Linking Human Resource Management, Human Capital Development, and Innovation Adoption to Sustainable Firm Performance: Insights from the Ornamental Plant Agribusiness Sector

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Abstract

The ornamental plant industry in East Java holds substantial potential but faces challenges such as intense market competition, shifting consumer preferences, and the continuous demand for innovation. This study examines the influence of human resource management (HRM) practices on workforce capability enhancement, innovation uptake, and their implications for organizational outcomes in ornamental plant enterprises in Surabaya and Malang. A quantitative approach was applied using Structural Equation Modeling–Partial Least Squares (SEM-PLS) based on data collected from 150 human resource managers. The results indicate that effective HRM practices significantly strengthen workforce capabilities, which subsequently enhance firms' capacity to adopt innovation. Innovation uptake plays a critical role in improving organizational outcomes, particularly in productivity, product quality, and long-term business viability. Furthermore, the findings confirm the presence of indirect effects through the mediating roles of workforce capability enhancement and innovation uptake. These results support the integration of the Resource-Based View, Knowledge-Based View, and Dynamic Capabilities perspective in explaining performance improvement mechanisms within ornamental plant agribusinesses. From a broader perspective, strengthening HRM systems, investing in employee competencies, and accelerating innovation uptake contribute not only to firm competitiveness but also to sustainable agribusiness development by supporting resilient agricultural enterprises, improving rural employment quality, and advancing the achievement of SDG 8 and SDG 12.

Keywords: innovation uptake; organizational outcomes; strategic HR practices; sustainable agribusiness; workforce capability

Introduction

Globally, enhancing the productivity, sustainability, and resilience of agribusiness sectors has become a central agenda in achieving sustainable development. Agribusiness plays a critical role in supporting rural livelihoods, creating employment opportunities, and contributing to environmental sustainability through responsible resource management. Within this context, the ornamental plant industry occupies a unique position. Beyond its economic contribution, the sector enhances urban green spaces, improves environmental quality, and supports ecosystem services, while simultaneously carrying a potential environmental footprint related to resource use, waste generation, and production efficiency. Consequently, improving organizational performance in ornamental plant agribusinesses is increasingly linked to broader objectives of sustainable agriculture and green economic development.

In Indonesia, the ornamental plant industry represents one of the fastest-growing agribusiness subsectors, particularly in East Java. According to data from the Central Bureau of Statistics (BPS), East Java accounts for approximately 1.86 million m² of ornamental plant cultivation area with an annual production exceeding 335 million plants, positioning the province as one of the national production centers (BPS Jawa Timur, 2024). Batu City (Malang Raya) is widely recognized as the largest rose-producing area in

Indonesia, supplying tens of millions of stems annually, while Surabaya functions as a strategic trade and distribution hub serving both domestic and export markets. Together, these regions form an integrated ornamental plant value chain encompassing production, processing, and distribution, making them a relevant context for examining firm competitiveness and sustainability.

Despite its strong growth potential, the ornamental plant industry faces increasing competitive pressure, rapidly changing consumer preferences, and rising demands for efficiency and product differentiation. Meeting these challenges requires continuous innovation and adaptive organizational capabilities. However, many ornamental plant enterprises continue to rely on conventional human resource management (HRM) practices, such as informal recruitment processes, limited performance-based evaluation, and the absence of structured or certified training programs. These practices constrain systematic human capital development (HCD) and limit the capacity of firms to absorb, implement, and sustain innovation (Kimseng et al., 2020) (Prikshat et al., 2023). As a result, firms often struggle to improve productivity, maintain consistent product quality, and ensure long-term business sustainability.

Prior studies have consistently highlighted the strategic role of HRM in strengthening human capital and enhancing innovation-related outcomes (Donate et al., 2016; Rehman et al., 2020; Wang et al., 2021). From the Resource-Based View (RBV), sustainable competitive advantage is achieved through the effective management of valuable, rare, inimitable, and non-substitutable resources, with human capital being a central strategic asset (López-Cabarcos et al., 2015). Complementarily, Dynamic Capabilities Theory emphasizes that firms must continuously reconfigure their resources to respond to environmental dynamism and innovation pressures (Pundziene et al., 2021).

Nevertheless, much of the existing literature focuses primarily on direct relationships between HRM and firm performance, or between HRM and innovation outcomes, while giving limited attention to the mediating mechanisms through which these effects occur. From a Knowledge-Based View (KBV) perspective, human capital development and innovation adoption represent critical knowledge-driven pathways that translate HRM practices into superior performance outcomes (Pundziene et al., 2021; Rasool et al., 2019). This limitation highlights the need for a more integrative analytical framework that simultaneously captures the roles of HCD and innovation adoption as mediating variables.

