrated marketing communications. Furthermore, studies rarely explore the specific challenges and opportunities of marketing halal distribution infrastructure in emerging markets like Indonesia, where institutional coordination, regulatory frameworks, and stakeholder partnerships significantly influence marketing strategy effectiveness. This study addresses these gaps by developing a comprehensive marketing and communication strategy framework specifically adapted to the SHFDC context, integrating stakeholder perspectives with established marketing theory.

3. RESEARCH METHODOLOGY

3.1 Research Design

This qualitative study employs an exploratory case study approach to design a marketing and communication strategy framework for SHFDC development. The research utilizes purposive sampling to select key stakeholders whose insights are critical for understanding institutional coordination mechanisms, market requirements, and communication channel effectiveness in the halal food distribution sector.

3.2 Data Collection

Primary data collection occurred during August-October 2024 through semi-structured in-depth interviews with nine key stakeholders:

- BAPPENAS representatives (n=2): providing perspectives on government-to-government funding coordination and national economic policy alignment
- KADIN officials (n=3): offering insights on commercial partnership facilitation, investor networking, and private sector requirements
- University researchers (n=2): contributing expertise on halal certification processes, product innovation, and research and development capacity
- Ministry of SMEs officers (n=2): sharing knowledge on MSME integration programs, capacity-building initiatives, and small business empowerment strategies

Interviews averaged 60-90 minutes, following a semi-structured protocol that explored:

(1) institutional roles and coordination mechanisms, (2) market positioning and value proposition requirements, (3) communication channel preferences and effectiveness, (4) sustainability integration approaches, (5) regulatory constraints and partnership opportunities, and (6) regional cooperation potential for halal food marketing.

3.3 Secondary Data

Secondary data sources included:

- SHFDC feasibility study documents detailing financial projections, operational capacity, and infrastructure requirements.
- Market research reports on halal food consumption patterns in the Greater Jakarta region
- Policy documents from BAPPENAS, Ministry of Agriculture, and Ministry of SMEs related to halal food ecosystem development.
- Industry publications on halal logistics standards and certification requirements
- Comparative case studies of halal distribution centers in Malaysia and Thailand

3.4 Data Analysis

Thematic analysis identified recurring patterns across stakeholder perspectives regarding marketing strategy requirements, communication channel effectiveness, and sustainability integration approaches. The analysis process involved:

1. Transcription and coding of interview data using NVivo software.
2. Identification of emergent themes related to value propositions, stakeholder coordination, and market positioning.
3. Cross-validation of themes with secondary data sources
4. Triangulation with feasibility study projections and market research findings
5. Synthesis of stakeholder insights with established marketing strategy frameworks (STP model, IMC principles, sustainability marketing approaches)

The operational framework design integrates stakeholder perspectives with marketing theory adapted to the halal food distribution context, ensuring practical relevance while maintaining academic rigor.

4. FINDINGS

4.1 Stakeholder Coordination Framework

Interview results reveal critical institutional roles essential for SHFDC marketing strategy implementation. BAPPENAS functions as the government-to-government (G2G) funding coordinator, requiring formal Memoranda of Understanding (MoU) frameworks that align SHFDC development with national halal food ecosystem priorities and National Economic Recovery programs. This coordination provides legitimacy and policy support essential for marketing SHFDC to government agencies and public sector buyers concerned with regulatory compliance and national development alignment.

KADIN facilitates commercial partnerships through investor networking events, due diligence support for private sector partners, and business matchmaking services connecting SHFDC with potential corporate buyers in hospitality, food service, and retail sectors, halal certification process optimization, and technical training programs that enhance SHFDC's credibility as a knowledge-driven operation. The Ministry of SMEs provides MSME integration programs enabling small producers to meet SHFDC quality standards, capacity-building initiatives for local entrepreneurs, and preferential procurement policies that

support SHFDC's local sustainability positioning.

4.2 Key Constraints and Challenges

Stakeholder interviews identified four primary constraints affecting marketing strategy implementation:

Regulatory Fragmentation: Permit requirements span local (Bogor City), provincial (West Java), and national authorities, creating approval delays that undermine marketing efforts emphasizing rapid market responsiveness. This fragmentation complicates communication of SHFDC's value proposition to time-sensitive buyers requiring predictable supply schedules.

Minimal Fiscal Incentives: Limited tax breaks, subsidies, or preferential financing for halal-certified infrastructure investment reduce SHFDC's cost competitiveness relative to conventional distributors, constraining price-based value propositions particularly for cost-sensitive market segments.

Long-term Financing Limitations: Conventional banking products inadequately address SHFDC's capital requirements for infrastructure development and working capital during the initial 2-3 year market penetration phase. This necessitates Public-Private Partnership (PPP) structures with risk-sharing mechanisms, complicating financial messaging in investor relations and partner negotiations.

ASEAN Halal Standards Fragmentation: Absence of harmonized halal logistics protocols across Southeast Asian nations creates cross-border trade barriers that limit SHFDC's regional marketing potential and complicate positioning as a regional halal hub serving ASEAN markets.

4.3 Product Portfolio and Market Segmentation

SHFDC's product portfolio comprises three strategic lines supporting differentiated market positioning:

Core Meat Products: Halal-certified frozen meat, sliced meat, and processed meat (minced) with 100 tons daily capacity, sourced from certified slaughterhouses in Sukabumi, Cianjur, Bogor, and surrounding West Java regions. Market segmentation targets 52.6 tons/day frozen meat, 33.5 tons/day sliced meat, and 18.9 tons/day processed meat, distributed across beef, chicken, lamb/goat, and fish categories. Additionally, processed surimi products address demand from East Asian cuisines popular in Jakarta's hospitality sector.

4.4 Market Positioning Strategy

Stakeholder insights reveal distinct value proposition requirements across four primary B2B segments:

Hotels & Restaurants (Hospitality Sector): This segment prioritizes international halal certification compliance meeting standards required for Muslim international guests, comprehensive cold chain integrity documentation preventing food safety incidents, and flexible product formats (frozen, sliced, processed) enabling menu versatility. Communication channels include industry association presentations (Indonesian Hotel and Restaurant Association), trade show exhibitions (Food Hotel Asia, Jakarta Food Service Week), and dedicated account management through relationship executives. Marketing materials emphasize SHFDC's capacity to deliver consistent quality at scale, simplify halal

compliance documentation, and reduce procurement costs through direct sourcing eliminating intermediary markups.

Catering Services: High-volume, price-sensitive buyers requiring efficient ordering systems and flexible delivery schedules. The digital B2B portal functions simultaneously as operational tool and marketing channel, enabling advance orders, real-time delivery tracking, and dynamic pricing information facilitating competitive bidding for large catering contracts (corporate events, government functions, airline catering). Communication emphasizes operational efficiency gains (reduced ordering time, simplified logistics coordination) and cost advantages from intermediary elimination, with case studies demonstrating total cost of ownership improvements versus traditional wholesalers.

Central Markets (Traditional Wholesale): Traders value direct producer relationships providing supply stability and competitive wholesale pricing preventing margin erosion during supply shortages. Communication strategies emphasize SHFDC's role as fair intermediary stabilizing supply flows and preventing price volatility that disadvantages small traders. Engagement occurs through trader associations, demonstration days showcasing traceability systems, and testimonials from early adopter traders highlighting income improvements from SHFDC partnerships.

Modern Retail (Supermarkets/Hypermarkets): This segment prioritizes branded products, retail-ready packaging, consistent supply of standardized SKUs, and co-marketing opportunities (in-store promotions, seasonal campaigns). Value-added services include private label production, custom packaging design, and category management support. Digital-first communication employs SEO-optimized content, social media presence (#HalalFromBogor, #SHFDCQuality), influencer partnerships with Muslim lifestyle personalities, and user-generated content campaigns building consumer awareness driving retail foot traffic.

4.5 Integrated Marketing Communication Strategy

The overarching IMC strategy communicates three positioning pillars across all channels:

Halal Integrity: Guaranteed through HAS 23000-certified processes, transparent end-to-end traceability systems accessible via QR codes, and third-party audits by recognized halal certification bodies. Marketing materials feature video documentation of handling procedures, infographics visualizing supply chain flows, and digital certificates accessible for verification.

Fair Pricing: Achieved through supply chain optimization eliminating exploitative intermediaries, balanced profit distribution rewarding producers fairly while maintaining buyer competitiveness, and transparent pricing mechanisms with real-time dashboards showing market rates. Communications include producer testimonials highlighting income improvements and buyer case studies demonstrating cost savings.

Local Sustainability: Demonstrated through regional sourcing from 500+ farmer/rancher suppliers, direct employment of 150+ Bogor residents, environmental stewardship (integrated waste management, water treatment), and community development (MSME

capacity building, halal training programs). ESG-focused communications attract socially conscious corporate buyers, facilitate government partnerships, and qualify for green financing mechanisms. Quantifiable impact metrics (jobs created, farmer income increases, waste reduction percentages) provide proof points differentiating SHFDC from competitors making unsubstantiated sustainability claims.

4.6 Digital Platform as Marketing Infrastructure

The Agrologistics Platform built on Advanced Digital Technology serves as the central nervous system for marketing communications, enabling:

- **Data-driven market intelligence:** Real-time analytics on purchasing patterns, price sensitivities, and product preferences inform adaptive marketing strategies and product development decisions.
- **Customer relationship management:** Integrated CRM tracking buyer interactions, purchase history, and engagement levels enable personalized communication and targeted retention campaigns.
- **Multichannel content distribution:** Platform integration with social media, messaging apps (WhatsApp Business), and email marketing enables segmented communication campaigns adapted to customer type and preferences.
- **Operational transparency as marketing tool:** Public-facing dashboards displaying supply volumes, pricing data, and quality metrics build trust with producers (gaining market visibility) and buyers (gaining supply assurance)

This digital-first approach reduces marketing costs while increasing reach and enables rapid market feedback informing continuous improvement of both operations and communications.

4.7 Financial Feasibility and Investment Requirements

The SHFDC investment totals IDR 120,617.2 million, allocated across:

- Land preparation: IDR 1,092 million
- Preliminaries (design and construction): IDR 3,940.5 million
- Buildings: IDR 21,149.4 million
- Production equipment and machinery: IDR 32,466.4 million
- Mechanical, electrical, and pipeline infrastructure: IDR 57,375.6 million
- Fire fighting equipment: IDR 2,870.3 million
- Storage racks: IDR 1,723 million

Sharia-compliant financial analysis comparing net profit with gold price appreciation projects a Payback Period of 2.9 years, Investible Surplus of IDR 1,866,282.3 million over 10 years, ISR ratio of 90.2%, and GI calculation of 1.33 (assuming 50% profit distribution to investors). These projections support marketing communications emphasizing SHFDC's commercial viability and attractive returns for private sector partners in PPP arrangements.

5. DISCUSSION

5.1 Operational Excellence as Marketing Differentiator

The findings demonstrate that SHFDC's operational systems function simultaneously as service delivery mechanisms and as marketing communication tools building market confidence. The implementation of rigorous Standard Operating Procedures aligned with Halal Assurance System (HAS 23000) standards provides tangible proof points in marketing

communications, demonstrating institutional commitment to halal integrity and food safety beyond mere certification display. The cold chain infrastructure and controlled-temperature logistics system communicate reliability and quality preservation to B2B customers whose businesses depend on consistent product standards, a critical differentiator versus traditional wholesalers lacking temperature monitoring and documentation.

Most critically, the digital traceability system enabled by the Agrologistics Platform provides unprecedented transparency addressing the core concern of halal consumers: verification of product authenticity and supply chain integrity from farm to table. This operational transparency transforms conventional marketing claims into verifiable facts communicated through multiple channels. Buyers can independently verify halal compliance, view supplier information, and track handling procedures, building trust that no amount of advertising spending could replicate. This finding extends existing literature on halal marketing by demonstrating how operational systems can be designed from the outset as integrated marketing communications rather than treating transparency as a compliance burden to be minimized.

5.2 Local Sustainability as Competitive Advantage

The research reveals how SHFDC's measurable local economic impacts constitute core content for marketing communications that differentiate the center from competitors. The projected direct employment of 150 Bogor residents, income improvements for 500+ farmer/rancher suppliers through fair pricing mechanisms, estimated IDR 250 billion annual regional GDP contribution, and support for 200+ MSME processors and logistics providers provide quantifiable proof points for sustainability claims.

The communication strategy deliberately positions local sustainability as competitive advantage rather than corporate social responsibility afterthought. Marketing materials emphasize how SHFDC's business model inherently generates positive local impact through its operational design: fair pricing mechanisms redistributing wealth to producers, employment policies prioritizing local hiring, procurement strategies strengthening regional supply networks, and environmental practices (integrated waste management, water treatment) preserving resources for future generations.

This framing transforms sustainability from a cost center into a value driver that attracts socially conscious customers, facilitates government partnerships (through alignment with local economic development priorities), qualifies for green financing (ESG-linked loans, sustainability bonds), and builds long-term brand loyalty among stakeholders sharing these values. The authenticity of these claims, verifiable through operational data and third-party audits, provides SHFDC with a defensible market position addressing the "greenwashing" skepticism increasingly prevalent among sophisticated buyers.

5.3 Stakeholder Coordination as Marketing Enabler

The findings highlight how effective stakeholder coordination directly enables marketing strategy implementation. BAPPENAS involvement provides government endorsement that simplifies marketing to public sector buyers (government catering, institutional food services, state-owned enterprises) requiring vendors aligned with national policy priorities. KADIN networking facilitates introductions to corporate buyers and reduces customer acquisition costs versus cold prospecting. University partnerships enhance credibility with quality-conscious buyers valuing research-backed processes and continuous improvement.

Ministry of SMEs programs strengthen SHFDC's local empowerment narrative with concrete examples of farmer training and small business development.

However, the identified constraints, regulatory fragmentation, minimal fiscal incentives, financing limitations, and ASEAN standards fragmentation, create significant marketing challenges. Permit delays undermine messaging emphasizing responsiveness and reliability. Limited fiscal incentives constrain price competitiveness. Financing limitations create cash flow pressures that may compromise service quality during market penetration. Standards fragmentation limits regional positioning potential.

Addressing these constraints requires advocacy efforts positioning SHFDC stakeholders as policy influencers, not merely policy followers. Marketing strategy must therefore extend beyond commercial communications to include policy advocacy and public affairs dimensions, engaging regulators, industry associations, and regional cooperation frameworks (ASEAN Working Group on Halal Food) to create enabling environments for halal distribution infrastructure.

5.4 Regional Cooperation Opportunities

The research reveals significant opportunities for Southeast Asian Muslim nations consortium development addressing shared challenges in halal food marketing. Harmonized halal logistics protocols across ASEAN nations would enable cross-border marketing positioning SHFDC as a regional hub serving Jakarta, Singapore, Kuala Lumpur, and Bangkok markets. Integrated distribution network development with Malaysian and Thai halal centers could achieve economies of scale in marketing investments and shared logistics infrastructure. Collective marketing strategies (regional halal food festivals, joint buyer missions, coordinated digital campaigns) could strengthen the ASEAN halal brand versus Middle Eastern and European competitors.

This regional cooperation dimension extends existing literature by demonstrating how halal food marketing strategy must operate at multiple scales simultaneously: local (community empowerment), national (policy alignment), and regional (ASEAN coordination). Marketing frameworks developed for Western markets inadequately address these multi-scalar coordination requirements, necessitating adapted approaches grounded in ummah welfare principles and regional solidarity.

6. IMPLICATIONS AND RECOMMENDATIONS

6.1 Managerial Implications

For SHFDC Management:

1. Prioritize digital platform development as marketing infrastructure, not merely operational system, ensuring public-facing transparency features are user-friendly and mobile-optimized.
2. Establish dedicated marketing and communications team with expertise in B2B marketing, digital content creation, and sustainability reporting.
3. Invest in customer relationship management systems enabling personalized engagement and targeted retention campaigns across diverse buyer segments.
4. Develop comprehensive brand guidelines ensuring consistent messaging across all stakeholder touchpoints (packaging, digital platforms, facility signage, employee training)
5. Implement robust impact measurement systems tracking sustainability metrics (jobs created, farmer income increases, waste reduction) for credible marketing communications.

For Government Partners:

1. Accelerate regulatory harmonization across local, provincial, and national authorities, establishing one-stop-shop permit systems for halal infrastructure projects.
2. Design fiscal incentive packages (tax holidays, accelerated depreciation, preferential utility rates) enhancing SHFDC's price competitiveness.
3. Develop halal-specific financing products through state banks and development finance institutions, addressing long-term capital requirements and working capital needs during market penetration.
4. Lead ASEAN Working Group initiatives on halal logistics standards harmonization, positioning Indonesia as regional thought leader.

For Private Sector Partners:

1. Structure PPP arrangements with clear risk-sharing mechanisms, milestone-based capital calls, and performance incentives aligned with market penetration targets.
2. Contribute marketing expertise and corporate buyer networks, leveraging existing relationships to accelerate SHFDC's customer acquisition.
3. Support co-branding initiatives that leverage partner corporate reputations while building SHFDC brand equity

6.2 Policy Recommendations

Regulatory Framework: The Bogor City Government should establish the Halal Agrotourism Area Master Plan as binding regional regulation, creating legal certainty for business planning across agrotourism, halal food logistics, MSME development, and tourism amenities. This regulatory clarity facilitates marketing to investors and partners requiring predictable operating environments.

Institutional Coordination: Establish a multi-stakeholder SHFDC Coordination Committee including government representatives (BAPPENAS, Ministry of SMEs, Bogor City), private sector partners (KADIN, anchor buyers), academic institutions (Pertamina University, IPB), and farmer associations. This committee should meet quarterly to review marketing performance, address coordination challenges, and align stakeholder activities supporting SHFDC objectives.

Regional Cooperation: The Indonesian government should champion a Southeast Asian Muslim Nations Halal Food Consortium including Indonesia, Malaysia, Brunei, and southern Thailand. This consortium should pursue: (1) harmonized halal certification standards and logistics protocols, (2) integrated distribution network development connecting major Muslim population centers, (3) collective marketing campaigns promoting ASEAN halal food brands in global markets, (4) knowledge sharing on halal infrastructure best practices and technology solutions.

6.3 Academic Implications

This research contributes to halal marketing literature by demonstrating how operational systems can be designed as integrated marketing communications from project inception, rather than treating transparency as a compliance burden. The findings extend IMC theory by showing how digital platforms enable real-time operational transparency functioning as

continuous marketing communication, not episodic advertising campaigns.

The stakeholder coordination framework developed in this study provides a template for analyzing institutional partnerships essential for halal infrastructure marketing, addressing a gap in existing literature that typically focuses on consumer marketing while neglecting B2B and institutional dimensions. Future research should examine the effectiveness of different communication channels across B2B buyer segments through quantitative methods, track actual market penetration outcomes against projected targets, and conduct comparative studies of halal distribution center marketing strategies across Southeast Asian nations.

6.4 Limitations

This study's qualitative methodology provides deep insights into stakeholder perspectives but limits statistical generalizability. The research focuses on SHFDC's pre-operational phase, relying on projected financial data rather than actual performance results. Future studies should conduct longitudinal research tracking marketing strategy effectiveness over SHFDC's initial 3-5 years of operations, examining how communication approaches evolve based on market feedback.

The focus on B2B marketing may understate direct-to-consumer marketing opportunities through SHFDC's planned e-commerce platform. Additional research should explore consumer behavior dimensions including online purchasing patterns, halal certification awareness levels, and willingness to pay premiums for verified sustainable sourcing.

7. CONCLUSION

This research establishes a comprehensive marketing and communication strategy framework for the Smart Halal Food Distribution Center (SHFDC) in Rancamaya, Bogor, demonstrating how operational excellence and digital transparency can be leveraged as primary marketing differentiators in halal food distribution. Through qualitative analysis of stakeholder interviews and secondary data synthesis, the study reveals critical success factors spanning product portfolio diversification, B2B market segmentation, integrated marketing communications, and institutional coordination mechanisms.

Key findings indicate that SHFDC's marketing strategy must address four distinct B2B segments through differentiated value propositions: hotels/restaurants requiring international halal compliance and cold chain documentation; catering services prioritizing cost efficiency and digital ordering systems; central markets valuing direct producer relationships and price stability; and modern retail seeking co-branding opportunities and consistent SKU availability.

The research demonstrates that operational systems—particularly the digital Agrologistics Platform enabling real-time traceability, pricing transparency, and supply monitoring—function simultaneously as service delivery mechanisms and marketing communication tools building stakeholder trust. This operational transparency transforms conventional marketing claims into verifiable facts, addressing the credibility challenges endemic to halal food marketing. The quantifiable local economic impacts including 150+ direct jobs, 500+ farmer supplier partnerships, and IDR 250 billion annual GDP contribution provide authentic sustainability narratives that differentiate SHFDC from competitors making unsubstantiated claims.

However, successful implementation faces significant constraints including regulatory

fragmentation, minimal fiscal incentives, long-term financing limitations, and ASEAN halal standards fragmentation. Addressing these barriers requires multi-stakeholder coordination leveraging BAPPENAS for policy alignment, KADIN for commercial partnerships, universities for R&D credibility, and Ministry of SMEs for MSME integration. Marketing strategy must therefore extend beyond commercial communications to encompass policy advocacy and regional cooperation dimensions.

The research recommends establishing a Southeast Asian Muslim Nations Halal Food Consortium pursuing harmonized standards, integrated distribution networks, and collective marketing strategies strengthening regional halal food sovereignty. This regional cooperation approach reflects the ummah welfare principles central to Islamic economic thought while creating commercial advantages through economies of scale and shared infrastructure.

Ultimately, this study demonstrates that halal food distribution center marketing requires integrated approaches balancing commercial viability with social sustainability, operational excellence with authentic transparency, and local empowerment with regional cooperation. The SHFDC framework provides a replicable model for halal infrastructure development across Indonesia and Southeast Asia, contributing to the region's emergence as a global halal food hub serving 1.8 billion Muslims worldwide.

Project Feasibility Summary: With a projected investment of IDR 120,617.2 million, 100 tons daily capacity across diversified product lines, and projected Payback Period of 2.9 years with ISR ratio of 90.2%, the SHFDC development demonstrates commercial feasibility supporting Public-Private Partnership structures. The integration of rigorous marketing and communication strategy from project inception positions SHFDC for rapid market penetration and sustained competitive advantage in Indonesia's growing halal food ecosystem.

References

1. A.A. Aida, Y.B. Che Man, C.M.V.L. Wong, A.R. Raha, R. Son, Man (2005) Analysis of raw meats and fats of pigs using polymerase chain reaction for Halal authentication, Meat Science, 69:1, 47-52.
2. Agustin, H. 2017. Financial analysis of Hamdi's Model sharia business. Indonesian Business Management Journal, Vol.4(3).pp. 295-305
3. Agustin, H. 2017. Feasibility Study of Sharia Business. Edition 1. Printing 1. Rajawali Press. Depok
4. Almunawar, M. Nabil. 2020. Crafting Digital Platform Based Business Ecosystem for Agriculture and Agriculture Product. SBE, University Brunei Darussalam
5. Bokor Z, & Somogyi R.M. 2015. Applying activity-based costing at a logistics service provider. Periodica Polythecnica Transportation Engineering, 43(2). pp. 98-105
6. Boris P., Petr N. 2011. Activity-based costing application in an urban mass transport company. Journal of Competitiveness, Issue 4. Pp 51-65
7. Bowersox, D.J. 2002. Supply Chain Logistics Management. New York: The McGraw-Hill Companies, Inc
8. Center of System. 2018. Reduction of Postharvest Losses for Agricultural Produce and Products in the ASEAN Region. ASEAN Cooperation Project and JAIF. Jakarta
9. Center of System. 2021. Analysis of Fruit and Vegetable Value Chain in Indonesia. Asian Development Bank. Unpublished
10. Eriyatno and Lala Kolopaking. 2019. Agfin 4.0 Platform: Financing System for Micro Agricultural Businesses. IPB Press. Bogor
11. Economic Bureaucracy Eriyatno. 2001. Regional Economic Development System Based on Local Resource Capabilities, In: Social Regional Autonomy Management. LSKPI. Jakarta.

12. Farmer, R.E. 2017. Prosperity for All: How to Prevent Financial Crises. Oxford University Press, New York
13. Fung, V.K. et al. 2008. Competing in a flat world. Building Enterprise for Borderless World. Wharton School Publishing
14. Ghiani, G., G. Laporte, and R. Musmanno. 2004. Introduction to Logistics Systems Planning and Control. Hoboken, NJ, USA: Wiley-Interscience.
15. Global Islamic Economy Report 2019-2020. Dina Standard Research & Advisory.
16. Halal Assurance System (HAS 2300). LPPOM MUI
17. Jasir, I et al. 2020. "Reference List of Materials with Halal Critical Points and Non-Halal Material Substitutes". National Committee for Sharia Economics and Finance. ISBN 978- 623-90941-9-5
18. Joint Institute for Food Safety and Applied Nutrition. 2018. Food Safety Risk Analysis Training Program. University of Maryland, USA.
19. Kucera T. 2017. Cost management in logistics of warehousing: The use of activity-based costing in the logistics service provider. University of Pardubice, Faculty of Transport Engineering-Department of Transport Technology and Control
20. Marimin. 2009. Theory and Application of Expert Systems in Managerial Technology. IPB-Press, Bogor
21. Indonesian Sharia Economic Masterplan 2019-2024. Results of Sharia Economic Analysis in Indonesia.
22. Miller T. 2018. The ABCs of activity-based costing for logistics. Article in Material Handling & Logistics Edition July-August. www.MHLNEWS.com
23. Nakyinsige, Y.B. Che Man, A.Q. Sazili Halal authenticity issues in meat and meat products Meat Science, 91 (2012), pp. 207-214
24. Rahman, F.A. & Oktaviani, R.N. 2022. Analysis of the feasibility study of Islamic business in small and medium industries in obtaining financing from Islamic banking. Jurnal Tabarru': Islamic Banking & Finance, Vol.5(1).pp. 108-121
25. Rohman, A. & Y. B. Che Man (2012) Analysis of Pig Derivatives for Halal Authentication Studies, Food Reviews International, 28:1, 97-112, DOI: 10.1080/87559129.2011.595862
26. Rother, M. and Shook, J. 2003. Learning to See: Value stream mapping to add value and eliminate muda. Cambridge, MA: Lean Enterprise Institute.
27. Ruston A., Croucher P., Baker P. 2017. The Handbook of Logistics and Distribution Management. Kogan Page Limited. USA.
28. Salim, Abbas. 1993. Transportation Management. Jakarta: Raja Grafindo Persada
29. Sekaran, U. 2009. Research Methods for Business. A Skill Building Approach. John Wiley Pub. Inc, New York.
30. Suryanto, Rasmini M., Lidwina T. 2020. Activity-based costing: An accurate method for determining hotel room costs. Journal of Business Administration & Entrepreneurship Thought & Research, 5(1). pp. 51-62
31. Sutarman S, Eriyatno. 2001. Business Partnership Engineering and the Role of BDS in the Local Economy. In: Partnerships in Local Economic Development. Village-City Development Partnership Foundation and BIC-Indonesia. Jakarta.
32. Wignjosoebroto, S. 2009. Factory Layout and Material Handling. Guna Widya. Surabaya.
33. Zaroni. 2015. Creating a lean process using Value Stream Mapping. Article. www.supplychainindonesia.com [Accessed December 18, 2022].

CHAPTER 2
Identifying Internal Factors of Handbags Product Quality Based on the Perceived Quality Among Manufacturing Workers

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ABSTRACT

This study investigates internal factors that influence the perceived quality of handbags in the manufacturing sector, using Total Quality Management (TQM) as the overarching framework. Key determinants examined include worker education, quality mindset, teamwork, tooling/machinery conditions, and material quality. Using a quantitative approach with survey data from handbag manufacturing workers, the study applies Structural Equation Modeling (SEM) to test variable validity, reliability, and hypotheses regarding the relationships among internal factors and perceived product quality. Results show that worker education, teamwork, and material quality significantly affect perceived handbag quality, while worker mindset and machinery conditions do not. These findings support TQM's focus on structured training, team collaboration, and strict material control, while also suggesting that machinery-related effects may depend on industry-specific contexts. Overall, this research contributes to quality management studies by highlighting the practical relevance of TQM principles. It emphasizes the importance of continuous improvement, workforce development, and supplier quality control to enhance product perception and maintain competitiveness.
Keywords: Total Quality Management, Perceived Quality, Worker's Education, Material Quality, Teamwork, Handbag Manufacturing.

INTRODUCTION

The global fashion industry continues to grow and is projected to reach US$2.5 trillion by 2025. One of its strongest segments, the luxury goods industry, was valued at US$354.80 billion in 2023, while the luxury handbag market alone was worth US$58.3 billion in 2018 and is expected to reach US$89.9 billion by 2026. Despite this growth, the industry faces major challenges due to digital transformation, shifting consumer behavior, and global disruptions such as the COVID-19 pandemic, geopolitical tensions, and economic instability. These factors have reshaped purchasing patterns, pushing luxury brands to adjust their strategies and strengthen online presence.

In this context, quality has become a critical differentiator for handbag manufacturers. Perceived quality consumer judgment of a product's overall excellence is influenced by materials, craftsmanship, design, functionality, and durability. High perceived quality enhances satisfaction and loyalty, yet limited studies have explored how internal manufacturing factors shape this perception, especially from workers' viewpoints.

Customers' perceptions of a product's overall excellence, or perceived quality, are a key factor in determining their pleasure and loyalty. It is impacted by the product's physical and intangible characteristics, such as the materials used, the handbag's style and appearance, the level of craftsmanship and attention to detail, and the product's functionality and longevity. Studies show that high perceived product quality can increase consumer satisfaction and loyalty, while low perceived product quality can reduce these results (Kim et al., 2020).

Previous research (Chuenyindee et al., 2022) identified five internal factors influencing perceived product quality in footwear manufacturing: worker education, quality mindset, teamwork, tooling/machinery condition, and material quality. This study adopts these factors to examine their influence on perceived handbag quality from the perspective of production workers. By focusing on internal manufacturing variables rather than external market forces, this research offers a novel contribution to the luxury handbag literature.

The study aims to measure workers' perceptions of product quality and analyze how these internal factors correlate with perceived quality. The findings are expected to provide valuable insights for manufacturers to improve production processes, enhance product quality, and strengthen customer satisfaction and competitiveness in the luxury handbag sector. In line with this objective, the research further seeks to understand how workers' education in quality, their quality mindset, the degree of teamwork and cooperation, the perceived condition of tooling and machinery, and the perceived material quality each contribute to shaping product quality perceptions within the production environment. Examining these five aspects is essential in closing the existing knowledge gap regarding internal manufacturing determinants, and ultimately provides a comprehensive foundation for developing more effective quality improvement strategies in the luxury handbag industry.

LITERATURE REVIEW

1. Management

Experts have defined management from various perspectives, yet these definitions complement one another. Terry (2018) describes management as a structured process involving planning, organizing, directing, and controlling activities to achieve objectives through the utilization of human and other resources. Similarly, Manullang (2018) emphasizes that management is both an art and a science that includes planning, organizing, directing, and supervising human resources to accomplish organizational goals. Hasibuan (2020) and Robbins & Coulter (2018) also affirm that management is the process of coordinating and overseeing the work of individuals or units to ensure tasks are carried out effectively and efficiently. Based on these perspectives, management can be summarized as a systematic process of

planning, organizing, leading, and controlling organizational activities to achieve predetermined goals.

a. **Management Basics**

Hasibuan (2020) states that the basic principles of management include collaboration among a group of people in a formal structure, shared objectives, division of tasks, formal and disciplined working relationships, and the involvement of groups in work processes.

b. **Management Levels**

According to Siregar et al. (2020), organizations consist of four levels of management: top management, middle management, lower or first-level supervisory management, and non-managerial employees who carry out operational tasks.

c. **Management Objectives**

The primary objective of management is to ensure that resources are utilized effectively and efficiently to achieve organizational goals. Hasibuan (2020) highlights that management is both an art and a science in directing the use of resources to accomplish predetermined objectives.

d. **Management Functions**

Management functions are essential elements within the managerial process. Hasibuan (2020) divides management functions into planning, organizing, directing, and controlling. Robbins & Coulter (2018) further explain that management involves setting goals (planning), arranging the organizational structure (organizing), providing leadership and motivation (leading), and supervising to ensure alignment between implementation and goals (controlling).

e. **Business Management**

Business encompasses all organized activities aimed at producing goods or services and generating profit (Sinambela et al, 2023). To operate a business effectively, companies require management principles to formulate strategies, analyze competitors, manage financial operations, and maintain product quality. In this study, the main aspect of business management examined is product quality.

2. Total Quality Management (TQM)

Total Quality Management (TQM) is a comprehensive approach to managing quality, rooted in the ideas of Deming and Juran. TQM emphasizes continuous improvement, customer satisfaction, and the involvement of all employees in quality processes (Juran, 2020). In this study, TQM is relevant because it provides the foundation for examining internal factors that influence handbag product quality, including worker education, quality mindset, teamwork, tooling and machinery conditions, and material quality.

3. Product Quality

a. **Quality**

Kotler and Keller (in Herviana & Anik, 2018) define product quality as the characteristics of a product that determine its ability to meet customer needs. Juran (Suwarno, 2020) provides two perspectives: (1) quality as product features that satisfy customer needs and increase revenue, and (2) quality as the absence of defects, which reduces errors and operational costs. Deming emphasizes that 85% of quality issues originate from systemic factors rather than individual workers. Juran also introduces five dimensions of quality: design, conformance, availability, safety, and practicality, which together determine a product's fitness for use.

b. **TQM and Perceived Quality in Manufacturing**

Perceived quality in handbag manufacturing is closely linked to TQM principles. Chuenyindee et al. (2022) highlight factors such as worker training, quality mindset, teamwork, tooling/machinery condition, and material quality as key determinants. Under TQM, these factors support continuous improvement and defect reduction. Deming (2018) reinforces that improving systems and processes is

essential for enhancing overall quality.

c. **Products**

A product must align with consumer needs to compete effectively in the market. Firmansyah (2019) describes a product as anything that can be used or consumed to satisfy consumer wants. Kotler and Armstrong (2018) emphasize that a product consists of goods and services offered to meet market needs. They outline five product levels core benefit, basic product, expected product, augmented product, and potential product which together form the complete customer value hierarchy.

