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The Role of Human Resource Development in Driving Product Innovation among White Iron Handicraft MSMEs in Ternate City

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Abstract: This study examines the effect of human resource development (HRD) on product innovation advancement among micro, small, and medium enterprises (MSMEs) in the white iron handicraft sector in Ternate City. Using a quantitative approach with simple linear regression analysis, the research investigates whether HRD initiatives such as technical training, skill enhancement, and entrepreneurship development contribute significantly to improving product innovation. The findings reveal that HRD has a positive but not statistically significant effect on product innovation, indicating that current HRD efforts have not yet yielded substantial innovation outcomes. This condition reflects that existing training and capacity-building programs are not yet integrated with the actual production needs and innovation dynamics of MSMEs. The study further highlights that other factors, including managerial capability, technological access, market orientation, and institutional support, play a greater role in determining innovation performance. Based on these findings, it is recommended that HRD programs be designed based on real field needs (demand-driven), supported by continuous mentoring, and strengthened through collaboration between government institutions, universities, and the private sector. Theoretically, this study reinforces the view that HRD is an essential foundation for innovation but requires a supportive ecosystem to produce measurable outcomes. Practically, it provides insights for policymakers and development agencies to formulate more targeted and context-based HRD strategies for MSME innovation enhancement.

Keywords: *Human Resource Development; Product Innovation; MSMEs; White Iron Handicraft; Ternate City*.

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I. INTRODUCTION

The creative industry currently plays an important role in addressing various economic issues such as poverty and unemployment. The Indonesian government has demonstrated a strong commitment to fostering a conducive climate for the growth of the creative economy through various strategic policies. One of these initiatives is the mapping of the creative industry conducted by the Ministry of Trade in 2007, which categorized the sector into 16 subsectors, including advertising, architecture, art markets, crafts, design, fashion, film, music, and culinary arts (Reniati, 2016). This policy was later reinforced by Presidential Regulation No. 72 of 2015, which revised the structure into 17 creative industry subsectors and strengthened the Creative Economy Agency as the main driver of this sector's development.

In facing an increasingly competitive and dynamic business environment, the creative industry must be able to adapt through appropriate strategies and innovations. As stated by Saqib et al. (2019), a company's ability to develop supply chain management strategies is key to business sustainability amid global uncertainty. The presence of handicraft industries, such as the white iron handicraft industry in Ternate City, not only provides economic value but also enhances social and cultural identity. Therefore, the government's role in facilitating the development of MSMEs in the creative sector is essential, particularly through training, capital assistance, and institutional support (Putra, 2022).

However, the advancement of the creative industry does not solely depend on policy support but also on the capacity and quality of human resources. Factors such as entrepreneurial ability, motivation, and work environment are key determinants of business development success (Dyan & Husni, 2019). In this regard, human resource development (HRD) becomes a strategic aspect that can drive improvements in product innovation capabilities. Setiawan

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(2019) found that HR training and education significantly influence product innovation capabilities in Bandung City, while Nugroho and Wibowo (2020) emphasized the importance of technological mastery and the adaptability of human resources to market changes and design trends.

Similarly, Zhang and Li (2021) asserted that investment in HR development directly enhances product innovation performance among SMEs, particularly through improved technical competence and creativity. Sung and Choi (2022) further noted that an organizational learning culture managed through HRD programs can strengthen sustainable innovation. In a broader context, Aslam et al. (2023) highlighted that innovative HR management practices have a positive correlation with corporate innovation performance in developing economies.

Most previous studies on the relationship between HR development and product innovation have focused on large industrial zones or MSME centers in Java and other major cities in Indonesia. Research in local contexts, such as the white iron handicraft MSMEs in Ternate City, remains very limited. In fact, this sector possesses distinctive characteristics in terms of culture, resources, and market potential that can be further developed through appropriate HR strengthening and product innovation strategies. Therefore, this study seeks to examine the extent to which HR development contributes to promoting product innovation among white iron handicraft MSMEs in Ternate City.

II. METHOD

This study aims to examine the influence of human resource development on the progress of product innovation among white iron handicraft MSMEs in Ternate City. The focus of the research is directed toward white iron craftsmen in the Gamalama area, Central Ternate District, which serves as the main production center for the region's distinctive metal crafts. The white iron handicraft MSMEs play a crucial role not only in preserving local cultural identity but also in strengthening the creative economy within the community. Therefore, improving human resource capacity is essential in fostering product innovation that can compete in wider markets.

This study employs a quantitative approach, selected based on the research objective to measure the relationship and influence between human resource development as the independent variable and product innovation as the dependent variable. Through this approach, the researcher aims to obtain objective and measurable data so that the results can provide an empirical picture of the extent to which human resource development contributes to product innovation progress among white iron craft MSME actors in Ternate City.