The novelty of this study lies in its comprehensive examination of how human capital development and innovation adoption jointly mediate the relationship between HRM and firm performance. Unlike most prior studies conducted in manufacturing or high-technology sectors, this research provides contextual verification of strategic HRM theories within a specific agribusiness value chain, namely the ornamental plant industry. By focusing on an innovation-driven yet labor-intensive agribusiness subsector, this study extends the applicability of the RBV, KBV, and Dynamic Capabilities perspectives to a context that has received limited empirical attention.

Accordingly, this study aims to analyze the influence of HRM practices on human capital development, examine the relationship between human capital development and innovation adoption, and assess the contribution of innovation adoption to firm performance. It further investigates the mediating roles of human capital development and innovation adoption in linking HRM practices with firm performance. Theoretically, this study contributes to strategic management and agribusiness literature by integrating the RBV, KBV, and Dynamic Capabilities into a unified explanatory framework. Practically, the findings provide insights for ornamental plant enterprises in Surabaya and Malang to transition from conventional to strategic HRM practices, strengthen workforce capabilities, accelerate innovation adoption, and ultimately support sustainable agribusiness development through improved productivity, product quality, and business resilience.

Literature Review and Hypothesis Development

Human Resource Management (HRM) and Human Capital Development (HCD)

Human resource management plays a strategic role in ensuring that organizations acquire and retain a competent and productive workforce (Ibojo & Akinade, 2024). The classical functions of HRM include recruitment and selection, training and development, as well as reward and incentive systems (O'Donovan, 2019; Piwowar-Sulej, 2021). Effective HRM practices enhance employee skills, motivation, and commitment (Blom et al., 2020).

From the Resource-Based View (RBV), HRM is considered a strategic asset that can be transformed into human capital (Delery & Roumpi, 2017). Human capital encompasses technical, managerial, and soft skills that strengthen a firm's competitive advantage (Modgil et al., 2025). Therefore, the better HRM is implemented, the stronger the quality of human capital that is developed.

Hypothesis 1 (H1): Human resource management has a positive effect on human capital development.

Human Capital Development (HCD) and Innovation Adoption

Human capital development provides the foundation for organizations to adapt to dynamic business environments. Employees' technical, managerial, and soft skills influence the extent to which firms are able to adopt new innovations (Oeij et al., 2022; Pedraza-Rodríguez et al., 2023).

According to Absorptive Capacity Theory (Shao et al., 2025), firms with stronger human capital are more capable of identifying, assimilating, and applying innovations. This is particularly relevant in the ornamental plant agribusiness sector, where innovation in cultivation, supply chains, and marketing is key to competitiveness.

Hypothesis 2 (H2): Human capital development has a positive effect on innovation adoption.

Innovation Adoption and Firm Performance

Innovation adoption is defined as a firm's ability to integrate new technologies, processes, or methods into its business activities. (Rogers, 2003b) identifies key dimensions of innovation adoption, including relative advantage, compatibility, and trialability/observability. Successful adoption leads to higher productivity, efficiency, product quality, and business sustainability (Atif et al., 2021).

In line with Dynamic Capabilities Theory (Teece et al., 1997), a firm's ability to adopt innovations represents a dynamic capability that directly impacts performance. Empirical studies further confirm that innovative firms generally outperform more conservative ones (Bogetoft et al., 2024).

Hypothesis 3 (H3): Innovation adoption has a positive effect on firm performance.

The Mediating Role of Human Capital Development and Innovation Adoption

Beyond direct effects, indirect pathways must also be considered. HRM not only influences performance directly but also through human capital development, which enhances a firm's ability to adopt innovations. This process aligns with the Knowledge-Based View, which emphasizes that human capital serves as a source of knowledge mediating the relationship between HRM practices and organizational outcomes (Gupta, 2022).

Accordingly, effective HRM enhances human capital development, which in turn strengthens innovation adoption, ultimately leading to improved firm performance.

Hypothesis 4 (H4): Human capital development positively influences firm performance through innovation adoption.

Hypothesis 5 (H5): Human resource management positively influences firm performance through human capital development and innovation adoption.

Conceptual Model

Drawing on the theoretical foundations and hypothesis development, this study establishes a conceptual model that links human resource management (HRM), human capital development (HCD), innovation adoption, and firm performance. HRM is conceptualized as the starting point that enhances HCD, which subsequently improves a firm's capacity to adopt innovations. In turn, innovation adoption is expected to drive better firm performance, reflected in productivity, product quality, and sustainability outcomes.