4. Hypothesis Development and Research Framework

H1: Quality Education of Workers Influences Perceived Product Quality

Quality education enhances workers' skills, which directly impacts perceived product quality. Studies show that effective training and education improve human capital and proficiency, leading to better product outcomes and higher customer satisfaction (Ismail et al., 2021; Sadeghee & Khalil, 2020; Ramovš & Milfelner, 2023).

H2: Workers' Quality Awareness Influences Perceived Product Quality

Awareness of quality standards enables workers to adhere to TQM practices, improving product outcomes. Managerial support, training, and communication are key factors in fostering this awareness (Mukwakungu & Mbohwa, 2018; Rauf et al., 2018).

H3: Teamwork and Collaboration Affect Perceived Product Quality

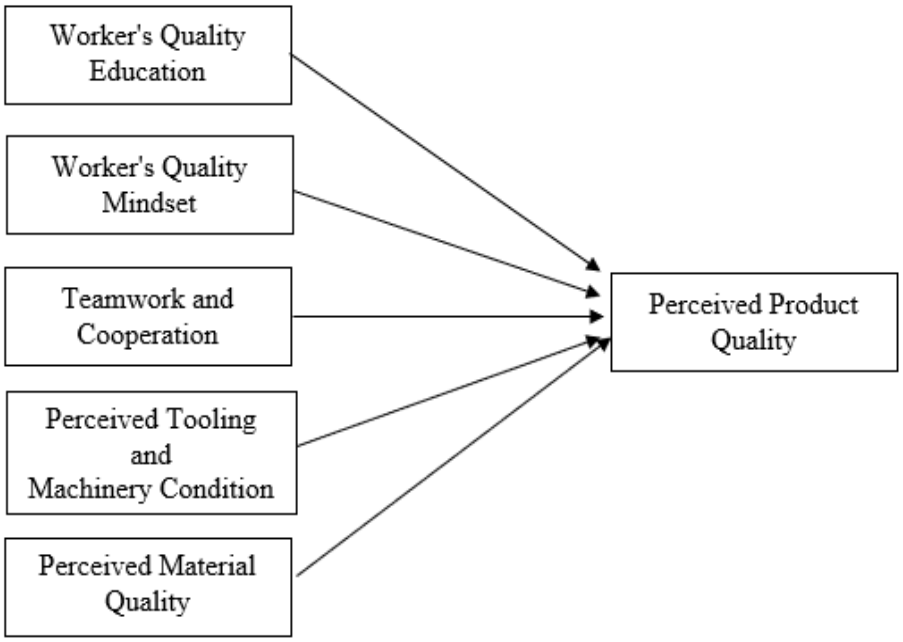
Effective teamwork and collaboration improve performance and quality outcomes. High-quality collaboration in projects leads to better perceived product quality, as shown in manufacturing studies (Al Shatti, 2018; Kämmer et al., 2021; Chuenyindee et al., 2022).

H4: Perception of Tool and Machine Condition Influences Perceived Product Quality

Well-maintained tools and machines enhance workers' perception of product quality. Equipment condition affects production efficiency and sensory evaluation of products (Chuenyindee et al., 2022; Stylidis et al., 2018; Mubarok et al., 2022).

H5: Perceived Material Quality Affects Perceived Product Quality

The quality of raw materials strongly determines the final product's perceived quality. Clean, consistent, and high-quality materials lead to better products, while poor materials cause defects and lower perceived value (Purnomo & Tsany, 2024; Haryadi et al., 2024; Hidayat et al., 2021).

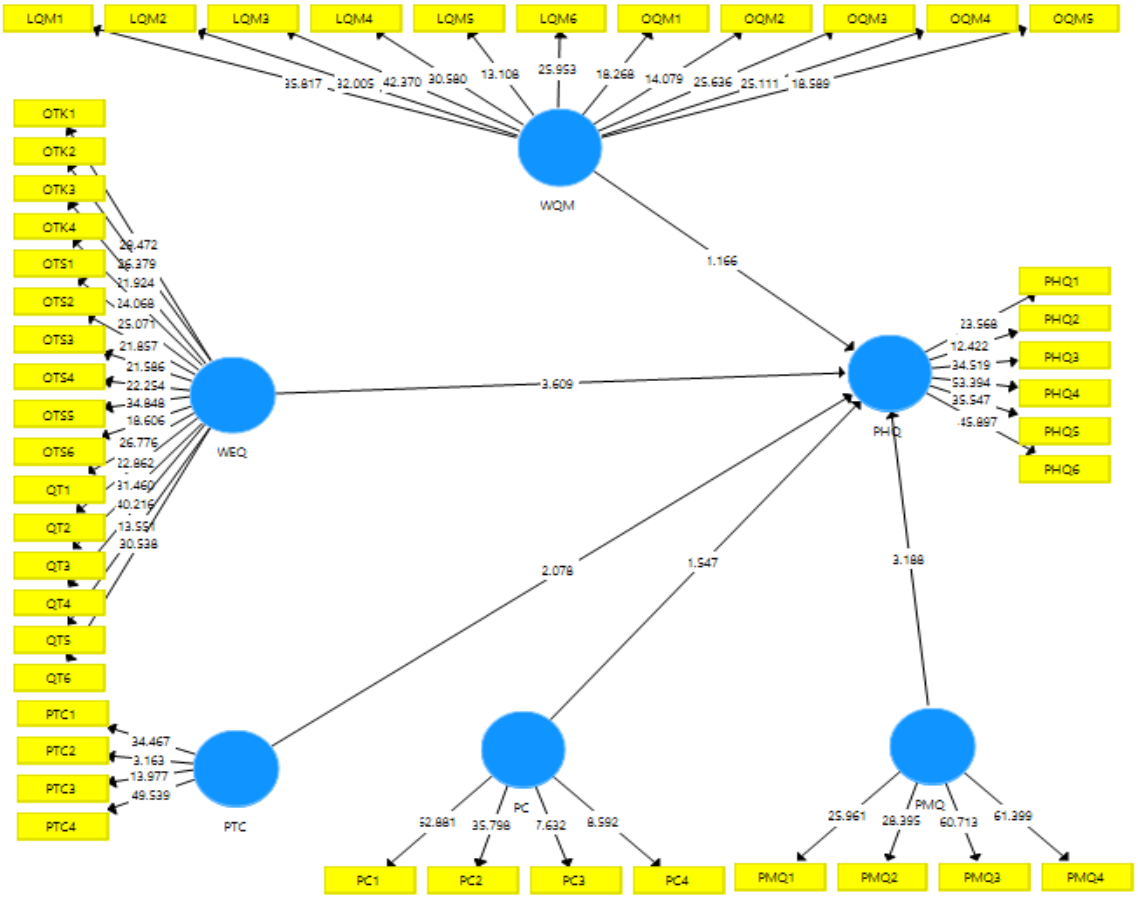


METHOD

This study employs a quantitative approach using Structural Equation Modeling (SEM) to analyze the influence of five internal production factors Worker's Education in Quality, Worker's Quality Mindset, Teamwork and Cooperation, Perceived Tooling and Machinery Condition, and Perceived Material Quality on Perceived Product Quality. The population consists of all workers involved in the handbag production process, while the sample is selected through purposive sampling based on criteria such as understanding of work procedures, machine operation, and material assessment, with the sample size adjusted to meet the minimum SEM requirement of five to ten times the number of indicators. Data are collected using a Likert-scale questionnaire that has undergone validity and reliability testing. The analysis includes evaluating the measurement model to assess construct validity and reliability, followed by examining the structural model to test the relationships among latent variables. Hypothesis testing is conducted using path coefficients and significance levels. All analyses are performed using Partial Least Squares Structural Equation Modeling (PLS-SEM), which is appropriate for complex models, predictive latent variables, and relatively moderate sample sizes. This study aims to provide empirical insights into how internal production factors influence workers' perceptions of product quality in the handbag manufacturing context.

RESULTS AND DISCUSSION

This chapter presents a summarized explanation of the findings obtained from the SEM analysis, focusing on the influence of five internal factors—Worker's Education in Quality, Worker's Quality Mindset, Teamwork and Cooperation, Perceived Tooling and Machinery Condition, and Perceived Material Quality—on Perceived Product Quality. The results are presented in a concise narrative while maintaining analytical depth.



Outer Model Test

Source: Processed Primary Data, 2024

1. Measurement Model Testing

Variable	AVE	Cronbach's Alpha	Composite Reliability	Path Coefficient (β)	Interpretation
Perceived Tooling/Machinery Condition (PC)	0.761	0.952	0.765	0.078	Small, not significant
Perceived Handbag Quality (PHQ/Y)	0.685	0.905	0.928	—	Dependent variable
Perceived Material Quality (PMQ)	0.744	0.884	0.921	0.206	Small, significant
Perceived Teamwork & Cooperation (PTC)	0.825	0.841	0.761	0.155	Small, significant
Worker's Education in Quality (WEQ/X1)	0.601	—	—	0.388	Small, significant
Worker's Quality Mindset (WQM/X2)	0.617	—	—	0.097	Small, not significant

The measurement model evaluation indicates that all indicators for each research variable are suitable for use, as reflected in the AVE, Cronbach's Alpha, Composite Reliability, and path coefficient tables. All indicators have loading factors above 0.70, demonstrating their ability to adequately represent their respective constructs. Convergent validity is also fulfilled, with Average Variance Extracted (AVE) values exceeding 0.50 for all variables: 0.601 for Worker's Education in Quality (WEQ/X1), 0.617 for Worker's Quality Mindset (WQM/X2), 0.825 for Perceived Teamwork & Cooperation (PTC), 0.761 for Perceived Tooling/Machinery Condition (PC), 0.744 for Perceived Material Quality (PMQ), and 0.685 for Perceived Handbag Quality (PHQ/Y).

Regarding reliability, Cronbach's Alpha and Composite Reliability values demonstrate strong internal consistency, ranging from 0.841 to 0.952 for Cronbach's Alpha and 0.761 to 0.928 for Composite Reliability. The structural model testing shows that Worker's Education in Quality (WEQ) has a positive and significant effect on Perceived Handbag Quality with a path coefficient of 0.388. Additionally, Perceived Material Quality (PMQ) and Perceived Teamwork & Cooperation (PTC) also have positive and significant effects with path coefficients of 0.206 and 0.155, respectively. In contrast, Worker's Quality Mindset (WQM) and Perceived Tooling/Machinery Condition (PC) have small and non-significant effects on perceived handbag quality, with path coefficients of 0.097 and 0.078, respectively.

These findings confirm that the main factors influencing perceived handbag quality are worker education in quality, material quality, and teamwork, whereas worker mindset and machinery condition have limited contributions in the context of this study.

2. Structural Model Testing

Variable	R-square	R-square adjusted
Perceived Handbag Quality	0,743	0,739

The results show that the Perceived Handbag Quality value is 0.743. This value shows Perceived Tooling / Machinery Condition, Perceived Material Quality, Perceived Teamwork and Cooperation, Worker's Education in Quality, and Worker's Quality Mindset affect the Perceived Handbag Quality variable by 74.3 per cent and the rest (25.7) is influenced by other variables outside the variables in this study.

3. Hypothesis Testing

Significance testing used T-statistics and p-values ($\alpha = 0.05$). Summary of results:

Hypothesis	β	T-stat	p-value	Decision
H1: WEQ → PHQ	0.388	3.609	0.000	Accepted (significant)
H2: WQM → PHQ	0.097	1.166	0.244	Rejected (not significant)
H3: PTC → PHQ	0.155	2.078	0.038	Accepted (significant)
H4: PC → PHQ	0.078	1.547	0.123	Rejected (not significant)
H5: PMQ → PHQ	0.206	3.188	0.002	Accepted (significant)

The hypothesis testing results indicate that Worker's Education in Quality (WEQ) has a positive and significant effect on Perceived Handbag Quality (PHQ), with a path coefficient (β) of 0.388, T-statistic of 3.609, and a p-value of 0.000, leading to the acceptance of H1. Similarly, Perceived Teamwork & Cooperation (PTC) and Perceived Material Quality (PMQ) also show positive and significant effects on PHQ, with β values of 0.155 and 0.206, T-statistics of 2.078 and 3.188, and p-values of 0.038 and 0.002, respectively, supporting the acceptance of H3 and H5.

In contrast, Worker's Quality Mindset (WQM) and Perceived Tooling/Machinery Condition (PC) demonstrate small effects on PHQ, with β values of 0.097 and 0.078, T-statistics of 1.166 and 1.547, and p-values of 0.244 and 0.123, respectively. These results indicate that H2 and H4 are not statistically significant and are therefore rejected.

Overall, the findings suggest that among the five factors examined, worker education in quality, teamwork, and material quality are the most influential in shaping perceived handbag quality, whereas quality mindset and machinery condition have limited impact in this study.

4. Importance–Performance Matrix Analysis (IPMA)

IPMA prioritizes variables based on their importance (total effects) and performance levels.

Construct	Total Effects (Importance)	Performance (%)	Quadrant
WEQ	0.388	84.151	II (High importance, high performance — maintain)
PMQ	0.206	86.158	II (Maintain)
PTC	0.155	83.620	I/II (Important, moderate performance)
WQM	0.097	86.397	I (Important, performance relatively lower by IPMA threshold)
PC	0.078	77.160	III/IV (Low importance, low performance)

The Importance-Performance Matrix Analysis (IPMA) results provide insights into strategic priorities for enhancing perceived handbag quality. Worker's Education in Quality (WEQ) and Perceived Material Quality (PMQ) are both high in importance and performance, indicating that these factors are performing well and should be maintained. Perceived Teamwork and Cooperation (PTC) and Worker's Quality Mindset (WQM) show moderate importance with performance levels that suggest room for improvement, requiring targeted efforts to increase their contribution to perceived quality. In contrast, Perceived Tooling/Machinery Condition (PC) has low importance and low performance, indicating it is a lower priority for improvement. Overall, the findings suggest that maintaining WEQ and PMQ while focusing on enhancing PTC and WQM will most effectively improve perceived handbag quality.

CONCLUSION AND RECOMMENDATION

1. Conclusion

Based on the results of this study, several conclusions can be drawn regarding the factors influencing Perceived Handbag Quality. First, the findings indicate that Worker's Education in Quality (WEQ) has a significant positive effect on Perceived Handbag Quality, highlighting the importance of training and education in enhancing product quality perception. Second, Worker's Quality Mindset (WQM) does not show a significant effect, suggesting that individual mindset alone may not be sufficient to influence quality perception without proper education or training. Third, Perceived Teamwork and Cooperation (PTC) positively impacts Perceived Handbag Quality, emphasizing the role of collaborative work and coordination among employees in achieving higher product quality. Fourth, Perceived Tooling/Machinery Condition (PC) does not have a significant effect, indicating that the state of equipment and machinery, while important operationally, may not directly alter employees' perception of handbag quality. Finally, Perceived Material Quality (PMQ) significantly influences Perceived Handbag Quality, reinforcing the critical role of material quality in shaping the overall product perception. Overall, these findings suggest that enhancing worker education, promoting teamwork, and ensuring high-quality materials are key strategies to improve perceived handbag quality.

2. Recommendation

Therefore, future research is recommended to extend the research period and include additional variables that may influence Perceived Handbag Quality or other products. Expanding the research population to cover different regions or sectors is also advisable. Based on the IPMA results, particular attention should be given to factors with high importance but relatively low performance, such as Worker's Education in Quality and Perceived Teamwork and Cooperation. Future studies could explore ways to improve these areas and investigate underlying challenges to enhance overall product quality.

REFERENCES

Al Shatti, L. (2018, July). Investigating the Impact of Teamwork Quality on Project Effectiveness in a Multiple-Project Management Setting. In *Proceedings of the 2nd European Conference on Industrial Engineering and Operations Management (IEOM) Paris, France*.

Chuenyindee, T., Torres, R. B., Prasetyo, Y. T., Nadlifatin, R., & Persada, S. F. (2022). Determining Factors Affecting Perceived Quality Among Shoe Manufacturing Workers Towards Shoe Quality: A Structural Equation Modeling Approach. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(2), 82.

Firmansyah, Anang. (2019). *Pemasaran Produk dan Merek*. Cetakan Pertama, Penerbit Qiara Media, Jawa Timur.

G. R. Terry. (2018). *Manajemen Sumber Daya Manusia*. Jakarta: PT Bumi Aksara.

Hasibuan, M. S. (2020). *Manajemen Sumber Daya Manusia Edisi Revisi*. PT. Bumi Aksara, Jakarta.

Hidayat, R., Hidayat, H., Yusron, R. M., Wasiur, W., & Jufriyanto, M. (2021). The Influence of Oil Raw Materials on The Quality of Finished Soap Products in The Laboratory Division at PT. Solar Wings Corps. In *E3S Web of Conferences* (Vol. 328, p. 05009). EDP Sciences.

Kim, J. H. (2020). Luxury Brands in the Digital Age: Perceived Quality and Gender difference. *The International Review of Retail, Distribution and Consumer Research*, *30*(1), 68-85. DOI: 10.1080/09593969.2019.1651379.

Kotler, & Amstrong. (2018). *Prinsip-Prinsip Pemasaran*. Jakarta: Erlangga.

Manullang. (2018). Dasar-Dasar Manajemen. Jakarta: Ghalia Indonesia.

Mubarok, I. W., Lestari, S. P., & Rahwana, K. A. (2022). The Effect of Raw Materials Quality and Production Processes on Product Quality (Survey on Garuda Jaya Factory Ciamis Employees). *Journal of Indonesian Management*, *2*(2), 253-262.

Mukwakungu, S. C., & Mbohwa, C. (2018). Assessment of Employee Awareness and Understanding of Quality at the ABC Company. In *Proceedings of the International Conference on Industrial Engineering and Operations Management* (Vol. 2018, No. JUL, pp. 1217-1228).

Ramovš, M., & Milfelner, B. (2023). The Importance of Educational Service Quality for Customer Satisfaction and Organizational Reputation. *Naše gospodarstvo/Our economy*, *69*(2), 29-40.

Rauf, N. (2018). The Impact of Quality Awareness on Quality results of manufacturing firms: The mediating effect of total quality management. *Archives of Business Research*, *6*(12), 24-32. DOI: 10.14738/abr.612.5645.

Robbins, Coulter. (2018). Management 14th Edition. Canada: Pearson.

Sadeghee, R., & Khalilzadeh, M. (2022). Comparison Between the Effects of Educational Programs and Quality of Working Life on Product Quality. *International Journal of Services and Operations Management*, *43*(2), 269-286.

Sinambela, E. A., Sintani, L., Nawarcono, W., Kamaruddin, M. J., Wiyono, D., Pratomo, A. B., Yunus, A. I., Supraptiningsih, J. D., & Fachrurazi. (2023). *Manajemen Bisnis Digital* (P. T. Cahyono, Ed.). Yayasan Cendikia Mulia Mandiri.

Stylidis, K., Wickman, C., & Söderberg, R. (2020). Perceived quality of products: a framework and attributes ranking method. *Journal of Engineering Design*, *31*(1), 37-67. DOI: 10.1080/09544828.2019.1669769.

Suwarno, S., Basrowi, B., & Marwanto, I. G. G. H. (2020). Technology of Qualitative Analysis to Understand Community Political Behaviors in Regional Head Election in Wates District, Kediri, Indonesia. International Journal of Advanced Science and Technology, 29(05 SE-Articles).

CHAPTER 3
Depo Bangunan vs. Mitra10: A Competitive Positioning Study in Indonesia's Retail Building Materials Market

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ABSTRACT

This study examines the competitive position of PT Caturkarda Depo Bangunan Tbk (DEPO) within Indonesia's building materials retail sector by conducting a comprehensive desktop review of secondary data, including annual reports, industry publications, and market research sources. Through an integrative analytical approach, the research applies Strategic Groups Map, PESTEL, Porter's Five Forces, Porter's Four Corners, Critical Success Factors (CSF), and Competitive Profile Matrix (CPM) to evaluate both external industry pressures and the company's relative strategic standing. The findings reveal that prolonged weakening of consumer purchasing power, intense competition driven by multiple modern retailers, and concentrated supplier dominance pose significant challenges for firms in this industry. Among major competitors, Mitra10 emerges as the strongest player due to its aggressive expansion strategy, broader national coverage, advanced digital capabilities, and superior operational integration. Meanwhile, DEPO maintains strengths in competitive pricing, customer service quality, and one-stop-shopping convenience, yet remains constrained by its smaller store network and slower digital transformation efforts. Overall, the study concludes that accelerating technological adoption, strengthening omnichannel capabilities, and expanding strategic retail presence are essential priorities for DEPO to enhance its long-term competitiveness in an increasingly dynamic and consumer-driven market environment.
Keywords: Competitive Analysis, Strategic Analysis, Building Materials Retail Industry, DEPO, Mitra10.

INTRODUCTION

The global and national building materials industry outlook shows positive trends. A report from Grand View Research (2024) projects that the global building materials market will continue to grow, driven by increased construction activity worldwide. In line with this, projections for the Indonesian construction market also show an increase in market value from year to year, indicating strong potential demand (Market Research Indonesia, 2024). In theory, this macro picture should create a fertile environment for the growth of companies in the building materials retail sector.

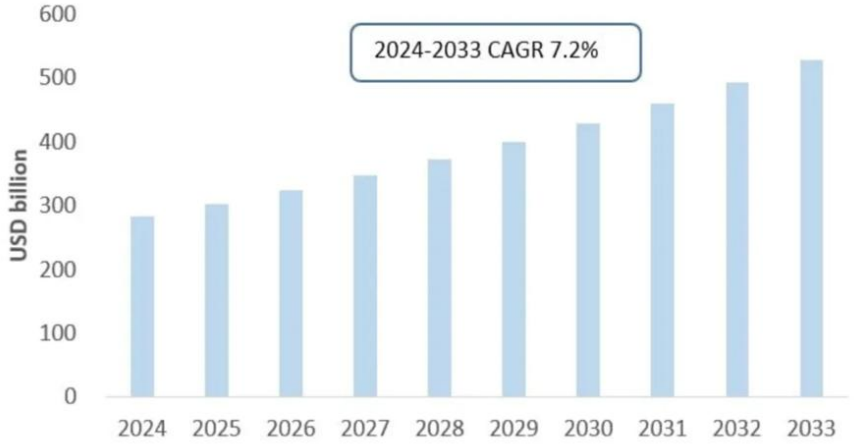

Figure-1: Predicted Size of the Indonesian Construction Industry Market (2024–2033)
Source: Market Research Indonesia (2024)

However, this optimistic picture at the industry level is offset by serious challenges at the level of consumer purchasing power in Indonesia. Data shows an economic anomaly in the form of weakening purchasing power, marked by a long period of deflation. Throughout 2024, Indonesia experienced deflation for five consecutive months from May to September (GoodStats, 2024). This weakening trend continued into 2025, with deflation returning in February, a period leading up to Ramadhan which historically should be marked by increased consumption and potential inflation (Tempo, 2024). This phenomenon of consecutive deflation is a strong signal that people tend to hold back on spending and prioritize primary needs.

This condition directly impacts PT Caturkarda Depo Bangunan Tbk (DEPO) as one of the major players in the modern building materials retail market in Indonesia. DEPO is a modern building materials retailer established in 1996 and officially listed on the stock exchange in 2021, with 16 outlets throughout Indonesia in 2024, operating with a vision to become the leader in building materials and household appliances supermarkets through product completeness, trusted reputation, and an extensive outlet network. Its strategy focuses on store expansion, operational efficiency through ERP system upgrades, and the implementation of cost leadership to offer competitive prices, while improving service quality as a non-product differentiation in facing competitors such as Mitra10 and BJ Home. To ensure sustainable performance, the company has four core values—Delight Customer (prioritizing customer satisfaction), Expertise (deep product competence and knowledge), Professional (high integrity and work ethic), and Open and Challenge (openness to change and courage to innovate)—which guide all employees in their interactions, decision-making, and service delivery.

The products offered by DEPO, such as materials for home renovation or construction, are essentially secondary or tertiary needs. Purchases of these products are durable goods and can be postponed, making them highly vulnerable to declines in people's purchasing power. When household finances tighten, the allocation of funds for renovation or construction is one of the first things to be cut (Avdjiev et al., 2021).

The weakening purchasing power is clearly reflected in the slowing growth of both DEPO and its main competitor—Mitra10, over the past three years. Analysis of their 2017–2024 financial statements further confirms that this trend is not company-specific but represents a sector-wide slowdown driven by deteriorating domestic macroeconomic conditions (Figure-2).

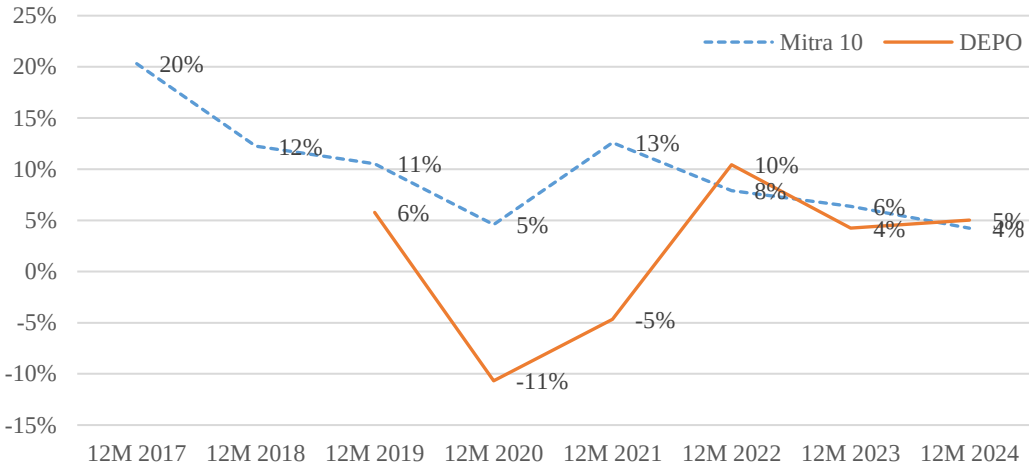

Figure-2: Comparison of Financial Growth between DEPO and Mitra10 (2017–2024)
Source: Catur Sentosa Adiprana (2025); Caturkarda Depo Bangunan (2025)

From a strategic perspective, DEPO's position can be analyzed in greater depth. Based on the business life cycle, the company is in the growth stage. This is characterized by four main indicators: aggressive expansion of physical outlets, large but still growing revenues, innovation and brand strengthening efforts, and increased capital through an IPO to fund expansion (Indonesia Stock Exchange, 2021). This step places DEPO in a position that requires large investments to capture market share in an industry that is also growing.

The generic strategy that underpins DEPO's operations is cost leadership (Indonesia Stock Exchange, 2021). As stated in its prospectus, this advantage is achieved through a direct purchasing model (cut-off) from suppliers and operational efficiency from a large business scale. This internal cost advantage is then translated into a key strength in attracting customers. With highly competitive pricing, the combination of a high-growth market and DEPO's position as a strong challenger places it in the question mark quadrant of the BCG matrix, where significant investment is required to transform it into a market leader in the star quadrant.

According to DEPO's President Director, Kambiyanto Kettin, the company follows an aggressive expansion strategy, targeting the addition of three new outlets each year (Bisnis Indonesia, 2022). However, the realization of this strategy shows that there are obstacles, as by July 2025 the company only had a total of 16 outlets (Caturkarda Depo Bangunan, 2025). This reflects a gap between the company's strategic ambition and the realities of a weakening market. The paradox between the positive long-term industry outlook and the reality of declining consumer purchasing power, as well as the dilemma of DEPO's expansion strategy amid slowing performance, creates a crucial issue to be examined. Therefore, it is important to conduct an in-depth competitive analysis to understand how DEPO, as a company operating within the modern building materials retail sector, can effectively navigate this challenging market landscape through its technological leadership (digital innovation and modern service capabilities) and its retail network coverage (number and distribution of stores).

Thus, the research question is how competitive is DEPO in the Indonesian building materials retail market. In addition, this study aims to determine how competitive the building materials retail market is. The scope of this study focuses on business competition analysis specifically in the modern building

materials retail industry in Indonesia. The main object of the case study is DEPO. Given the company's extensive network, the scope of operational and strategic analysis will be limited to 16 DEPO outlets that have been operating in Indonesia as of July 2025. The competitor analysis will focus on the main competitor in the same segment—Mitra10, without conducting an in-depth analysis of traditional building materials retail stores. The aspects analyzed include pricing, expansion, and business model strategies, with financial and operational data 2022–2024 used to identify relevant slowdown trends. This research will not discuss in-depth internal financial analysis such as liquidity or profitability ratios, but will focus on the strategic implications of this performance in the context of competition.

1. LITERATURE REVIEW

1.1 Strategic Groups Map

According to Grand View Research (2024), strategic groups are a group of companies within an industry that follow the same or similar strategies based on certain strategic dimensions. In determining these groups, it is important to also consider the relationship between the company and its parent company, as this can affect objectives, resources, and decision-making. Strategic groups are not the same as market segments or segmentation strategies, as they are formed based on a broader strategic approach rather than solely on market characteristics. Differences in companies' initial strengths and weaknesses, timing of entry into different industries, or certain historical factors can be reasons for the formation of various strategic groups. Companies in the same strategic group generally have many similarities, not only in terms of their main strategies, but also in terms of market share and how they respond to external changes or competitors' moves due to their similar strategies.

1.2 PESTEL

According to Yüksel (2012), PESTEL helps recognize the work environment and predict future conditions. Because the environment is dynamic, macro analysis needs to be conducted regularly so that companies can see external trends and risks (Makvandi, 2024; Pulaj & Kume, 2013; Rastogi & Trivedi, 2016). This analysis helps companies understand the often-unexpected influence of the external environment (Amega et al., 2024; Khalid & Rahman, 2019; Song et al., 2017). PESTEL covers six factors—political, economic, social, technological, environmental, and legal.

Politics encompasses various forms of government intervention and political lobbying activities in an economy (Ocho et al., 2024). Buye (2021) describe economics as the current economic situation can present opportunities or pose threats, such as taxes, tariffs, interest rates, economic growth, recession, inflation rates, exchange rates, minimum wages, wage rates, unemployment, cost of living, working hours, credit availability, financing availability, and economic growth rates. Socio-cultural factors relate to a set of values, beliefs, rules, and institutions embraced by certain community groups (Aithal, 2017). Social factors influence business by shaping customer behavior and social trends (Madureira et al., 2024).

Technological factors relate to technological innovations that can affect industrial operations and markets, such as automation, the impact of new technologies, and technological awareness (Dalirazar & Sabzi, 2020). The environment based on demand for green and sustainable products is increasing in line with high public awareness of climate change and social responsibility (Makvandi, 2024). Legal factors reflect the formal outcome of the political process embodied in statutes, mandates, regulations, and court decisions, all of which can have a direct impact on a company's potential profits (Rothaermel, 2024).

1.3 Porter's Five Forces

In 1979, Harvard University professor Michael Eugene Porter, through his article How Competitive Forces Shape Strategy in the Harvard Business Review, developed an analytical tool for evaluating a company's microenvironment called Porter's Five Forces. It is a framework for understanding the competitive forces within an industry and encouraging how economic value is shared among industry players (Porter, 1979). Porter's Five Forces analysis helps identify opportunities and threats, assess the level of probability within an industry, evaluate the attractiveness of an industry, and understand the implications of a company's strategic position within the industry.

These five forces determine every industry in shaping and forming the future of a company. Once we understand them, we can make better predictions, create more competitive strategies, and increase profits. This market and business competition analysis may indicate that more information is needed to gain clarity on certain issues. Information does not guarantee success, but at the very least it increases the chances of making the right decisions and is a form of risk reduction. Most people view business competition as a tug-of-war between competitors to gain more sales or market share. However, according to Porter (2008), competition is more complex than that; it is not about who is the biggest, but who is the most profitable. Based on Porter (1980), profitability is determined by five competitive forces, namely the threat of new entrants, the bargaining power of buyers, the bargaining power of suppliers, the threat of substitute products or services, and rivalry among existing competitors.

1.4 Porter's Four Corners

Porter's Four Corners is a strategic tool used to analyze competitors. Unlike other analytical tools, this model focuses solely on competitors and attempts to predict their future moves (Consuunt, 2025). It uses four main aspects called corners, which are divided into two categories: motivation and action. On the motivation side, there are drivers that indicate what competitors are looking for, such as their business goals, ambitions, or strategic intentions, as well as management assumptions, which are assumptions that competitors consider to be certain, for example, how they view themselves compared to the actual market reality. Meanwhile, in terms of actions, this model looks at strategy, which is how competitors strive to achieve their goals through business decisions and performance, as well as capabilities, which are the resources that competitors have and how they utilize them effectively. The combination of these four perspectives helps map out potential future steps for competitors.

Porter's Four Corners should be used when the market is dominated by one large company that determines the direction of competition, or when you are able to do the same thing as your competitors, but in a better way. This model is also relevant when there are competitors who continue to close in and threaten your position, or when the market is so saturated that the only way to grow is to replace competitors to capture market share (Porter, 1980). The main advantage of this model is its ability to see the psychological aspects of competitive behavior, especially motivational factors that are often overlooked, even though they are often the main drivers (Gautam et al., 2019).

1.5 Critical Success Factor (CSF)

CSFs are key results that must be prioritized to achieve success (Wuni & Shen, 2022). On the other hand, Ab Talib & Abdul Hamid (2014) state that CSFs are not only related to the success of a company, but also to the company's ability to overcome the challenges it faces. Therefore, these factors must be the focus to ensure competitiveness (Sanchez Badini et al., 2018) and help organizations gain a competitive advantage among their competitors (Kannan, 2018).

