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# BUILDING ORGANIZATIONAL EXCELLENCE THROUGH KNOWLEDGE SHARING AND INNOVATION: THE CENTRAL ROLE OF COMPETITIVE ADVANTAGE IN UNCERTAIN MANUFACTURING CONTEXTS

## *CONSTRUINDO A EXCELÊNCIA ORGANIZACIONAL ATRAVÉS DO COMPARTILHAMENTO DE CONHECIMENTO E DA INOVAÇÃO: O PAPEL CENTRAL DA VANTAGEM COMPETITIVA EM CONTEXTOS DE FABRICAÇÃO INCERTOS*

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**Abstract**
Purpose This study investigates the impact of knowledge sharing, innovation, environmental uncertainty, and quality culture on competitive advantage and manufacturing industry performance. It also examines how competitive advantage mediates the relationship between these factors and company performance. Grounded in theories of knowledge sharing, innovation, environmental uncertainty, and quality culture, this research develops a model incorporating these variables alongside competitive advantage and company performance. The relationships were analyzed quantitatively using Structural Equation Modeling (SEM) with Partial Least Squares (PLS) 4.0. The study focuses on large and medium-sized manufacturing companies in Southeast Sulawesi, Indonesia. A total of 143 questionnaires were distributed, with 118 returned, achieving an 83% response rate. Structural equation modeling was employed to test the hypotheses. The results reveal that knowledge sharing, innovation, environmental

***Resumo***
*Objetivo Este estudo investiga o impacto do compartilhamento de conhecimento, inovação, incerteza ambiental e cultura da qualidade na vantagem competitiva e no desempenho da indústria manufatureira. Também examina como a vantagem competitiva medeia a relação entre esses fatores e o desempenho da empresa. Fundamentada em teorias de compartilhamento de conhecimento, inovação, incerteza ambiental e cultura da qualidade, esta pesquisa desenvolve um modelo que incorpora essas variáveis juntamente com a vantagem competitiva e o desempenho da empresa. As relações foram analisadas quantitativamente utilizando Modelagem de Equações Estruturais (MEE) com Mínimos Quadrados Parciais (PLS) 4.0. O estudo concentra-se em grandes e médias empresas manufatureiras no Sudeste de Sulawesi, Indonésia. Um total de 143 questionários foram distribuídos, com 118 devolvidos, atingindo uma taxa de resposta de 83%. A modelagem de equações estruturais foi empregada para testar as hipóteses. Os*

uncertainty, and quality culture positively and significantly impact manufacturing industry performance. Similarly, knowledge sharing, innovation, and environmental uncertainty significantly enhance competitive advantage. However, while quality culture positively influences competitive advantage, its effect is not statistically significant. Furthermore, knowledge sharing, innovation, and environmental uncertainty indirectly improve performance through the mediating role of competitive advantage. In contrast, competitive advantage does not mediate the influence of quality culture on performance. This study is limited to Southeast Sulawesi's manufacturing industries, suggesting a need for broader research across other regions to enhance generalizability. Practically, the findings underscore the importance of fostering knowledge sharing, innovation, and adaptability to environmental uncertainty, as well as embedding quality culture to strengthen competitive advantage and boost performance.

**Keywords:** Knowledge Sharing, Innovation, Environmental Uncertainty, Quality Culture, Competitive Advantage.

*resultados revelam que o compartilhamento de conhecimento, a inovação, a incerteza ambiental e a cultura da qualidade impactam positiva e significativamente o desempenho da indústria manufatureira. Da mesma forma, o compartilhamento de conhecimento, a inovação e a incerteza ambiental aumentam significativamente a vantagem competitiva. No entanto, embora a cultura da qualidade influencie positivamente a vantagem competitiva, seu efeito não é estatisticamente significativo. Além disso, o compartilhamento de conhecimento, a inovação e a incerteza ambiental melhoram indiretamente o desempenho por meio do papel mediador da vantagem competitiva. Em contrapartida, a vantagem competitiva não medeia a influência da cultura da qualidade sobre o desempenho. Este estudo se limita às indústrias manufatureiras do Sudeste de Sulawesi, o que sugere a necessidade de pesquisas mais abrangentes em outras regiões para aumentar a generalização dos resultados. Na prática, as descobertas ressaltam a importância de fomentar o compartilhamento de conhecimento, a inovação e a adaptabilidade à incerteza ambiental, bem como de incorporar uma cultura da qualidade para fortalecer a vantagem competitiva e impulsionar o desempenho.*

