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Increasing Production Efficiency in Handicraft Small Industries in West Java Through the Utilization of Technological Innovation

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ABSTRACT

This study looks at the dynamics of technical innovation adoption and how it affects the productivity of small-scale craft businesses in West Java, Indonesia. A quantitative approach was used to collect data from 110 small craft businesses, including statistical analysis and quantitative surveys. The workforce had high skill levels, moderate levels of technology adoption, and perceived problems such as resistance to change and financial restrictions. These findings were supported by descriptive statistics. Technology use, worker skills, and production efficiency were found to be significantly positively correlated, as evidenced by multiple regression analysis. Differences in adoption patterns between rural and urban industries were revealed through cross tabulation. The results of this study highlight the need for a customized approach, resource distribution and information exchange to enhance technical innovation in the heterogeneous craft industry in West Java.

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1. INTRODUCTION

The craft industry in West Java, Indonesia, plays a vital role in the local and national economy. With a rich cultural heritage and a long-standing tradition of craftsmanship, the small craft industry in West Java contributes significantly to the economic landscape of the region and the country as a whole. The industry's contribution to the national economy is evident in its role as a strong and resilient sector, particularly in the manufacturing industry. The manufacturing industry, including the textile and textile products industry, is a key driver of economic growth and provides a social safety net for residents and workers in West Java [1]. Additionally, the craft industry's contribution to employment opportunities in the region is significant, making it an integral part of the economic fabric of West Java [2].

In the face of global competition and rapidly evolving market dynamics, industries are at a crossroads and need to strategically embrace technological innovations to ensure their continuity and competitiveness. This is because innovation and new technology are widely recognized as major contributors to achieving and sustaining competitive advantage [3]. Traditional production systems based on centralized automation architectures are not adaptable or flexible

enough to meet the increasing demand for product personalization and low production costs. Therefore, industries need to quickly adapt their production systems and migrate towards novel systems characterized by digitalization and robotization [4]. Technological evolution has the potential to create new business models but also poses a threat to old industries and markets. Developing viable strategies requires understanding how markets are changing and participating in economic and value creation processes [5]. The increasing role of innovative and disruptive technologies has stimulated changes in global exports and manufacturing sectors, making knowledge-intensive and innovation-absorbing industries primary drivers of economic growth and competitiveness [6]. In the interconnected world, competitiveness is crucial for firms to survive and grow. Rapidly-growing enterprises are reshaping old business models and challenging industry operating environments, making it important for industries to become learning organizations [7].

The actual adoption and effective utilization of technological innovations in the small craft industry in West Java is still relatively low [8]. This is evident from the research conducted on small industrial craftsmen in West Java, which found that spiritual intelligence and entrepreneurial competence significantly influence the performance of small handicraft industry through innovation. [9] Additionally, the study on digital entrepreneurs in West Java identified factors such as entrepreneurial behavior, skills, educational background, and service quality as drivers of business success. [10] However, the development of cooperatives and micro-small businesses in West Java has not been able to compete with other business entities, especially in utilizing internet technology. [11] Furthermore, the impact of technological innovation in promoting economic development, particularly in the distribution of digitally empowered peer-to-peer lending, has not reached its optimum point in Indonesia. [12] Therefore, there is a need for strategies to encourage the adoption and effective utilization of technological innovations in the small craft industry in West Java.

This study is to investigate the relationship between technical innovation and production efficiency in the particular context of the West Java craft sector. It is driven by the need to comprehend and close this gap. This research is primarily motivated by the need to discover and comprehend the elements that affect the small craft industry's adoption and best use of technological developments. The issues that come up are about how technology is now being adopted, what obstacles stand in the way of its successful use, and how this will affect the industry's ability to produce goods efficiently. The West Javan craft industry, which is well-known for its age-old skills, is currently confronted with the task of skillfully incorporating technology to boost output without sacrificing the core of its cultural legacy. This is a complex task that takes into account labor skills, resource constraints, and the rapidly evolving field of technology breakthroughs.

2. LITERATURE REVIEW

2.1 Technological Innovation in Small Craft Industry

The small craft industry in West Java is gradually embracing technological innovation to improve efficiency and meet consumer expectations while preserving traditional craftsmanship [1], [13]. Traditional production methods that emphasized manual craftsmanship are being integrated with technology to enhance production capabilities [14]. The use of parametric technology and digital transformation in bamboo weaving, for example, has provided new design methods and ideas for the development of bamboo weaving products [15]. Similarly, the application of two-dimensional engraving techniques has improved the visual appearance and aesthetic value of craft products [16]. These studies highlight the transformative potential of technology in the small craft industry, allowing it to adapt to

contemporary market demands while preserving its cultural heritage.

2.2 Factors Influencing the Adoption of Technological Innovations

Understanding the determining factors that shape the adoption of technological innovation in the small craft industry is essential. Internal factors, such as organizational culture, leadership commitments, and workforce skills, are intertwined with external influences, including market demand, regulatory frameworks, and access to technology [17], [18]. The importance of leadership support and organizational readiness in facilitating technology adoption is highlighted in the literature [19]. Additionally, external incentives and support structures play a crucial role in fostering an environment conducive to innovation [20].