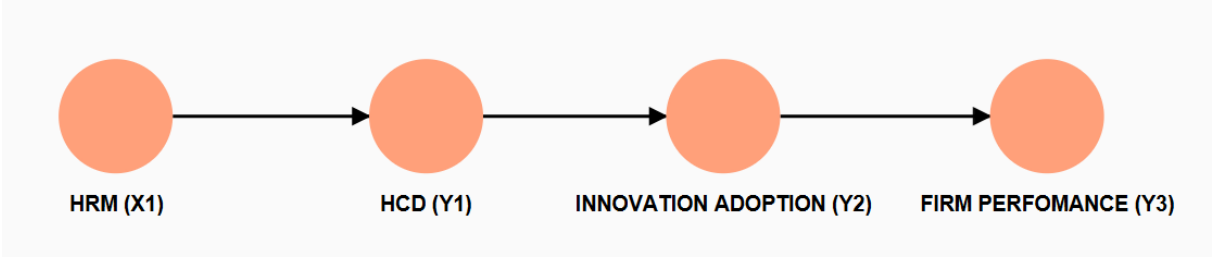

Figure 1. Conceptual Model

As illustrated in Figure 1, the model not only highlights direct relationships but also incorporates indirect mechanisms. HCD is expected to mediate the relationship between HRM and innovation adoption, while innovation adoption mediates the influence of HCD on firm performance. In addition, a sequential mediation is proposed, in which HRM contributes to firm performance through the combined effects of HCD and innovation adoption. This framework integrates the Resource-Based View, Knowledge-Based View, and Dynamic Capabilities Theory to provide a comprehensive explanation of how HRM practices shape human capital and innovation capabilities to strengthen organizational performance.

Materials and Methods

Research Design

This study employs a quantitative approach using Structural Equation Modeling–Partial Least Squares (SEM-PLS). SEM-PLS was chosen because it is suitable for examining complex causal relationships among latent constructs, while simultaneously assessing the validity and reliability of measurement instruments (Hair et al., 2019).

Research Location and Objects

The research was conducted in ornamental plant companies located in Surabaya and Malang, East Java—two regions that represent the core of the province's ornamental plant agribusiness. According to the Central Bureau of Statistics (BPS), East Java has more than 8 million m² of ornamental plant cultivation area, producing over 300 million plants annually. Major commodities include chrysanthemums, tuberoses, orchids, and roses, contributing significantly to national production.

Batu City (Malang Raya) is recognized as the largest rose production center in Indonesia, with annual productivity exceeding 55 million stems. Surabaya, as a metropolitan city, functions as the primary hub for trade, distribution, and market development of ornamental plants. Together, Malang and Surabaya are considered representative areas for examining the role of HRM, HCD, and innovation adoption in enhancing firm performance.

Population and Sample

This study involved 150 respondents from ornamental plant companies in Surabaya and Malang. The sample size met the requirements for Structural Equation Modeling–Partial Least Squares (SEM-PLS), following the "10-times rule," which recommends a minimum sample of ten times the largest number of indicators in a construct (Hair et al., 2019). With 12 indicators, the minimum requirement was 120 respondents, and the final sample exceeded this threshold. Moreover, prior methodological literature suggests that a sample size of 100–200 is adequate for SEM-PLS applications in management and social science research (Chin, 2010; Hair et al., 2021).

A non-probability purposive sampling technique was applied, selecting respondents who held managerial or decision-making roles related to human resource management and innovation. The sampling frame was identified through local agricultural offices, horticultural associations, and business directories. All respondents participated voluntarily and provided informed consent prior to data collection. Anonymity and confidentiality were ensured by not collecting personally identifiable information. The study adhered to standard ethical guidelines for social research, and formal approval from an institutional review board or ethics committee was not required, as the research involved minimal risk and non-invasive survey procedures.

Variables and Indicators

The study examined four main constructs: Human Resource Management (X1), Human Capital Development (Y1), Innovation Adoption (Y2), and Firm Performance (Y3). The research instrument was developed as a structured questionnaire using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data Analysis Technique

Data were analyzed using SEM-PLS with the SmartPLS software. The analysis consisted of two main stages. First, the measurement model (outer model) was evaluated through tests of convergent validity, discriminant validity, construct reliability, and multicollinearity using the Variance Inflation Factor (VIF). Second, the structural model (inner model) was assessed by examining path coefficients, R-square values, and the significance of relationships among variables using bootstrapping procedures.

Table 1. Regression Analysis Results: N and Vegetation Index

Variable	Indicator	Code	Reference
Human Resource Management (X1)	Recruitment and selection of employees	X1.1	(Armstrong & Taylor, 2020; Dessler, 2020)
	Training and employee development	X1.2	(Noe et al., 2021)
	Reward and incentive system	X1.3	(Armstrong, 2016; Milkovich et al., 2019)
Human Capital Development (Y1)	Technical competencies (cultivation, processing, supply chain)	Y1.1	(Becker, 1993; Crook et al., 2011)
	Managerial competencies (planning, leadership)	Y1.2	(Lepak & Snell, 1999; Wright & McMahan, 2011)
	Soft skills (collaboration, problem solving)	Y1.3	(Heckman & Kautz, 2012; Robles, 2012)
Innovation Adoption (Y2)	Relative advantage (cost efficiency, productivity improvement)	Y2.1	(Damanpour & Schneider, 2006; Rogers, 2003b)
	Compatibility (fit with business processes)	Y2.2	(Rogers, 2003b; Tornatzky & Fleischer, 1990)
	Trialability/observability (trial and observable success)	Y2.3	(Damanpour, 1991; Rogers, 2003b)
Firm Performance (Y3)	Business productivity (output/efficiency)	Y3.1	(Kaplan & Norton, 1996; Venkatraman & Ramanujam, 1986)
	Product quality (standards and competitiveness)	Y3.2	(Porter, 1985; Prajogo & Sohal, 2006)
	Profitability and business sustainability	Y3.3	(Kaplan & Norton, 2004)