***Palavras-chave:*** *Compartilhamento de conhecimento. Inovação. Incerteza ambiental. Cultura da qualidade. Vantagem competitiva.*

## 1 INTRODUCTION

According to the Nature Resources Based View (NRBV) theory, strategic management in companies is required to possess the ability to adapt to environmental uncertainties to drive competitive growth, which ultimately enhances social and economic outcomes (Chen *et al*., 2005). However, Hart & Dowell (2011) argues that the NRBV often overlooks critical factors imposed by the natural environment. This differing perspective has sparked heated discussions among academics and practitioners regarding the importance of companies adapting and formulating strategies to adjust to environmental uncertainties to improve organizational performance. Additionally, organizational issues remain a critical aspect of organizational development or general progress (Javaid *et al*., 2022).

The evolution of service systems, such as mobile devices, online services, and social networks, serves as the foundation for changes in information service systems

considered by manufacturing industry players, transitioning from conventional service systems to electronic service systems. Sharma *et al*. (2023) highlights that changed in services, as a result of advancements in computer and telecommunications technology, will influence service systems and customer behavior.

Business competitiveness cannot be considered without organizational culture, as nearly all business developments have been driven by high-performance cultures. Hogan & Coote (2014) emphasize the importance of organizational culture, as it significantly affects employee attitudes and largely contributes to organizational performance. Therefore, the manufacturing industry requires a strong organizational culture to enhance its competitive advantage and performance.

The rapid pace of modern development parallels advancements in science and business competition. This is evidenced by new challenges that manufacturing industries must face to achieve their vision and mission. To address these challenges, manufacturing industries must possess competent and high-quality human resources to achieve competitive advantages and remain competitive. The quality of human resources can be observed through their efforts to improve performance (Wiewiora *et al*., 2014).

Organizational citizenship behavior refers to employees' voluntary engagement in activities or behaviors aimed at benefiting the manufacturing industry without any sense of obligation or expectation of reward (Taşkiran & İyigün, 2019). The absence of such behavior does not necessarily lead to punishment. This behavior extends beyond the expected roles, tasks, and responsibilities of employees. Several factors may influence OCB, including quality culture, the level of quality of work life (QWL), and knowledge (Hermanto *et al*., 2024)

Quality culture represents fundamental values that serve as a unifying force and distinctive characteristic of an organization, creating a conducive work environment for sustainable and continuous improvement (Bendermacher *et al*., 2019). Manufacturing industries with a strong quality culture will hold the key to their success in achieving their objectives.

Based on researcher observations of manufacturing industries in Southeast Sulawesi, it was found that knowledge sharing has not been effectively implemented. This is evident in the uneven distribution of expertise across various manufacturing companies, particularly regarding product knowledge. Interviews with several employees from different manufacturing companies revealed that they lacked sufficient

understanding of the products produced by their companies. Similarly, innovation—especially in service innovation—has not been optimally developed by manufacturing industries in Southeast Sulawesi.

Moreover, environmental uncertainty remains a daunting issue for manufacturing industries in Southeast Sulawesi when operating their businesses. Many have failed to grow or even ceased operations due to their inability to predict environmental uncertainties. Additionally, quality culture has yet to become a top priority among manufacturing industries in Southeast Sulawesi, as very few possess a strong quality culture. Factors such as knowledge sharing, innovation, environmental uncertainty, and quality culture are suspected to influence competitive advantage.

## 2 LITERATURE REVIEW

### 2.1 Knowledge sharing

Knowledge sharing (KS) refers to the exchange of experiences, information transfer, and skill-sharing across business units, institutions, organizations, or companies to share knowledge among members. According to Chase *et al*. (2005); Durst & Runar Edvardsson (2012); Rigby & Bilodeau (2011) knowledge sharing is a complex yet value-adding activity in knowledge management and is a fundamental factor in corporate strategies to achieve optimal performance. In knowledge management, KS is considered a critical element. Similarly, Pasaribu (2017) defines knowledge sharing as an organizational culture and social interaction that includes shared knowledge, experience, and work-related skills among all organizational members.

Knowledge sharing can be categorized into individual, group (team), organizational, and inter-organizational dimensions from an ontological perspective; explicit and tacit knowledge sharing from an epistemological perspective (Shibata & Takeuchi, 2006); knowledge collection and knowledge donation from a process-sharing perspective Lin (2007); Yesil & Sozbilir (2013); or internal and external knowledge sharing from a resource perspective (Carmeli *et al*., 2013). KS is a layered process that implies accessibility to strategic knowledge at all levels of an organization (Grant, 2016).