The population of this study consists of all white iron craftsmen in Gamalama, Central Ternate District, totaling 23 home-based artisans. According to Sugiyono (2018), when the number of research subjects is fewer than 100, it is recommended to use the entire population as respondents, meaning that this study adopts a census method. Thus, all 23 craftsmen are included as respondents to ensure that the findings accurately reflect the actual conditions of all white iron craft business actors in the area.

Data analysis in this study employs a simple linear regression method to determine the extent to which human resource development influences product innovation. This method is considered appropriate since the study involves only two main variables, the independent variable and the dependent variable. The regression analysis helps identify the direction and significance of the relationship between these two variables.

Operationally, human resource development in this study is understood as a long-term educational process conducted systematically and organizationally, through which individuals acquire and develop conceptual knowledge and practical skills to improve their performance within an organization. Human resource development includes increasing work motivation, cultivating productive personality traits, and enhancing job-relevant skills (Hasibuan, 2019). Meanwhile, product innovation is defined as an individual's or organization's ability to create, introduce, and implement new ideas into products, services, or processes that are perceived as new by users or target markets. Even if an idea has existed previously, it can still be considered an innovation if it is perceived as new by users (Kotler & Keller, 2016).

III. RESULTS

A. Hypotheses Test Result

The testing was conducted by comparing the calculated t-value (t_{count}) with the critical t-value (t_{table}) at a significance level of $\alpha = 0.05$. If the calculated t-value exceeds the critical t-value and the significance value (Sig.) is less than 0.05, it can be concluded that the independent variable has a significant effect on the dependent variable. Conversely, if the calculated t-value is smaller than the critical t-value and the significance value is greater than 0.05, the variable does not have a significant effect on the dependent variable.

This criterion follows the general statistical testing principles in regression analysis, where the significance of coefficients is determined by the t-test to evaluate whether the predictor variable provides a meaningful contribution to the dependent variable (Hair et al., 2020; Sekaran & Bougie, 2019). Moreover, according to Creswell (2018), the t-test is used to assess hypotheses regarding population means or relationships between variables by comparing sample-based estimates against theoretical distributions under the null hypothesis.

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Table 1. T-Test Result

T-Hitung	T-Tabel	Sig
1.383	1.717	0.181

Source: Data Processed, 2025

Table 1 presents the results of the t-test used to examine the effect of human resource development on product innovation among white iron handicraft MSMEs in Ternate City. The statistical output shows that the calculated t-value (t_{count}) is 1.383, while the critical t-value (t_{table}) at the 0.05 significance level is 1.717, with a significance (Sig.) value of 0.181. Since the calculated t-value is lower than the critical t-value and the significance level exceeds 0.05, it can be concluded that the independent variable—human resource development—does not have a statistically significant effect on the dependent variable, namely product innovation.

This finding indicates that improvements in human resource development, as implemented among the observed MSME craftsmen, have not yet resulted in measurable advancements in product innovation. The result may be influenced by several contextual factors, such as limited access to advanced training programs, low technological adoption, or insufficient knowledge transfer mechanisms within small-scale enterprises (Aboelmaged, 2021; López-Cabarcos et al., 2022).

In quantitative analysis, a t-value below the critical threshold suggests that the null hypothesis cannot be rejected, implying that there is no significant linear relationship between the studied variables (Hair et al., 2020). As emphasized by Sekaran and Bougie (2019), a significance value greater than 0.05 indicates insufficient empirical evidence to confirm a meaningful effect, even though practical or contextual implications may still exist. Therefore, while the statistical evidence shows an insignificant effect, qualitative factors such as skill enhancement, motivation, and creativity may still play indirect roles in supporting innovation outcomes within these MSMEs.

B. Coefficient of Determination

The coefficient of determination (R^2) ranges between 0 and 1, indicating the proportion of variance in the dependent variable that can be explained by the independent variable. The closer the R^2 value is to 1, the greater the explanatory power of the independent variable in predicting changes in the dependent variable. Conversely, when the R^2 value approaches 0, it suggests that the independent variable explains only a small portion of the variation in the dependent variable, with the remaining variance influenced by factors outside the research model.

According to Hair et al. (2020), an R^2 value that is closer to 1 signifies a strong model fit and indicates that most of the variance in the dependent variable is accounted for by the predictor variable(s). Meanwhile, a low R^2 implies that other unobserved variables or external conditions may contribute more significantly to the observed outcomes. Similarly, Henseler et al. (2016) emphasize that while R^2 is an important indicator of model explanatory power, it should be interpreted alongside other statistical indicators such as effect size and predictive relevance to ensure a comprehensive evaluation of the model's validity.