Result and Discussion

Data Analysis

Before analyzing the structural model, this study presents the general characteristics of respondents. A total of 150 respondents participated, all of whom were human resource managers from ornamental plant companies operating in Surabaya and Malang. Presenting these characteristics provides contextual understanding of the sample profile and strengthens the interpretation of subsequent findings.

Table 2. Characteristics of Respondents

Characteristic	Category	Frequency (n=150)	Percentage (%)
Gender	Male	95	63.3
	Female	55	36.7
Age	< 30 years	20	13.3
	30–39 years	48	32.0
	40–49 years	52	34.7
	≥ 50 years	30	20.0
Education	High school (SMA/SMK)	15	10.0
	Diploma	25	16.7
	Bachelor's degree (S1)	85	56.7
	Postgraduate (S2/S3)	25	16.6
Work Experience	< 5 years	30	20.0
	5–10 years	65	43.3
	> 10 years	55	36.7
Company Scale	Small	40	26.7
	Medium	70	46.7
	Large	40	26.6

The table shows that the majority of respondents were male and within the productive age range of 30–49 years. In terms of education, most respondents held a bachelor's degree, reflecting sufficient academic qualifications to manage human resources and support innovation strategies. Work experience was relatively diverse, with most respondents having 5–10 years of tenure, suggesting a solid understanding of HRM practices in their organizations. Company scale was distributed fairly evenly, though medium-sized firms dominated the sample. These characteristics indicate that the respondents were representative for examining the influence of HRM, HCD, and innovation adoption on firm performance in the ornamental plant industry of East Java.

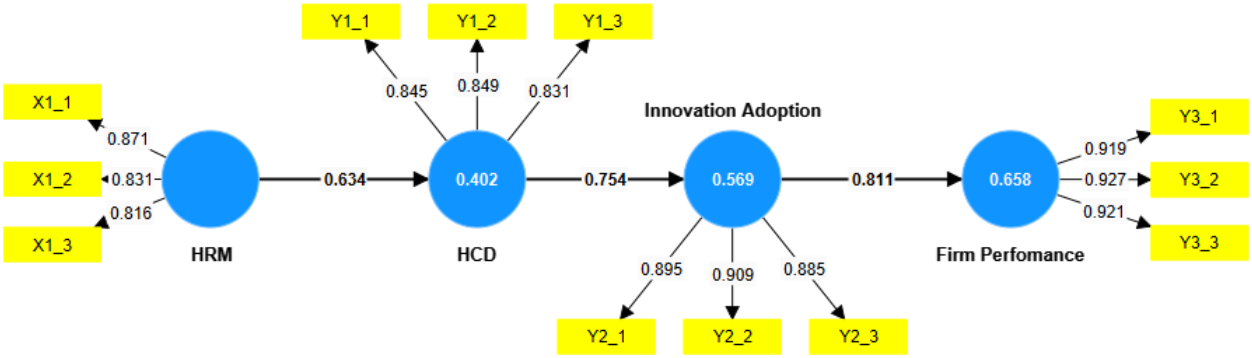

Figure 2. SEM Analysis Results

Structural model analysis was then conducted to test the hypothesized relationships among constructs. Figure 1 presents the estimation results, indicating that all paths were positive, thereby supporting the proposed hypotheses regarding the contribution of exogenous to endogenous variables.

Table 3. Factor Loadings, Reliability, Validity, and Multicollinearity

Variable	Indicator	Loading Factor	CR	AVE	VIF
Human Resource Management (X1)	X1.1	0.871	0.878	0.705	1.750
	X.1.2	0.831			1.665
	X1.3	0.816			1.608
Human Capital Development (Y1)	Y1.1	0.849	0.879	0.708	1.732
	Y1.2	0.845			1.785
	Y1.3	0.831			1.574
Innovation Adaption (Y2)	Y2.1	0.895	0.924	0.803	2.399
	Y2.2	0.909			2.562
	Y2.3	0.885			2.264
Firm Perfomance (Y3)	Y3.1	0.919	0.945	0.851	3.003
	Y3.2	0.921			3.221
	Y3.3	0.927			3.116

The results in Table 3 confirm that all indicators had high factor loadings, establishing their validity in reflecting each construct. Composite reliability and average variance extracted (AVE) values exceeded the accepted thresholds, ensuring internal consistency of the measurement instrument. Variance inflation factor (VIF) scores indicated no multicollinearity, confirming the independence of indicators in the model.