Tsai (2002) describes knowledge sharing as the transfer of wisdom, skills, and technology to generate greater knowledge resources. It facilitates knowledge mobilization

in mutually beneficial and meaningful exchanges. Efficient knowledge sharing is particularly crucial when resources are limited, especially regarding tacit knowledge such as practical expertise and experience-based wisdom (Durst & Runar Edvardsson, 2012).

Helmstädter (2003) defines knowledge sharing as the interaction between human actors where raw materials consist of knowledge. It involves exchanging tacit and explicit knowledge, skills, and experiences among employees (Hoegl *et al*., 2003). Knowledge sharing also encompasses the ability to transfer expertise, information, and insights into practice (Wiewiora *et al*., 2014). Broadly, knowledge sharing is defined as a means through which organizations access their own and other organizations' knowledge. Trivellas *et al*. (2015) define knowledge sharing as a collaborator's willingness to share acquired or created knowledge with others.

Knowledge sharing is key to strategic organizational development Cunningham *et al*. (2016), as strong relationships exist between knowledge sharing and performance (Geiger & Schreyögg, 2012; Huang *et al*., 2021). In family manufacturing industries, knowledge-sharing initiatives are highly valuable due to limited resources (Dotsika & Patrick, 2013). How manufacturing industries manage their knowledge resources is significantly influenced by their workforce (Sohn *et al*., 2013; Woratschek *et al*., 2020).

*Hypothesis 1: Knowledge sharing affects competitive advantage.*

*Hypothesis 2: Knowledge sharing affects the performance of the manufacturing industry.*

## 2.2 Innovation

Innovation is the ability to apply creative solutions to problems and opportunities to improve or enrich human life (Chuluun *et al*., 2017; Coombs & Miles, 2000; Salunke *et al*., 2019). This means that innovation enables businesses to adapt to changes and challenges to gain advantages. Innovation is not merely about being different but must add value, appeal, uniqueness, and align with consumer preferences. Manufacturing industries, as business entities, must plan strategically and anticipate long-term challenges, as many businesses fail due to inadequate planning despite initial consumer enthusiasm (Claudya *et al*., 2020).

Cooper & Kleinschmidt (2000) explains that product superiority is crucial in the highly competitive global market. Superiority stems from innovative product

development, leading to competitive advantages in the market. Product uniqueness is a critical attribute influenced by high innovation capabilities and advanced technology, satisfying consumer demands (Li & Calantone, 2018).

Innovation involves creating and applying new knowledge for developing new technologies, processes, products, and services. The stronger manufacturing industries innovate, the more effective their innovation performance becomes, leading to excellent business innovation performance (Hsin Chang & Wang, 2011; J. Wang *et al*., 2024).

Therefore, companies are expected to create new ideas, innovative product offerings, and satisfactory service innovations for customers. Innovation is increasingly important not only for organizational survival but also for excelling in competition (Torres de Oliveira *et al*., 2022; Vuorio *et al*., 2020).

Ulas (2019) outline innovation dimensions that can serve as indicators for measuring innovation in small and medium enterprises (SMEs): 1) product innovation: Introducing entirely new or significantly improved goods or services related to functional characteristics or usage. It includes developing new products with novel techniques, using entirely different raw materials, modifying existing products, or updating raw materials; 2) process innovation: Implementing entirely new or significantly improved production or delivery methods, involving changes in techniques, equipment, or software. Process innovation helps reduce production costs and satisfy customers; 3) marketing innovation: Implementing new marketing methods in packaging, design, product placement, promotion, and pricing. Marketing innovation aims to increase sales, market share, and open new markets; 4) organizational innovation: Implementing new organizational methods in business practices, workplace organization, or external relationships. Organizational innovation improves company performance by reducing administrative or transaction costs, enhancing job satisfaction, and lowering supply costs; 5) Service Innovation: Refers to service offerings that directly or indirectly generate value for the company and its customers/clients (Salunke *et al*., 2019). Coombs & Miles (2000) categorize service innovation into assimilation, demarcation, and synthesis perspectives.