1.6 Critical Profile Matrix (CPM)

According to Ba Hung Anh & Hoang Tien (2021), there are three benefits of the CPM matrix. First, the same factors are used to compare companies, this makes comparisons more accurate. Second, the analysis displays information in a single matrix, facilitating visual comparisons between companies. Third, the results of the matrix simplify decision-making, enabling companies to determine which areas need to be strengthened or protected, or which strategies should be implemented. CPM uses CSF, which include internal and external factors that have the greatest impact on an organization, and compares that organization with its main competitors in a particular industry (Bhattacharjee & Dey, 2015; Capps & Glissmeyer, 2012).

1.7 Analytical Framework

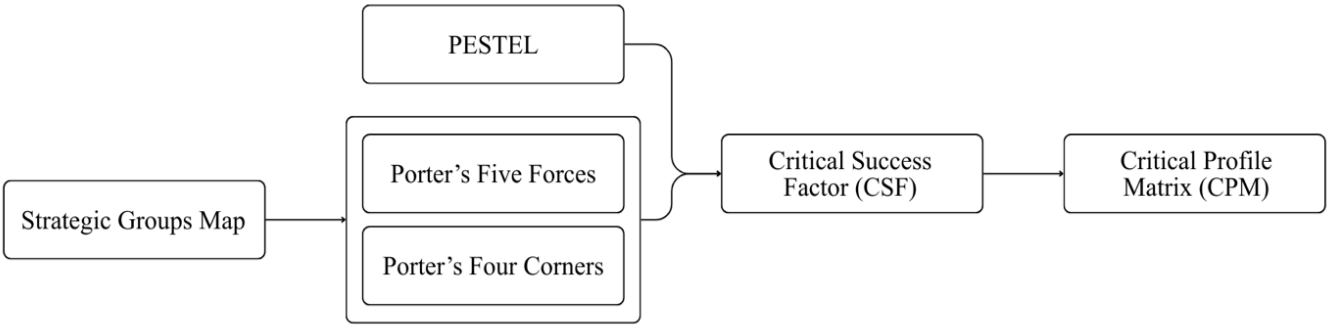

Figure-3: Analytical Framework
Source: Author (2025)

This analytical framework study begins with a Strategic Groups Map, which is used to identify DEPO's position within the competitive landscape and identify companies operating within the same strategic cluster. This mapping helps clarify which competitors are exerting the most direct competitive pressures and provides a contextual foundation for subsequent industry analysis. Once the competitive landscape is mapped, the study examines the external environment using PESTEL, Porter's Five Forces, and Porter's Four Corners. Together, these tools reveal macro-level opportunities and threats, the intensity of industry competition, and potential strategic moves by key competitors like Mitra10, allowing for a comprehensive view of industry dynamics. The insights from this analysis were then synthesized into CSF, which outline the essential capabilities needed for competitive success, including brand strength, logistics, operational efficiency, and supplier relationships. These CSFs formed the basis for the CPM, which compares DEPO with its competitors through a weighted scoring. The CPM provides an objective and measurable assessment of each company's strengths and weaknesses, providing a clear picture of DEPO's competitive position.

2. METHOD

This study uses secondary data collection and analysis sourced from documents and official publications related to DEPO. This method was chosen because it helps researchers obtain an in-depth and comprehensive picture of the company's external and internal conditions. The secondary data sources used were the company's annual reports, issuer prospectuses, the company's official website, market research publications, academic articles (Elsevier, Harvard Business Review, and Google Scholar). In data analysis, this study adopts an integrative strategic analysis framework. The analysis process begins with scanning the external environment using four main tools: Strategic Groups Map to map the relative position of the company against its main competitors based on similar strategic dimensions, PESTEL analysis to examine macro factors, Porter's Five Forces to identify the level of competition intensity in the industry, and Porter's

Four Corners Model to understand the strategic direction and response of competitors. Then, CSF were identified, which are the main factors that determine the company's success in winning the competition in its industry. These CSFs were then used as the basis for preparing the CPM, which aims to compare the strategic performance of DEPO with its main competitors based on the weight and rating of these key factors.

3. FINDINGS AND DISCUSSION

3.1 Strategic Groups Map

The results of Strategic Groups Map using two main indicators—the number of stores as a measure of service coverage and the level of digital innovation as a reflection of service modernization, show that DEPO occupies a semi-national position with a moderate level of innovation and service modernization. This position reflects DEPO's outpacing of competitors like BJ Home and traditional building materials stores, both in terms of store network size and technology adoption, placing it at a developmental stage in terms of digital integration and operational modernization. However, DEPO still lags behind stronger players, such as Mitra10, which has a broader national network and excels in digital transformation, service modernization, and system integration. This situation highlights the competitive gap that DEPO needs to bridge to advance to become an industry leader and strengthen its position in the national competitive landscape.

However, the company still has some way to go to catch up with Mitra10 as the market leader. This indicates significant opportunities for growth, particularly through two important steps: (1) expanding the coverage of outlets to a national scale, and (2) developing digital systems and technology-based services such as e-commerce and omnichannel service channels. Thus, DEPO's position in the middle strategic group indicates that the company has great potential to move up to the top level. To achieve this, an accelerated strategy in digitalization and market expansion needs to be implemented in a targeted manner. The current position also allows DEPO to be more flexible in choosing its strategic focus—whether for service improvement or operational cost efficiency to strengthen its competitiveness in the industry.

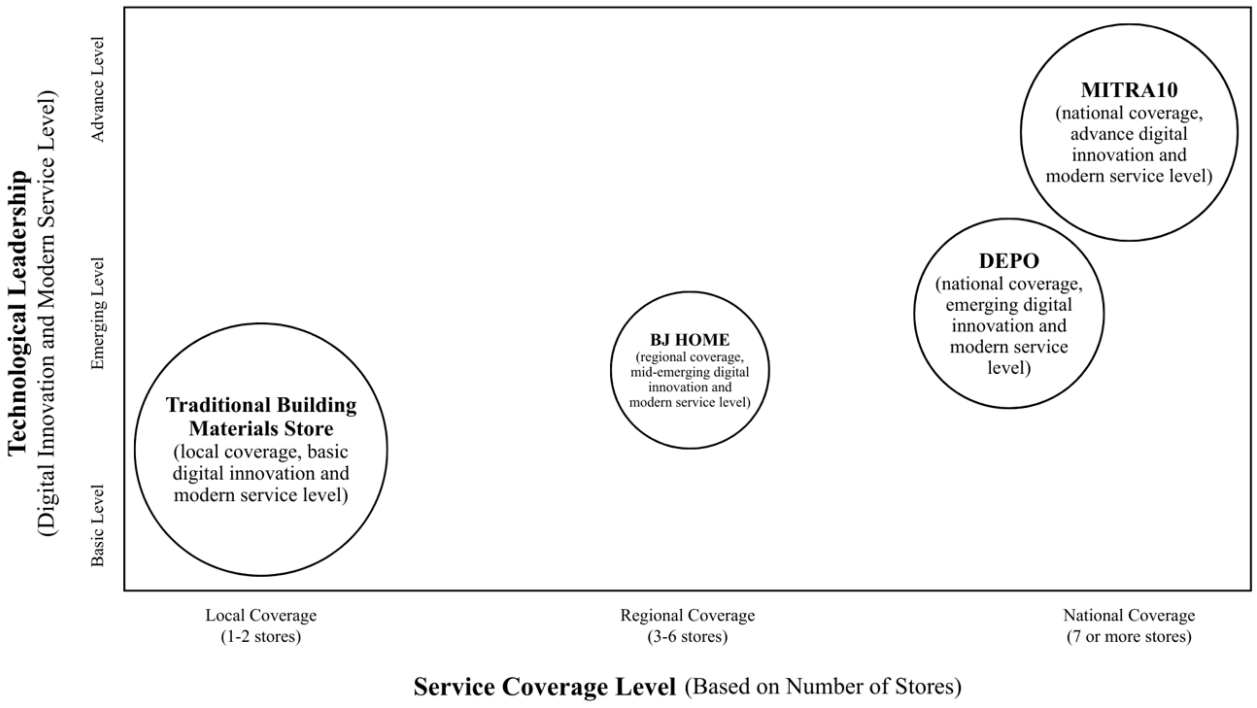

Figure-4: DEPO's Strategic Groups Map
Source: Author (2025)

3.2 PESTEL

Table 1: DEPO's PESTEL Analysis

Factor	Opportunities Emerge	Threat Facing the Firm
Politic	O1. Government support for infrastructure development has boosted sales of building materials O2. The housing subsidy program has driven growth in the property industry and increased sales at building material stores	T1. Political instability can trigger changes in government policy T2. Trade wars and embargoes can disrupt the supply of imported material
Economics	O3. Increased demand for building materials in the property sector	T3. Inflationary increases in raw material prices T4. Declining purchasing power of the public
Social	O4. Public awareness of quality material O5. Consumer preference for shopping at stores with a trusted reputation	T5. Rapid changes in consumer preferences
Technology	O6. Utilizing e-commerce to reach a wider consumer segment O7. Using virtual showrooms and AR to help consumers choose the right products	T6. Increasing competition in the building materials industry
Environment	O8. Consumers are starting to choose environmentally friendly building materials	T7. Environmentally friendly products are not yet varied and require new partnerships with other brands
Legal	O9. Compliance with products that have SNI standards	T8. There are penalties for failing to comply with the rules set in the industry

Source: Author (2025)

3.3 Porter's Five Forces

Competitive rivalry in the building materials retail industry is intense due to the presence of large retailers such as DEPO, Mitra10, and BJ Home, alongside thousands of traditional hardware stores that intensify market saturation. The commodity nature of products and low switching costs allow customers to easily switch between retailers, while slow industry growth and high fixed operating costs further increase competitive pressure. Buyer bargaining power is also strong, as consumers can easily compare prices through digital marketplaces and product differentiation remains limited, encouraging DEPO to focus on strengthening customer loyalty and enhancing service value. At the same time, supplier bargaining power is also strong due to the small number of dominant suppliers, the influence of established brands, and the potential for forward integration. These conditions require the company to build strategic partnerships to maintain stable margins and ensure supply continuity.

The threat of new entrants is considered moderate. While digital technology has lowered some barriers to entry, establishing a physical retail network still requires significant capital investment, and the strong reputations of incumbents create substantial barriers for potential new entrants. Likewise, the threat of substitute products is moderate, as emerging construction technologies such as modular systems and prefabrication are still in their early stages of adoption, despite their potential to disrupt the industry in the future. Overall, the results of Porter's Five Forces analysis indicate that DEPO operates under significant competitive pressure, but still has opportunities to strengthen its competitive position through service differentiation, digital transformation, and deeper collaboration with suppliers.

3.4 Porter's Four Corners

Based on information obtained from the prospectus of DEPO. In the building retail industry competition, Mitra10 is the company's main competitor. To analyze DEPO's competitors in greater depth, this study uses a four-corner analysis to present the information needed. The analysis consists of two main parts—motivation and actions. Motivation shows what drives competitors. To identify this, motivation is divided into two groups—future goals and assumptions. Meanwhile, actions ask what competitors do and are capable of doing. Based on this, actions are categorized into two parts—current strategy and capabilities. These four factors will lead to the formation of a profile of how competitors are likely to respond. Figure-4 is Porter's Four Corners analysis framework for identifying the competitor response profile of DEPO's main competitor, Mitra10.

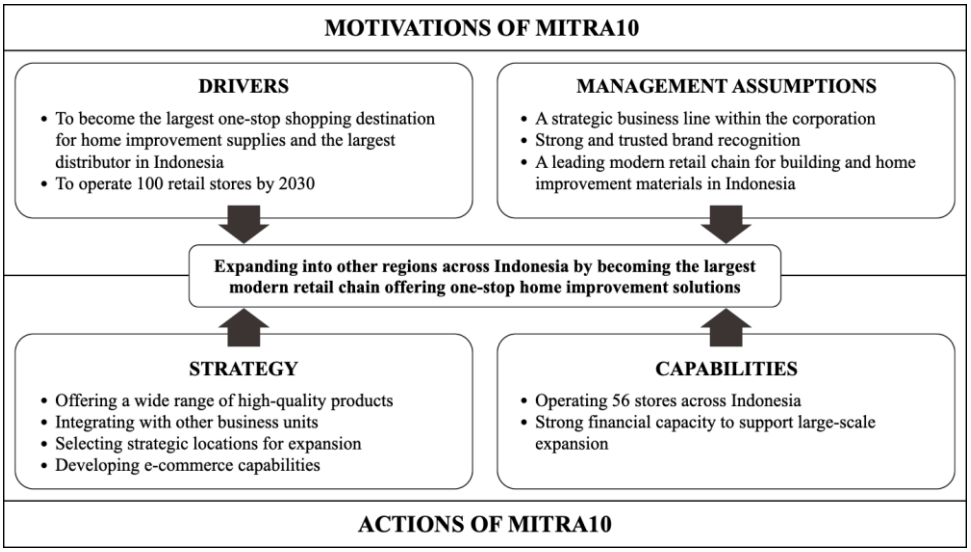

Figure-5: Porter's Four Corners of Mitra10
Source: Author (2025)

3.5 Critical Success Factor (CSF)

Determining CSFs is an important step in understanding the strategic elements that most influence the competitiveness of DEPO in the building materials retail industry. The CSFs compiled in this analysis are the result of a synthesis of various strategic approaches, including PESTEL analysis, Porter's Five Forces, Porter's Four Corners, and Strategic Groups Map. This approach ensures that the factors identified reflect the internal dynamics of the company and external pressures from the industry and the macro environment.

Table-2: DEPO's CSF

CSF	Source of Analysis	Description	Rank
Availability of complete and high-quality products	Porter's Five Forces, Strategic Groups Map	Being key to one-stop shopping; it is important to maintain customer loyalty	1
Competitive pricing	Porter's Five Forces	The main attraction of DEPO; a price-sensitive market	2
Strategic expansion of retail outlets	Strategic Groups Map	Needed to increase scale and reach the national market	4
Enhanced digital transformation and e-commerce channels	PESTEL, Strategic Groups Map	Respond to shifts in consumer behavior and threats from digital native copmpetitors	3
Long-term partnerships	Porter's Five Forces	Ensure supply and price	7

with key suppliers		stability of branded products	
Quality customer service and modern shopping experience	Porter's Four Corners	Differentiation from traditional stores; strengthening customer loyalty	5
Branding and reputation as a trusted retail store	Strategic Groups Map	To expand the customer base and reduce switching rates	6
Adopting and promoting eco-friendly, innovative products	PESTEL	Following environmental awareness trends and opening new markets	10
Operational efficiency through technology (ERP, supply chain)	Porter's Five Forces	Maintaining margins in an industry with high fixed costs	8
Human resource development (frontline)	Porter's Four Corners	Creating a superior shopping experience and supporting the value of "expertise"	9

Source: Author (2025)

3.6 Critical Profile Matrix (CPM)

After identifying the five CSFs that most influence the competitiveness of companies in the building materials retail industry in Indonesia, we then compiled a CPM to assess the competitive position of DEPO compared to its two direct competitors, Mitra10 and BJ Home. In this CPM analysis, each CSF is assigned a weight by using the Point Allocation method, which involves setting weights proportionally based on their level of importance to competitive success, with a total weighting of 1.00. The following are the results of the CPM analysis, which show the relative performance of each company against the five CSFs.

Table-3: DEPO and Competitor's CPM

CPM	Weight	DEPO	Score	Mitra10	Score	BJ Home	Score
Availability of complete and high-quality products	0,30	3	0,90	4	1,20	2	0,60
Competitive pricing	0,20	4	0,80	3	0,60	3	0,60
Enhanced digital transformation and e-commerce channels	0,20	2	0,40	3	0,65	1	0,20
Strategic expansion of retail outlets	0,15	2	0,30	4	0,60	2	0,30
Quality customer service and modern shopping experience	0,15	4	0,60	4	0,60	2	0,30
Total	**1,00**		**3,00**		**3,65**		**2,00**

Source: Author (2025)

CONCULUSION AND RECOMMENDATIONS

Conclusion

Based on the results of a comprehensive analysis using Strategic Groups Map, PESTEL, Porter's Five Forces, Porter's Four Corners, CSF, and CPM approaches, it can be concluded that the strategic position of DEPO in the building materials retail industry in Indonesia is still below its main competitor—Mitra10, in dimensions of technological leadership (digital innovations and modern service level) and service coverage level (based on number of stores). Although the company demonstrates certain operational efficiencies, its

limited distribution reach, suboptimal service innovation, and lack of digital technology adoption result in relatively lower competitiveness. Meanwhile, Mitra10 demonstrates advantages in terms of outlet expansion, a more modern shopping experience, and a more progressive omnichannel strategy integration. Therefore, in order to strengthen its position in the industry competition, DEPO needs to strengthen its strategy, especially in terms of service differentiation, business process digitalization, and more aggressive and adaptive market reach expansion.

Recommendations

Based on the results of the business competition analysis conducted using Strategic Groups Map, PESTEL, Porter's Five Forces, Porter's Four Corners, determination of CSF and CPM, there are two strategic recommendations that DEPO should consider and prioritize to strengthen its competitive position in the competitive building materials retail industry.

First, DEPO needs to accelerate its digital transformation and strengthen its omnichannel channels. This is crucial due to changes in consumer behavior, with consumers becoming increasingly accustomed to online purchases. This also presents a huge opportunity for new digital-native players to enter the online building materials retail industry. DEPO needs to develop an e-commerce platform that is integrated with its physical store system and offer digital features such as interactive catalogs, augmented reality (AR) technology, and customer loyalty programs. This transformation aims to improve accessibility, customer convenience, and operational efficiency in the future.

Second, DEPO needs to strategically expand its store network to broaden the market reach and increase business scale. Currently, DEPO's stores are still limited compared to competitors such as Mitra10. Therefore, DEPO needs to expand into tier two and three cities with high property growth to open up new markets. The format of the expansion can be directed towards a medium-sized modular outlet model for efficiency in terms of construction time and costs. In expanding its outlets, DEPO also needs to develop an integrated logistics and delivery system.

REFERENCES

Ab Talib, M. S., & Abdul Hamid, A. B. (2014). Application of Critical Success Factors in Supply Chain Management. *International Journal of Supply Chain Management*, *3*(1), 21–33.

Aithal, P. S. (2017). A Critical Study on Various Frameworks Used to Analyse International Business and Its Environment. *International Journal of Applied Engineering and Management Letters*. https://doi.org/http://dx.dooi.org/10.52281/zenodo.1053578.

Amega, K., Moumouni, Y., Laré, Y., Bhandari, R., Takouda, P., & Madougou, S. (2024). Power system transformation in emerging countries: A SWOT/PESTLE analysis approach towards resiliency and reliability. *Heliyon*, *10*(12). https://doi.org/10.1016/j.heliyon.2024.e33018

Avdjiev, S., Binder, S., & Sousa, R. (2021). External debt composition and domestic credit cycles. *Elsevier. Journal of International Money and Finance*, *115*. https://doi.org/10.1016/j.jimonfin.2021.102377

Ba Hung Anh, D., & Hoang Tien, N. (2021). Strategic analysis for Nguyen Hoang Group in Vietnam the approach using CPM matrix. *International Journal of Multidisciplinary Research and Growth Evaluation*, *2*(4), 55–60. www.allmultidisciplinaryjournal.com

Bhattacharjee, D., & Dey, M. (2015). Competitive Profile Matrix: A Theoretical Review. *ABAC Journal*, *35*, 61–70.

Bisnis Indonesia. (2022, September 18). *Ambisi Emiten Hermanto Tanoko (DEPO) Buka 21 Gerai Baru 2025*. Bisnis Indonesia. https://market.bisnis.com/read/20220918/192/1578580/ambisi-emiten-hermanto-tanoko-depo-buka-21-gerai-baru-2025

Buye, R. (2021). Critical examination of the PESTEL Analysis Model. *Action Research for Development*.

Capps, C. J., & Glissmeyer, M. D. (2012). Extending The Competitive Profile Matrix Using Internal Factor Evaluation And External Factor Evaluation Matrix Concepts. *The Journal of Applied Business Research*, *28*(5), 1059–1062. https://doi.org/DOI:10.19030/jabr.v28i5.7245

Catur Sentosa Adiprana. (2025). *Annual Report PT Catur Sentosa Adiprana Tbk 2017-2014*. https://csahome.com/id/investors/#annual-report

Caturkarda Depo Bangunan. (2025). *Annual Report PT Caturkarda Depo Bangunan Tbk 2021-2024*. https://corporate.depobangunan.co.id/laporan-tahunan/

Consuunt. (2025). *Porter's Four Corners*. https://www.consuunt.com/porters-four-corners/

Dalirazar, S., & Sabzi, Z. (2020). Strategic analysis of barriers and solutions to development of sustainable buildings using PESTLE technique. *Taylor & Francis. International Journal of Construction Management*, *23*(1), 167–181. https://doi.org/10.1080/15623599.2020.1854931

Gautam, S., Sharma, N. L., Gautam, B., & Gautam, D. K. (2019). Strategic Analysis Models and Strategic Analysis for Edible Oil Industry. *SSRN. International Journal of Research and Analytical Reviews*. https://ssrn.com/abstract=3357220

GoodStats. (2024). *Indonesia Alami Deflasi 5 Bulan Beruntun, Daya Beli Melemah?* https://data.goodstats.id/statistic/indonesia-alami-deflasi-5-bulan-beruntun-daya-beli-melemah-fWKWB

Grand View Research. (2024). *Building Materials Market Size, Share & Trends Analysis Report By Type (Aggregates, Bricks, Cement, Others), By Application (Residential, Commercial, Industrial), by Region, and Segment Forecasts, 2023 to 2030*. https://www.grandviewresearch.com/industry-analysis/building-materials-market-report

Indonesia Stock Exchange. (2021). *DEPO Prospektus IPO*.

Kannan, D. (2018). Role of multiple stakeholders and the critical success factor theory for the sustainable supplier selection process. *Elsevier. International Journal of Production Economics*, *195*, 391–418. https://doi.org/https://doi.org/10.1016/j.ijpe.2017.02.020

Khalid, L. S., & Rahman, I. A. (2019). Conceptual Model for the External Factors Affecting Project Performance Using PESTLE Factors. *Journal of Advanced Research in Dynamical & Control Systems*, *11*. https://www.researchgate.net/publication/339098245

Madureira, T., Nunes, F., Mata, F., & Vaz-Velho, M. (2024). A SWOT Analysis of Organizations in the Agri-Food Chain Sector from the Northern Region of Portugal Using the PESTEL and MEETHS Frameworks. *Agriculture (Switzerland)*, *14*(9). https://doi.org/10.3390/agriculture14091554

Makvandi, R. (2024). Analysis of the Impact of Macroeconomic Factors on the Development of Financial Products: Application of the PESTEL Model in Identifying Opportunities and Threats. *Transactions on Quantitative Finance and Beyond*, 233–246. https://doi.org/10.22105/tqfb.v1i2.40

Market Research Indonesia. (2024). *Indonesia's Construction Industry is Ready for Big Changes*. https://marketresearchindonesia.com/insights/articles/indonesia-construction-industry-ready-for-big-changes

Ocho, N. V. V., Gutiérrez, T. D. J. M., Piñas, L. F. P., & Machado, O. J. A. (2024). Neutrosophic evaluation through the PESTEL method. *Neutrosophic Sets and Systems: Advances in Super Hyper Structures and Applied Neutrosophic Theories*, *74*, 2024.

Porter, M. E. (1979). How Competitive Forces Shape Strategy. *Harvard Business Review*.

Porter, M. E. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. The Free Press.

Porter, M. E. (2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review: HBR's Must-Reads on Strategy*.

Pulaj, E., & Kume, V. (2013). How the Albanian External Environment Affects the Construction Industry. *Annales Universitatis Apulensis Series Oeconomica*, *15*(1), 295–309.

Rastogi, N., & Trivedi, M. K. (2016). PESTLE Technique: A Tool to Identify External Risks in Construction Projects. *International Research Journal of Engineering and Technology*, *03*(01). www.irjet.net

Rothaermel, F. T. (2024). *Strategic Management* (6th ed.). McGraw-Hill.

Sanchez Badini, O., Hajjar, R., & Kozak, R. (2018). Critical success factors for small and medium forest enterprises: A review. *Elsevier. Forest Policy and Economics*, *94*, 35–45. https://doi.org/10.1016/j.forpol.2018.06.005

Song, J., Sun, Y., & Jin, L. (2017). PESTEL analysis of the development of the waste-to-energy incineration industry in China. *Elsevier. Renewable and Sustainable Energy Reviews*, *80*, 276–289. https://doi.org/10.1016/j.rser.2017.05.066

Tempo. (2024, August 11). *Daya Beli Masyarakat Disinyalir Menurun, Diduga Dampak Deflasi Beruntun*. Tempo.

Wuni, I. Y., & Shen, G. Q. (2022). Developing critical success factors for integrating circular economy into modular construction projects in Hong Kong. *Elsevier. Sustainable Production and Consumption*, *29*, 574–587. https://doi.org/https://doi.org/10.1016/j.spc.2021.11.010

Yüksel, I. (2012). Developing a Multi-Criteria Decision Making Model for PESTEL Analysis. *International Journal of Business and Management*, *7*(24). https://doi.org/10.5539/ijbm.v7n24p52.

CHAPTER 4
Intention to Adopt Digital Banking Application with the Moderating Role of Financial Technology Application Usage

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ABSTRACT

This study examines the factors influencing the intention to adopt digital banking applications in Indonesia, with a focus on the moderating role of financial technology (fintech) usage. Using the Unified Theory of Acceptance and Use of Technology (UTAUT) model, we examine the effects of performance expectancy, effort expectancy, social influence, facilitating condition, and promotion on behavioral intention to adopt digital banking, and whether fintech usage moderates these relationships. Data collected via an online survey (Google Forms) from 107 respondents in Jabodetabek, analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The result of the test shows effort expectancy, facilitating condition and promotions positively influence adoption intention. Performance expectancy and social influence show no significant impact. Fintech usage does not significantly moderate these relationships. Adoption intention strongly predicts actual usage. Digital banks should prioritize user-friendly design and promotional strategies to accelerate adoption. The study also highlights the limited moderating role of fintech usage, offering theoretical insights for future research.
Keywords: Digital Banking, Fintech, Promotion, User Adoption.

INTRODUCTION

The Indonesian Financial Services Authority (Otoritas Jasa Keuangan, OJK) introduced digital banks through OJK Regulation No. 12/POJK.03/2021 on Commercial Banks to promote the digitization of banking operations and simplify investments in digital banking. Issuance of Bank Indonesia Circular Letter No. 6 / 18 / DPNP / 2004, which prohibits the establishment of Internet-only banking in Indonesia (JE Louis, 2022). By the end of 2024, 17 digital banks were operating in Indonesia. Bank Mandiri, a state-owned bank, has taken a unique approach to address technological disruption. Instead of establishing a separate digital bank, they have opted to enhance their existing application, Livin Mandiri, and expand their ecosystem.

Over the past decade, the number of fintech companies in Indonesia has increased six-fold, from 51 active players in 2011 to 334 in 2022. Initially, this growth was primarily driven by the payment segment. This evolution indicates that Indonesia's fintech ecosystem is expanding beyond payments to offer more sophisticated products and services (Kumar et al., 2023). Fintech can effectively reach unbanked individuals and those with limited financial literacy and provide financial services to the unbanked population (B Setiawan, 2021).

Vicenzo (2023) found that the ecosystem is a crucial factor that requires further investigation to enhance customer satisfaction with digital banking applications. Additionally, a thorough analysis of the features and capabilities of digital banking apps is necessary to ensure that customers use them consistently and are less likely to switch to other providers or banks. Therefore, this triggers research to investigate whether financial technology adoption increases users' intention to adopt digital banking in Indonesia.

1. – LITERATURE REVIEW

1.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Venkatesh et al. (2003).

Performance Expectancy, Venkatesh et al. defined performance expectancy as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance." Their research found that performance expectancy positively influences behavioral intention, and this relationship is mediated by gender and age.

Effort Expectancy, Venkatesh et al. defined effort expectancy as "the degree of ease associated with the use of the system." Their research found that effort expectancy positively influences behavioral intention, and this relationship is mediated by gender, age, and experience.

Social Influence, Venkatesh et al. defined social influence as "the degree to which an individual perceives that important others believe he or she should use the new system." Their research found that social influence positively influences behavioral intention, and this relationship is mediated by gender, age, voluntariness, and experience.

Facilitating Conditions, Venkatesh et al. defined facilitating conditions as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system." Their research found that facilitating conditions do not influence behavioral intention but have a positive impact on user behavior. This relationship is also mediated by age and experience

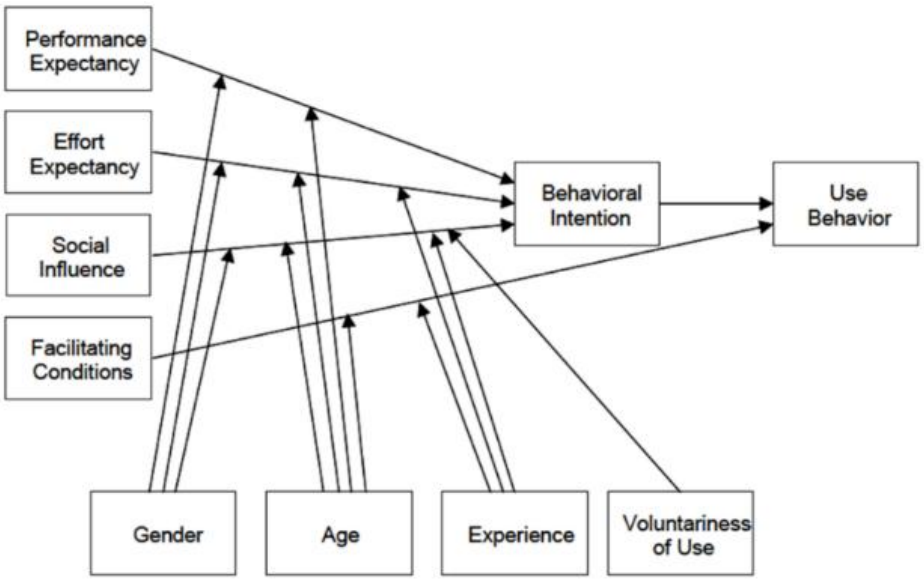


Figure-1. Unified Theory of Acceptance and Use of Technology (Venkatesth, 2003)*

Source: User Acceptance of Information Technology: Towards A Unified View by Venkatesth, et al (2003)

1.2 Promotion

Promotion refers to the value of discounts or incentives offered by digital banks through dynamically generated advertising messages. In this study, promotions are defined as incentives provided when using digital banking. J Teck Weng (2013) suggested that promotions positively influence behavioral intention. Alamsyah's (2024) study indicates that service quality, promotions, and ease of use collectively and significantly impact the interest in using mobile banking payments in Sharia banking.

1.3 Digital Banking

The rapid advancement of information technology has ushered the world into a new era known as the Industrial Revolution 4.0, as outlined by King (2019), who described the evolution of banking as follows:

1. Bank 1.0 (1472-1980): The traditional bank emerged in 1472, offering savings and loan services that required physical interactions between the bank and its customers.
2. Bank 2.0 (1980-2007): The introduction of ATMs allowed customers to conduct transactions without visiting the bank. This era marked the beginning of self-service banking, and the commercial internet appeared in 1995.
3. Bank 3.0 (2007-2017): Known as the era of internet and mobile banking, this period enabled customers to perform banking activities from anywhere, thanks to the advent of smartphones in 2007, which facilitated mobile payments.
4. Bank 4.0 (2017-present): Banks have moved away from face-to-face interactions and branch office services, leveraging technological advancements such as artificial intelligence, big data, and blockchain technology to support the industry.

Digital banking, also referred to as branchless banking, involves delivering financial services outside traditional bank branches through information and communication technology (ICT) (Herington, 2009).

1.4 Financial Technology

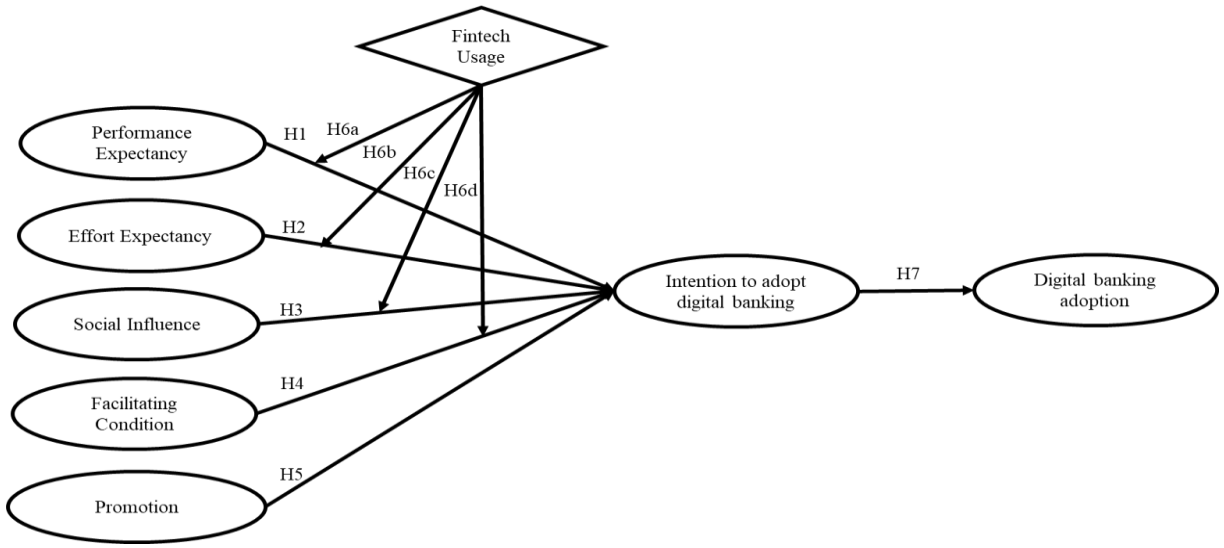
Fintech encompasses a range of innovative services driven by advancements in information and communication technology. This sector includes companies that provide technology-based financial services, combining the concepts of "finance" and "technology" into "financial technology" (E Abad-Segura, 2020). According to Bank Indonesia, fintech involves the application of technology within the financial system to create new products, services, technologies, and business models, potentially affecting monetary stability, financial system stability, and the efficiency, security, and reliability of payment systems (AFTECH 2020).