Table 4. Discriminant Validity (Fornell-Larcker Criterion)

Variable	Firm Perfomance	HCD	HRM	Innovation Adoption
Firm Perfomance	0.922			
HCD	0.733	0.842		
HRM	0.627	0.634	0.84	
Innovation Adoption	0.811	0.754	0.587	0.896

As shown in Table 4, the square root of AVE for each construct was greater than its correlation with other constructs. This demonstrates satisfactory discriminant validity, indicating that the constructs are empirically distinct from one another.

Table 5. Model Fit

Criteria	Saturated model	Estimated model
SRMR	0.055	0.093
d_ULS	0.239	0.681
d_G	0.2	0.237
Chi-square	179.323	201.326
NFI	0.856	0.839

Goodness-of-fit indices presented in Table 5 confirm that the proposed structural model meets the required criteria, making it suitable for explaining the hypothesized relationships.

Table 6. Direct Effects among Variables

Path Relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
HCD -> Innovation Adoption	0.754	0.754	0.036	21.117	0.000
HRM -> HCD	0.634	0.635	0.052	12.195	0.000
Innovation Adoption -> Firm Perfomance	0.811	0.811	0.032	25.111	0.000

Table 6 reveals that HRM positively influences HCD, HCD significantly improves innovation adoption, and innovation adoption contributes positively to firm performance. These results demonstrate that effective HRM enhances human capital capacity, which in turn strengthens firms' ability to adopt innovations and achieve better performance outcomes.

Table 7. Indirect Effects

Path Relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
HCD -> Innovation Adoption -> Firm Perfomance	0.612	0.612	0.045	13.482	0.000
HRM -> HCD -> Innovation Adoption -> Firm Perfomance	0.388	0.389	0.049	7.997	0.000
HCD -> Innovation Adoption -> Firm Perfomance	0.612	0.612	0.045	13.482	0.000

The mediation analysis in Table 7 indicates that HCD influences firm performance through innovation adoption. Moreover, HRM affects firm performance indirectly through HCD and subsequently innovation adoption. This confirms that innovation adoption serves as a crucial mediator linking HRM and firm performance.

Table 8. R-square Values

Variable	R-square	R-square adjusted
Firm Perfomance	0.658	0.656
HCD	0.402	0.398
Innovation Adoption	0.569	0.566

Finally, Table 8 presents the coefficient of determination (R^2). The results show that firm performance can be substantially explained by HCD and innovation adoption, while both constructs are adequately explained by their antecedents. This demonstrates the strong explanatory power of the proposed research model.

Discussion

The findings of this study indicate that human resource management (HRM) has a positive effect on human capital development (HCD). HRM practices such as selective recruitment, continuous training, and fair reward systems enhance employees' technical, managerial, and soft skills. This result supports the Resource-Based View (Barney, 1991), which emphasizes that well-managed human resources can become a source of competitive advantage, and is consistent with (Hamadamin & Atan, 2019), who confirmed the contribution of HRM to the quality of human capital. Within the context of ornamental plant companies in Surabaya and Malang, effective HRM provides a critical foundation for strengthening employee capabilities.

The study also finds that HCD significantly influences innovation adoption. This result reinforces Absorptive Capacity Theory (Knoppen et al., 2022), which posits that the quality of human capital determines an organization's ability to identify, assimilate, and apply new innovations. In line with (Blanka et al., 2022; Muduli & Choudhury, 2024), the findings show that employees' technical and managerial competencies play an important role in accelerating the adoption of new technologies—particularly relevant for the ornamental plant agribusiness, where firms must adapt quickly to developments in cultivation techniques, processing, and supply chain management.

Furthermore, the results demonstrate that innovation adoption has a positive and significant effect on firm performance. This finding is consistent with Dynamic Capabilities Theory, which emphasizes that firms achieving sustainable competitive advantage are those capable of sensing opportunities, seizing innovations, and reconfiguring resources in response to environmental changes (Bari et al., 2022). In line with previous empirical studies (Heenkenda et al., 2022; Mady et al., 2023), the findings indicate that firms with higher levels of innovation adoption tend to achieve superior productivity, improved product quality, and stronger competitive positioning.

More specifically, respondents in the ornamental plant industry were likely referring to process, marketing, and organizational innovations. Process innovations include the adoption of efficient irrigation systems, improved fertilization techniques, and standardized cultivation practices, which enhance plant quality while reducing water and input use, thereby supporting resource efficiency and SDG 6 (Clean Water and Sanitation). Marketing innovations, such as the use of digital platforms, e-commerce channels, and social media branding, expand market access and improve sales performance without substantially increasing physical resource consumption. In addition, organizational and distribution-related innovations, including better logistics planning, eco-friendly packaging, and waste reduction practices, contribute to lower environmental impacts and align with SDG 12 (Responsible Consumption and Production). Collectively, these forms of innovation not only improve short-term financial performance but also strengthen long-term business sustainability by enhancing operational efficiency, environmental responsibility, and market resilience in the ornamental plant agribusiness sector.