2.3 Impact of Technological Innovation on Production Efficiency

Technological innovation has a significant impact on production efficiency in various industries, including the small craft industry. It can lead to efficient production processes, cost reduction, and improved product quality [21], [22]. However, there is a challenge in balancing the incorporation of technology with the preservation of craft authenticity [23]. The literature emphasizes the importance of carefully striking this balance to ensure that technological advancements are aligned with the unique characteristics of the craft sector [24]. By considering the specific needs and requirements of the craft industry, technological innovation can be implemented in a way that enhances production efficiency while maintaining the authenticity and value of craft products [25].

2.4 Challenges of Technology Adoption in Small Craft Industries

Small craft industries face challenges in the adoption of technological innovation. Limited financial resources, lack of skilled labor, and resistance to change are common hurdles [26], [27]. Targeted interventions, including capacity-building initiatives and financial support programs, are needed to facilitate smooth technology integration [28]. Government initiatives and policies play an important role in shaping the technological innovation landscape in the small craft industry [28]. The impact of government-led programs, such as subsidies, training initiatives, and research grants, in promoting technology adoption is significant [29]. The literature emphasizes the need for a supportive policy environment that recognizes the unique needs of the craft sector and provides tailored incentives to encourage technological advancement [30]–[33].

2.5 Theoretical Framework

This study uses a theoretical framework that integrates ideas from organizational change, production management, and innovation theory to comprehend the relationship between technical innovation and production efficiency. A theoretical foundation for comprehending the stages of technology adoption and the variables influencing these stages in the context of the small craft industry may be found in literature on innovation diffusion models, such as the Technology Acceptance Model (TAM) and the Innovation-Decision Process.

3. METHODS

This study employed a quantitative research approach to methodically examine the connection between the small craft industry in West Java's adoption of technological improvements and production efficiency. With the use of a structured survey, numerical data is gathered for this study methodology, allowing statistical analysis to yield insightful findings and empirical conclusions.

An approach known as stratified random sampling was employed to guarantee the sample's representativeness. West Java's small craft enterprises make up the population of interest. Geographical location will be the basis for stratification in order to guarantee fair representation of both urban and rural areas. A balance is maintained between statistical significance and practical feasibility by utilizing a sample size of 110

small craft industries, which is selected by statistical considerations.

3.1 Data Collection

A systematic survey is utilized to gather primary data from important stakeholders within the designated small craft sectors. The purpose of the survey instrument is to gather data on perceived obstacles, production efficiency metrics, and the present state of adoption of technical breakthroughs. To enable thorough and varied data gathering, the survey is delivered electronically, and data collecting will take place over a prearranged period of time.

Both closed-ended and Likert-scale items are included in the survey questionnaire. Quantitative information on factors including labor training, the rate at which technology is adopted, and the perceived advantages and difficulties will be gathered through closed-ended questions. Respondents will be able to express their ideas on a scale using Likert-scale questions, which will give a more nuanced understanding of attitudes and perceptions of technological innovation in the craft industry.

3.2 Data Analysis

Data analysis in the small craft industry was conducted using the Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were used to provide an overview of the data set, including measures of central tendency and dispersion. Inferential statistics, such as regression analysis, were employed to examine relationships between variables, specifically to identify factors affecting production efficiency in the industry. Multiple regression analysis was used to consider the impact of technological innovation while controlling for other relevant variables. Cross-tabulation was utilized to explore relationships between categorical variables, providing insights into technology adoption across different segments of the small craft industry.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

The descriptive statistical analysis offers a thorough summary of the important variables in the dataset and sheds light on the adoption of new technologies, labor skill levels, perceived difficulties, and productivity efficiency in West Java's small craft industries.

The small craft industries studied have a modest level of technology integration, as shown by their mean technology adoption score of 3.75 (on a 5-point scale). A fair amount of variety is indicated by the standard deviation of 0.85, with certain industries adopting technology at higher rates than others. Even while the adoption rate is generally moderate, there is some diversity, which implies that some industries may be good models for successfully integrating technology. Comprehending the elements that contribute to this unpredictability is essential in devising focused tactics to enhance the overall adoption rate.

On a scale of 1 to 5, the average skill level of the workforce is comparatively high, as indicated by its score of 3.92. The examined industries exhibit modest range in skill levels, as indicated by the standard deviation of 0.78. It is promising that the workforce, on average, possesses the abilities needed to interact with and apply technology developments, as seen by the high average skill level. On the other hand, addressing variability is essential to guaranteeing more consistent abilities across sectors.

The three most frequently mentioned difficulties are inadequate access to technology (20%), opposition to change (28%), and financial limitations (35%). The prevailing financial limitations as a primary obstacle highlight the restricted resources encountered by the small-scale craft sector. Targeted initiatives that lessen the financial burden and promote an environment that is receptive to technological change are necessary to overcome these obstacles.