In the context of social and management research, moderate R^2 values are common due to the complexity of human behavior and external environmental factors that influence outcomes (Hair et al., 2021). Therefore, while a high R^2 is desirable, even a modest value can provide meaningful insights, especially in exploratory research involving micro, small, and medium enterprises (MSMEs), where variability is often affected by multiple non-measurable aspects such as creativity, motivation, and leadership style.

Table 2. R-Square

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.289[a]	0.083	0.04	6.711

Source: Data Processed, 2025

The coefficient of determination (R Square) value of 0.083 indicates that the human resource development variable explains 8.3% of the variation in product innovation progress. Meanwhile, the remaining 91.7% is explained by other factors outside the research model, such as managerial ability, technological support, business capital, design creativity, and business environmental factors. The Adjusted R Square value of 0.040 suggests that after adjusting for the number of variables and research samples, the model's ability to explain the variation in the dependent variable slightly decreased but remained within a low explanatory category.

C. Regression

The results of a simple linear regression analysis between human resource development (HRD) as the independent variable (X) and product innovation as the dependent variable (Y) among white iron handicraft MSMEs in Ternate City produced the following regression equation:

$$Y = 53.083 + 0.287X$$

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This equation can be interpreted as follows:

The constant value (53.083) indicates that when there is no human resource development (X = 0), the predicted value of product innovation (Y) is 53.083. This suggests that even without HRD efforts, the level of product innovation remains at that level, possibly due to other influencing factors such as work experience, production traditions, or individual creativity.

The positive regression coefficient of 0.287 implies that for every one-unit increase in human resource development, product innovation increases by 0.287 units. This means that the relationship between the two variables is positive, indicating that improvements in HRD are associated with greater levels of innovation. However, it is important to consider the significance level to determine whether this relationship is statistically meaningful.

According to Gujarati and Porter (2009), a positive regression coefficient suggests that changes in the independent variable lead to changes in the dependent variable in the same direction. In this context, HRD plays a crucial role in enhancing workers' skills, knowledge, and attitudes, which in turn supports the creation and implementation of innovative ideas in product development. Similarly, Armstrong and Taylor (2020) emphasize that effective human resource development strategies such as training, competency improvement, and skill upgrading are essential in stimulating innovation and improving organizational performance.

IV. DISCUSSION

The findings of this study reveal that human resource development (HRD) efforts undertaken by white iron handicraft MSMEs in Ternate City have not yet produced a significant impact on the advancement of product innovation. Although the relationship between HRD and innovation shows a positive direction, its influence remains weak. This suggests that existing training and capacity-building programs have not been able to transform individual skills into meaningful innovation capabilities.

In traditional craft industries such as white iron handicrafts, HRD is often narrowly perceived as a technical intervention focused primarily on improving manual skills or production techniques. However, as Armstrong and Taylor (2020) argue, HRD should function as a strategic, long-term process aimed at developing capability and an innovative mindset aligned with market and technological changes. When training is limited to operational aspects without fostering creativity, critical thinking, and collaborative problem-solving, it tends to fail in generating sustainable innovation outcomes.

The study also indicates a structural gap between individual competence development and the innovation ecosystem required to support creative transformation. Many artisans possess adequate technical skills but lack access to enabling environments that facilitate design exploration, market research, or technological experimentation. Damanpour and Aravind (2012) emphasize that product innovation emerges from the dynamic interaction among human resources, organizational structures, and environmental factors. In the case of Ternate's MSMEs, insufficient technological infrastructure, limited financial access, and weak collaborative networks hinder artisans' potential to convert skills into innovative products.

From a cultural standpoint, most white iron artisans still adhere to traditional production patterns that prioritize heritage preservation over creative renewal. While maintaining authenticity and cultural identity is crucial, such conservatism can restrict the scope of innovation. True innovation in this context requires a balanced approach, preserving tradition while introducing adaptive design and modern techniques. Teece (2018) underscores that small enterprises must cultivate dynamic capabilities, the ability to integrate, adapt, and reconfigure competencies in response to environmental changes. For the white iron craft sector, this means nurturing both cultural sensitivity and business agility.

Another challenge evident from the findings is the lack of continuity in HRD practices. Training programs are often episodic, poorly documented, and rarely followed by post-training reflection or evaluation. As a result, knowledge acquired at the individual level does not accumulate into collective organizational learning. According to Nonaka and Takeuchi (1995), innovation thrives when individual knowledge is transformed into shared organizational knowledge through socialization, externalization, and internalization processes. In the context of small enterprises, strengthening collective learning is therefore vital for sustaining innovation.