Beyond the direct effects, the study confirms indirect relationships: HRM influences firm performance through HCD and innovation adoption. This result supports the Knowledge-Based View (Nguyen & Dao, 2023), which argues that human capital serves as a critical knowledge resource mediating the link between HRM and organizational performance. Consistent with (Cui & Diwu, 2024), the study highlights that developing human capital enhances innovation capability, which subsequently improves performance. Thus, effective HRM not only generates direct outcomes but also creates a chain effect through strengthened human capacity and innovation adoption.

Theoretically, this study contributes by integrating RBV, absorptive capacity, dynamic capabilities, and KBV into one comprehensive framework explaining the interplay of HRM, HCD, innovation adoption, and

performance. The findings underline that organizational success depends not only on HRM practices but also on how these practices develop human capital and stimulate innovation. Practically, the study provides guidance for ornamental plant companies in Surabaya and Malang to invest in structured HRM systems, strengthen human capital development, and accelerate both technological and managerial innovation. These strategies enable firms to improve productivity, maintain product quality, and ensure long-term sustainability in increasingly competitive markets.

Conclusion

This study examined the influence of human resource management (HRM) on human capital development (HCD), innovation adoption, and firm performance in ornamental plant companies in Surabaya and Malang, based on data from 150 HR managers. The findings demonstrate that effective HRM practices significantly enhance human capital quality, which subsequently strengthens firms' capacity to adopt innovation. Innovation adoption, in turn, positively affects firm performance, particularly in terms of productivity, product quality, and long-term business sustainability. Furthermore, HCD and innovation adoption function as critical mediating mechanisms through which HRM contributes to superior organizational outcomes.

From a theoretical perspective, this study advances strategic management and agribusiness literature by integrating the Resource-Based View, Knowledge-Based View, and Dynamic Capabilities into a unified framework that explains how HRM indirectly influences firm performance through human capital and innovation pathways. The findings highlight that organizational success in agribusiness is shaped not merely by HRM practices in isolation, but by their ability to systematically develop human capital and foster adaptive innovation capabilities.

From a practical and policy-oriented perspective, the results suggest several actionable implications. For policymakers, particularly agricultural extension agencies and local governments, integrating strategic HRM and innovation management modules into agribusiness training and extension programs can enhance workforce quality and innovation readiness, thereby supporting SDG 8 (Decent Work and Economic Growth). Industry associations and cooperatives in the ornamental plant sector can facilitate collective training, certification programs, and knowledge-sharing platforms to accelerate the diffusion of innovation and promote sustainable production practices aligned with SDG 12 (Responsible Consumption and Production). At the firm level, agribusiness owners are encouraged to formalize HRM systems, invest in continuous skill development, and adopt process, marketing, and organizational innovations to strengthen competitiveness and business resilience.

Despite its contributions, this study has several limitations. The cross-sectional research design limits the ability to capture dynamic changes in HRM practices, innovation adoption, and performance over time. Future research is therefore encouraged to employ longitudinal designs to examine the long-term effects of innovation adoption on firm performance. Additionally, expanding the study to other agribusiness subsectors and regions would enhance the generalizability of the findings and provide deeper insights into the role of strategic HRM in supporting sustainable agricultural development.

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References

Armstrong, M. (2016). *Armstrong's Handbook of Reward Management Practice*. Kogan Page.

Armstrong, M., & Taylor, S. (2020). *Armstrong's Handbook of Human Resource Management Practice* (15th ed.). Kogan Page.

Atif, S., Ahmed, S., Wasim, M., Zeb, B., Pervez, Z., & Quinn, L. (2021). Towards a conceptual development of industry 4.0, servitisation, and circular economy: A systematic literature review. *Sustainability (Switzerland)*, *13*(11). https://doi.org/10.3390/su13116501

Bari, N., Chimhundu, R., & Chan, K. C. (2022). Dynamic Capabilities to Achieve Corporate Sustainability: A Roadmap to Sustained Competitive Advantage. *Sustainability (Switzerland)*, *14*(3). https://doi.org/10.3390/su14031531

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120.

Becker, G. S. (1993). *Human Capital: A Theoretical and Empirical Analysis, with special reference to education*.