In Indonesia, two main authorities oversee the fintech industry: (1) Bank Indonesia (BI), which regulates fintech companies for products related to payments, and (2) the Financial Services Authority (Otoritas Jasa Keuangan or OJK), which regulates fintech companies and products related to financial services, such as digital banking, peer-to-peer (P2P) lending, crowdfunding, insure-tech, investment, and market aggregators (Batunanggar, 2020).

1.5 Financial Technology Usage Moderates the Relationship of UTAUT factors and intention to use

Yohannes et al. (2020) employed quantitative methods and analyzed the data using SmartPLS. The findings indicate that factors such as Effort Expectancy, Social Influence, and Facilitating Conditions are significant determinants of user acceptance, particularly in fintech applications. Rini R. and Ari M. (2022) study found that consumer perceptions of benefits and trust in fintech services affect consumer attitudes and the desire to continue using these services. Jangir et al. (2022) study found that perceived usefulness, satisfaction, and confirmation all have a statistically significant positive impact on the intention to continue using FinTech services. Additionally, FinTech use positively impacts financial inclusion (Odei-Appiah et al., 2022). This research will examine the effect of performance expectancy, effort expectancy, social influence, facilitating condition and promotion with moderation of financial technology usage on intention to adopt the digital bank and as shown in the exhibit below.

Figure-2: Research Framework



Based on the research framework, there are several hypotheses to examine:

- H1: Performance expectancy has a positive effect on the intention to adopt digital banking.
- H2: Effort expectancy has a positive effect on the intention to adopt digital banking.
- H3: Social influence has a positive effect on the intention to adopt digital banking.
- H4: Facilitating Condition has a positive effect on the intention to adopt digital banking.
- H5: Promotion has a positive effect on the intention to adopt digital banking.
- H6a: The effect of performance expectancy on the intention to adopt digital banking is positively moderated by financial technology usage.
- H6b: The effect of effort expectancy on the intention to adopt digital banking is positively moderated by financial technology usage.
- H6c: The effect of social influence on the intention to adopt digital banking is positively moderated by financial technology usage.
- H6d: The effect of social influence on the intention to adopt digital banking is positively moderated by financial technology usage.
- H7: Intention to use has a positive effect on the actual usage of digital banking application.

2. RESEARCH METHOD

2.1 Type of Research

For this study, a quantitative approach will be employed where survey questions are distributed to research samples and later analyzed using statistical techniques.

2.1 Data Source and Collection Method

The primary data for this study will be collected by having respondents complete questionnaires, while secondary data will be sourced from books, papers, and other materials. This study will use closed-ended questions formatted with a Likert scale, ranges from 1 to 5, with each point representing: "1" Strongly Disagree, "2" Disagree, "3" Neutral, "4" Agree, and "5" Strongly Agree.

2.2 Population and Sample

Respondents with criteria: 1) Age above 18 years old 2) Use finance technology usage and 3) they live in the Greater Area of Jakarta (Jabodetabek). This research aims for a significance level of 5% and a relatively small minimum R^2 (0.25). Given that this study involves ten arrows pointing at the constructs, the required sample size will be at least 91.

2.3 Development of Questionnaire

The questionnaire is structured into two sections: A and B. Section A gathers demographic information, including gender, age, the most frequently used service, and the frequency of application usage.

Table -1: Questionnaire Design

Variable	Items	Source
Performance Expectancy (PE.)	1. Using a digital banking application would increase my productivity. 2. Using a digital banking application would help me accomplish banking tasks more quickly	Venkatesh et al. (2003)
Effort Expectancy (EE.)	1. My interaction with digital banking applications would be clear and understandable. 2. I would find digital banking applications easy to use	Venkatesh et al. (2003)
Social Influence (SI.)	1. People who are important to me think that I should use digital banking applications. 2. People who influence my behavior think that I should use digital banking applications. 3. The senior management of this business has been helpful in the use of system	Venkatesh et al. (2003)
Facilitating Condition (FC)	1. I have the necessary resources to use the bank's digital application. 2. I have the necessary knowledge to use digital banking applications	Venkatesh et al. (2003)
Finance Technology Usage (FU)	1. I don't worry about data and information security when using financial technology applications 2. I will continue to use financial technology applications	Karim (2022)
Promotion (PR)	1. I choose to buy products when there are discounts. 2. I choose to buy products when there are special promotions: gift/merchandise for new user, discount due to integration with e-commerce. 3. Digital banking application use a interesting and informative promotion	Dung An (2017)
Behavioral Intention (BI.)	1. I will consider using digital banking application in next 12 months 2. I will be most likely to use digital banking application in the future 3. I believe that I should use a digital banking application in the future	Venkatesh et al. (2003)
Actual Usage (AU)	1. I often use internet banking to manage my account. 2. I often use internet banking to remit money, payroll/collection. 3. I often use digital bank account for banking transaction	Venkatesh et al. (2003)

2.4 Data Analysis

Descriptive analysis use PLS-SEM analysis, utilizing both the inner and outer models. The choice of PLS-SEM is based on several conditions that align with the requirements for using this analysis method (Ghozali, 2014)

3. FINDING, ANALYSIS, DISCUSSION

3.1 Finding

In this study, 107 respondents are profiled according to their gender, age, domicile, occupation, last education. Descriptive statistics based on frequency were examined to determine the critical features of the sample, as indicated in the table below.

Table-2: Respondent Profile

Demographic Variables	Category	Count	Percentage
Gender	Laki-laki	70	65%
	Perempuan	37	35%
Total		**107**	**100%**
Age	18 - 23	3	3%
	24 - 29	13	12%
	30 - 35	24	22%
	36 - 41	18	17%
	42 - 47	17	16%
	48 - 53	22	21%
	> 53	10	9%
Total		**107**	**100%**
Address	Bekasi	24	22%
	Bogor	15	14%
	Depok	13	12%
	DKI Jakarta	34	32%
	Tangerang	21	20%
Total		**107**	**100%**
Occupation	Entreprise Staff	85	79%
	Students	2	2%
	Civil Servant	6	6%
	Unemployed	3	3%
	Self-Employed	11	10%
Total		**107**	**100%**
Education	High School	7	7%
	Diploma	12	11%
	Bachelor Degree	67	63%
	Master Degree	21	20%
Total		**107**	**100%**
NumberFintechApps_Used	1.00	66	62%
	2.00	30	28%
	3.00	4	4%
	4.00	5	5%
	5.00	2	2%
Total		**107**	**100%**
Digital Banking Application Usage	Yes	68	64%
	No	39	36%
Total		**107**	**100%**

Source: SPSS Report by Author, 2025

In this section, the Collinearity Statistics (VIF), Path Coefficient (β), Coefficient of Determination (R2), and Effect Size (f2) were measured to evaluate the structural model evaluation as shown in Table 4.7 below (Hair, 2014).

The path coefficient demonstrates the association between two variables and ranges from -1.00 to 1.00. In this study, the relationship is positive, as shown by the path coefficient value. It means that all exogenous

constructs have a positive influence on endogenous construct except for SI to BI, FU x SI to BI, Fu x FC to BI and FU x PE to BI. Multicollinearity is the third criteria in structural model assessment. Table below shows that there are no collinearity difficulties because all of the VIF values are less than 5. (Hair, 2014). The f2 values are the fourth criteria in structural model evaluation, and they examine a predictor variable's relative effect on an independent variable (Hair, 2014)

Table-3: Path Coefficient, R-square , VIF, and f-square

Relationship	Path coefficients	R-square	VIF	f-square
BI -> AU	0.607	0.368	1.000	0.583
EE -> BI	0.348	0.574	4.339	0.065
FC -> BI	0.239		2.825	0.047
FU -> BI	0.077		2.408	0.006
PE -> BI	0.014		3.690	0.000
PR -> BI	0.329		1.495	0.170
SI -> BI	-0.087		2.232	0.008
FU x SI -> BI	-0.096		2.732	0.010
FU x FC -> BI	-0.134		3.583	0.018
FU x EE -> BI	0.152		4.085	0.021
FU x PE -> BI	-0.011		4.626	0.000

Source: PLS-SEM Report by Author (2025)

3.2 Hyphothesis Testing

Hair (2014) suggests using 5000 as the bootstrap sample size. SmartPLS4's bootstrapping approach was used to test hypotheses and evaluate route coefficients' significance and t values.

Table-4: Hypothesis Testing Result

Ha	Relationship	T statistics	P values	Result
H1	PE -> BI	0.111	0.912	Not Supported
H2	EE -> BI	2.403	0.016	Supported
H3	FC -> BI	2.040	0.041	Supported
H4	SI -> BI	0.740	0.459	Not Supported
H5	PR -> BI	2.557	0.011	Supported
H6a	FU x PE -> BI	0.099	0.922	Not Supported
H6b	FU x EE -> BI	0.862	0.389	Not Supported
H6c	FU x SI -> BI	0.915	0.360	Not Supported
H6d	FU x FC -> BI	0.980	0.327	Not Supported
H7	BI -> AU	7.104	0.000	Supported

Source: PLS-SEM Report by Author, 2025

In summary, the paths BI → AU, EE → BI, FC → BI, and PR → BI have significant effects, as their p-values are less than the significance level of 0.05.

3.3 Discussions on finding

a. Relationship between Performance Expectancy and Behavioral Intention is not supported by this research which not aligned with UTAUT model and other research that find significant relationship between both variables, such as (A Ali, 2022).

b. Relationship between Effort Expectancy and Behavioral Intention, is supported by this research. This finding is aligned with UTAUT model and other research that find significant relationship between both variables, such as (A Ali, 2022).

c. Relationship between Facilitating Condition and Behavioral Intention, is supported by this research. This finding is aligned with UTAUT model.

d. Relationship between Social Influence and Behavioral Intention is not supported by this research. This

finding contradicts with UTAUT model and other research that find significant relationship between both variables, Putra et al (2023) and Mailoa et al (2023). However, some result align with result from research of M. Tariq et al(2024)

e. Relationship between Promotion and Behavioral Intention is supported by this research. Align with study result by (J Teck Weng, 2013) and Alamsyah (2024) that promotion has significant impact to Behavioral Intention.

f. moderating effect of Finance Technology Usage

From hypothesis testing, it has been found that Finance Technology Usage doesn't moderate intention to adopt digital banking. It is contradicted with empirical finding of studies by Nguyen Phuong Le, 2023, Odei-Appiah et al, 2022 and R Chan, 2022. This study shows that the more experienced individuals in Financial Technology are not more likely to adopt digital banking applications. Respondents for this research have experience in using e-wallets, 28% have used two financial technology applications. Study performed by BCG in 2023 shares that key barrier for financial technology adoption is too many applications to choose.

g. Relationship between Behavioral Intention and Actual Usage is supported by this research. Align with study result, aligned with UTAUT model.

CONCLUSION

This study provides empirical evidence on the factors influencing the intention to adopt digital banking applications using the UTAUT framework and examining the moderating role of financial technology usage. The findings reveal that effort expectancy, facilitating conditions, and promotional strategies significantly drive adoption intention, while performance expectancy and social influence do not show a notable impact. Furthermore, fintech usage does not moderate these relationships, indicating that prior experience with financial technology does not necessarily translate into higher adoption of digital banking. These insights suggest that digital banks should prioritize user-friendly design and robust promotional campaigns to enhance adoption rates. For policymakers and industry stakeholders, the results underscore the importance of creating supportive regulations and ecosystems that foster innovation while ensuring security and accessibility. Recommendations for future research role of Artificial Intelligence (AI) in enhancing digital banking adoption, personalization of services, fraud detection, and improving customer experience.

REFERENCES

King, B. (2019). Banking Everywhere, Never at a Bank. Chichester, West Sussex: Wiley.

Sugiyono. (2012). Metode Penelitian Kuantitatif, Kualitatif dan R&D. Alfabeta.

A Ali, R. D. (2022). Examination of Customers Intention to Adopt Digital Bank Services: Moderating Role of Perceived Risk in Banking Sector of Pakistan during COVID-19. Journal of Social Sciences Review, 19-26.

Batunanggar, S. (2019). Fintech development and regulatory frameworks in Indonesia (No. 1014). ADBI Working Paper Series.

C Herington, S. W. (2009). E-retailing by banks; e-service quality and its importance to customer satisfaction. European journal of marketing, 43(9/10), 1220-1231.

Dung, M. T., & An, N. Y. Research on the Purchase Intention Through Tiktok Affiliate Marketing of Vietnamese Youth. International Research Journal of Economics and Management Studies IRJEMS, 3(7).

E Abad-Segura, M. G.-Z.-M. (2020). Financial Technology: review of trends, approaches and management. Mathematics 8 (6), 951.

Ghozali, I. (2014). Structural Equation Modeling: Metode Alternatif dengan Partial Least Square (PLS). Universitas Diponegoro.

Hair, J. F., Hult, G. T. M., Ringle, C. M. & Sarstedt, M. (2014). A Primer on Partial Least Squares Structural Equation Modeling

Jangir, K., Sharma, V., Taneja, S., & Rupeika-Apoga, R. (2022). The moderating effect of perceived risk on users' continuance intention for FinTech services. Journal of Risk and Financial Management, 16(1), 21.

JE Louis, B. J. (2022). A Comparative Legal Study on Neobank Between South Korea and Indonesia. Journal of Law and Policy Transformation, 109-123.

Odei-Appiah, S., Wiredu, G., & Adjei, J. K. (2022). Fintech use, digital divide and financial inclusion. Digital Policy, Regulation and Governance, 24(5), 435–448.

Setiawan, B., Nugraha, D. P., Irawan, A., Nathan, R. J., & Zoltan, Z. (2021). User innovativeness and fintech adoption in Indonesia. Journal of Open Innovation: Technology, Market, and Complexity, 7(3), 188.

Karim, R. A., Sobhani, F. A., Rabiul, M. K., Lepee, N. J., Kabir, M. R., & Chowdhury, M. A. M. (2022). Linking fintech payment

services and customer loyalty intention in the hospitality industry: The mediating role of customer experience and attitude. Sustainability, 14(24), 16481.

Kumar, S., Li, A., Wong, H., Chauhan, H., Shubhankar, S., Oetama, I. (2023). Indonesia's fintech industry is ready to rise. Boston Consulting Group. https://web-assets.bcg.com/11/8f/644106dd4bdeb4bd272eccb1901c/ indonesia-fintech-report-28-03-2023.pdf

K. Yohanes, K. Junius, Y. Saputra, R. Sari, Y. Lisanti and D. Luhukay, "Unified Theory of Acceptance and Use of Technology (UTAUT) Model Perspective to Enhance User Acceptance of Fintech Application," 2020 International Conference on Information Management and Technology (ICIMTech), Bandung, Indonesia, 2020, pp. 643-648, doi: 10.1109/ICIMTech50083.2020.9211250.

Putra, A. H., Halianto, L. D., & Damayanti, Y. C. N. (2023). Factors affecting intention to use on the digital banking services offered by digital banks in Indonesia.

Vicenzo. (2023). Enhancing customer satisfaction through digital banking ecosystem analysis. [Unpublished manuscript].

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly: Management Information Systems, 27(3), 425-478. https://doi.org/10.2307/30036540.

CHAPTER 5
Pairwise Comparison for Training Mıx Program in the Mining Industry in Indonesia

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ABSTRACT

The Indonesian mining and quarrying sector contributed around 9.1% to the national Gross Domestic Product (GDP), with the largest contribution coming from minerals and coal. However, major challenges still lie ahead in managing human resources in this sector. The development of modern mining technology, the digitisation of production processes, improved occupational safety standards, and demands for sustainable mining practices require comprehensive improvements in worker competencies. Meanwhile, in various regions, there is still a gap between the competencies of mining workers and the required standards. In this context, training needs analysis (TNA) is a very important first step. The paper intends to address these concerns. This study aims to formulate a product mix of training programs demanded by customers using pairwise comparison from the previous history. The study's conclusions may be used by training provider and cooperative management to improve the method of strategic planning by adopting relevant solutions using pairwise comparison, which is the study's significant contribution.
Keywords: Training formulation, pairwise comparison, competency gap, mining industri.

Introduction

Based on data from the Central Statistics Agency (BPS), in 2024, the Indonesian mining and quarrying sector contributed around 9.1% to the national Gross Domestic Product (GDP), with the largest contribution coming from minerals and coal. In addition, this sector employs hundreds of thousands of direct and indirect workers, spread across various regions of Indonesia. However, major challenges still lie ahead in managing human resources in this sector. The development of modern mining technology, the digitisation of production processes, improved occupational safety standards, and demands for sustainable mining practices require comprehensive improvements in worker competencies. Meanwhile, in various regions, there is still a gap between the competencies of mining workers and the required standards, for example: a lack of technical understanding related to safe and efficient mining operations, especially in small-scale mining, minimal mastery of digital technology, such as the use of drones for mapping, mining software (MineScape, Surpac), or IoT-based monitoring, and low awareness of safety and environmental aspects. In this context, training needs analysis (TNA) is a very important first step.

Training Needs Analysis (TNA) is the determination of the difference between the actual condition and the desired condition regarding the performance of human knowledge, skills, and attitudes in an organisation. TNA serves to systematically identify the type of training needed, by whom, where it should be located, and the methods by which the training should be implemented. TNA also refers to the Indonesian National Work Competency Standards (SKKNI) for the mining and quarrying sector, and is aligned with the Indonesian National Qualifications Framework (KKNI) as the basis for competency-based training development.

Several global literature and studies indicate the main challenges of training in the mining sector: a) mismatch between training curriculum and industry needs. b) lack of practical facilities and certified trainers. c) changes in mining technology (digitalisation, IoT, automation) that require adaptation of new competencies. d) Increased demands for Environmental, Social, and Governance (ESG) principles.

Organisations such as the International Labour Organisation (ILO) and the World Bank also emphasise the importance of strengthening national vocational training systems and fostering synergies among government, industry, and educational institutions. As a technical training institution under the Ministry of Energy and Mineral Resources, the Geominerba Human Resources Development Centre (BPPSDM Geominerba) plays a key role in supporting the strengthening of mining human resource capacity. Therefore, the preparation of the TNA document is not only intended to fulfil institutional obligations, but also as a form of active contribution in creating a highly competitive, safe, and sustainable mining ecosystem.

The purpose of this study is to a) identify the types of technical and non-technical competencies required by workers in the mining sector in accordance with the national standard, b) assess the gap between existing competencies and applicable standards, and c) identify recommendations for training programs until 2026 based on data obtained from surveys and focus group discussion.

Theoretical Framework

Training Needs Analysis

Training needs analysis (TNA) is a process to identify the gap between the competencies that individuals currently possess and those required to achieve optimal performance (Billett, 2020). The purpose of TNA is to ensure that the training provided is relevant, effective, and has an impact on performance improvement. Several techniques need to be considered in conducting training needs analysis, namely: a) conducting assessments by testing participants and analyzing assessment forms, b) conducting surveys by asking respondents and supervisors about competencies and training needs, c) focus group discussions by

asking individuals, colleagues, and customers, d) observation by paying attention to how the work is carried out (Yahman, 2020).

Level of TNA

According to Goldstein and Ford (2002), TNA encompasses three main levels: 1) organizational analysis, 2) operational analysis, and 3) individual analysis. (Fig.1).

Figure 1. Level of training needs analysis

From Figure 1, it can be seen that training gap analysis can be carried out in three different levels with different objectives and methods of analysis. The individual level focuses on identifying competencies, consisting of knowledge and unique individual skills. Meanwhile, the organisational level focuses on ensuring alignment with organizational objectives. The following is the theory explanation: First level is organisational analysis, where training needs analysis should be conducted at the organizational level first to determine strategies for achieving organizational goals (Leat & Jack Lovell, 1997). Needs analysis explores several features of organizational goals, resource skills, and organisational climate.

The second level is Operational Analysis: Task analysis identifies tasks that must be performed at the departmental level, regarding performance measures, skills, and knowledge needed to perform departmental tasks. The method of analysis is to examine job descriptions and the skills needed to achieve departmental performance indicators compared to actual current performance. Finally, the third level is individual analysis conducted at the individual level uses information from employee or participant performance to consider training program needs. Participants or employees can be surveyed, interviewed, or tested to identify individual competency gaps. Interviews can be conducted individually.

Training is a solution designed to solve performance problems caused by knowledge, skills, and attitude. The factors that determine work performance are opportunity, capacity, and willingness to perform (Jewell & Siegall, 1990). Opportunity: includes tools, materials, supplies, working conditions, coworker actions, leadership behaviour, mentoring, policies, regulations, organizational procedures, information, time, and salary. Capacity consists of age, health, skills, intelligence, motor skills, education level, endurance, stamina, and energy level, and willingness: consists of motivation, job satisfaction, job status, task characteristics, work involvement, norms, values, perceptions, and sense of fairness.

Competency-Based Training

Competency is defined as a combination of knowledge, skills, and work attitudes necessary to perform a job effectively. A competency-based training (CBT) framework is a system that uses skills and

competencies as the basis for training programs. The CBT framework focuses on developing practical skills to ensure that employees can perform their jobs effectively and align training with organizational goals.

The Competency-Based Training (CBT) model is the main framework for analyzing individual needs (Guthrie, 2009). CBT emphasizes the achievement of measurable learning outcomes that are in line with established competency standards. Training is designed so that participants not only understand the theory but are also able to apply it effectively in the field, when the training material is relevant to their work and experience. Learning is problem-based and oriented towards problem solving. Training in the mining sector is generally aimed at adults, so the learning approach refers to the theory of andragogy (Knowles, 1984), namely that adults need to understand the reasons why they should learn something.

Pairwise comparison

Pairwise comparison is a systematic method used to evaluate multiple alternatives by comparing them two at a time on a common set of criteria. In the context of training programs in the mining industry, this approach allows researchers to assess the relative strengths, weaknesses, and effectiveness of each program by examining how one option performs in direct comparison to another. Pairwise comparison reduces the complexity of multi-criteria decisions by breaking them into simpler judgment tasks, enabling a more transparent and structured evaluation process. This method is frequently applied in decision-making frameworks such as the Analytic Hierarchy Process (AHP), where expert judgments are quantified to generate priority weights. By using pairwise comparison, this study can more objectively identify which training program provides greater value in terms of safety, technical competency, regulatory compliance, and operational performance—key dimensions that are critical in the mining sector.

Methods

The study was conducted using a mixed-method approach that combines quantitative and qualitative methods in order to obtain a comprehensive and representative picture of the condition of human resources in the mining sector throughout Indonesia. Study uses survey and FGD to clearly define the training target group by creating a questionnaire as a measurement instrument that takes into account the following elements: training subjects; the importance of training; training that has been and will be attended; current competencies; potential target groups; training frequency; and respondents' expectations regarding training topics.

A widely used framework that can be used to guide the training needs analysis process The five steps adopted are as follows: identification of problems and training needs; determination of TNA-related designs; data collection; data analysis; and the development of solutions and recommendations (Miranda et al., 2023). The initial step involves collaboration with key stakeholders, including management, department heads, and HR professionals, to align training objectives with organisational priorities. This step is important for identifying training and scheduling for the coming year, creating new titles or creating new markets. The session was conducted via an online meeting, and by observing training documents from the previous three years.

The primary data is obtained by questionnaires and surveys of mining companies, workers, and managers, and focus group discussions (FGD) in various respondent areas. Secondary data was obtained from employment statistics from the Central Statistics Agency (BPS) and the Ministry of Energy and Mineral Resources (ESDM), and previous training documents from the institution. Respondents were divided into two different target groups: the employees and the client’s HR managers. The sampling technique used in this study was random sampling, with the sampling frame being data from the list of training participants for 2022–2024. A total of 90 employees and HR manager respondents were selected to

complete the questionnaire. The number of responses received for employees was 60, while for HR managers it was 63.

Pairwise comparison techniques (Nordstokke, 2024) were used for weighting and prioritisation, and a priority matrix was compiled. The data analysis framework is illustrated as a workflow (Fig. 2).

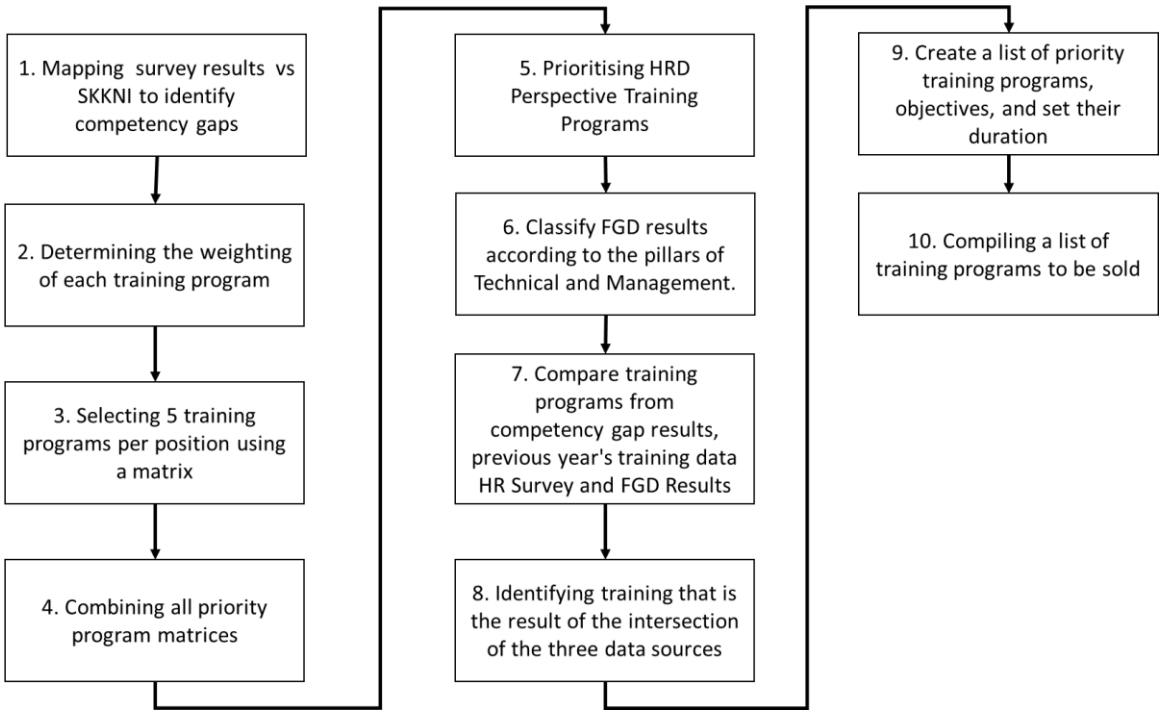

Figure 2. Workflow of the study

Result and Data Analysis

Respondent Profile

A total of sixty (60) people filled out the questionnaire, with the largest number (53%) being those with the positions of QHSE Engineer, Mining Planning Engineer (10%), as can be seen in Table 1.

Table 1 Respondent Profile

No	Position	Frequency	Percent
1	QHSE Engineer	44	53%
2	Mine Planning Engineer	6	10%
3	Engineer Produksi	2	3%
4	Engineer Geo Teknikal	2	2%
	Total	60	100%

Competency Mapping

The competency map is tailored to the positions and competencies outlined in the Indonesian Mining Industry SKKNI (National Competency Standards), SKKNI No. 168 of 2015 - General Mining Engineering, SKKNI No. 215 of 2019 - Mining Safety and Environmental Management, SKKNI No. 251 of 2019 - Reserve Modelling and Estimation. Below is an example of competency mapping against the standard for a certain position.

Table 2: Actual Competency Map for four positions

A. QHSE Engineer		B. Mine-planning enginer		B. Production Engineer		C. Geo Technical Engineer	
1. Knowledge of local and international mining regulations	38%	1. Knowledge of mine planning	42%	1. Knowledge of production planning	33%	1. Knowledge of geotechnical engineering	50%
2. Knowledge of best industrial K3LH practices	31%	2. Knowledge of planning design concepts ,	33%	2, Knowledge of loading and unloading operations	33%	2, Knowledge of geotechnical concepts	67%
3. Skills in using EHS & MS-Office software	49%	3. Skills in using planning software	42%	3. Skills in basic software	33%	3. Ability to use software	58%
		4. Compliance with regulations	33%	4. Knowledge of production regulatory requirements	33%	4.Knowledge of geotechnical regulatory requirements	33%
		5. Knowledge of industry best practices	44%	5. Knowledge of best practices (innovation)	33%	5. Knowledge of best practices	33%
6. Knowledge of Occupational Safety and Health		6. Knowledge of Occupational Safety and Health	33%	6. Knowledge of Occupational Safety and Health	67%	6. Knowledge of Occupational Safety and Health	33%
Avg	35%	Avg	38%	Avg	39%	Avg	46%

From table 2, it can be seen that Geotechnical engineers have the highest score of competency (46%)

Pairwise comparison

At this stage, the training program list will be weighted using the pairwise comparison technique. Below is an example of a pairwise comparison table.

Table 3 Pairwise comparison of different programs

Engineer Perencanaan Tambang	1. Dasar-Dasar Perencanaan Tambang	2. Estimasi Cadangan Dasar (JORC /KCMI)	4. Certified Mine Planning Engineer	5. Penggunaan Mine Planning Software Certification	6. Excel Lanjut untuk Perencanaan Tambang	7. Komunikasi Teknis dan Pelapora	8. Pengantar K3 Pertambangan dan Regulasi	TOTAL	Justifikasi	% tase bobot
1. Dasar-Dasar Perencanaan		1	0	0	1	0	1	3	4	14,8%
2. Estimasi Cadangan Dasar (JORC/KCMI)	0		0	0	1	1	1	3	4	14,8%
4. Certified Mine Planning Engineer	1	1		1	1	1	1	6	7	25,9%
5. Penggunaan Mine Planning Software Certification (Surpac, Minescape, Datamine	1	1	0		1	1	1	5	6	22,2%
6. Excel Lanjut untuk Perencanaan Tambang	0	0	0	0		0	0	0	1	3,7%
7. Komunikasi Teknis dan Pelaporan	1	0	0	0	1		0	2	3	11,1%
8. Pengantar K3 Pertambangan dan Regulasi Minerba	0	0	0	0	0	1		1	2	7,4%
							Total	20	27	100%

Selection based on rating

To select the top five training programs, a training program profile matrix for each position is used. The criteria for determining the rating refer to the level of resources of the training service provider in teaching participants, namely.

4 = The training service provider is an expert in teaching training
3 = The training service provider is proficient in teaching training
2 = The training service provider is still competent in teaching training
1 = The training service provider is still an advanced beginner in teaching training

An example of a matrix profile provided with the highest weight for planning engineers can be seen in Table 4.

Table 4 Program Prioritised for Mine Planning Engineer

Program Pelatihan	Weight	Rating	Score
Fundamentals of Mine Planning	14,8%	4	0,593
Basic Reserve Estimation (JORC/KCMI)	14,8%	3	0,444
Certified Mine Planning Engineer	25,9%	4	1,037
Use of Surpac / Micromine for Mine Design	7,4%	4	0,296
Advanced Excel for Mine Planning	3,7%	4	0,148
Technical Communication and Reporting	11,1%	4	0,444
Introduction to Mining Health, Safety, and Environment (HSE) and Mineral and Coal Mining Regulations	7,4%	4	0,296

Prioritizing

The next step is to arrange the position assessed for its competency and training demanded by the customer as follows, for example, for 20 programs (Table 5).

Table 5: Final Training programs issued

	Pelatihan yang diprioritaskan	Jumlah	% tase
1	POP	83	22,9%
2	Vocational High School	83	22,9%
3	Accident Investigation Technical Training	40	11,0%
4	POM	40	11,0%
5	Leadership	24	6,6%
6	Heavy Equipment Testing Technical Training	19	5,2%
7	Work Safety Aspects Technical Training	18	5,0%
8	POU	18	5,0%
9	Blaster	10	2,8%
10	Geotechnical	5	1,4%
11	Mine Surveyor	4	1,1%

	Pelatihan yang diprioritaskan	Jumlah	% tase
12	Technical Expertise	4	1,1%
13	Mine Planning	3	0,8%
14	Reclamation	3	0,8%
15	Fleet management system	2	0,6%
18	Accident Investigation	1	0,3%
19	Net Zero Emission	1	0,3%
20	Productivity	1	0,3%
		362	100%

Focus Group Discussion

The focus group discussion was conducted two times in Jakarta. From the FGD, a list of training requests was obtained, 39 course including: production planning, mine surveyor, digital technology in the mining sector, pilot drone certification, geotechnics, reclamation and post-mining, environmental management, hazardous waste management, occupational health and safety, mine acid water management, cost control, rkab, ert (water rescue and vertical rescue), environmental technical personnel, esg (environmental, social, & government), ıcam accident investigation methods, radiation protection.

Training Plan Formulation

Training programs were identified by selecting from four data sources in Tables 4 and 5, resulting in 42 training programs, and then identifying programs that overlapped with other data sources. The number of overlapping data sources became the criterion for determining training. The results are presented in Table 6.

Table 6. Result of the Program based on Competency

	Program	Purpose	Learning Outcomes	Duration
1	Geotechnical engineer	Improving participants' competence in analyzing and managing slope stability, underground or open pit mine geotechnical stability, and mitigating the risk of landslides and geological structure failure.	Participants can perform geotechnical analysis and recommendations in accordance with technical and mining safety standards.	4
2	Audit and Implementation Safety Management System	Improving participants' competence in conducting internal audits and implementing Mining SMK in accordance with Ministry of Energy and Mineral Resources regulations	Participants understand and can implement SMKP in accordance with regulations.	2
3	Basic safety training	Providing a basic understanding of workplace safety principles in mines, introducing potential hazards, the use of personal protective equipment (PPE), and emergency response procedures.	Participants understand the basic principles of occupational health and safety.	2
4	Cost Control and Mining Operation Budgeting	Develop participants' abilities in preparing, monitoring, and controlling mining operational budgets to be more efficient and accountable.	Participants are able to prepare RKAB and control mining operational costs.	2

	Program	Purpose	Learning Outcomes	Duration
5	Training and Certification for Mineral or Coal Reserve Estimation Experts	Equipping participants with technical and analytical skills in estimating reserves in accordance with national (KCMI) or international (JORC, NI 43-101) standards, as well as meeting professional certification requirements.	Participants are able to accurately estimate and report mineral or coal reserves in accordance with standards.	5

Discussion

From the 9 stages of creating a training program, 30 program proposals were produced to be implemented in 2026. Compared to the previous year, which had 21 training programs, the number of training proposals for 2026 has increased.