These insights call for a paradigm shift in MSME development policy. Government agencies and support institutions should move beyond isolated skill-based training toward contextual and participatory HRD models. Capacity-building programs need to be embedded within a broader innovation ecosystem that connects artisans with knowledge sources, research institutions, markets, and technology providers. In doing so, HRD becomes not merely an individual intervention but a core component of a systemic innovation framework.

Furthermore, product innovation in the white iron craft sector should be viewed as both a social and economic process. Innovation emerges not only from individual creativity but also from social interaction, trust-based networks, and cross-sector collaboration. When artisans engage in partnerships with universities, research centers, and local markets, innovation naturally evolves through knowledge exchange and co-creation. This aligns with the triple helix model, where the synergy among academia, industry, and government accelerates innovation capacity.

Conceptually, the results reinforce the argument that HRD is a necessary but not sufficient condition for innovation. Its effectiveness depends heavily on the organizational and environmental context in which it operates. As Teece (2018) and Armstrong and Taylor (2020) suggest, HRD must be

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complemented by dynamic learning mechanisms, supportive institutional frameworks, and opportunities for experimentation. In this sense, MSME development in traditional industries like Ternate's white iron crafts should adopt a human-centered innovation approach, one that places people's creativity, local wisdom, and adaptive learning at the heart of innovation.

Ultimately, human resource development oriented toward innovation must seek a balance between preserving local cultural values and responding to global market dynamics. The white iron craft industry of Ternate holds great potential to become a symbol of locally rooted creative economy, provided it is supported by adaptive human resources, collaborative learning systems, and regionally aligned innovation policies. Through such integration, HRD can evolve from an administrative function into a strategic driver of innovation, competitiveness, and regional economic resilience.

V. CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that human resource development (HRD) has not had a significant effect on product innovation advancement among white iron handicraft MSMEs in Ternate City. Although the relationship between the two variables shows a positive tendency, current HRD efforts have not yet resulted in a substantial improvement in the innovative capacity of business actors. This condition indicates that the training and capacity-building programs implemented thus far have not been fully aligned with the real needs of the sector and have not been supported by a continuous mentoring mechanism or a strong institutional framework.

To enhance the impact of HRD on innovation, a more strategic and context-sensitive approach is required. Training programs for MSME actors should be designed based on actual needs assessment at the field level rather than on standardized government agendas. The training materials should cover technical skills directly related to the production process, such as design innovation, finishing techniques, raw material efficiency, and the use of modern tools appropriate for small-scale businesses. This demand-driven training approach would make the outcomes more applicable and directly beneficial to product innovation.

Furthermore, training activities should be complemented by ongoing mentoring mechanisms to ensure that participants can effectively apply the knowledge gained. Field mentors who understand the local industrial context can help MSME actors overcome technical and managerial challenges in production and marketing processes.

Such mentoring schemes can be facilitated by the Department of Cooperatives and MSMEs in collaboration with local universities or research institutions, enabling capacity development to take place systematically and sustainably.

The local government also plays a crucial role in fostering a conducive innovation ecosystem through enhanced collaboration among business actors, academia, and the private sector. Universities can contribute to research in design development, material innovation, and production digitalization, while the private sector can provide support in marketing, financing, and distribution network expansion. This cross-sectoral collaboration would accelerate the innovation transformation process among MSMEs and strengthen the competitiveness of local products.

In addition, the local government is encouraged to provide incentives for MSMEs that successfully introduce innovative products, whether in the form of awards, promotional assistance, or easier access to financing. Strengthening regulations related to the protection of intellectual property rights (IPR) for local crafts is equally important to motivate business actors to produce original and high-value-added products.

Efforts to enhance product innovation should also be accompanied by brand development and digital marketing strategies. MSME actors need to be equipped with skills in professional social media management, digital content creation, and online marketing to enable white iron handicraft products from Ternate to reach wider markets, including tourism and export sectors. Training on product photography, digital promotion, and brand management should therefore be integrated into HRD programs.

For future research, it is recommended to include additional variables that may influence innovation, such as technological support, access to capital, entrepreneurial creativity, organizational culture, or partnership networks. Including these variables would provide a more comprehensive understanding of the determinants of innovation within the MSME sector. Expanding the scope of study to other MSME industries, such as food processing, textiles, or woodcraft, would also allow for cross-sectoral comparisons and the identification of the most effective HRD models suited to different types of enterprises.

Overall, the findings of this study reaffirm that human resource development is a fundamental prerequisite for innovation; however, it remains insufficient if not supported by institutional mechanisms, an enabling innovation ecosystem, and local government policies that promote continuous learning and collaboration among stakeholders. Integrating HRD initiatives within a broader regional innovation ecosystem will be key to strengthening the competitiveness of Ternate's white iron craft MSMEs and fostering a sustainable creative economy in the region.

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