Blanka, C., Krumay, B., & Rueckel, D. (2022). The interplay of digital transformation and employee competency: A design science approach. *Technological Forecasting and Social Change*, *178*(February), 121575. https://doi.org/10.1016/j.techfore.2022.121575

Blom, R., Kruyen, P. M., Van der Heijden, B. I. J. M., & Van Thiel, S. (2020). One HRM Fits All? A Meta-Analysis of the Effects of HRM Practices in the Public, Semipublic, and Private Sector. *Review of Public Personnel Administration*, *40*(1), 3–35. https://doi.org/10.1177/0734371X18773492

Bogetoft, P., Kroman, L., Smilgins, A., & Sørensen, A. (2024). Innovation strategies and firm performance. *Journal of Productivity Analysis*, *62*(2), 175–196. https://doi.org/10.1007/s11123-024-00727-1

BPS Jawa Timur. (2024). *Luas Panen Tanaman Hias Menurut Jenis Tanaman di Provinsi Jawa Timur, 2024*.

Chin, W. W. (2010). How to Write Up and Report PLS Analyses. In V. Esposito Vinzi, W. W. Chin, J. Henseler, & H. Wang (Eds.), *Handbook of Partial Least Squares: Concepts, Methods and Applications* (pp. 655–690). Springer. https://doi.org/10.1007/978-3-540-32827-8_29

Crook, T. R., Todd, S. Y., Combs, J. G., Woehr, D. J., & Jr., D. J. K. (2011). Does human capital matter? A meta-analysis of the relationship between human capital and firm performance. *Journal of Applied Psychology*, *96*(3), 443–456.

Cui, Z., & Diwu, S. (2024). Human capital upgrading and enterprise innovation efficiency. *Finance Research Letters*, *65*, 105628. https://doi.org/https://doi.org/10.1016/j.frl.2024.105628

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, *34*(3), 555–590.

Damanpour, F., & Schneider, M. (2006). Phases of the adoption of innovation in organizations: Effects of environment, organization and top managers. *British Journal of Management*, *17*(3), 215–236.

Delery, J. E., & Roumpi, D. (2017). Strategic human resource management, human capital and competitive advantage: is the field going in circles? *Human Resource Management Journal*, *27*(1), 1–21. https://doi.org/https://doi.org/10.1111/1748-8583.12137

Dessler, G. (2020). *Human Resource Management* (16th ed.). Pearson.

Donate, M. J., Peña, I., & Sánchez de Pablo, J. D. (2016). HRM practices for human and social capital development: effects on innovation capabilities. *The International Journal of Human Resource Management*, *27*(9), 928–953. https://doi.org/10.1080/09585192.2015.1047393

Gupta, K. (2022). Impact of knowledge-based HRM practices on organizational performance: Mediating effect of intellectual capital. *International Journal of Knowledge Management*, *18*(1), 1–22. https://doi.org/10.4018/IJKM.290026

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Sage Publications.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). Sage Publications.

Hamadamin, H. H., & Atan, T. (2019). The impact of strategic human resource management practices on competitive advantage sustainability: The mediation of human capital development and employee commitment. *Sustainability (Switzerland)*, *11*(20). https://doi.org/10.3390/su11205782

Heckman, J. J., & Kautz, T. (2012). Hard evidence on soft skills. *Labour Economics*, *19*(4), 451–464.

Heenkenda, H. M. J. C. B., Xu, F., Kulathunga, K. M. M. C. B., & Senevirathne, W. A. R. (2022). The Role of Innovation Capability in Enhancing Sustainability in SMEs: An Emerging Economy Perspective. *Sustainability (Switzerland)*, *14*(17). https://doi.org/10.3390/su141710832

Ibojo, B. O., & Akinade, M. E. (2024). Human Resource Development and Employees Performance: A Theoretical Review. *IIARD International Journal of Economics and Business Management*, *9*(9), 110–121. https://doi.org/10.56201/ijebm.v9.no9.2023.pg110.121

Kaplan, R. S., & Norton, D. P. (1996). *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business School Press.

Kaplan, R. S., & Norton, D. P. (2004). *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*. Harvard Business School Press.

Kimseng, T., Javed, A., Jeenanunta, C., & Kohda, Y. (2020). Applications of fuzzy logic to reconfigure human resource management practices for promoting product innovation in formal and non-formal R&D Firms. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(2). https://doi.org/10.3390/JOITMC6020038

Knoppen, D., Saris, W., & Moncagatta, P. (2022). Absorptive capacity dimensions and the measurement of cumulativeness. *Journal of Business Research*, *139*, 312–324. https://doi.org/https://doi.org/10.1016/j.jbusres.2021.09.065

Lepak, D. P., & Snell, S. A. (1999). The human resource architecture: Toward a theory of human capital allocation and development. *Academy of Management Review*, *24*(1), 31–48.

López-Cabarcos, M. Á., Göttling-Oliveira-Monteiro, S., & Vázquez-Rodríguez, P. (2015). Organizational Capabilities and Profitability: The Mediating Role of Business Strategy. *SAGE Open*, *5*(4). https://doi.org/10.1177/2158244015616852

Mady, K., Battour, M., Aboelmaged, M., & Abdelkareem, R. S. (2023). Linking internal environmental capabilities to sustainable competitive advantage in manufacturing SMEs: The mediating role of eco-innovation. *Journal of Cleaner Production*, *417*, 137928. https://doi.org/https://doi.org/10.1016/j.jclepro.2023.137928

Milkovich, G. T., Newman, J. M., & Gerhart, B. (2019). *Compensation* (12th ed.). McGraw-Hill Education.