The factors causing the increase in the number of training programs are, firstly, Technological developments in mining operations, such as the use of software in the design, operation, and production of mines, which make operations more effective and efficient. Secondly, in addition to technical competencies, workers in the mining industry also need non-technical training to be able to operate in this industry well and with high productivity, such as training in leadership, management, regulations, and digital transformation.

The analysis methods used in this report vary, starting with competency mapping using SKKNI standards at the individual level. This is followed by training and certification proposals for individuals in specific positions. When analysing training programs at the organisational level determined by the human resources manager, there are usually obstacles in terms of financing and approval from superiors. Therefore, at the organisational level, the training that is budgeted for is usually mandatory first. From the mapping results using Indonesian standards, 114 training programs were identified that could be offered to fill competency gaps. This number decreased to 20 when it became the output of a survey from the perspective of human resources and management.

The selection of programs to be proposed was then ranked according to priority based on pairwise comparison and weighting to obtain a total of 37 program recommendations for the 8 positions analyzed. Pairwise comparison used the criterion of the readiness of training providers to meet training demand. The rating determination also needed to be reviewed to obtain an internal perspective.

Two FGDs in Jakarta and online resulted in 55 training programs that are in demand by the community and workers in the mining industry. To obtain future training programs, in addition to predictions, training needs analysis based on triangulation and comparing databases can also be used to obtain intersections of several data sources, namely from SKKNI competency gap data, HRD perceptions, FGDs, and the success of the previous year's training which is a proposal for 30 training programs that need to be implemented.

In addition, many suggestions from the FGDs could not be prioritized, such as requests for training programs on topics such as creating competency maps for mining employees, Mandarin language training due to the large number of Chinese workers in Indonesia, mining law, compensation and benefits, creating SOPs, measuring the effectiveness of training, technical health personnel, TOT for knowledge transfer, mining for HR, QA/QC related to minerals, and good mining practices. Finally, the training program for 2026 was successfully developed with a high level of confidence because it used four sources of data (SKKNI, FGD, HRD survey, and the previous year's training data).

Conclusion and Recommendation

The first objective of this report is to identify the types of individual competencies required for specific positions in the mining sector in accordance with SKKNI. The results are presented in Phase 1 of the list of technical competencies for each position with reference to SKKNI. The second objective of this report is to assess the gap between existing competencies and applicable standards, both based on SKKNI and current industry practices, at the individual level. The results show that the average competency level is below 50%, although there are some exceptions for those who are already proficient, expert, and competent in operational, production, and geotechnical positions.

The third objective is to identify training program recommendations for 2026 based on data obtained from two surveys and two FGDs. A list of training programs has been compiled, involving facilitators with technical expertise in mining and geology. Using pairwise comparison and a priority matrix, 41 training programs were proposed, consisting of 20 technical programs and 21 non-technical programs.

Implications and limitations of the study

The document will give information needed to design training programs , as a reference for designing job specifications and job descriptions and compiling the general and specific competencies required by the organisation to achieve its objectives. Input for performance appraisal in the form of a list of tasks to be performed and work standards to be achieved by each employee. The implication also in terms of supporting government programs in improving the quality of human resources in the energy and mineral resources sector, in accordance with the Strategic Plan of the Ministry of Energy and Mineral Resources and the 2025–2029 National Medium-Term Development Plan.

REFERENCES

Adhuri, D. S., Rachmawati, L., Sofyanto, H., & Hamilton-Hart, N. (2016). Green market for small people: Markets and opportunities for upgrading in small-scale fisheries in Indonesia. *Marine Policy*, *63*, 198-205.

Ahsan, M. K., Runa, N. S., Ghosh, S. K., Hasan, M. M., & Kamal, M. (2016). Socio-economic condition of fishermen and intermediaries involved in marine fish marketing chain in Cox s Bazar area, Bangladesh. *Asian Journal of Medical and Biological Research*, *2*(1), 67-73.

Al-Refaie, A., Al-Tahat, M., & Lepkova, N. (2020). Modelling relationships between agility, lean, resilient, green practices in cold supply chains using ISM approach. *Technological and Economic Development of Economy*, *26*(4), 675-694.

Ansari, Z. N., Kant, R., & Shankar, R. (2019). Prioritizing the performance outcomes due to adoption of critical success factors of supply chain remanufacturing. *Journal of Cleaner Production*, *212*, 779-799.

Arango-Botero, D., & Arias, M. L. B. (2020). Social Entrepreneurship: Dynamics and Current Trends. *SCMS Journal of Indian Management*, *17*(2), 94-110.

Ariansyach, I. (2017). Fisheries country profile: Indonesia. SEAFDEC. In.

Arifandy, F. P., Norsain, N., & Firmansyah, I. D. (2020). Peran Koperasi Dalam Meningkatkan Perekonomian Masyarakat Nelayan: Perspektif Modal Kerja. *Jurnal Akademi Akuntansi*, *3*(1), 118-132.

Basbeth, F., Wisudo, S. H., Baskoro, M., & Imron, M. (2024). Pendampingan Pemasangan Atraktor Cumi-Cumi dan Pengenalan Koperasi Nelayan di Kaimana, Papua Barat. *Journal of Sustainable Community Development (JSCD)*, *6*(1), 40-50.

Broadstock, D. C., Matousek, R., Meyer, M., & Tzeremes, N. G. (2020). Does corporate social responsibility impact firms' innovation capacity? The indirect link between environmental & social governance implementation and innovation performance. *Journal of Business Research*, *119*, 99-110.

Chai, P., & Hu, Q. (2021). Influence of Fishery Cooperative Support on Safety Factor Input Behavior of Aquaculturists: The Intermediary Role of Order Fishery and Product Certification. Sustainability, 13(19), 10714. https://doi.org/https://doi.org/10.3390/su131910714

Clamp, C. A., & Alhamis, I. (2010). Social entrepreneurship in the Mondragon co-operative corporation and the challenges of successful replication. The *Journal of Entrepreneurship*, *19*(2), 149-177.

Gardas, B. B., Raut, R. D., & Narkhede, B. (2017). Modeling causal factors of post-harvesting losses in vegetable and fruit supply chain: An Indian perspective. *Renewable and sustainable energy reviews*, *80*, 1355-1371.

Glaser, M., Breckwoldt, A., Deswandi, R., Radjawali, I., Baitoningsih, W., & Ferse, S. C. (2015). Of exploited reefs and fishers–A holistic view on participatory coastal and marine management in an Indonesian archipelago. *Ocean & Coastal Management*, *116*, 193-213.

Goedhals-Gerber, L. L., & Khumalo, G. (2020). Identifying temperature breaks in the export cold chain of navel oranges: A Western Cape case. *Food control*, *110*, 107013.

Gölcük, İ., & Baykasoğlu, A. (2016). An analysis of DEMATEL approaches for criteria interaction handling within ANP. *Expert Systems with Applications*, *46*, 346-366.

Gupta, P., Chauhan, S., Paul, J., & Jaiswal, M. P. (2020). Social entrepreneurship research: A review and future research agenda. *Journal of Business Research*, *113*, 209-229.

Halim, A., Loneragan, N. R., Wiryawan, B., Fujita, R., Adhuri, D. S., Hordyk, A. R., & Sondita, M. F. A. (2020). Transforming traditional management into contemporary territorial-based fisheries management rights for small-scale fisheries in Indonesia. *Marine Policy*, *116*, 103923.

Han, J.-W., Zuo, M., Zhu, W.-Y., Zuo, J.-H., Lü, E.-L., & Yang, X.-T. (2021). A comprehensive review of cold chain logistics for fresh agricultural products: Current status, challenges, and future trends. *Trends in Food Science & Technology*, *109*, 536-551.

Kalikoski, D. C., Jentoft, S., McConney, P., & Siar, S. (2019). Empowering small-scale fishers to eradicate rural poverty. In (Vol. 18, pp. 121-125): Springer.

Kurniawan, K. (2018). Strategi pengembangan perikanan tangkap di Kabupaten Bangka Selatan. *Akuatik: Jurnal Sumberdaya Perairan*, *12*(2), 93-101.

Kurniawan, K., br Sebayang, M., & Utami, E. (2019). Potensi Dan Tingkat Pemanfaatan Sumberdaya Ikan Menggunakan Metode Surlpus Produksi Diperairan Kabupaten Bangka Tengah (Potential And Level Utilization Of Fish Resources Use The Production Surplus Method In The Waters Of Center Bangka Regency). *Saintek Perikanan: Indonesian Journal of Fisheries Science and Technology*, *15*(2), 129-133.

Lynch, A. J., Cooke, S. J., Deines, A. M., Bower, S. D., Bunnell, D. B., Cowx, I. G., Nguyen, V. M., Nohner, J., Phouthavong, K., & Riley, B. (2016). The social, economic, and environmental importance of inland fish and fisheries. *Environmental reviews*, *24*(2), 115-121.

Ma, L., Chen, Z., Su, K., Zhang, H., Wen, Y., & Hou, Y. (2024). Can Cooperatives Enhance the Income-Generating Effect of Eco-Industries for Farmers?—Empirical Evidence from the Crested Ibis National Nature Reserve, China. *Forests*, *15*(5), 757.

Maulu, S., Hasimuna, O. J., Haambiya, L. H., Monde, C., Musuka, C. G., Makorwa, T. H., Munganga, B. P., Phiri, K. J., & Nsekanabo, J. D. (2021). Climate change effects on aquaculture production: sustainability implications, mitigation, and adaptations. *Frontiers in Sustainable Food Systems*, *5*, 609097.

Mukherjee, P., Saha, A., Sen, K., Erfani, H., Madhu, N. R., & Sanyal, T. (2022). Conservation and prospects of Indian Lacustrine fisheries to reach the Sustainable Developmental Goals (SDG 17). *A Basic Overview of Environment and Sustainable Development*, 98-116.

Mustafa, M. F. M. S., Namasivayam, N., & Demirovic, A. (2024). Food Cold Chain Logistics and Management: A Review of Current Development and Emerging Trends. *Journal of Agriculture and Food Research*, 101343.

Mutiar, I. R., Sumarti, T., & Satria, A. (2018). Tindakan Rasional dan Strategi Berjejaring Rumah Tangga Nelayan Kecil. *Sodality: Jurnal Sosiologi Pedesaan*, *6*(1), 32-39.

Nakamura, J., Chuenpagdee, R., & El Halimi, M. (2021). Unpacking legal and policy frameworks: a step ahead for implementing the small-scale fisheries guidelines. *Marine Policy*, *129*, 104568.

Prakash, S., Jasti, N. V. K., Chan, F., Sharma, V. P., & Sharma, L. K. (2022). Decision modelling of critical success factors for cold chains using the DEMATEL approach: A case study. *Measuring Business Excellence*, *26*(3), 263-287.

Rad, F. F., Oghazi, P., Palmié, M., Chirumalla, K., Pashkevich, N., Patel, P. C., & Sattari, S. (2022). Industry 4.0 and supply chain performance: A systematic literature review of the benefits, challenges, and critical success factors of 11 core technologies. *Industrial Marketing Management*, *105*, 268-293.

Ridwan, M. (2022). Poverty Reduction Through Strengthening The Role Of Cooperative Institutions: Case Study Of Rural Rice Farming Communities. *Jurnal Agrisep: Kajian Masalah Sosial Ekonomi Pertanian Dan Agribisnis*, 55-68.

Said, A., & Chuenpagdee, R. (2019). Aligning the sustainable development goals to the small-scale fisheries guidelines: A case for EU fisheries governance. *Marine Policy*, *107*, 103599.

Sanyal, T., Saha, A., & Mukherjee, P. (2023). Activities of fisheries co-operative societies in India to boost up and optimise the resources and economy of farmers: a review. *Journal of Fisheries*, *11*(2), 112301-112301.

Saz-Gil, I., Bretos, I., & Díaz-Foncea, M. (2021). Cooperatives and social capital: A narrative literature review and directions for future research. *Sustainability*, *13*(2), 534.

Sebatjane, M. (2024). A sustainable inventory model for a two-echelon cold chain with green technology investments and stock-dependent demand under carbon emissions tax regulation. *Cleaner Logistics and Supply Chain*, *13*, 100173.

Sharma, M., Joshi, S., Kannan, D., Govindan, K., Singh, R., & Purohit, H. (2020). Internet of Things (IoT) adoption barriers of smart cities' waste management: An Indian context. *Journal of Cleaner Production*, *270*, 122047.

Sivakumar, K., Jeyapaul, R., Vimal, K., & Ravi, P. (2018). A DEMATEL approach for evaluating barriers for sustainable end-of-life practices. *Journal of Manufacturing Technology Management*, *29*(6), 1065-1091.

Stacey, N., Gibson, E., Loneragan, N. R., Warren, C., Wiryawan, B., Adhuri, D., & Fitriana, R. (2019). Enhancing coastal livelihoods in Indonesia: an evaluation of recent initiatives on gender, women and sustainable livelihoods in small-scale fisheries. *Maritime Studies*, *18*, 359-371.

Stacey, N., Gibson, E., Loneragan, N. R., Warren, C., Wiryawan, B., Adhuri, D. S., Steenbergen, D. J., & Fitriana, R. (2021). Developing sustainable small-scale fisheries livelihoods in Indonesia: Trends, enabling and constraining factors, and future opportunities. *Marine Policy*, *132*, 104654.

Suwandi, M. A., & Harlyandra, Y. (2024). Program Community Development Cirebon Power Sebagai Upaya Memutus Rantai Ketergantungan Nelayan Terhadap Tengkulak. *GovernancE: Jurnal Ilmiah Kajian Politik Lokal dan Pembangunan*, *10*(3).

Vishvakarma, N. K., Singh, R. K., & Sharma, R. (2022). Cluster and DEMATEL analysis of key RFID implementation factors across different organizational strategies. *Global Business Review*, *23*(1), 176-191.

Warren, C., & Steenbergen, D. J. (2021). Fisheries decline, local livelihoods and conflicted governance: An Indonesian case. *Ocean & Coastal Management*, *202*, 105498.

Wilson, E. W. (2017). Cooperatives: The First Social Enterprise. *DePaul Law Review*, *66*(4), 3.

Zhao, L., Sun, H., & Jiang, H. (2019). Research on the development of new fishery management entities based on the perspective of industrial integration. *Guangdong Agric. Sci*, *46*, 162-172.

CHAPTER 6
The Role of Business Incubator Ecosystems in Strengthening MSME Sustainability within the SDGs Framework

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ABSTRACT

Business incubator ecosystems play a critical role in enhancing the sustainability and long-term resilience of Micro, Small, and Medium Enterprises (MSMEs), particularly within the global framework of the Sustainable Development Goals (SDGs). This study explores how university-based incubatorssupported by academic resources, government regulations, financial access facilitators, development partners, and external stakeholders—strengthen MSME capabilities through integrated services and ecosystem coordination. Using a qualitative literature-based approach, this paper synthesizes scholarly findings on business incubation, entrepreneurial ecosystems, and innovation support to identify the mechanisms that influence MSME development. The analysis reveals that incubators contribute not only by offering technical assistance, mentoring, and business clinics but also by enabling multi-stakeholder collaboration that aligns with SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 17 (Partnerships for the Goals). In particular, incubators help MSMEs improve competitiveness, adopt sustainable production practices, enhance innovation capacity, expand networks, and access essential resources that support business continuity. Overall, this study provides a conceptual understanding of how integrated business incubator ecosystems especially those embedded within universities serve as an effective pathway to advancing sustainable MSME development in alignment with global sustainability goals.
Keywords: Business Incubator; MSME Sustainability; Entrepreneurial Ecosystem; Innovation Support; University-Based Incubator; Sustainable Development Goals (SDGs); Partnerships; Capacity Building

1. INTRODUCTION

1.1Background

Micro, Small, and Medium Enterprises (MSMEs) represent a dominant pillar of Indonesia's economic structure. Over the past several years, the number of MSMEs has shown a steady upward trend. As illustrated in Figure 1, the total number of MSMEs increased from approximately 29 million units in 2018 to more than 60 million units in 2023. This continuous growth reflects the crucial and expanding role of MSMEs in driving national economic activity, supporting entrepreneurship, and sustaining community-level livelihoods.

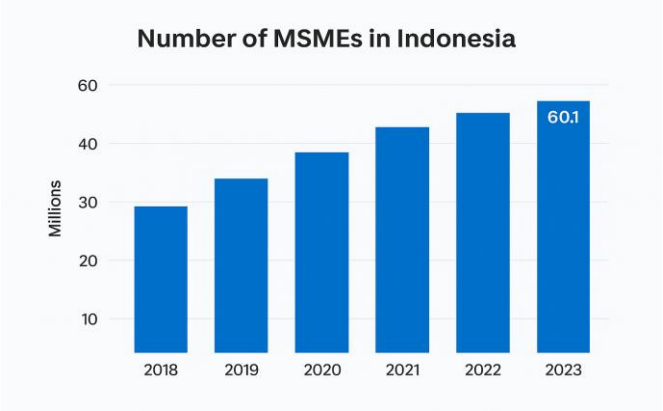

Figure 1. Number of MSMEs in Indonesia (2018–2023)

Source: Processed by the author based on data from KADIN (2024), Ministry of Cooperatives and SMEs, and GoodStats Indonesia.

MSMEs play a vital role in Indonesia’s macroeconomic structure, contributing around 61% to national GDP and employing approximately 97% of the labor force (KADIN, 2024; GoodStats, 2023). Despite this significant contribution, MSMEs continue to face persistent constraints such as limited access to finance, low technological adoption, weak innovation capacity, and vulnerability to external shocks, all of which inhibit their competitiveness and long-term sustainability (Tambunan, 2019).

The Sustainable Development Goals (SDGs) highlight the urgency of strengthening MSME resilience through innovation, productive employment, responsible business practices, and multi-stakeholder collaboration. SDG 8 promotes sustainable economic growth and decent work, SDG 9 emphasizes innovation and resilient infrastructure, SDG 12 focuses on responsible consumption and production including the adoption of eco-friendly processes and efficient resource management while SDG 17 underscores partnership-driven solutions (UNDP, 2023). In this context, robust support ecosystems particularly business incubators are increasingly viewed as strategic mechanisms for enabling sustainable MSME development.

Business incubators help address MSME challenges by providing structured learning, innovation support, resource access, and scaling opportunities. Studies indicate that incubators enhance performance through mentoring, knowledge exchange, and targeted capability development (Albort-Morant & Oghazi, 2016). Next-generation incubators further create value through customized services and strong industry linkages (Pauwels et al., 2016). Their multi-stakeholder orientation aligns with the Triple and Quadruple Helix models, integrating universities, government, industry, and civil society to generate stronger innovation and sustainability outcomes (Etzkowitz & Leydesdorff, 2000; Carayannis & Campbell, 2009; Hausberg & Korreck, 2020).

Incubators also improve MSMEs' access to finance by increasing investor confidence and strengthening business development processes (Mian, Lamine & Fayolle, 2016). Moreover, they contribute to environmental and social sustainability through initiatives that encourage green innovation and responsible resource management (Battisti & Perry, 2011). Digital transformation further expands incubator reach and accelerates learning, efficiency, and market access, especially in emerging economies (Mahmood, Siddique & Adnan, 2022).

Despite the advancement of incubator models, empirical insights on how integrated incubator ecosystems specifically support MSME sustainability within the SDGs framework remain limited, particularly in Indonesia. Most prior studies focus on incubator performance or innovation outcomes rather than ecosystem-wide contributions involving policy, university engagement, financing access, and collaborative partnerships.

Therefore, this study explores the strategic role of business incubator ecosystems in enhancing MSME sustainability within the SDGs framework. Using a qualitative, literature-based approach, it synthesizes global evidence on incubation, entrepreneurial ecosystems, and sustainable development to conceptualize how interconnected incubator components contribute to MSME resilience. The findings are expected to offer theoretical and practical insights for developing more adaptive, collaborative, and SDG-aligned incubator models.

1.2 Research Problem

Although business incubators are increasingly recognized as strategic mechanisms for strengthening MSME competitiveness, several limitations remain in existing research. Most studies focus on incubator performance or tenant-level outcomes, with limited attention to how ecosystem-based incubators operate holistically in emerging economies (Hausberg & Korreck, 2020). Moreover, while the SDGs provide a global sustainability framework, the connection between incubator ecosystem components and SDG-oriented MSME outcomes is still underexplored, particularly in Southeast Asia.

Research also tends to examine individual components—such as mentorship (Albort-Morant & Oghazi, 2016), access to finance (Mian et al., 2016), or university involvement (Etzkowitz & Leydesdorff, 2000) without analyzing how these elements interact synergistically as an integrated ecosystem. Additionally, studies investigating incubators' contributions to MSME long-term sustainability, beyond short-term performance gains, remain scarce. These gaps highlight the need for a more comprehensive understanding of how multi-stakeholder incubator ecosystems enhance MSME resilience and align with the SDGs.

1.3 Research Gap

Based on the existing literature, several gaps can be identified:

Gap 1 — Limited analysis on incubators within the SDGs framework

Most incubator studies focus on innovation, entrepreneurship, or business growth, while the connection to SDG 8, SDG 9, SDG 12 and SDG 17 remains largely unexplored.

Gap 2 — Lack of ecosystem-level perspectives

Research tends to analyze incubator services individually (mentorship, financing, training), but not as an interdependent ecosystem involving universities, industry, government, and communities.

Gap 3 — Lack of contextual research in developing economies.

Studies in Indonesia or emerging markets often focus on operational challenges or program evaluations, but rarely on ecosystem governance, stakeholder synergy, or sustainability outcomes.

Gap 4 — Limited studies on long-term MSME resilience

Most studies examine performance improvements during incubation, but not long-term sustainability such as innovation capability, network expansion, or resilience to external shocks.

Therefore, this study fills gaps by synthesizing literature on incubator ecosystems and mapping their contribution to MSME sustainability aligned with SDGs.

1.4 Research Objectives

This study aims to:

1. Analyze the role of business incubator ecosystems in strengthening MSME sustainability.
2. Identify ecosystem components (university support, government regulation, access to finance, development partners, and external stakeholders) that contribute to MSME long-term resilience.
3. Examine the relevance of incubator ecosystems within the SDGs framework, particularly SDG 8, SDG 9, SDG 12 and SDG 17.
4. Develop a conceptual understanding of how multi-stakeholder synergy enhances MSME capabilities and competitiveness.

1.5 Research Questions

Based on the objectives, the study addresses the following questions:

1. How do business incubator ecosystems contribute to MSME sustainability?
2. Which ecosystem components play the most strategic role in strengthening MSME long-term resilience?
3. How do incubator ecosystem mechanisms align with the SDGs framework?
4. What multi-stakeholder synergies are necessary to enhance sustainable MSME development?

1.6 Significance of the Study

Theoretical Contribution

- Offers an integrated conceptual model linking incubator ecosystems to sustainability-oriented MSME development.

- Expands current understanding of Triple Helix and Quadruple Helix frameworks in the context of MSME empowerment.
- Fills the gap in SDG-aligned business incubation research.

Practical Contribution

- Provides guidance for universities, incubator managers, policymakers, and development partners to design more sustainable incubation strategies.
- Supports future policymaking toward SDG-oriented MSME development.
- Assists stakeholders in optimizing ecosystem collaboration for long-term MSME resilience.

CHAPTER 2. LITERATURE REVIEW

2.1 Business Incubator Ecosystems

Business incubators have transformed from facilities offering basic space and administrative support into dynamic ecosystems that foster entrepreneurial learning, innovation, and sustainable growth. Modern incubators act as knowledge ecosystems that integrate networks, mentoring, and access to finance to enhance tenant competitiveness (Mian, Lamine, & Fayolle, 2016). Pauwels et al. (2016) highlight three core value-creation mechanisms in next-generation incubators: service customization, network orchestration, and strategic positioning.

Incubator ecosystems operate as intermediaries that connect tenants with essential resources. A systematic review by Hausberg & Korreck (2020) shows that incubator effectiveness is strongly shaped by ecosystem orientation, particularly the interaction among universities, government, and industry. Albort-Morant & Oghazi (2016) further demonstrate that incubators strengthen business survival by facilitating knowledge exchange, managerial capability development, and strategic planning. Additionally, incubators support entrepreneurial capability building by providing access to mentors, professional networks, and market insights (Bruneel et al., 2012). Overall, incubator ecosystems function as resource integrators that help MSMEs overcome barriers related to knowledge, funding, technology readiness, and market access.

2.2 MSME Sustainability

MSME sustainability refers to the ability of enterprises to maintain long-term performance, resilience, and competitiveness while balancing economic, social, and environmental demands. OECD (2022) notes that MSMEs consistently struggle with financial constraints, limited technological capability, and inadequate innovation practices.

Key drivers of sustainability include:

a. Innovation Capability – MSMEs with stronger innovation capacity show higher competitiveness and resilience (Roxas & Chadee, 2016).

b. Access to Finance – Limited financing reduces survival rates and restricts growth and innovation (Beck & Demirgüç-Kunt, 2006).

c. Digital Transformation – Digital adoption enhances efficiency, scalability, and market reach, particularly in emerging economies (Mahmood, Siddique & Adnan, 2022).

d. Network Strength and Collaboration – Linkages with universities, government, investors, and community institutions reduce business vulnerability (Besser & Miller, 2010).

Overall, MSME sustainability is multidimensional and shaped by innovation, finance, digital capabilities, and ecosystem support—including the role of incubators in providing structured access to these resources.

2.3 Innovation Ecosystems and Multi-Stakeholder Collaboration

Innovation ecosystems consist of interconnected actors—universities, industries, governments, communities, and financial institutions—collaborating to support innovation (Autio & Thomas, 2014). The Triple Helix Model emphasizes university–industry–government interaction as the core of innovation networks (Etzkowitz & Leydesdorff, 2000), while the Quadruple Helix Model expands this by integrating civil society to enhance inclusivity and societal relevance (Carayannis & Campbell, 2009).

In developing economies, such multi-stakeholder collaboration is particularly vital, as MSMEs often face technological and resource limitations. Incubators function as intermediaries that bridge knowledge gaps, strengthen networks, and promote technological advancement (Ndabeni, 2008). Innovation ecosystems also create shared learning spaces where entrepreneurs, academics, policymakers, and industry partners co-develop solutions, fostering resilience and adaptability (Robinson, Rip & Mangematin, 2007). Thus, innovation ecosystems play a key role in supporting the sustainability of incubated MSMEs by providing collaborative and resource-rich environments for continuous capability development.

2.4 Business Incubators and the SDGs Framework

The Sustainable Development Goals (SDGs) established by the United Nations provide a comprehensive framework for promoting economic development, innovation, and partnership-driven initiatives.

Figure 2. SDG Framework

Figure 2 illustrates the Sustainable Development Goals (SDGs) framework, which provides a foundation for promoting innovation, inclusive economic development, and partnership-driven solutions. Several SDGs are directly linked to the role of business incubators in enhancing MSME resilience and sustainable growth.

SDG 8 (Decent Work and Economic Growth): Incubators strengthen entrepreneurial capacity, job creation, and MSME productivity through training, mentoring, and capability development (UNDP, 2023).

SDG 9 (Industry, Innovation, and Infrastructure): Incubators support innovation-led growth by improving technological capability, enabling digital transformation, and fostering university–industry collaboration.

They also promote sustainable production and competitiveness (Battisti & Perry, 2011).

SDG 12 (Responsible Consumption and Production): Sustainability-focused incubators guide MSMEs in adopting eco-friendly practices, efficient resource use, and circular economy approaches. Lennox, York, and Bodewes (2020) found that these programs help embed environmental responsibility from the early stages of business development.

SDG 17 (Partnerships for the Goals): Incubators serve as platforms that coordinate collaboration across universities, industry, government, NGOs, and financial institutions. Such partnerships enable knowledge flow, resource access, and ecosystem development (Mian et al., 2016).

Recent studies further affirm the alignment between incubation and sustainability, showing that incubators encourage green innovation, responsible business models, and circular economy practices (Lennox et al., 2020). Entrepreneurial ecosystems, including incubators, also contribute to building sustainable local economies when they integrate economic, social, and environmental value creation (Cohen, 2006).

Overall, the integration of SDG 8, 9, 12, and 17 amplifies the strategic relevance of incubators as catalysts for sustainable MSME development, particularly in emerging markets where institutional support and collaborative networks remain fragmented.

CHAPTER 3. RESEARCH METHOD

This study employs a qualitative research design using a systematic literature review (SLR) combined with a conceptual synthesis approach. This method is suitable for examining the strategic role of business incubator ecosystems in enhancing MSME sustainability within the SDGs framework, as it integrates multiple constructs such as ecosystems, sustainability, innovation, and multi-stakeholder collaboration. Following the guidelines of Tranfield, Denyer & Smart (2003) and Petticrew & Roberts (2006), the SLR systematically identifies, evaluates, and synthesizes prior research. A complementary conceptual thematic analysis (Torraco, 2005) is used to integrate diverse findings into a coherent framework. This combined approach addresses fragmented evidence and supports a comprehensive understanding of how incubator ecosystems contribute to SDG-oriented MSME sustainability.

CHAPTER 4. FINDINGS

4.1 The Integrated Ecosystem Model of the MNC University Business Incubator

Figure 3 presents the integrated ecosystem model of the MNC University Business Incubator, which uses a two-stage incubation framework to enhance MSME capabilities and long-term sustainability. The model illustrates the interaction of internal and external stakeholders within a structured innovation environment aligned with key SDGs, particularly SDG 8, SDG 9, and SDG 17.

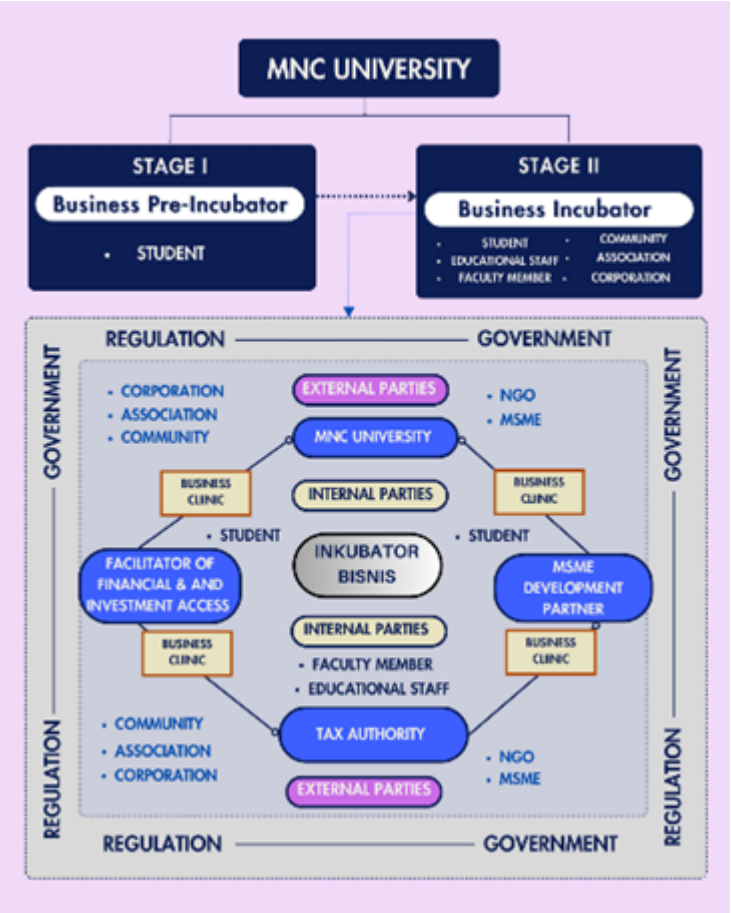

Figure 3. Multi-Actor Collaboration Model in the MNC University Business Incubator

4.2 Two-Stage Incubation Process: Pre-Incubation and Full Incubation

The ecosystem operates through two stages. Stage I: Business Pre-Incubator targets students in the early idea-generation phase, focusing on entrepreneurial mindset development, creativity, opportunity recognition, idea validation, and basic business model training. Stage II: Business Incubator involves a wider participant group including students, faculty, staff, communities, corporations, and associations and emphasizes business development, advanced mentoring, market and network access, investment readiness, and collaboration with MSME partners. This two-stage structure reflects best practices in incubation literature promoting progressive capability-building and structured development pathways (Pauwels et al., 2016; Bruneel et al., 2012).

4.3 Internal Stakeholders: The Academic Core of the Ecosystem

Internal actors faculty members, students, and educational staff serve as the intellectual foundation of the incubator ecosystem. They contribute expertise for business clinics, research-driven innovation insights, instructional support for business model development, and academic legitimacy that strengthens structured learning. Their collective function aligns with the Triple Helix model, positioning universities as central drivers of innovation.

4.4 External Stakeholders: Strengthening Networks and Sustainability Pathways

The model brings together diverse external stakeholders who strengthen MSME innovation and

sustainability. Industry partners provide market and technology insights; associations and communities offer local knowledge; NGOs enhance capacity-building and inclusive markets; financial facilitators improve access to funding; and regulators ensure policy alignment. Collectively, these actors reflect the Quadruple Helix model, emphasizing collaboration across industry, government, academia, and civil society to support socially aligned, innovation-driven MSMEs.

4.5 Functional Mechanisms: Business Clinics, Financial Facilitation, and MSME Development Programs

The incubator ecosystem operates through three key mechanisms. First, Business Clinics offer personalized mentoring, diagnostic assessments, and capability-building to strengthen MSME skills. Second, Financial and Investment Access Facilitation connects MSMEs with banks, investors, and government programs to enhance financial literacy, prepare funding proposals, and improve investment readiness. Third, MSME Development Partnerships with NGOs, communities, and associations support inclusive business models, sustainability practices, and community-driven innovation. Together, these mechanisms reinforce an integrated incubation system aligned with SDG 9 and SDG 12.