Hypothesis 3*: Innovation affects competitive advantage*

Hypothesis 4*: Innovation affects the performance of the manufacturing industry*

## 2.3 Environmental uncertainty

Companies must manage environmental uncertainty to remain effective (Dropulić, 2013; Koç *et al*., 2022). Environmental uncertainty occurs when managers lack sufficient information about environmental factors, resulting in an inability to understand and predict needs and changes. Environmental characteristics include factors affecting organizations and the extent of their changes. Environmental uncertainty is defined as the inability of a company to assess the probability of decision success or failure due to difficulties in predicting future events (Cadez & Guilding, 2012; Shahzadi *et al*., 2018). In stable environments, planning and control processes face fewer issues. However, in uncertain conditions, planning and control become more challenging due to unpredictable future events. High levels of uncertainty make it difficult for individuals to predict the success or failure of decisions accurately.

Hypothesis 5*: Environmental uncertainty affects competitive advantage*

Hypothesis 6*: Environmental uncertainty affects the performance of the manufacturing industry*

## 2.4 Quality culture

Katiliute & Neverauskas (2009) states that "Quality culture is the main ingredient in a successful TQM program," meaning that quality culture is key to achieving success in Total Quality Management (TQM). Stamelos & Bartzakli (2013) emphasize that quality culture is a reciprocal relationship between systems and communities of practice, influencing each other. Goetsch & Davis (2014) define quality culture as an organizational value system that fosters an environment conducive to establishing and continuously improving quality.

Hypothesis 7: *Quality culture affects competitive advantages*

Hypothesis 8: *Quality culture affects the performance of the manufacturing industry*

## 2.5 Competitive advantage

Competitive strategy positions an organization more competitively compared to similar industries (Hubbard & Beamish, 2011). Effective combinations of national circumstances and company strategies result in competitive advantage (Damodar N & Porter, 2009). Competitive advantage in manufacturing involves systematic plans to position products superior to competitors.

Hypothesis 9: *Competitive advantage affects the performance of the manufacturing industry.*

Hypothesis 10: *Competitive advantage mediates the effect of knowledge sharing on the performance of the manufacturing industry.*

Hypothesis 11: *Competitive advantage mediates the effect of innovation on the performance of the manufacturing industry.*

Hypothesis 12: *Competitive advantage mediates the effect of environmental uncertainty on the performance of the manufacturing industry.*

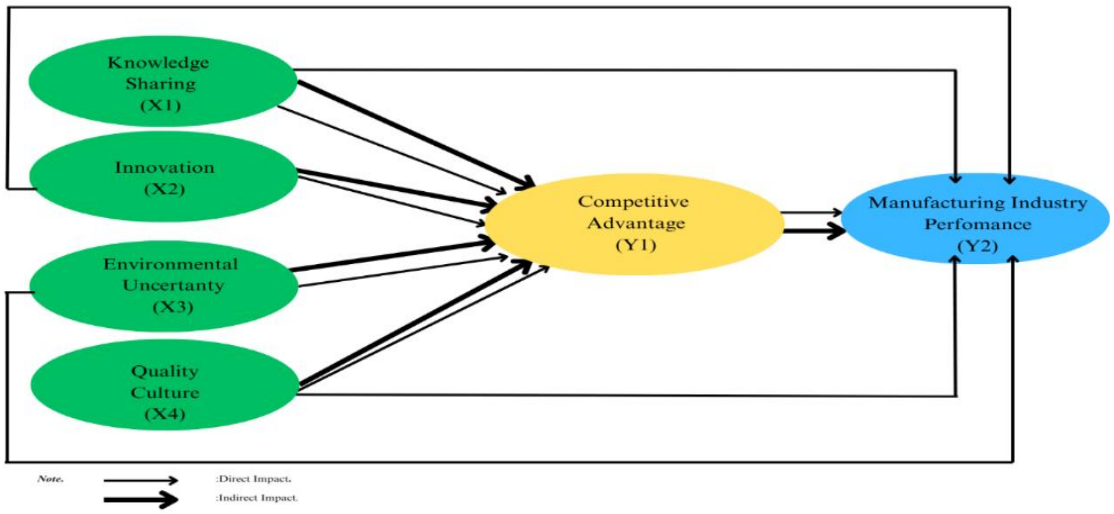
Hypothesis 13: *Competitive advantage mediates the effect of quality culture on the performance of the manufacturing industry*

## 2.6 Manufacturing industry performance

Rivai & Basri (2005) define organizational performance as a company's ability to manage available resources to provide value. Performance measures efficiency, productivity, and goal achievement, reflecting an organization's development.