On a scale of 1 to 5, the average production efficiency score of 4.18 denotes a high degree of average production efficiency. The examined industries have a relatively low level of variability in production efficiency, as indicated by the standard deviation of 0.72. An elevated average production efficiency number is a favorable sign, suggesting that

higher production output is linked to technical progress. Low variability suggests a degree of constancy in the efficiency-boosting effects of technology adoption.

4.2 Multiple Regression Analysis

The relationship between worker skill level, production efficiency, and the adoption of technological advancements was investigated using multiple regression analysis. By determining the degree and importance of these correlations, this analysis hopes to improve knowledge of the variables influencing production efficiency in West Java's small craft sector.

Acceptance of Innovation in Technology $P < 0.001$, $\beta = 0.543$ The adoption of technical innovation and production efficiency have a considerable positive association, as indicated by a positive beta coefficient of 0.54. This suggests that West Java's small craft industries tend to become more efficient producers the more technology advancements they incorporate. Given the low p-value ($p < 0.001$), it is exceedingly improbable that this link happened by accident. Level of Labor Skill ($\beta = 0.373$, $p < 0.01$) The worker skill level and production efficiency have a considerable positive association, as indicated by the positive beta coefficient of 0.37. This suggests that production efficiency tends to grow as labor skill levels rise. The relevance of this link is further supported by the low p-value ($p < 0.01$).

The adoption of technological advancements and worker skill levels show positive beta coefficients, suggesting that these variables positively impact production efficiency in West Java's small craft sectors. The size of the coefficients indicates how strong the association is, with labor skill levels having a significantly smaller impact than technical innovation. Technological innovation in small craft businesses usually results in notable increases in production efficiency. While not as much as technological innovation, skilled labor does play a favorable role in manufacturing efficiency.

4.3 Cross-Tabulations

The cross-tabulations show that small craft enterprises in rural and urban areas adopt technological improvements differently. It was discovered that 70% of small craft industries in urban areas had embraced technology at a high pace, 20% had done so moderately, and 10% had done so slowly. On the other hand, significant technology adoption was reported by 40% of small craft businesses in rural areas, moderate adoption by 30%, and poor adoption by 30%. These findings suggest that urban small craft businesses have embraced technology more quickly than their rural counterparts.

The cross-tabulation demonstrates how rural and urban small craft businesses use new technologies in diverse ways. The majority of urban industries have embraced technology at rapid rates, suggesting a greater inclination to incorporate advances into their production procedures. Conversely, the adoption of technology in rural industries follows a less consistent trend, with a significant fraction exhibiting intermediate and low levels.

Small, urban craft firms that stand to gain from better infrastructure and resource accessibility are more likely to embrace technology innovations. The greater rate of high technological adoption suggests a proactive approach to integrating technology into production processes. Small rural artisan enterprises operate in a more diverse setting. While a sizable portion demonstrates high technology adoption, a sizable portion also falls into the moderate and low adoption groups. This suggests that several rural industries are capable of integrating technology and are reasonably equipped to do so.

DISCUSSION

The adoption of technical advancements and production efficiency in West Java's small craft industries are positively correlated, according to the findings. High production efficiency was a result of a skilled workforce and a moderate level of technology adoption in the organizations surveyed. The study revealed

that financial limitations and reluctance to alter were significant obstacles that required focused interventions, like government assistance schemes and industry-wide educational programs. These findings are consistent with previous research [34]–[36].

Geographical research revealed differences in the uptake of new technologies between small craft enterprises in rural and urban areas. Urban sectors typically adopt technology more quickly because they may have better access to resources and infrastructure. This emphasizes how crucial it is to implement policies that support inclusivity in technological growth while catering to the unique requirements of rural businesses.

Implications

The geographical analysis highlights the gap in the adoption of technological innovations between urban and rural small craft industries. This has several implications for policy makers, industry stakeholders, and researchers:

1. Tailored interventions: Recognizing the different needs and challenges of urban and rural industries, interventions should be tailored to address specific contextual factors. Urban areas may benefit from targeted support to maintain their momentum, while rural areas may require focused initiatives to overcome barriers to adoption.
2. Resource Allocation: Policymakers can use these insights to allocate resources more effectively. Urban areas may require investments in advanced technologies and training programs, while rural areas may benefit from initiatives that improve access to technologies and address specific challenges that hinder adoption.
3. Knowledge Sharing: Facilitating knowledge sharing between urban and rural industries can contribute to a more balanced and equitable technology landscape. Successful case studies from urban areas can serve as models for rural industries, fostering a collaborative ecosystem within the craft sector.

5. CONCLUSION

This study contributes valuable insights into the intricate relationships between technological innovation, workforce skills, and production efficiency within West Java's small craft industries. The moderate level of technological adoption, coupled with high workforce skills, signifies a promising foundation for enhanced production efficiency. The identified challenges, including financial constraints and resistance to change, underscore the complexity of integrating technology into traditional craft practices.

The multiple regression analysis provides robust evidence of the positive impact of both technological adoption and workforce skills on production efficiency. Policymakers and industry stakeholders can leverage these findings to formulate targeted interventions, addressing specific challenges and promoting a conducive environment for innovation.

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