4.6 Policy and Regulatory Environment: Government Role in Ecosystem Sustainability

The model highlights Regulation and Government as a crucial outer layer, underscoring how public policy shapes the environment for MSME growth. Through fiscal incentives, tax systems, digital initiatives, empowerment programs, and innovation governance, government support strengthens incubator sustainability and ensures alignment with national SDG commitments.

4.7 Integration with Sustainable Development Goals (SDGs)

The MNC University incubator ecosystem strengthens MSMEs by directly advancing key SDGs. It supports SDG 8 through job creation, entrepreneurship training, and productivity enhancement. It drives SDG 9 by boosting innovation, technology adoption, and collaborations that accelerate industrial development. Through sustainability-focused mentoring and partnerships, it aligns with SDG 12, promoting eco-friendly practices and responsible production. Finally, it advances SDG 17 by building strong multi-stakeholder partnerships across universities, industry, government, and civil society. Altogether, the model offers a comprehensive, sustainability-driven incubation framework that empowers MSMEs to thrive and contribute meaningfully to sustainable development.

4.8 Synthesis: The Ecosystem as an SDG-Aligned Innovation Engine

The ecosystem in Figure 2 shows that a strong university-based incubator brings together academic, industry, government, and community actors to drive innovation, learning, and financial access. It boosts MSME resilience through mindset development, capability building, and networking while aligning all activities with global sustainability goals. Overall, it reinforces existing theories and expands their application to SDG-focused MSME development in emerging economies.

CHAPTER 5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study shows that university-based business incubators play a pivotal role in strengthening MSME sustainability within the SDGs framework. Through a two-stage incubation model, business clinics, financial access support, and extensive external partnerships, the MNC University ecosystem effectively builds entrepreneurial mindsets, innovation capabilities, digital readiness, and collaborative networks. Rooted in the Triple and Quadruple Helix frameworks, these interactions foster knowledge exchange and inclusive ecosystem participation. The findings also reveal strong alignment with SDG 8, SDG 9, SDG 12, and SDG 17, demonstrating how incubators help MSMEs develop sustainable business models and innovative solutions. Overall, the study offers a conceptual foundation for understanding how university-led incubator ecosystems enhance MSME resilience and competitiveness in emerging economies.

5.2 Theoretical Implications

The study contributes to theory by linking incubation research with the SDG agenda, showing how incubator activities translate into sustainability outcomes. It strengthens the Triple and Quadruple Helix perspectives by highlighting the importance of coordinated collaboration among universities, industry, government, and civil society. The MNC University model also offers a conceptual blueprint for SDG-oriented incubation, illustrating how mindset development, innovation, digitalization, and partnerships function as an integrated sustainability mechanism. Additionally, the study expands the MSME sustainability framework by emphasizing that long-term resilience depends not only on internal capabilities but also on the surrounding ecosystem facilitated by incubators.

5.3 Practical Recommendations

The study recommends strengthening incubator ecosystems by enhancing entrepreneurship mindset training, expanding and customizing business clinic services, and boosting digital transformation support through online tools and virtual incubation. It also urges stronger financial access initiatives through deeper collaboration with banks and investors, along with formalizing multi-stakeholder partnerships to ensure consistent, long-term support for MSME development.

5.4 Directions for Future Research

Future research should empirically examine how incubator ecosystems impact MSME growth, innovation, and long-term survival through quantitative, qualitative, or mixed-method approaches. Comparative studies across university, corporate, and government incubators can reveal structural strengths and best practices. Researchers are also encouraged to develop standardized metrics to assess incubators' contributions to SDG achievement. Longitudinal studies tracking MSMEs over time would deepen understanding of which ecosystem components most strongly support sustained development and resilience. These directions will strengthen the empirical foundation of incubation and sustainability research.

REFERENCES

Albort-Morant, G., & Oghazi, P. (2016). How useful are business incubators for entrepreneurs? *Journal of Business Research*, 69(6), 2125–2129.

Autio, E., & Thomas, L. D. W. (2014). Innovation ecosystems. In M. Dodgson, D. Gann, & N. Phillips (Eds.), *The Oxford Handbook of Innovation Management* (pp. 204–228). Oxford University Press.

Battisti, M., & Perry, M. (2011). Emissions, practices and motivations of SMEs. *Business Strategy and the Environment*, 20(7), 434–450.

Beck, T., & Demirgüç-Kunt, A. (2006). Small and medium-size enterprises: Access to finance. *Journal of Banking & Finance*, 30(11), 2931–2943.
Besser, T. L., & Miller, N. (2010). The significance of community networks in small business success. *Journal of Small Business Management*, 49(4), 600–619.
Bruneel, J., Ratinho, T., Clarysse, B., & Groen, A. (2012). The evolution of business incubators: Comparing demand and supply of business incubation services. *Technovation*, 32(2), 110–121.
Carayannis, E. G., & Campbell, D. F. J. (2009). "Mode 3" and "Quadruple Helix": Toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3–4), 201–234.
Cohen, B. (2006). Sustainable valley entrepreneurial ecosystems. *Business Strategy and the Environment*, 15(1), 1–14.
Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From National Systems to a Triple Helix of university–industry–government relations. *Research Policy*, 29(2), 109–123.
Hausberg, J. P., & Korreck, S. (2020). Business incubators and accelerators: A systematic review, typology, and research agenda. *Journal of Technology Transfer*, 45, 151–176.
Lennox, C., York, J., & Bodewes, W. (2020). Sustainability-oriented incubators: Scaling impact for SMEs. *Journal of Cleaner Production*, 252, 119831.
Mahmood, T., Siddique, M., & Adnan, N. (2022). Role of digital platforms in SME growth in emerging economies. *Technology in Society*, 68, 101900.
Mian, S., Lamine, W., & Fayolle, A. (2016). Technology business incubation: An overview of the state of knowledge. *Technovation*, 50–51, 1–12.
Ndabeni, L. (2008). SMEs and incubation in Africa: Experiences and challenges. *Development Southern Africa*, 25(3), 259–268.
OECD. (2022). *SME and Entrepreneurship Outlook 2022*. OECD Publishing.
Pauwels, C., Clarysse, B., Wright, M., & Van Hove, J. (2016). Understanding a new generation incubator model: The accelerator. *Technovation*, 50–51, 13–24.
Petticrew, M., & Roberts, H. (2006). *Systematic Reviews in the Social Sciences: A Practical Guide*. Blackwell Publishing.
Roxas, B., & Chadee, D. (2016). Innovation capability and SMEs' performance in emerging economies. *Journal of Small Business Management*, 54(1), 75–96.
Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339.
Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222.
UNDP. (2023). *Sustainable Development Goals Overview*. United Nations Development Programme.
Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), xiii–xxiii.
Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods* (6th ed.). Sage Publications.

CHAPTER 7
The Influence of Knowledge Management, Social Capital, and Absorptive Capacity on Employee Performance

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ABSTRACT

This study aims to identify the influence of Knowledge Management, Social Capital, Absorptive Management on Employee Performance at PT. Lion Group. The type of research used in this study is a quantitative method. The sampling technique in this study uses probability sampling. The population in this study is 102 employees at PT. Lion Group. The number of samples to be studied in this study was determined by the Slovin formula with a sample size of 82 employees. In this study, data collection was carried out through several methods, namely questionnaires, interviews, observations, and literature studies. The data analysis methods used in this study include descriptive statistical analysis, data quality tests consisting of validity tests and reliability tests, and hypothesis tests which include F tests, t tests, and determination coefficient tests. The results showed that Knowledge Management mediated by Information Technology was proven to have a positive and significant influence on Employee Performance, Social Capital mediated by Information Technology did not have a significant influence on Employee Performance, Absorptive Capacity mediated by Information Technology also did not have a significant influence on Employee Performance, and overall, the combination of the three independent variables (Knowledge Management, Social Capital, and Absorptive Capacity) mediated by Information Technology does not have a significant influence on Employee Performance.
Keywords: Knowledge Management, Social Capital, Absorptive Capacity, Information Technology.

INTRODUCTION

Currently, technological developments have brought changes to the business world, such as the culinary business, one of which is the coffee shop business which is now famous as a coffee shop. The culinary business, especially cafes, has become a very promising venture. Along with the increase in people's incomes, the lifestyle of spending a lot of time eating out of the home is also becoming more popular, driving the growth of the culinary industry. The phenomenon of the mushrooming of coffee shops in Indonesia indicates a trend that has been booming in recent times. This trend can be seen from the significant increase in the number of coffee shops that have sprung up in various countries (Priwanti, 2022).

Air transportation means for reaching various destinations with less hassle in more efficient approaching times. People often take advantage of the cozy services to relax, meet friends, or even work. This place not only offers quality of services, but also an environment that supports interaction and connection between passengers. PT Lion Group for example, is an air transportation groups that was established in 2010. Until now, PT Lion Group has 144 fleets throughout Indonesia. With rapid growth, PT Lion Group has many employees working in various fields, such as field operations and IT.

The survival of a company depends heavily on its success in managing human resources (Faeni et al., 2025). HR plays an important role in realizing the company's vision, mission, and goals that have been set. (Faeni et al., 2022). In addition, effective HR management can determine the company's achievements in real terms by utilizing available resources.(Faeni, et al., 2025). Human Resources (HR) can be defined as the science and art that manages the relationships and roles of the workforce to achieve the goals of the company, employees, and society in an effective and efficient way. HR is a very important asset for a company, as its role and functions cannot be replaced by other resources, including modern technology. Quality human resources will be able to carry out various company activities more optimally and reduce the risk of loss. (Faeni, 2024).

One of the aspects that supports the success or performance of a company is employee performance. Performance is the result achieved by a person in his or her work, which reflects the quality and quantity of the effort that has been made. This performance covers various aspects, ranging from work efficiency, the ability to meet targets, to customer satisfaction or other stakeholders. (Faeni, 2024). Performance can serve as a measuring tool to assess the extent of the quality and quantity of work that has been achieved by an employee in carrying out his duties and responsibilities. This performance appraisal is important to understand the efficiency and effectiveness of employee work, as well as to identify areas that need further improvement or development. Good employee performance will result in company improvement and development (Adnyana & Bahri, 2020).

Knowledge management today has a major impact on employee performance. A comprehensive Knowledge Management process, combined with work experience and knowledge, can improve the quality of employees in carrying out their assigned tasks effectively (Nuridha, 2022). Employees who take part in regular training will be able to innovate quickly and appropriately so that it has a positive impact on improving the company's overall performance (Hendayana et al., 2024). Knowledge Management The process that includes the creation, communication, and application of knowledge in a company aims to create business value. This is done by improving learning, employee performance, and overall organizational performance. (Amri et al., 2022). Therefore, it can be concluded that knowledge management has an important principle in preparing companies for success in the digital economy era (Auliana & Achmad, 2023).

Regarding the development of the company, the existence of social capital is also needed. Social capital describes aspects in social structures that include a network of relationships, norms, and trusts that facilitate coordination and cooperation for the common good (Winarso et al., 2022). This concept expands on previously accepted views of the human theoretical model by adding social elements that have a major

influence on the success and well-being of individuals and society. (Alshurafat et al., 2021). Social capital is defined as resources that can be accessed by individuals and groups through membership in social networks. (Amalia et al., 2022). Social capital is an aspect that can influence employee performance because social capital can encourage employees to develop and compete with other employees (Anwar, 2021).

The rise of PT Lion group business makes businessmen more creative by making new innovations such as travel package destinations, variants and product promotions that attract consumers, in order to be able to win business competition. The absorption capacity of this quality of human resources is how employees implement creative ideas that can make improvements in company performance (Anindityo, 2021). Absorptive capacity has been analyzed and proposed as a strategic factor in generating competitive advantages in the company (Afifah & Cahyono, 2020). Absorptive Capacity assists companies in scaling up and mapping new business ventures, including proactiveness, innovation, and strategic self-renewal remains a key role of the strategic decision board (Al-Hanifah, 2020). Absorptive capacity is said to be one of the main drivers to improve organizational performance (Boy et al., 2023). Study conducted by (Aviasti et al., 2022) Explain how absorptive capacity drives new, adaptable structures and ways of working that can provide new processes and information across the company, to encourage organizational creativity.

In the modern era, information technology is more than just software and hardware, but it also involves complex network infrastructure to support data exchange (Aristana, 2021). Information Technology helps knowledge management to improve, so that employees become smarter and understand in developing new innovations, so that Fore Coffee can be more advanced than other cafes (Vandela & Sugiarto, 2021). In addition, with information technology, employees can be helped in improving their performance, speeding up work processes, and facilitating communication within the organization. to make it easier to develop things, and make employees more developed in making new things (Shintia & Riduwan, 2021). Information Technology also encourages PT Lion Group to create its own application called "Lion Application" The advantage of having these application is that customers can directly order through the application, no need to bother to queue and can be ordered anytime and anywhere (Sinaga et al., 2020).

Based on the above phenomena and things, a study entitled "The Effect of Knowledge Management, Social Capital, Absorptive Capacity on Employee Performance Mediated by Information Technology at PT. Lion Group".

REVIEW OF LITERATURE

Information Technology

Information technology (IT) is a technique that involves a series of processes that focus on collecting, providing, storing, processing, announcing, analyzing, and disseminating information. In the modern era, IT is more than just software and hardware, but it also involves complex network infrastructure to support data exchange (Umar, 2023). An important strategic decision of companies in the current business climate, especially in the midst of a wave of disruption, is to invest in IT with the aim of improving company results (Purwoko, 2020). IT Currently, information technology has a very important role in supporting the operations of an organization or company, so that various activities can take place more effectively and efficiently.

The disruptive technological development in the modern era is the basis for the importance of the role of IT for every component (Romario et al., 2022). The crucial role or function of IT can be seen in the transformation of business processes. Business productivity can be greatly increased by utilizing the power of information processing, speed, and computer connections and internet technology, while improving the aspects of communication and cooperation in it. Thanks to IT, various conveniences can be felt by humans.

Employee Performance

One of the aspects that supports the success or performance of a company is employee performance. Performance is the result of a person's work that reflects both the quality and quantity of the work that has been completed. (Sutikno et al., 2022). Performance serves as an indicator to measure the extent to which an employee has managed to achieve targets and complete tasks in accordance with the assigned responsibilities (Soepardy, 2020). Good employee performance will result in the improvement and development of the company. Employee performance is the result of work achieved by an individual or group in an organization in an effort to achieve organizational goals.

Performance is influenced by various factors, both internal and external. Sari et al. (2020) Identify several factors that affect employee performance, including individual factors, leadership factors, team factors, system factors, and contextual/situational factors. Individual factors include the characteristics of the individual in question, such as the level of competence, motivation, and commitment to work. Leader factors include the leader's ability to provide motivation and inspiration to subordinates, the direction and support provided by the leader to subordinates in carrying out their duties, and the availability of leaders to provide the assistance and resources needed by subordinates. The team factor reflects the dynamics and support within the work team, including the level of support and cooperation provided by colleagues in achieving common goals. System factors include work systems and facilities provided by the company, such as procedures, rules, and mechanisms that govern how employees work, as well as resources and infrastructure provided by the company to support the smooth work of employees. Contextual factors include external factors and changes in the environment that can affect employee performance, such as the level of pressure and challenges employees face at work, as well as changes in internal and external conditions of the organization that can affect how employees work.

Knowledge Management

Knowledge management today has a huge influence on employee performance. The Knowledge Management process that involves work experience and knowledge will improve the quality of employees in carrying out their duties more effectively. This will happen if employees continue to follow ongoing training, so they can continue to develop and improve their abilities (Ramdhani et al., 2020).

Knowledge management Knowledge management is the process of creating, communicating, and applying knowledge within a company to create business value, by improving learning, employee performance, and the organization as a whole. Therefore, it can be concluded that knowledge management has a very important role in preparing companies to succeed in facing the digital economy era (Kawiana, 2023). The higher the implementation of knowledge management, the higher the performance of employees. On the other hand, the low implementation of knowledge management can have a negative impact and reduce employee performance. Effective knowledge management helps employees perform their tasks better, increase productivity, and drive innovation within the Company (Darmawati, 2021). Knowledge management, an employee must be the process of acquiring, capturing, sharing, and utilizing knowledge to improve expertise and performance in the Company (Pratama et al., 2020).

Social Capital

Social capital describes the elements in the social structure, it expands the pre-existing perspective on the human theoretical model.(Rahman & Arifin, 2022). Social capital is defined as resources that can be accessed by individuals and groups through their participation in social networks. (Frimayasa & Lawu, 2020). There are four propositions that develop the theory, which leads to the theoretical approach of social capital in public relations: First, as a central management function, professionals have the necessary expertise to manage intangible resources as social capital, and structurally they occupy a unique position in

the network. Second, relational interactions result in different resources. Third, strategic decision-making aims to maintain social capital. Fourth, these strategic steps provide advantages in achieving organizational goals (Pentury, 2023). Social capital is also an aspect that can influence employee performance because social capital can encourage employees to develop and compete with other employees (Wulandari & Irwanto, 2020).

Absorptive Capacity

Absorptive capacity has been analyzed and proposed as a strategic factor in generating competitive advantages in the company (Wulandari, 2020). From the idea that competitive advantage no longer relies on internal knowledge but comes from external knowledge, it becomes the basis of absorptive capacity, where the learning process is directed to explore and exploit external knowledge (Darmawan, 2023). Absorptive Capacity assists companies in scaling up and mapping new business ventures, including proactiveness, innovation, and strategic self-renewal remains a key role of the strategic decision board (Sanusi & Ganika, 2021). Absorptive capacity can be said to be one of the main drivers to improve organizational performance (Saputra, 2024). Absorptive capacity drives new, adaptable structures and ways of working that can provide new processes and information across the company, to encourage organizational creativity (Purwianti, 2021).

Conceptual Framework

Based on the foundation of previous theories and research, the conceptual framework of this research is:

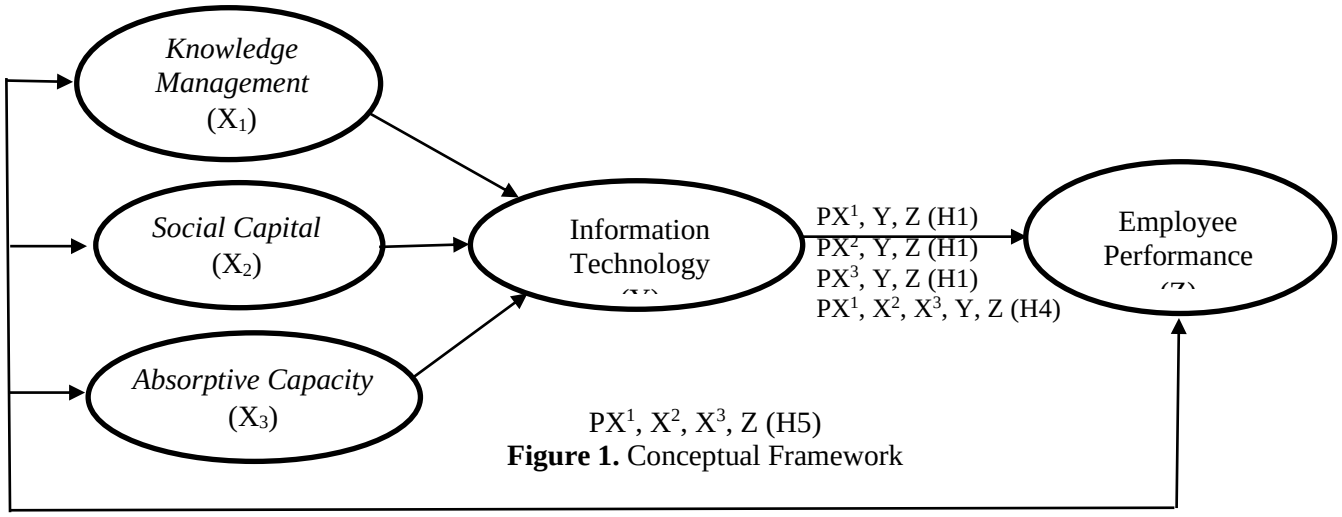

Figure 1. Conceptual Framework

METHODOLOGY

The type of research used in this study is a quantitative method. The sampling technique in this study uses probability sampling. The population in this study is 1600 employees at PT. Fore Coffee. The number of samples to be studied in this study was determined by the Slovin formula with a sample size of 320 employees. In this study, data collection was carried out through several methods, namely questionnaires, interviews, observations, and literature studies. The data analysis methods used in this study include descriptive statistical analysis, data quality tests consisting of validity tests and reliability tests, and hypothesis tests which include F tests, t tests, and determination coefficient tests.

FINDINGS

Results of Outer Model Data Analysis

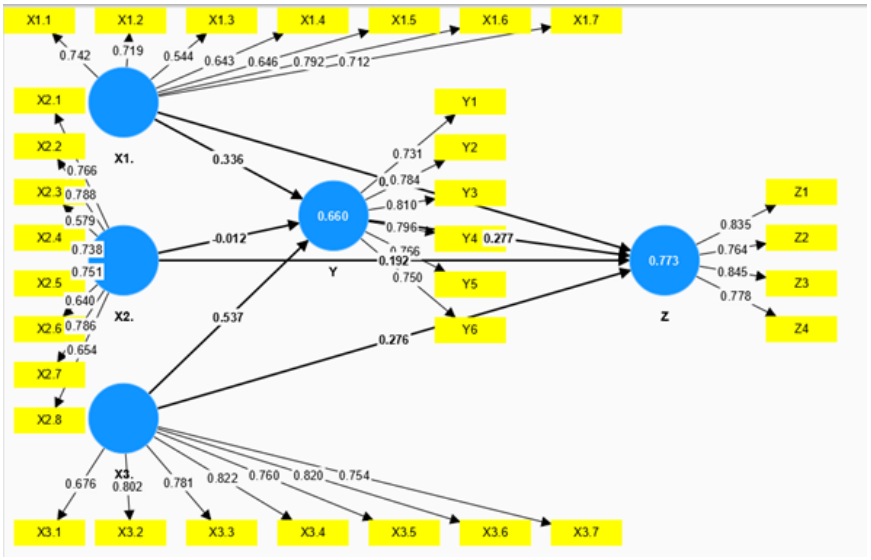

Figure 2. Outer Model

Validity Test Results

The validity test was used to determine the validity of the items of the research variables, in this case using SmartPLS. For more details, it will be displayed in the form of a recapitulation of the results of the calculation of research indicators as seen in table 1 below:

Variable	Indicators	Outer Loadings	Information
Knowledge Management	X1.1	0.770	Valid
	X1.2	0.803	Valid
	X1.3	0.769	Valid
	X1.4	0.835	Valid
Social capital	X2.1	0.723	Valid
	X2.2	0.808	Valid
	X2.3	0.726	Valid
	X2.4	0.780	Valid
Absorptive capacity	X3.1	0.751	Valid
	X3.2	0.869	Valid
	X3.3	0.768	Valid
	X3.4	0.910	Valid
Information Technology	Y1	0.781	Valid
	Y2	0.784	Valid
	Y3	0.827	Valid
	Y4	0.770	Valid
Employee Performance	Z1	0.829	Valid
	Z2	0.831	Valid
	Z3	0.845	Valid
	Z4	0.790	Valid

Table 1. Validity Test Results

Latin Variables	AVE	Condition	Information
Knowledge Management	0.517	0,5	Valid
Social Capital	0.513	0,5	Valid
Absorptive Capacity	0.600	0,5	Valid
Information Technology	0.598	0,5	Valid

Employee Performance	0.650	0,5	Valid

Table 2. AVE

Table 1 and 2 above show that all research indicator items are valid because they have outer loadings greater than 0.70 as required (Ghozali, 2014) at a significant level of 5%, and AVE 0.5 so that it can be concluded that all question items can be used as research indicators.

Reliability Test Results

Reliability tests are used to test the reliability of research instruments so that they can be trusted as a data collection tool. The results of reliability tests for competency, work culture, information technology, motivation and performance variables will be described in the following table 3:

Table 3. Reliability Test Results

Latin Variables	*Cronbach's alpha*	Condition	Information
Knowledge Management	0.811	0,70	Reliable
Social Capital	0.865	0,70	Reliable
Absorptive Capacity	0.888	0,70	Reliable
Information Technology	0.865	0,70	Reliable
Employee Performance	0.820	0,70	Reliable

Source: SmartPLS 4.00, 2025

Table 3 shows that all research variables are reliable because the Alpha Cronbach'c value is greater than 0.70 (Ghozali, 2014) so that the research variables can be concluded to be reliable and can be used as research instruments.

Results of Inner Model Data Analysis

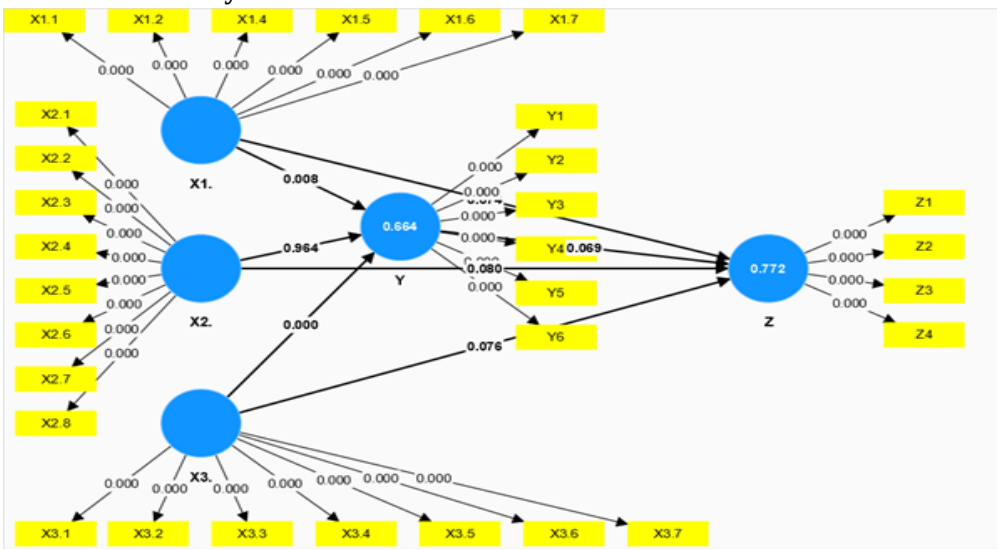

Figure 3. Inner Model

VIF Test Results

Variable Relationship	VIF
X1. → Y	2.449
X1. → Z	2.784
X2. → Y	2.428
X2. → Z	2.428
X3. → Y	2.707

Table 4. VIF Test Results

Based on the Variance Inflation Factor (VIF) table above, the results of the study are as follows:

1. X_1 (Knowledge Management) to Y (Information Technology): A VIF value of 2,449 indicates that Knowledge Management has a good relationship with Information Technology without multicollinearity problems.
2. X_1 to Z (Employee Performance): A VIF value of 2.784 indicates that the relationship between Knowledge Management and Employee Performance is not affected by multicollinearity.
3. X_2 (Social Capital) to Y: A VIF value of 2,428 indicates the relationship between Social Capital and Information Technology free of multicollinearity.
4. X_2 to Z: A VIF value of 2,428 also indicates that there is no multicollinearity problem between Social Capital and Employee Performance.
5. X_3 (Absorptive Capacity) to Y: The VIF value of 2.707 shows that the relationship between Absorptive Capacity and Information Technology is quite strong without multicollinearity.
6. X_3 to Z: A VIF value of 3,574 indicates that Absorptive Capacity affects Employee Performance in the absence of significant multicollinearity.
7. Y (Information Technology) to Z: A VIF value of 2,973 shows that the relationship between Information Technology and Employee Performance is quite strong and is not influenced by multicollinearity.

From the results of the VIF test, it can be concluded that this research model is suitable for further analysis because there is no significant multicollinearity problem.

1. The variables Knowledge Management, Social Capital, and Absorptive Capacity independently have a strong relationship with Information Technology and Employee Performance.
2. Information Technology (Y) also plays an important role as a mediator in the relationship between independent variables (X1, X2, X3) and Employee Performance (Z).

DISCUSSION

Direct Effect

To find out the direct influence, it can be known from the path coefficient. With the path coefficient, it can be known whether there is a direct influence between independent variables (Knowledge management, Social Capital, Absoptive capacity) on dependent variables (performance) and the influence of independent variables (Knowledge management, Social Capital, Absoptive capacity) on mediation variables (Information Technology) and mediation variables (Information Technology) on dependent variables (performance) which can be seen from table 5 below.

Table 5. Path Coefficients

Variable Relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
X1. → Y	0.335	0.339	0.126	2.663	0.008
X1. → Z	0.222	0.221	0.124	1.788	0.074
X2. → Y	-0.005	0.001	0.107	0.045	0.964
X2. → Z	0.202	0.211	0.115	1.753	0.080
X3. →	0.540	0.538	0.144	3.750	0.000
X3. →Z	0.288	0.282	0.162	1.777	0.076
Y→Z	0.275	0.270	0.151	1.818	0.069

The Influence of Knowledge Management on Information Technology

A. Original Sample (O): 0.335 shows a positive relationship between Knowledge Management and Information Technology.
B. T-Statistics: 2,663 (above 1.96 at a significance level of 5%).
C. P-Values: 0.008 (less than 0.05).
D. Interpretation: Knowledge Management has a significant positive influence on Information Technology. This shows that improving Knowledge Management in the company will improve Information Technology.

The Influence of Knowledge Management on Employee Performance

A. Original Sample (O): 0.222 shows a positive relationship between Knowledge Management and Employee Performance.
B. T-Statistics: 1.788 (below 1.96).
C. P-Values: 0.074 (greater than 0.05).
D. Interpretation: Knowledge Management has a positive, but not significant, influence on Employee Performance. This shows that the influence of Knowledge Management on Employee Performance is not strong enough.

The Influence of Social Capital on Information Technology

A. Original Sample (O): -0.005 indicates a very weak and negative relationship between Social Capital and Information Technology.
B. T-Statistics: 0.045 (well below 1.96).
C. P-Values: 0.964 (much greater than 0.05).
D. Interpretation: Social Capital has no significant influence on Information Technology. This relationship is weak and negative.

The Influence of Social Capital on Employee Performance

A. Original Sample (O): 0.202 shows a positive relationship between Social Capital and Employee Performance.
B. T-Statistics: 1,753 (below 1.96).
C. P-Values: 0.080 (greater than 0.05).
D. Interpretation: Social Capital has a positive, but not significant, influence on Employee Performance. This relationship is not strong enough to be said to be significant.

The Effect of Absorptive Capacity on Information Technology

A. Original Sample (O): 0.540 shows a strong positive relationship between Absorptive Capacity and Information Technology.
B. T-Statistics: 3,750 (above 1.96).
C. P-Values: 0.000 (very significant, less than 0.05).
D. Interpretation: Absorptive Capacity has a significant positive influence on Information Technology. This shows that increasing the ability to absorb information will strengthen Information Technology.

The Effect of Absorptive Capacity on Employee Performance

A. Original Sample (O): 0.288 shows a positive relationship between Absorptive Capacity and Employee Performance.

B. T-Statistics: 1,777 (below 1.96).
C. P-Values: 0.076 (greater than 0.05).
D. Interpretation: Absorptive Capacity has a positive, but not significant, influence on Employee Performance.

The Influence of Information Technology on Employee Performance

A. Original Sample (O): 0.275 shows a positive relationship between Information Technology and Employee Performance.
B. T-Statistics: 1.818 (below 1.96).
C. P-Values: 0.069 (greater than 0.05).
D. Interpretation: Information Technology has a positive, but not significant, influence on Employee Performance.

Indirect Effect

To know the indirect influence, it can be known from specific indirect effects. With specific indirect effects, it can be known whether there is an indirect influence between independent variables (Knowledge management, Social Capital, Absoptive capacity) and dependent variables (performance) mediated by information technology. To make the analysis easier, specific indirect effects are displayed as shown in table 6 below.

Variable Relationship	***Original sample* (O)**	**Samplemean(M)**	***Standard deviation* (STDEV)**	***T statistics* (|O/STDEV|)**	**P *values***
X1. → Y →Z	0.092	0.093	0.064	1.448	0.148
X2. →Y→Z	-0.001	0.007	0.034	0.039	0.969
X3. →Y→Z	0.149	0.139	0.085	1.756	0.079

Table 6. Indirect effect

The Influence of Knowledge Management on Employee Performance through Information Technology

A. Original Sample (O): 0.092 shows the indirect positive influence of Knowledge Management on Employee Performance through Information Technology.
B. T-Statistics: 1,448 (below 1.96).
C. P-Values: 0.148 (greater than 0.05).
D. Interpretation: The indirect influence of Knowledge Management on Employee Performance through Information Technology is not significant. This means that Information Technology as a mediator does not have a strong enough impact to mediate the relationship.

The Influence of Social Capital on Employee Performance through Information Technology

A. Original Sample (O): -0.001 shows a very small and negative indirect influence of Social Capital on Employee Performance through Information Technology.
B. T-Statistics: 0.039 (well below 1.96).
C. P-Values: 0.969 (much greater than 0.05).
D. Interpretation: The indirect influence of Social Capital on Employee Performance through Information Technology is not significant. Information Technology does not mediate the relationship between Social Capital and Employee Performance.

The Effect of Absorptive Capacity on Employee Performance through Information Technology

A. Original Sample (O): 0.149 shows the positive indirect influence of Absorptive Capacity on Employee Performance through Information Technology.
B. T-Statistics: 1,756 (still below 1.96).
C. P-Values: 0.079 (greater than 0.05).
D. Interpretation: The indirect influence of Absorptive Capacity on Employee Performance through Information Technology is close to significant but still at an insignificant level. Information Technology only provides a weak mediating influence in this relationship.