Modgil, S., Singh, R. K., & Agrawal, S. (2025). Developing human capabilities for supply chains: an industry 5.0 perspective. In *Annals of Operations Research* (Vol. 348, Issue 3). Springer US. https://doi.org/10.1007/s10479-023-05245-1

Muduli, A., & Choudhury, A. (2024). Exploring the role of workforce agility on digital transformation: a systematic literature review. *Benchmarking: An International Journal*, *32*(2), 492–512. https://doi.org/10.1108/BIJ-02-2023-0108

Nguyen, D. T., & Dao, T. K. (2023). The mediating role of innovation in the relationship between high-performance human resource management practices and firm performance. *Heliyon*, *9*(12), e22720. https://doi.org/10.1016/j.heliyon.2023.e22720

Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2021). *Fundamentals of Human Resource Management* (9th ed.). McGraw-Hill Education.

O'Donovan, D. (2019). *HRM in the Organization: An Overview BT - Management Science: Foundations and Innovations* (C. Machado & J. P. Davim, Eds.; pp. 75–110). Springer International Publishing. https://doi.org/10.1007/978-3-030-13229-3_4

Oeij, P. R. A., Hulsegge, G., Preenen, P. T. Y., Somers, G., & Vos, M. (2022). Firm Strategies and Managerial Choices to Improve Employee Innovation Adoption in the Logistics Industry. *Journal of Innovation Management*, *10*(1), 76–98. https://doi.org/10.24840/2183-0606_010.001_0005

Pedraza-Rodríguez, J. A., Ruiz-Vélez, A., Sánchez-Rodríguez, M. I., & Fernández-Esquinas, M. (2023). Management skills and organizational culture as sources of innovation for firms in peripheral regions. *Technological Forecasting and Social Change*, *191*(January). https://doi.org/10.1016/j.techfore.2023.122518

Piwowar-Sulej, K. (2021). Core functions of Sustainable Human Resource Management. A hybrid literature review with the use of H-Classics methodology. *Sustainable Development*, *29*(4), 671–693. https://doi.org/10.1002/sd.2166

Porter, M. E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press.

Prajogo, D. I., & Sohal, A. S. (2006). The integration of TQM and technology/R&D management in determining quality and innovation performance. *Omega*, *34*(3), 296–312.

Prikshat, V., Islam, M., Patel, P., Malik, A., Budhwar, P., & Gupta, S. (2023). AI-Augmented HRM: Literature review and a proposed multilevel framework for future research. *Technological Forecasting and Social Change*, *193*(September 2022). https://doi.org/10.1016/j.techfore.2023.122645

Pundziene, A., Nikou, S., & Bouwman, H. (2021). The nexus between dynamic capabilities and competitive firm performance: the mediating role of open innovation. *European Journal of Innovation Management*, *25*(6), 152–177. https://doi.org/10.1108/EJIM-09-2020-0356

Rasool, S. F., Samma, M., Wang, M., Zhao, Y., & Zhang, Y. (2019). How human resource management practices translate into sustainable organizational performance: the mediating role of product, process

and knowledge innovation. *Psychology Research and Behavior Management*, *12*, 1009–1025. https://doi.org/10.2147/PRBM.S204662

Rehman, M., Mahmood, K., & Cheema, S. M. (2020). International Journal of Management Research and Emerging Sciences. *International Journal*, *8*(1), 1–8.

Robles, M. M. (2012). Executive perceptions of the top 10 soft skills needed in today's workplace. *Business Communication Quarterly*, *75*(4), 453–465.

Rogers, E. M. (2003a). *Diffusion of Innovations* (5th ed.). Free Press.

Rogers, E. M. (2003b). *Diffusion of Innovations, 5th Edition*. Free Press.

Shao, H., Jin, Q., Guo, Y., Zhou, F., Wider, W., & Lu, L. (2025). The relationship between the structure of firms' human capital and corporate innovation performance. *PLoS ONE*, *20*(4 April), 1–21. https://doi.org/10.1371/journal.pone.0321388

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, *18*(7), 509–533. https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington Books.

Venkatraman, N., & Ramanujam, V. (1986). Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*, *11*(4), 801–814.

Wang, Z., Cai, S., Liang, H., Wang, N., & Xiang, E. (2021). Intellectual capital and firm performance: the mediating role of innovation speed and quality. *The International Journal of Human Resource Management*, *32*(6), 1222–1250. https://doi.org/10.1080/09585192.2018.1511611

Wright, P. M., & McMahan, G. C. (2011). Exploring human capital: Putting "human" back into strategic human resource management. *Human Resource Management Journal*, *21*(2), 93–104.