CONCLUSION

Based on the results of the study entitled "The Influence of Knowledge Management, Social Capital, Absorptive Lion Group)", here are the conclusions that can be drawn:

1. **The Influence of Knowledge Management on Employee Performance through Information Technology**
   Knowledge Management mediated by Information Technology is proven to have a positive and significant influence on Employee Performance. This shows that good knowledge management, if supported by the effective use of Information Technology, can significantly improve employee performance. Thus, the first hypothesis (H1) is accepted.
2. **The Influence of Social Capital on Employee Performance through Information Technology**
   Social Capital mediated by Information Technology does not have a significant influence on Employee Performance. These results show that although social relationships between employees can be supported by Information Technology, its influence on performance is not yet strong enough to produce significant change. Thus, the second hypothesis (H2) was rejected.
3. **The Effect of Absorptive Capacity on Employee Performance through Information Technology**
   Absorptive Capacity mediated by Information Technology also does not have a significant influence on Employee Performance. This shows that the capacity to absorb external knowledge, although mediated by Information Technology, has not been enough to contribute significantly to performance improvement. Thus, the third hypothesis (H3) was rejected.
4. **The Effect of a Combination of Knowledge Management, Social Capital, and Absorptive Capacity on Employee Performance through Information Technology**
   Overall, the combination of the three independent variables (Knowledge Management, Social Capital, and Absorptive Capacity) mediated by Information Technology does not have a significant influence on Employee Performance. Thus, the fourth hypothesis (H4) was rejected.
5. **The Direct Influence of Knowledge Management, Social Capital, and Absorptive Capacity on Employee Performance**
   The direct influence of the three independent variables (Knowledge Management, Social Capital, and Absorptive Capacity) on Employee Performance was also not significant. This shows that without the mediation role of Information Technology, the influence of these variables on employee performance cannot be considered significant. Thus, the fifth hypothesis (H5) was rejected.

REFERENCES

Adnyana, I. M., & Bahri, P. (2020). Pengaruh Knowledge Management Terhadap Kinerja Karyawan Dimediasi Learning Organization Di BPJS Ketenagakerjaan Pusat Jakarta. Jurnal Ilmu Dan Budaya, 8299–8340.

Afifah, A. L., & Cahyono, B. (2020). Meningkatkan Innovation Performance : Melalui Absorptive Capacity, Knowledge Management Capability, Dan Generational Diversity. Jurnal Ekonomi Dan Bisnis, 21(1), 58. https://doi.org/10.30659/ekobis.21.1.58-71

Al-Hanifah, R. (2020). Pengaruh Green Absorptive Capacity Dan Green Market Orientation Terhadap Green Competitive Advantage (Studi Pada PT Natural Nusantara). Universitas Ahmad Dahlan.

Alshurafat, H., Al Shbail, M. O., Masadeh, W. M., Dahmash, F., & Al-Msiedeen, J. M. (2021). Factors affecting online accounting education during the COVID-19 pandemic: an integrated perspective of social capital theory, the theory of reasoned action and the technology acceptance model. Education and Information Technologies, 26(6), 6995–7013. https://doi.org/10.1007/s10639-021-10550-y

Amalia, R. A., Echdar, S., & Kitta, S. (2022). Pengaruh Human Capital, Social Capital Dan Organisasional Capital Terhadap Kinerja Karyawan Di Bank Bri Cabang Bulukumba. Jurnal Magister Manajemen Nobel Indonesia, 3(4), 564–574. http://repository.stienobel-indonesia.ac.id/handle/123456789/815%0Ahttp://repository.stienobel-indonesia.ac.id/bitstream/handle/123456789/815/RESKIAYUAMALIA.pdf?sequence=1&isAllowed=y

Amri, A., Erwina, E., Bakhtiar, B., & Masni, M. (2022). Pengaruh Knowledge Management terhadap Kinerja Karyawan pada PT. PLN (Persero) Unit Layanan Pelanggan Kota Palopo. JEMMA (Journal of Economic, Management and Accounting), 5(1), 27. https://doi.org/10.35914/jemma.v5i1.950

Anindityo, M. H. (2021). Efek Penerapan Supply Chain Agility Dalam Memediasi Hubungan Absorptive Capacity Dan Competitive Advantage. Universitas Islam Indonesia.

Anwar, N. (2021). The Effect of Locus of Control, Self Efficacy, and Social Capital on Agricultural Extension Worker Performance in the Agriculture and Food Agency of Rembang Regency. Agric, 33(2), 199–214. https://doi.org/10.24246/agric.2021.v33.i2.p199-214

Aristana, I. N. (2021). Kinerja di Era 4.0: Apakah Teknologi Informasi dan Knowledge Sharing itu Penting? Jurnal Ilmiah, Manajemen Sumber Daya Manusia.

Auliana, I. ., & Achmad, N. (2023). Pengaruh Knowledge Management, Lingkungan Kerja, Dan Beban Kerja Terhadap Kinerja Karyawan Dengan Kepuasan Kerja Sebagai Variabel Intervening Pada Pt. Gendhis Multi Manis. Jurnal Bisnis Dan Manajemen, 3(4), 654–667.

Aviasti, A., Rukmana, A. N., Supena, A. N., & Amaranti, R. (2022). Analisis Keterkaitan Antara Green Design, Green Process, Green Dynamic Capabilities, Dan Absorptive Capacity Pada Perusahaan Manufaktur. J@ti Undip: Jurnal Teknik Industri, 17(2), 62–70. https://doi.org/10.14710/jati.17.2.62-70

Boy, M., Nurmadi, R., & Habibie, A. (2023). Pengaruh Knowledge Sharing, Absortive Capacity dan Organizational Learning Capability Terhadap Innovation Performance Pada PT. Perkebunan Nusantara IV (Persero) Medan. Jurnal Akuntansi, Manajemen Dan Ilmu Ekonomi (Jasmien), 3(03), 182–191. https://doi.org/10.54209/jasmien.v3i03.381

Darmawan, A. (2023). The Influence Of Technological Capability, Social Capital, And Entrepreneurial Orientation On Firm Performance Through Absorptive Capacity In Food And Beverage Packaging Industry Companies. Journal of Comprehensive Science, 13(1), 104–116.

Darmawati, H. (2021). Pengaruh Knowledge Management dan Talent Management terhadap Pengembangan Karir Karyawan. Jurnal Riset Manajemen Dan Bisnis, 1(1), 36–41. https://doi.org/10.29313/jrmb.v1i1.38

Faeni, D. P. (2024a). Green Practices and Employees' Performance: The Mediating Roles of Green Human Resources Management Policies and Knowledge Development. Journal of Infrastructure, Policy and Development.

Faeni, D. P. (2024b). SERVQUAL measures: Indonesian government healthcare (BPJS) from a human resource perspective. Journal of Infrastructure, Policy and Development, 8(2), 1–21. https://doi.org/10.24294/jipd.v8i2.2271

Faeni, D. P., Faeni, R. P., Riyadh, H. A., & Yuliansyah. (2022). The COVID-19 pandemic impact on the global tourism industry SMEs: a human capital development perspective. Review of International Business and Strategy, 33(2), 317–327. https://doi.org/https://doi.org/10.1108/RIBS-08-2021-0116

Faeni, D. P., Oktaviani, R. F., Riyadh, H. A., Faeni, R. P., Ali, B., & Beshr, H. (2025). Green Human Resource Management and Sustainable Practices on Corporate Reputation and Employee Well-being: A Model for Indonesia's F&B Industry. Environmental Challenges, 101082. https://doi.org/10.1016/j.envc.2025.101082

Faeni, D. P., Oktaviani, R. F., Riyadh, H. A., Faeni, R. P., & Beshr, B. A. H. (2025). Green Human Resource Management and Sustainable Practices on Corporate Reputation and Employee Well-being: A model for Indonesia's F&B industry. Environmental Challenges, 18(January), 101082. https://doi.org/10.1016/j.envc.2025.101082

Frimayasa, A., & Lawu, S. H. (2020). Pengaruh Komitmen Organisasi Dan Human Capital Terhadap Kinerja Pada Karyawan Pt. Frisian Flag. Equilibrium : Jurnal Ilmiah Ekonomi, Manajemen Dan Akuntansi, 9(1), 36–47. https://doi.org/10.35906/je001.v9i1.485

Hendayana, Y., Faeni, D. P., & El-Kafafi, S. (2024). The Mediating Effect of Islamic Marketing Capabilities in The Relationship Between Entrepreneurial Orientation And Firm Performance at Handicraft SMEs In West Java. Amwaluna: Jurnal Ekonomi Dan Keuangan Syariah, 8(2), 383–396.

Kawiana, I. G. P. (2023). Peran Komitmen Organisasi Pada Pengaruh Knowledge Management dan Motivasi Kerja Terhadap Kinerja Karyawan di PT Limajari Interbhuana Bali. Jesya, 6(2), 2024–2040. https://doi.org/10.36778/jesya.v6i2.1258

Nuridha, R. (2022). Pengaruh Knowledge Management Terhadap Kinerja Karyawan Dengan Individual Innovation Capability Sebagai Variabel Intervening Studi pada Karyawan PT . Bank Rakyat Indonesia (Persero). Program Studi Magister Manajemen Fakultas Ekonomi Dan Bisnis Universitas Tanjungpura, 78(1), 315–324.

Pentury, G. M. (2023). Knowledge Sharing Mediates The Influence Of Social Capital And Learning Organization On Employee Performance at PT. Telkom Ambon Knowledge Sharing Memediasi Pengaruh Modal Sosial Dan Learning Organization Terhadap Kinerja Karyawan PT. Telkom Ambon. Management Studies and Entrepreneurship Journal, 4(3), 2694–2706. http://journal.yrpipku.com/index.php/msej

Pratama, D. A., Zuliansyah, A., & Fermansyah, D. (2020). Analisis Pengaruh Knowledge Management Terhadap Kinerja Karyawan Dalam Perspektif Ekonomi Islam. REVENUE: Jurnal Manajemen Bisnis Islam, 1(01), 1–8. https://doi.org/10.24042/revenue.v1i01.5681

Priwanti, E. P. (2022). Pengaruh Teknologi Informasi, Sistem Informasi Berbasis Web Dan Knowledge Management Terhadap

Kinerja Karyawan (Literature Review Executive Support Sistem (Ess) for Business). Jurnal Ekonomi Manajemen Sistem Informasi, 3(3), 267–285. https://doi.org/10.31933/jemsi.v3i3.818

Purwianti, L. (2021). Pengaruh Market Orientation, Entrepreneurial Orientation Terhadap Kinerja Perusahaan Dengan Mediasi Absorptive Capacity. Jurnal Ilmiah Bisnis Dan Ekonomi Asia, 15(2), 126–142. https://doi.org/10.32815/jibeka.v15i2.350

Rahman, M. D. F., & Arifin, K. K. (2022). The Effect Of Village Funds On Social Capital In Rural Poverty : PLS. Ekonomi Manajemen Akuntansi Keuangan Bisnis Digital, 1(2), 81–96.

Ramdhani, F. E., Harsono, & Sunardi. (2020). Pengaruh Manajemen Talenta dan Manajemen Pengetahuan Terhadap Kinerja Karyawan Dengan Employee Retention Sebagai Variabel Moderator. Jurnal Bisnis Dan Manajemen, 7(2), 126–132. http://jurnal.unmer.ac.id/index.php/jbm

Romario, F. De, Rangga, Y. D. P., & Erlin, Y. (2022). Pengaruh Kinerja Pegawai Dan Pemanfaatan Teknologi Informasi Terhadap Ketepatan Waktu Pelaporankeuangan (Studi Kasus Pada Badan Pengelola Keuangan Dan Aset Daerahkabupaten Sikka). Journal Accounting, 1(2), 45–53.

Sanusi, F., & Ganika, G. (2021). Strategi Meningkatkan Absorptive Capacity Perusahaan (Studi Empiris pada Perusahan Jasa Konstruksi Skala Kecil dan Menengah di Banten). JURISMA: Jurnal Riset Bisnis Dan Manajemen, 11(1), 97–111.

Saputra, S. (2024). Pengetahuan Teknologi Terhadap Kinerja Inovasi Produk Baru (Npip) Dengan Peran Absorptive Capacity Sebagai Mediasi. JIMEA Jurnal Ilmiah MEA (Manajemen, Ekonomi, Dan Akuntansi), 8(3).

Sari, N., Arifin, R., & Wahono, B. (2020). Pengaruh Knowledge Management, Skill, Attitude Dan Ability Terhadap Kinerja Karyawan (Studi Kasus Karyawan VarnaCulture Hotel Surabaya). E – Jurnal Riset Manajemen Fakultas Ekonomi Unisma, 09(09), 1–16.

Shintia, I. R., & Riduwan, A. (2021). Pengaruh Sistem Informasi Akuntansi, Motivasi Kerja DanPemanfaatan Teknologi Informasi Terhadap KinerjaKaryawan. Jurnal Ilmu Dan Riset Akuntansi, 10(3), 1–17.

Sinaga, E. R. H., Ratnasari, S. L., & Zulkifli, Z. (2020). Pengaruh Budaya Organisasi, Lingkungan Kerja, Transfer Ilmu, Dan Penerapan Teknologi Informasi Terhadap Kinerja Manajerial. Jurnal Dimensi, 9(3), 412–443. https://doi.org/10.33373/dms.v9i3.2718

Soepardy, A. T. (2020). Pengaruh Knowledge Management Terhadap Sustainable Livelihood. Jurnal Ilmiah Akuntansi Manajemen, 3(1), 68–77. https://doi.org/10.35326/jiam.v3i1.616

Sutikno, Fikriyah, M., & Nurkhin, A. (2022). Relationship of Social Capital, Entrepreneurial Competence, and Performance: The Case of Convection SMEs. Economic Education Analysis Journal, 11(1), 18–27. https://doi.org/10.15294/eeaj.v11i1.53976

Vandela, F., & Sugiarto, A. (2021). Pengaruh Penggunaan Teknologi Informasi Dan Kemampuan Berkomunikasi Interpersonal Terhadap Kinerja Karyawan. Jurnal Manajemen, 12(3), 429. https://doi.org/10.32832/jm-uika.v12i3.4913

Winarso, W., Sukardi, S., Azizah, A., Kuswantinah, K., Su'aidy, S., & Untari, D. T. (2022). Optimization of the Ahp Method in Determining the Location of Touristdestinations on the Island of Java, Indonesia. International Journal of Professional Business Review: Int. J. Prof. Bus. Rev., 7(3), 4.

Wulandari. (2020). Studi Peran Penerapan Sak Etap, E-Commerce, Dan Absorptive Capacity Dalam Meningkatkan Kinerja Usaha Dan Keberlanjutan Umkm (Studi Empirik pada UMKM Batik di Kota Semarang). Universitas Islam Sultan Agung.

Wulandari, B., & Irwanto. (2020). COSTING:Journal of Economic, Business and Accounting. Journal of Economic, Business and Accounting, 4(1), 274–281.

CHAPTER 8
The Relationship Between Learning Agility, Competency Exploration, And Training and Development on Employee Performance Is Mediated Organizational Commitment

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ABSTRACT

This research aims to determine whether there is a relationship between Learning Agility, Competency Exploration, and Training and Development on Employee Performance mediated by Organizational Commitment. The method used in this research is quantitative, the survey method is used to obtain primary data using questionnaires. The sampling technique used was simple random sampling technique, totalling 135 respondents. The data analysis technique uses outer model and inner model tests with SmartPLS 4.0. The research results show that in the inner model test the competency exploration variable has an influence but not significant on employee performance mediated by organizational commitment, with calculation results (T statistics 1.341 < T table 1.656) and (P Value 0.090 > 0.05). Based on the outer model test, simultaneously learning agility, competency exploration, and training and development have a significant effect on employee performance through the mediation of organizational commitment.
Keywords: Competency Exploration, Employee Performance, Learning Agility.

INTRODUCTION

The In facing the current of globalization, human resources (HR) play a very dominant role in running the company's operations. Every company needs to consider how to develop its HR to drive the company's progress and how to ensure that employees achieve high performance. Evaluation of HR can be seen from the results of the work that has been done (P. D. Faeni & Pramukty, 2022). Effective employee performance is key to a company's success. HR issues remain a focus for organizations to survive in this era of globalization. High-quality innovation becomes the focus of the framework for interactions between structures and provides opportunities for cycles of improvement or decline in company performance (Crozier & Atkinson, 2023). A company can achieve its goals or targets effectively if it has highly performed and knowledgeable employees, as this will also enhance the company's overall performance.

Employee performance is the result of work related to the successes and failures within an organization (Sopiah et al., 2020). The impact of increasing or decreasing employee performance quality is influenced by several factors, including learning agility, competency exploration, and training and development. These factors are also related to the influence of organizational commitment. Resources that have more expertise in the fields of knowledge and technology will produce more effective performance for the company (D. P. Faeni et al., 2024).

Building commitment between employees and the organization is very important for the organization itself to achieve its targets and goals (Damayanti et al., 2021). This commitment usually stems from the employees themselves, where they feel satisfied and comfortable with what the organization has provided, making them inclined to stay and commit to achieving the organization's desired targets and goals. Due to the commitment between employees and the organization, employee performance will continue to improve because employees also receive satisfying returns from the company. An employee's decision to stay with or leave the company is influenced by their level of commitment to the organization (Dharmawan et al., 2024).

Organizational commitment is also a significant factor in achieving company goals, such as learning agility in quickly starting new initiatives. This learning agility is usually demonstrated by leaders, who are the first to confront emerging issues directly. However, there are also many employees or individuals who seek to develop their skills through learning agility. When learning agility is applied to employees, they become better prepared to handle any problems the company might face. Talent management research underscores the importance of learning agility as a primary indicator of potential and highlights the competence of learning (Milani et al., 2021).

Competency exploration is crucial in overall HR management within a company, as it identifies individual strengths and weaknesses in the work context. The lack of this contribution occurs when the increased use of digital technology allows functions. Task-oriented competencies refer to the competencies objectively required to perform specified tasks, both theoretically and practically (Johansson & Wallo, 2020). Information innovation has become a trend for many life insurance companies because the healthcare industry is a knowledge-intensive industry that provides quality services and knowledge (D. P. Faeni, 2024).

One of the efforts made by the company to improve employee performance is by implementing training and development. Employee development and training are two concepts that are highly necessary for HR management (D. P. Faeni et al., 2023). Training and development programs will provide confidence and understanding regarding the objectives of the work that employees will perform (Wiyata, 2022), so that employees will become more independent, focused, and able to work effectively and efficiently.

Is an online flower shop company that sells various types of cut flowers. The company started as a home business in 2012 in a house garage and now has a main office. Focuses on selling flower arrangements such as flower boards, table flowers, standing flowers, and hand bouquets.

One of the challenges faced by this company is the declining level of employee performance. Based on direct interviews with employees. Who work as telemarketers in the company, the decline in employee performance is attributed to a lack of intensive communication between purchasing and suppliers. This lack of communication is caused by misunderstandings between purchasing and suppliers, resulting in products that do not meet customer expectations. Such situations usually occur when orders are overloaded, causing the purchasing department to struggle in responding to telemarketing requests for customer revisions.

THEORITICAL REVIEW

Grand Theory

The Grand Theory used in this research is Competency Theory, proposed by Richard Boyatzis, which states that individual performance is influenced by the competencies they possess. Competencies are defined as the underlying characteristics of an individual that drive and influence behaviour and performance. Therefore, this theory can provide a good understanding of how the development of employee competencies can affect performance through the role of organizational commitment. This theory also specifically examines how learning agility, competency exploration, and training and development contribute to employee performance and how organizational commitment mediates this relationship.

Learning Agility

Developing a career alone is not enough; learning agility is also essential in the workplace. Individuals with high learning agility tend to contribute more significantly to the team because they are motivated to achieve optimal results despite facing various conditions (Jatmika & Puspitasari, 2019). Learning agility is developed based on four dimensions. (Wardhani et al., 2022) as follows:

1. People Agility: To what extent do individuals with a deep understanding of themselves learn from experience, maintain a constructive attitude towards others, and remain resilient in the face of pressure, change, and diversity.
2. Results Agility: Inspired by someone who has achieved results in difficult situations, inspires others to perform with confidence, and builds trust in others.
3. Mental Agility: Inspired by individuals who view problems from a new perspective, are comfortable with complexity and ambiguity, and can communicate their thoughts to others.
4. Change Agility: Inspired by individuals who enjoy experimenting and are capable of effectively handling the discomfort caused by rapid changes.

And there are two factors that influence learning agility, namely internal factors and external factors (Nisa Nurul Hikmah, 2021).

Competency Exploration

Competency exploration is an HR strategy approach to monitor the effectiveness and growth of human resources within an organization (Lee & Pant, 2020). Competency exploration involves the employee learning process. The goals of competency exploration have different instructions and assessments to evaluate the mastery possessed by the employees (Park et al., 2022).

The competency indicators are as follows:

1. The knowledge and information possessed by an employee are crucial for carrying out their duties and responsibilities according to their field.
2. Ability or skill is the effort to carry out tasks assigned by the company to employees effectively and to the fullest extent.
3. Employee behaviour refers to the patterns of conduct exhibited by an employee in carrying out their duties and responsibilities in accordance with company regulations.

Training and Development

Employee training provides practical knowledge and its application in the corporate work environment, aiming to increase work productivity and achieve the desired goals of the organization (Dessler, 2020).

The various dimensions and indicators that must be reviewed in career development are as follows:

a. Fair behaviour in a career.
b. The supervisor's concern for their subordinates.
c. File on various promotion opportunities.

Training indicators (Anwar Prabu Mangkunegara, 2017):

a. Personality guidance.

   The guidance procedures must be conducted in accordance with the established guidelines.
b. Training object.

   The training objectives must be specific and regularly evaluated.
c. Teaching methods.

   The training materials mentioned are quite comprehensive and relevant for employee development.
d. The training system will be implemented.

   The training system to be implemented is training using the contribution method.
e. Capacity of members

   Full-time workforce and workforce referred by management.
f. Mentor expertise

   The mentor that can be provided in the material, must include the required skills.
g. The period (number of training sessions)

   The staff received training, thereby leading to higher skills and abilities among the employees.

Employee Performance

Employee performance is a measure of the extent to which an employee is able to carry out their duties and responsibilities effectively and efficiently (Darvishmotevali & Ali, 2020).

Here are some factors that affect employee performance.:

1. Work motivation. Motivated employees will work harder and be more productive.
2. Leadership. Good leadership can also influence employee performance.
3. Incentives and compensation. Fair and adequate incentives and compensation can also influence employee performance.
4. Work environment. A good work environment can enhance employee performance.

Here are some employee performance indicators along with their explanations:

1. Work quality. Work quality measures the extent to which employees can perform their jobs well and in accordance with established standards.
2. Productivity Work. Productivity Work measure how much efficient employee in do work and how much Lots employee capable produce output in specified time.
3. Presence Work. Presence Work measure how much often employee present on the spot Work in accordance with timetable work that has been done set.
4. Discipline Work. Discipline Work measure how much obedient employee in follow existing rules and procedures determined by the company.
5. Innovation. Innovation measure how much creative and innovative employee in provide new ideas for increase performance company.
6. Collaboration team. Cooperation team measure how much good employee in Work The same with member team other for reach objective together.

Commitment Organization

Commitment Organization is strength motivating psychology somebody For maintain its membership in something organization with identify goals and values organization (Rita, 2020).

There is two dimensions of commitment organization , that is dimensions continuity and dimension affective commitment organization (Rita, 2020).

Commitment organizations also have three indicators (Shaleh, 2018) , namely as following :

1. Existence will employee.
2. Existence faithfulness employee
3. Existence pride employees in the organization.

Hypothesis

Concept model This show How variable free (X) influence variable mediation (Y) and show How variable mediation (Y) strengthens variable free (X) against variable bound (Z). The following image show connection Among these ideas:

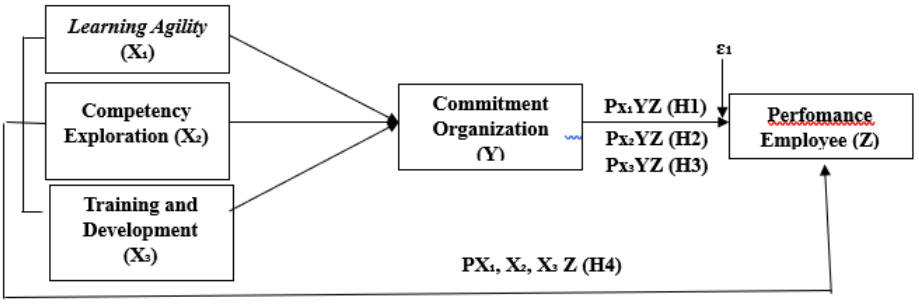

Figure 1. Framework Thinking
Source: Processed author, 2024.

H1 : Learning agility has an effect positive and significant to performance employee mediated commitment organization.

H2 : Exploration Competence influential positive and significant to performance employee mediated commitment organization.

H3 : Training and development have an effect positive and significant to performance employee mediated commitment organization.

H4 : Learning agility, exploration competence, and training and development have an influence positive and significant to performance employee mediated commitment organization.

Methodology

Study This use approach quantitative. How to collect data in research This done with through questionnaire filled out by respondents For obtain description general about characteristics population, Based condition environment research and level involvement researcher so study This including into the category studies field with level involvement minimal researchers (D. P. Faeni et al., 2021).

Population in study This is numbering 180 people. And samples taken from population company with use simple random sampling technique. Amount sample used in study based on calculation formula Slovin namely 135 respondents. Data sources used namely primary data and secondary data. Primary data was obtained from object study or in term technically respondents, while secondary data obtained from journal research, websites, and books are considered support discussion.

In study This writer use Likert scale for now connection between learning agility, exploration competence and training and development towards performance employee mediated commitment organization. Method analysis of the data used is use Partial Least Square (PLS) 4 application with the Structural Equation Modelling (SEM) model. The SEM model consists of from a number of stages namely Outer Model, Inner Model, Model Fit Test, and Hypothesis Test.

Population and Sample

On research there is a number of categorized respondents based on characteristics based on Species name gender, age, and education final. Normal name given moment born or moment register at a place, and can reflect identity culture, religion, or family somebody.

Table 1. Characteristics Respondent Based on Type Sex

Type Sex	Amount	Percentage
Man	53	39.3%
Woman	82	60.7%
TOTAL	**135**	**100%**

Source: Primary data processed, 2024

Based on table on showing percentage respondents type gender has characteristics type sex man that is as many as 53 people and women as many as 82 respondents. This result showing that dominates is manifold sex Woman.

Table 2. Characteristics Respondent Based on Age

Age	Amount	Percentage
18 - 24	54	40%
25 - 32	67	50%
33 - 40	14	10%
Total	**135**	**100%**

Source: Primary data processed, 2024

Based on table on showing that percentage respondents employees is more dominant range age 25 – 32 years that is as many as 67 people. And the least is in the range aged 33 – 40 years that is as many as 14 people. In category aged 18 -24 as many as 54 people.

Table 3. Last Education

Last education	Amount	Percentage
Senior High School	55	40.7%
S1	80	59.3%
Total	**135**	**100%**

Source: Primary data processed, 2024

Based on the table above show that percentage respondents the last level of education is S1, namely as many as 80 people and high school as many as 55 people.

Analysis Results

Analysis Descriptive

1. Distribution of Respondents' Answers Learning Agility Variable (X1)
   Is known that distribution answer Learning Agility variable (X1) from 135 respondents. Based on processed by Microsoft Excel then can concluded that 1.2% is very No agree, 1.8% disagree agree, 8.3% neutral, 50.3% agree, and 73.4% strongly agree. On variables This own mark middle of 4.42.
2. Distribution Answer Respondent Exploration Competency (X2)
   Is known that distribution answer variable Exploration Competency (X2) from 135 respondents. Based on processed by Microsoft Excel then can concluded that 1.5% is very No agree, 2.6% disagree agree, 9.3% neutral, 51.9% agree, and 69.7% strongly agree. On variables This own mark middle of 4.37.
3. Distribution Answer Training and Development Respondents (X3)
   Is known that distribution answer Training and Development variable (X3) from 135 respondents. Based on processed by Microsoft Excel then can concluded that 1.6% is very No agree, 1.4% disagree agree, 8.9% neutral, 69.1% agree, and 54% strongly agree. On variables This own mark middle of 4.27.
4. Distribution Answer Respondent Commitment Organization (Y)
   Is known that distribution answer variable Commitment Organization (Y) from 135 respondents. Based on processed by Microsoft Excel then can concluded that 1.1% is very No agree, 3.6% disagree agree, 17.2% neutral, 68.5% agree, and 44.6% strongly agree. On variables This own mark middle of 4.12.
5. Distribution Answer Respondent Performance Employees (Z)
   Is known that distribution answer variable Performance Employees (Z) from 135 respondents. Based on processed by Microsoft Excel then can concluded that 0.3% is very No agree, 1% don't agree, 6.6% neutral, 60.7% agree, and 66.4% strongly agree. On variables This own mark middle of 4.21.

Outer Model

For the equation model Can obtained with SmartPLS 4.0 Software help, results Graphical display of outer model output can be done seen as following following:

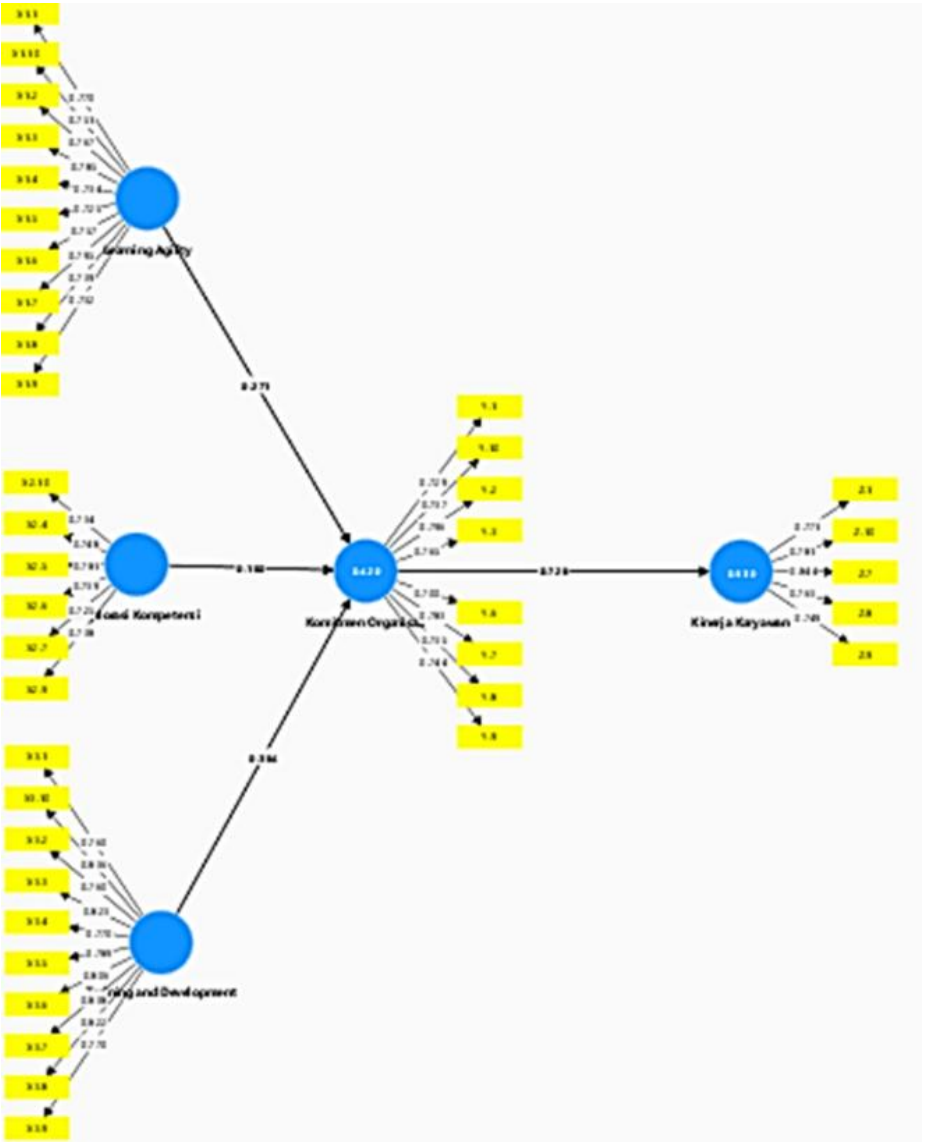

Figure 2. Graphical output of the outer model
Source: Primary data processed, 2024

Following a number of test results on the outer model:

Table 4. Results of Average Variance Extracted (AVE)

Variable	*Average Variance Extracted* (AVE)	Information
Learning Agility	0.571	Fulfilled
Exploration Competence	0.553	Fulfilled
Training and Development	0.636	Fulfilled
Commitment Organization	0.553	Fulfilled
Performance Employee	0.637	Fulfilled

Source: Primary data processed, 2024

Based on table above, shows that all variable reach value > 0.5. So can said all variable the has own The AVE value is valid in the convergent validity test.

Discriminant Validity Test

Cross Loading

Table 5. Cross Loading Results

	Learning Agility	Exploration Competence	*Training and Development*	Commitment Organization	Performance Employee
X 1 . 1	**0.768**	0.412	0.248	0.360	0.349
X 1 . 2	**0.766**	0.413	0.280	0.381	0.440
X1.3	**0.782**	0.395	0.276	0.335	0.393
X1.4	**0.732**	0.295	0.222	0.311	0.301
X1.5	**0.729**	0.311	0.205	0.283	0.234
X1.6	**0.761**	0.398	0.295	0.454	0.397
X1.7	**0.793**	0.423	0.330	0.450	0.474
X1.8	**0.743**	0.353	0.261	0.352	0.252
X1.9	**0.734**	0.331	0.234	0.292	0.168
X1.10	**0.749**	0.297	0.298	0.392	0.369
X2.4	0.330	**0.748**	0.204	0.309	0.395
X2.5	0.461	**0.786**	0.221	0.477	0.499
X2.6	0.350	**0.738**	0.227	0.246	0.378
X2.7	0.229	**0.722**	0.272	0.298	0.470
X2.9	0.287	**0.734**	0.308	0.216	0.514
X2.10	0.453	**0.733**	0453	0.249	0.416
X3.1	0.248	0.213	**0.756**	0.301	0.409
X3.2	0.203	0.173	**0.758**	0.322	0.368
X3.3	0.198	0.283	**0.824**	0.454	0.518
X3.4	0.234	0.290	**0.769**	0.310	0.461
X3.5	0.304	0.248	**0.791**	0.432	0.431
X3.6	0.317	0.257	**0.807**	0.499	0.534
X3.7	0.369	0.330	**0.838**	0.506	0.546
X3.8	0.259	0.213	**0.821**	0.272	0.370
X3.9	0.209	0.277	**0.770**	0.406	0.413
X3.10	0.417	0.270	**0.836**	0.506	0.498
Y. 1	0.418	0.283	0.418	**0.724**	0.504
Y. 2	0.343	0.285	0.387	**0.804**	0.490
Y. 3	0.419	0.430	0.517	**0.755**	0.619
Y. 5	0.278	0.249	0.216	**0.713**	0.421
Y. 6	0.370	0.277	0.305	**0.714**	0.517
Y.7	0.496	0.362	0.529	**0.770**	0.648
Y.8	0.377	0.333	0.296	**0.731**	0.497
Y.9	0.297	0.275	0.337	**0.745**	0.456
Y.10	0.378	0.339	0.378	**0.731**	0.583
Z.1	0.400	0.408	0.488	0.574	**0.769**
Z.7	0.378	0.477	0.438	0.622	**0.844**
Z.8	0.439	0.477	0.440	0.696	**0.767**
Z.9	0.266	0.507	0.464	0.392	**0.748**
Z.10	0.241	0.508	0.462	0.412	**0.779**

Source: Primary data processed, 2024

Based on table on produce cross loading value of every statement indicator with variable said to be valid discriminant.

Internal Consistency Reliability Test

Cronbach's Alpha and Composite Reliability.

Table 6. Cronbach's Alpha and Composite Reliability Results

Variable	*Cronbach's Alpha*	*Composite Reliability (rho_c)*	Information
Learning Agility	0.917	0.930	Reliable
Exploration Competence	0.844	0.881	Reliable
Training and Development	0.937	0.946	Reliable
Commitment Organization	0.899	0.874	Reliable
Performance Employee	0.811	0.896	Reliable

Source: Primary data processed, 2024

Based on table on showing results that every indicator from every variable stated accurate, reliable and precise so that in other words the whole variable has reliable with Good.

Inner Model

Measurement This through structural models that is R Square, Path Coefficient and Analysis test stages Mediation. Analysis measurement use SmartPLS 4.0.

Coefficient Test Determination (R^2)

Table 7. R-Square Results (R^2)

Variable	R *-square*	R *-square adjusted*
Performance Employee	0.507	0.504
Commitment Organization	0.401	0.387

Source: Primary data processed, 2024

Based on results calculation of data in tables on show that R-square value of variable Performance Employee of 0.507, that is all over construct exogenous namely Learning Agility (X1), Exploration Competency (X2), and Training and Development (X3) respectively simultaneous influential to Endogenous constructs viz Performance Employees (Z) is 0.507 or 50.7%. Next is the second there is R-square value of variable Commitment Organization with value 0.401 where mark is <0.5, meaning all over construct exogenous namely Learning Agility (X1), Exploration Competency (X2), and Training and Development (X3). simultaneous influential but no big to construct mediation that is Commitment Organization (Y) is 0.401 or 40.1%.

Path Coefficient

Table 8. *Path Coefficient* Results

	Original sample (O)	*Sample mean* (M)	*Standard deviation* (STDEV)	T *statistics* (|O/STDEV|)	P *values*
Exploration Competence -> Commitment Organization	0.183	0.192	0.134	1,365	0.086
Commitment Organization -> Performance Employee	0.712	0.719	0.056	12,700	0,000
Learning Agility -> Commitment Organization	0.269	0.250	0.103	2,612	0.005
Training and Development -> Commitment Organization	0.365	0.390	0.155	2,352	0.009

Source: Primary data processed, 2024

Analysis Mediation

Table 9. Specific Indirect Results Effects

	Original sample (O)	*Sample mean* (M)	*Standard deviation* (STDEV)	T *statistics* (|O/STDEV|)	P *values*
Learning Agility -> Commitment Organization -> Performance Employee	0.192	0.181	0.079	2,438	0.007
Training and Development -> Commitment Organization -> Performance Employee	0.260	0.281	0.115	2,256	0.012
Exploration Competence -> Commitment Organization -> Performance Employee	0.130	0.138	0.097	1,341	0.090

Source: Primary data processed, 2024

Based on table the seen that role significant mediation on variables Commitment Organization in the relationship between Learning Agility and Performance Employees, so influence No direct between Learning Agility and Performance Employee through Commitment Organization proven significant and stated mediated full. Role mediation on variables Commitment Organization in connection Exploration Competence to Performance Employees, so influence No direct between Exploration Competence to Performance Employee through Commitment Organization proven No significant and stated No mediated full. And Roles significant mediation on variables Commitment Organization in Training and Development relationship to Performance Employees, so influence No direct between Training and Development towards Performance Employee through Commitment Organization proven significant stated mediated full.

Hypothesis Testing Results

1. Learning Agility towards Performance Employee through Commitment Organization
   Analysis results show that Learning Agility has an effect positive and significant to Performance Employee mediated Commitment Organization with mark coefficient of 0.192, then mark Tstatistics 2,438 > Ttable 1,656 and P-values 0.007 < 0.05). So stated mediated full **(HI accepted).**
2. Exploration Competence to Performance Employee through Commitment Organization
   The results of data analysis show that Exploration Competence influential in a way positive but no significant to Performance Employee mediated Commitment Organization with mark coefficient of 0.130, then mark Tstatistics 1.341 > Ttable 1.656 and P-values 0.090 > 0.05. So stated own role both influential positive but no significant **(H2 no accepted).**
3. Training and Development towards Performance Employee through Commitment Organization
   The results of data analysis show that Training and Development has an influence in a way positive and significant to Performance Employee mediated Commitment Organization with mark coefficient of 0.260, then mark Tstatistics 2,256 > Ttable 1,656 and P-values 0.012 < 0.05. So stated No mediated full **(H3 accepted).**
4. Learning Agility, Exploration Competency, and Training and Development towards Performance Employee
   The results of the R-square analysis show that mark from variable Performance Employee of 0.507. So, you can conclude that hypothesis fourth accepted and declared all over construct exogenous namely Learning Agility (X1), Exploration Competency (X2), and Training and Development (X3) respectively simultaneous influential to Endogenous constructs viz Performance Employees (Z) is 0.507 or 50.7% **(H4 accepted).**

CONCLUSION AND SUGGESTION

1. Learning agility has an effect positive and significant to performance employee mediated commitment organization.
2. Exploration competence influential positive but no significant to performance employee mediated commitment organization.
3. Training and development have an influence positive and significant to performance employee mediated commitment organization.
4. Learning agility, exploration competence, and training and development have an influence to performance employee.

REFERENCES

Crozier, S. E., & Atkinson, C. (2023). 'You're only a care worker'. Exploring the status of adult social care work through the intersection of HRM innovation and job quality.

Damayanti, Y., Hadita, & Yulianah. (2021). The Effect of Human Capital and Organizational Learning on Performance Mediated by Organizational Competency. INFLUENCE: International Journal of Science Review, 3(3), 217–228. https://doi.org/10.54783/influence.v3i3.180

Darvishmotevali, M., & Ali, F. (2020). Job insecurity, subjective well-being and job performance: The moderating role of psychological capital.

Dessler, G. (2020). Fundamentals of Human Resource Management. Human Resource Management, November, 133–154.

Dharmawan, D., Anwar, M., Budiarti, I., Lestari, I., & Nururly, S. (2024). The Effect ofOrganizational CommitmentandWork Discipline onJob Satisfaction.

Faeni, D. P. (2024). SERVQUAL measures: Indonesian government healthcare (BPJS) from a human resource perspective. Journal of Infrastructure, Policy and Development, 8(2), 1–21. https://doi.org/10.24294/jipd.v8i2.2271

Faeni, D. P., Faeni, R. P., Riyadh, H. A., & Yuliansyah, Y. (2023). The COVID-19 pandemic impact on the global tourism industry SMEs: a human capital development perspective. 33(2).

Faeni, D. P., Puspitaningtyas, R., & Safitra, R. (2021). Work Life Balance, Peningkatan Karir dan Tekanan Kerja terhadap Produktivitas: Kasus pada Lembaga Sertifikasi Profesi P3 Pembangun Penyuluh Integritas Bangsa. Studi Akuntansi, Keuangan, Dan Manajemen, 1(1), 45–57. https://doi.org/10.35912/sakman.v1i1.602

Faeni, D. P., Setyawati, N. W., Fauzi, A., & Wijayanti, M. (2024). Kompetensi SDM, Peran Industri 5.0, Literasi Digital Terhadap Kinerja Organisasi Dimediasi Motivasi Belajar Karyawan PT XYZ.

Faeni, P. D., & Pramukty, R. (2022). The Influence of Workload and Work Discipline on Employee Performance in Companies in Bekasi City. International Journal of Advanced Multidisciplinary, 1(3), 258–269. https://greenpub.org/IJAM/article/view/200

Jatmika, D., & Puspitasari, K. (2019). Learning Agility Pada Karyawan Generasi Milenial Di Jakarta. 3(1), 187–199.

Johansson, P. E., & Wallo, A. (2020). Exploring the work and competence of interactive researchers.

Lee, J., & Pant, M. (2020). Competency-based learning (CBL): Developing a competencybased geometry methods course.

Milani, R., Setti, I., & Argentero, P. (2021). Learning Agility and Talent Management: A Systematic Review and Future Prospects.

Park, Y., Lim, D. H., & Lee, J. Y. (2022). Internal Marketability, External Marketability, and Career Resilience: The Mediating Role of Learning Agility.

Rita, K. (2020). Redefining Organizational Commitment: Theory and Applications in Today's Organization.

Shaleh, M. (2018). Komitmen Organisasi terhadap Kinerja Pegawai.

Sopiah, S., Kurniawan, D. T., Nora, E., & Narmaditya, B. S. (2020). Does talent management affect employee performance: The moderating role of work engagement. Journal of Asian Finance, Economics and Business, 7(7), 335–341. https://doi.org/10.13106/jafeb.2020.vol7.no7.335

Wardhani, N. S., Sulastiana, M., & Ashriyana, R. (2022). Adaptasi Alat Ukur Learning Agility pada Karyawan untuk Meningkatkan Organizational Agility: Versi Bahasa Indonesia Adaptation of Employee Learning Agility Scale for Organizational Agility: Indonesian Version. 27, 243–264. https://doi.org/10.20885/psikologika.vol27.iss2.art4

Wiyata, M. T. (2022). Pengaruh Training dan Development Terhadap Employee Performance di PT. PAI Sukabumi (JX). March 2020. https://doi.org/10.36418/syntax-literate.v5i3.979.

CHAPTER 9
Literature Reviews: Plant-Based Cellulose for Carboxymethyl Cellulose Conversion and Application in Drilling Mud Formulation

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ABSTRACT

Carboxymethyl cellulose (CMC) plays a very important role in oil drilling mud formulations, mainly due to its rheological properties that can be adjusted to field operating conditions. CMC functions as a viscosifier, fluid loss controller, and rheological stabiliser in water-based drilling mud systems. However, most CMC used in the oil and gas industry still relies on high-cost imported products, while the demand for environmentally friendly drilling mud additives is increasing. Natural cellulose derived from agro-industrial waste such as palm fronds, bagasse, rice straw, date palm fronds, rice husks, straw, and bamboo has high potential as a source of Carboxymethyl Cellulose (CMC) raw material for oil drilling mud formulation. Previous studies have shown that plant-based CMC has competitive performance with commercial products. Research shows that bagasse, cassava tubers, palm fronds, and bamboo are suitable for development as raw materials for CMC for water-based drilling mud formulations because they exhibit chemical-physical profiles that are close to/in line with SNI Quality II standards, thus having the potential to work simultaneously as a viscosifier and a fluid loss control agent. In addition, CMC from palm fronds can achieve a high degree of substitution and reduce moisture loss better than imported CMC, while rice husks can reduce moisture loss by up to 64.89%, approaching the performance of synthetic CMC and PAC. The use of local biomass not only reduces dependence on imported materials, but also supports environmental conservation efforts by processing agricultural waste into raw materials that have added value and are more economical.

Keywords: *Carboxymethyl Cellulose (CMC),Natural Cellulose*, *Drilling Mud*..

1. INTRODUCTION

The demand for environmentally friendly, economical, and easily accessible drilling mud additives continues to increase in line with the growth of the oil and gas industry (Darmiyati et al., 2021). Drilling mud plays a vital role in maintaining wellbore stability, controlling fluid loss, lubricating the drill bit, and transporting cuttings to the surface (Iswahyudi et al., 2025). To achieve these functions, synthetic polymers or cellulose derivatives such as Carboxymethyl Cellulose (CMC) are commonly added. Until now, CMC has been largely produced commercially from imported sources, leading developing countries to face high production costs and dependency on foreign supply (Benchabane & Bekkour, 2008). Therefore, the exploration of local biomass utilization, particularly from agricultural waste, has emerged as a strategic solution to reduce production costs while supporting sustainability principles.

Cellulose is present in large quantities in agricultural residues such as palm fronds, rice husks, and other plant wastes. Through chemical processes such as carboxymethylation, cellulose can be modified into CMC, which is water-soluble and functions as a viscosifier and fluid loss control additive (Asmoro et al., 2021).

2. LITERATURE REVIEW

This chapter will explain about the concept of cellulose it self in general as primary source of CMC conversion and its application in drilling mud.

2.1 Cellulose as a Natural Raw Material

Most of all plants contain this cellulose compound in their cellular structures. As the main component of plant cell walls, cellulose plays an essential role in providing structural strength and stability to plants (Indriyani, 2021). One of the most commercially valuable cellulose derivatives with wide-ranging applications is Carboxymethyl Cellulose (CMC), which is produced by modifying cellulose through a carboxymethylation process (Ferdiansyah et al., 2016). CMC is water-soluble, enhances viscosity, and functions as a thickener, stabilizer, and fluid loss control additive in various industrial applications, including drilling mud formulation. Another advantage of cellulose as a raw material is its renewable and eco-friendly nature(Rahmasari et al., 2022).

2.2 Conversion of Cellulose into Carboxymethyl Cellulose (CMC)

This conversion process is carried out through a chemical reaction known as carboxymethylation, which is a substitution reaction conducted under alkaline conditions using monochloroacetic acid as the main reagent. The success of the carboxymethylation reaction is generally measured by the parameter degree of substitution (DS), which indicates the average number of hydroxyl groups replaced by carboxymethyl groups per anhydroglucose unit (Wijaya et al., 2014).

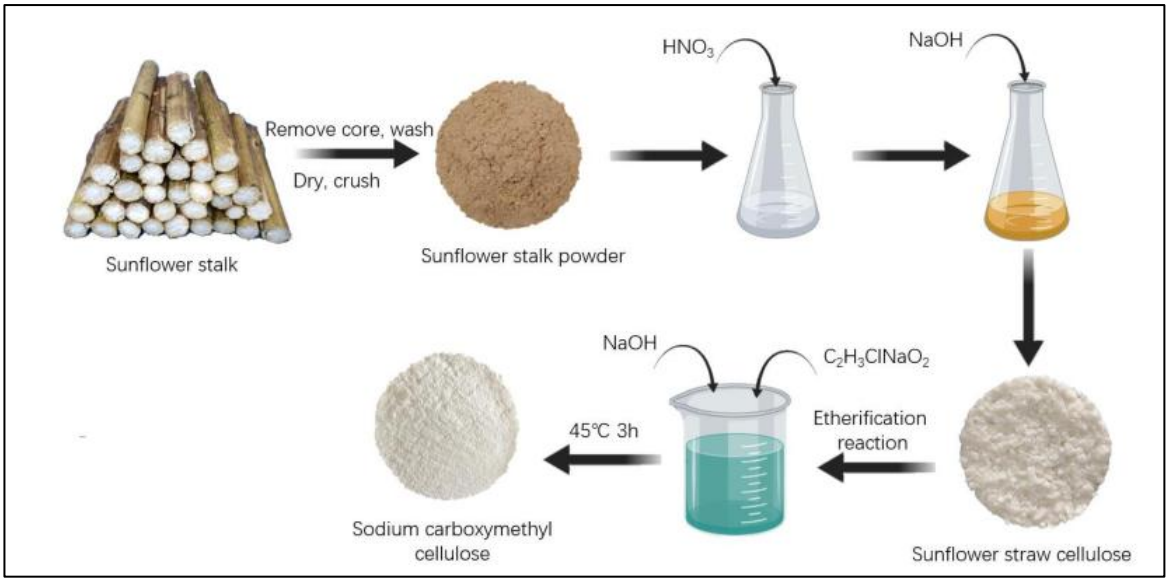

Figure 2. Process of Conversion of Cellulose into Carboxymethyl Cellulose (Zhangh et al., 2024)

The subsequent description outlines the procedural steps depicted in Figure 1, culminating in the product illustrated in Figure 2.

1. Preparation of Sunflower Seed Husk Powder (SFSP)

Sunflower seeds that have been harvested are thoroughly dried using a oven at 105 ± 2°C. After drying, the stems are cut into segments measuring 15 cm, and then the xylem and pulp are separated manually. The xylem is washed with distilled water to remove surface impurities, then dried again. The dried material is crushed and sieved using a 40–60 mesh sieve, resulting in sunflower husk powder (SFSP).

2. Preparation of Holocellulose from Sunflower Seed Husk Powder (CH-SFSP)

Approximately 50 grams of SFSP are treated with nitric acid (HNO_3) to remove lignin and other non-cellulosic compounds. The filtered residue is washed until neutral pH is achieved, then dried under vacuum at 105 ± 2°C, yielding acid-treated sunflower seed cellulose.

3. Preparation of Crude Fiber from Sunflower Seed Husk (CF-SFSP)

The cellulose obtained from acid treatment is used as the main raw material. Two grams of this material are mixed with 30 mL of 6% NaOH solution at 50°C for 1 hour. After mixing, the mixture is filtered under negative pressure to separate the crude cellulose fiber from the sunflower husk (CF-SFSP).

4. Preparation of Sunflower Seed Cellulose (C-SFSP)

The next step involves bleaching and purification using a 1% sodium hypochlorite (NaOCl) solution, with pH adjusted to 4–5 using glacial acetic acid. The mixture is stirred for 0.5 hours under specific stirring conditions. Afterward, filtration is performed under pressure, and the residue is washed until neutral pH is reached. The residue is then dried at 105 ± 2°C until constant weight is obtained, resulting in pure sunflower husk cellulose (C-SFSP).

5. Synthesis of Sodium Carboxymethyl Cellulose (CMC-SFSP)

Four grams of sunflower seed cellulose (C-SFSP) are placed into 80 mL of ethanol and incubated at 28°C for 30 minutes. Subsequently, 10 mL of 50% NaOH solution is added, and the mixture is reacted at 30°C for 60 minutes. Afterward, 10 mL of 40% sodium chloroacetate solution is added, and the temperature is increased to 45°C for 3 hours to continue the carboxymethylation reaction. After the reaction is complete, the solution is neutralized using glacial acetic acid, washed with water and alcohol to remove residual reagents. The final product is sodium carboxymethyl cellulose (CMC-SFSP), which is ready to be used as a natural polymer additive in environmentally friendly sand or drilling mud stabilization applications.

Figure 3 Results of Conversion Process: (a) SFSP, (b) CH-SFSP, (c) CF-SFSP, and (d) C-SFSP (Zhangh et al., 2024)

2.3 Application of CMC in Drilling Mud Formulation

Drilling mud plays a highly vital role in oil and gas exploration and production activities, as it not only functions as a medium for transporting cuttings from the bottom of the well to the surface, but also serves to support wellbore stability, control formation pressure, lubricate and cool the drill bit, and act as a fluid loss control agent (Fernanda, 2019). To support all of these functions, drilling mud must be formulated with specific additives, one of which is Carboxymethyl Cellulose (CMC) (Amani, 2021; Perkebunan, 2019; SAFITRI, 2025; Wibowo, 2020; Wijaya et al., 2014). Up to now, most of the additives used have been derived from synthetic polymers or imported cellulose derivatives, which economically result in high costs and dependency on foreign supply chains (Putrika, 2023; Rahmasari et al., 2022). This situation poses a particular challenge for developing countries striving to achieve energy independence. Therefore, the utilization of plant-based CMC derived from locally extracted biomass is considered a strategic alternative, both from technical and economic perspectives (Rinawati et al., 2019).

3. METHODOLOGY

The research method employed in this study is a literature review. A literature review was chosen because this research does not involve direct laboratory experiments but instead focuses on the exploration, analysis, and synthesis of various research findings that have been previously published. A literature review is conducted by reading, examining, and analyzing various written sources such as journals, books, proceedings, and research reports that are relevant to the topic, in order to produce a scientific work that presents a comprehensive overview of the issue under study (Ridwan et al., 2021). Thus, the purpose of this study is to collect and compare research findings related to plant-based cellulose, its conversion process into Carboxymethyl Cellulose (CMC), and its application in drilling mud formulation. In its implementation, this study employs the SPIDER framework (Sample, Phenomenon of Interest, Design, Evaluation, and Research

Type) as developed by Methley (2014) (Kalu, 2019). SPIDER was selected because it can be applied in qualitative, quantitative, or mixed-methods research, making it suitable for literature reviews that involve diverse research designs (Rahi, 2017). In the Sample (S) category, the literature sources were focused on articles discussing biomass or agricultural residues such as palm fronds, rice husks, straw, and other plant fibers that can be extracted into cellulose. In the Phenomenon of Interest (PI) category, the focus was directed toward the process of converting cellulose into CMC and its application as a drilling fluid additive, particularly in fluid loss control, viscosity enhancement, and mud stabilization. The Design (D) category included studies with experimental designs, both laboratory-based and comparative research, that evaluated the performance of natural additives against commercial products. In the Evaluation (E) category, the assessment was centered on the effectiveness of plant-based CMC in improving drilling mud rheology, reducing filtrate loss, and providing cost efficiency compared to imported additives. Finally, the Research Type (R) category encompassed both quantitative and qualitative studies published as journal articles, conference papers, and proceedings between 2010 and 2024, thereby covering the latest developments related to biomass utilization in the oil and gas industry.

4. FINDINGS AND DISCUSSION

After conducting a search of scientific articles through Google Scholar, PubMed, and ScienceDirect, four articles were found to meet the inclusion criteria out of a total of 24,840 clinical articles and research studies published between 2014 and 2024, as follows.

1. Elrayah et al. (2020) – Drilling Fluids Additive Sodium Carboxymethyl Cellulose (CMC) Produced from Palm Frond

- Research Objective: To develop CMC from palm fronds as a local drilling mud additive to replace imported products. This study also aimed to compare the physical properties, rheological characteristics, and effectiveness of locally produced CMC with commercial CMC in controlling fluid loss and enhancing drilling mud viscosity.
- Participants: The research subjects consisted of palm frond materials, bentonite, and water-based drilling mud.
- Design & Data Collection Method: Laboratory-based experimental research. The stages included cellulose extraction from palm fronds, carboxymethylation process, IR and XRD spectroscopy for characterization, as well as rheological and filtration property testing of drilling mud using a viscometer, mud balance, and filter press at various temperatures (25–90°C). Data were compared with API standards and imported CMC samples.
- Findings: CMC derived from palm fronds demonstrated fairly good rheological properties and fluid loss control, although still below the efficiency of imported PAC LV additives. Nevertheless, the results indicate high technical and economic potential for palm frond-based CMC to serve as an environmentally friendly local alternative.

2. Okon et al. (2014) – Evaluation of Rice Husk as Fluid Loss Control Additive in Water-Based Drilling Mud

- Research Objective: To evaluate the potential of rice husk, an agricultural waste in Nigeria, as a fluid loss control additive in water-based drilling mud, and to compare its effectiveness with CMC and PAC (Polyanionic Cellulose).
- Participants: No human participants were involved; the research subjects consisted of dried and ground rice husks, as well as API-standard bentonite-based drilling mud.

- Design & Data Collection Method: Laboratory experiment using fluid loss tests (API filter press test), measurement of filter cake thickness, and evaluation of basic mud properties. Rice husk was added at concentrations of 5–20 g/350 mL of mud and compared with CMC at concentrations of 2.5–10 g/350 mL of mud.
- Findings: Rice husk was able to reduce fluid loss by up to 64.89%, comparable to CMC (62.77%). The resulting filter cake was relatively thin and stable, indicating that rice husk has strong potential as a local, eco-friendly additive with performance nearly equivalent to synthetic polymers.

3. Mohammed & Elrayah (2025) – Production of High-Performance Drilling Fluid Additive Converting Palm Frond Waste into Carboxymethyl Cellulose (CMC)

- Research Objective: To convert palm frond waste into high-quality CMC as a sustainable drilling mud additive. The study aimed to evaluate the structural, thermal, and rheological characteristics of the synthesized CMC and compare them with commercial CMC.
- Participants: consisted of palm fronds, carboxymethylation chemicals, and bentonite-based drilling mud.
- Design & Data Collection Method: Laboratory research conducted through the following stages: (1) cellulose extraction from palm fronds (alkali cooking and bleaching), (2) CMC synthesis via reaction with monochloroacetic acid, (3) product characterization using FTIR and XRD, and (5) rheological testing of drilling mud according to API 13A standards.
- Findings: CMC derived from palm fronds had a degree of substitution of 0.77. The product demonstrated at least 15% better fluid loss reduction compared to commercial CMC. These results confirm both the technical and economic potential of palm frond-based CMC as an import substitute, while also contributing to agricultural waste management and the development of eco-friendly materials.

5. CONCULUSION AND RECOMMENDATION

Based on the findings of this literature review, it can be concluded that the utilization of plant-extracted cellulose as an alternative materials for Carboxymethyl Cellulose (CMC) holds highly promising prospects for development as a primary additive in drilling mud formulation. Cellulose is available in large quantities from agricultural residues such as palm fronds, rice husks, straw, and various other biomass wastes that have not been optimally utilized. Through the chemical process of carboxymethylation, cellulose can be modified into CMC, which is water-soluble, capable of enhancing viscosity, stabilizing drilling mud, and controlling fluid loss, thereby meeting the functional standards required in oil and gas drilling operations.

Previous studies consistently demonstrate that biomass-based CMC can deliver competitive performance, and in several aspects even outperform commercial CMC or synthetic polymers, as shown by (Elrayah et al., 2020) and Mohammed & Elrayah, who successfully converted palm fronds into high-quality CMC with an optimal degree of substitution, as well as by (Okon et al., 2014), who confirmed the effectiveness of rice husks in reducing fluid loss to levels nearly equivalent to imported products. These findings highlight that the utilization of local biomass not only offers technical solutions to reduce dependence on expensive imported additives but also provides economic value by lowering production costs, while contributing positively to environmental aspects by reducing agricultural waste and minimizing the use of petroleum-based synthetic polymers that are not environmentally friendly. Furthermore, the use of plant-derived cellulose-based CMC is aligned with the global agenda toward more sustainable, environmentally friendly oil and gas industry while supporting national energy independence. Nevertheless,

several challenges must be addressed, including optimization of extraction and carboxymethylation processes to achieve consistent product quality, further industrial-scale and field research to validate performance under real drilling conditions, and comprehensive economic feasibility analyses to enable large-scale implementation.

REFERENCES

Amani, Z. D. (2021). Analisis Pemanfaatan Limbah Kulit Nangka Menjadi Carboxymethyl Cellulose Dan Pengaruhnya Terhadap Sifat Rheologi Lumpur Pemboran. Universitas Islam Riau.

Asmoro, N. W., Afriyanti, A., & Marisa, P. (2021). KEMAMPUAN DAYA IKAT AIR DAN MINYAK PADA CARBOXYMETYL CELLULOSE (CMC) BATANG TANAMAN JAGUNG. SEMNAS 2018: Publikasi Hasil Penelitian Dan Pengabdian Masyarakat, 1(1).

Benchabane, A., & Bekkour, K. (2008). Rheological properties of carboxymethyl cellulose (CMC) solutions. Colloid and Polymer Science, 286(10), 1173–1180.

Darmiyati, Z. M., Randanan, E. C., Wicaksono, R. B., Aditya, R., & Darmiyati, I. (2021). Analisis Pengaruh Penambahan Aditif Xanthan Gum Pada Lumpur Pemboran. AL-MIKRAJ Jurnal Studi Islam Dan Humaniora, 2(1), 82–89.

Elrayah, A. A. I., Mohammed, A. A., & IBRAHIM Mohammed Elfatih, I. A. (2020). Drilling Fluids Additive Sodium Carboxymethyle Cellulose (CMC) Produced from Palm Frond.

Ferdiansyah, M., Marseno, D. W., & Pranoto, Y. (2016). Kajian karakteristik karboksimetil selulosa (CMC) dari pelepah kelapa sawit sebagai upaya diversifikasi bahan tambahan pangan yang halal. Jurnal Aplikasi Teknologi Pangan, 5(4), 136–139.

Fernanda, R. (2019). Analisis Penambahan Additive CMC Dari Kulit Durian Terhadap Filtration Loss Dan Rheology Lumpur Pemboran. Universitas Islam Riau.

Indriyani, D. (2021). Pengaruh Penambahan Natrium Karbonat dan Karboksimetil Selulosa Terhadap Karakter Bentonit Putih Boyolali Sebagai Bahan Pembuatan Lumpur Pengeboran. Universitas Gadjah Mada.

Iswahyudi, S., Paryanto, P., & Susanty, A. (2025). Analisis Peran Mudlogging Geologist dalam Pengawasan dan Pengelolaan Data Pengeboran Sumur Panas Bumi. Jurnal Profesi Insinyur Indonesia, 3(1).

Kalu, M. E. (2019). Using emphasis-purposeful sampling-phenomenon of interest–context (EPPiC) framework to reflect on two qualitative research designs and questions: A reflective process. The Qualitative Report, 24(10), 2524–2535.

Okon, A. N., Udoh, F. D., & Bassey, P. G. (2014, August). Evaluation of rice husk as fluid loss control additive in water-based drilling mud. SPE Nigeria Annual International Conference and Exhibition.

Perkebunan, M. (2019). Peningkatan kemurnian selulosa dan karboksimetil selulosa (CMC) hasil konversi limbah TKKS melalui perlakuan NaOH 12%. Menara Perkebunan, 87(2), 95–103.

Putrika, A. (2023). Jenisjenis Tumbuhan yang Berpotensi Sebagai Sumber Bahan Bakar Alternatif Masa Depan. In Biologi Terapan untuk Masa Depan dan Kemajuan Bangsa (p. 237).

Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. International Journal of Economics & Management Sciences, 6(2), 1–5.

Rahmasari, E., Zamhari, M., & Silviyati, I. (2022). Plastik Biodegradable Berbasis Carboxymethyl Cellulose dari Ampas Tebu. Jurnal Pendidikan Dan Teknologi Indonesia, 2(9), 385–391.

Ridwan, M., Suhar, A. M., Ulum, B., & Muhammad, F. (2021). Pentingnya penerapan literature review pada penelitian ilmiah. Jurnal Masohi, 2(1), 42–51.

Rinawati, R., Kiswandono, A. A., Juliasih, N. L. G. R., & Permana, F. D. (2019). Pemanfaatan Karbon Aktif Sekam Padi sebagai Adsorben Phenantrena dalam Solid Phase Extraction.

SAFITRI, D. A. W. (2025). Sintesis Carboxymethyl Cellulose (CMC) dari Kulit Pisang Ambon Hijau (Musa Paradisiaca Var. Sapientum). UPN Veteran Jawa Timur.

Wibowo, A. T. (2020). Desain Lumpur Pemboran Menggunakan Additive Barite dan CMC Industri untuk Mengatasi Formasi Salinitas Tinggi. Universitas Islam Riau.

Wijaya, S. M., Pitaloka, A. B., & Saputra, A. H. (2014). Sintesis dan Karakterisasi Carboxymethyl Cellulose (CMC) dari Selulosa Eceng Gondok (Eichhornia crassipes) dengan Media Reaksi Isopropanol Etanol. International Conference on Advance Material and Practical Nanotechnology (ICAMPN), 3(1), 1–11.

Zhangh, Z., Li, Z., Yao, L., Chang, S., & Wu, Y. (2024). Development and Performance Evaluation of Sunflower Straw Cellulose Ether Ecological Sand-Fixing Material. https://doi.org/@article{Zhang2024SunflowerStrawCMC,author={Zhang,ZiyangandLi,ZheyuandYao,LihongandChang,SiyuandWu,Yueqi},title={DevelopmentandPerformanceEvaluationofSunflowerStrawCelluloseEtherEcologicalSand-FixingMaterial},journal={BioResources},year={2024},volume={19},number={1},pages={1--20.

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She has been working with NDIM since August 2023.

Specializing in Human Resource Management, combines a robust educational background—Ph.D. from Dr. APJ Abdul Kalam Technical University and MBA from IMS Ghaziabad—with 24 years of rich teaching experience.

Her journey, which started with a B.Sc. in Civil Engineering from Aligarh Muslim University (first position holder, 1990-94 batch), led her to be a revered guest faculty at IIT Delhi and a notable member of MBA selection panels at Delhi Technological University.

Dr. Verma has significantly impacted training and assessments at IIT Delhi, performed psychometric assessments for corporate executives, and has been recognized with awards, such as the Best Paper Award in 2021.

With research interests spanning gender studies to CSR, she has presented globally, including 2019 Academy of Management Conference in Boston.

She contributes as a reviewer for various international journals.

Dr. Verma was also a selected Master Trainer under the UKIERI initiative in 2021-22 and is a dedicated mentor at the Anveshan Foundation, IGDTUW, Delhi.

Dr. Monica Verma
Professor Ph.D, MBA , Area of Specialization: Human Resource Management

Human Capital Development and Organizational Performance:

Management, Strategy, Learning, and Sustainability Perspectives

Edited by

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