**Figure 1**

*Research Model*




After reviewing the pertinent literature to investigate the impact of knowledge sharing, innovation, environmental uncertainty, and quality culture on the performance of manufacturing industries, as mediated by competitive advantage. The current study has developed a research model, as is depicted in Figure 1.

## 3 METHODOLOGY

This study employs a quantitative explanatory approach to validate and assess the factors driving competitive advantage within the manufacturing sector, building on prior research recommendations. Prior investigations have underscored the importance of market orientation, innovation, environmental uncertainty, and marketing strategies in shaping competitive advantage and organizational performance. Hatani (2023) demonstrated that market orientation and strategic location significantly enhance competitive advantage in Southeast Sulawesi's cocoa industry, though supply chain flexibility showed no significant effect.

Similarly, Hatani (2022) found that knowledge sharing fosters innovation but does not directly bolster competitive advantage, with innovation serving as a partial mediator. These studies advocate for incorporating additional variables such as economic growth and quality culture, alongside expanding respondent diversity to include suppliers, customers, and competitors, to enhance result generalizability.

Environmental uncertainty has also emerged as a pivotal factor. Hatani (2023) revealed its positive influence on competitiveness and performance in fisheries enterprises, with competitiveness acting as a partial mediator. Conversely, Vuorio *et al*. (2020) identified the internationalization-innovation paradox, wherein international expansion diminishes profitability for Finnish SMEs. Collectively, these findings accentuate the necessity of adapting to dynamic business environments through innovation, market orientation, and integrated marketing strategies. Syapsan (2019) corroborated this by showing that service quality and marketing mix strategies significantly bolster competitive advantage and local economic sustainability. Furthermore, Hatani *et al*. (2024) that supply chain environmental uncertainty positively impacts competitive advantage and operational performance, with competitive advantage functioning as a perfect mediator.

In essence, these studies collectively highlight the multifaceted interplay of internal and external factors in fostering competitive advantage and organizational resilience. A five-point Likert scale ranging from strongly disagree to strongly agree (1 to 5) was used to estimate all variables. This scale was chosen because it can accurately assess opinions, perceptions, and beliefs (Uma Sekaran, 2016).

### 3.1 Population of the study

Based on the directory of medium and large-scale manufacturing companies in Southeast Sulawesi Province, the number of manufacturing companies has fluctuated over the past five years (2019–2023). In 2019, there were 77 companies, which increased to 85 companies in 2020. By 2021, the number rose further to 105 companies, then to 121 companies in 2022, and finally increased again to 143 companies in 2023. The classification of manufacturing companies into medium and large industries is based on business scales defined by the Ministry of Industry.

Medium-scale companies employ up to 19 workers with a minimum investment of one billion Indonesian Rupiah, or employ at least 20 workers with an investment value of up to fifteen billion Rupiah. Large-scale companies employ at least 20 workers and have an investment value exceeding fifteen billion Rupiah (Badan Pusat Statistik, 2023). A total of 16 types of medium and large-scale manufacturing industries are targeted as respondents in this study.

### 3.2 Sampel Size and technique

The respondents of this research are General Managers, Directors, Operational Managers, or representatives at the management level of medium and large manufacturing industries in Southeast Sulawesi Province. The selection of General Managers, Directors, Operational Managers, or representatives at the company's management level as the research sample is considered appropriate because they can provide information based on considerations aligned with the objectives and research problems. The probability sampling method was used, with a technique called proportional area random sampling Ahmed (2024), which involves taking samples proportionally from each region.

The basis for using this technique is that the population is spread across various regions to determine the number of samples for each region, therefore in this study, the number of samples used is 143 companies. According Haryono (2017) larger sample sizes would result in more precise mean values, enhanced analysis confidence, and a lower rate of uncertainty, all of which would raise mean precision. This is consistent with the response challenges in the present study's setting (Mahmoud *et al*., 2021).

### 3.3 Method of data collection

The survey questionnaire approach was adopted as the appropriate mechanism for data collection. It was used to assess the reviewed variables, as it required gathering data from selected respondents in the manufacturing industry in Southeast Sulawesi. Responses were successfully collected via google forms over a one-month period after the initial distribution of the survey. This effort resulted in 118 valid survey responses. The researcher's consistent efforts in contacting previously confirmed respondents, maintaining contact details such as email addresses and phone numbers, and seeking additional information when necessary for the research purposes, contributed significantly to the success of the data collection process.

### 3.4 Validity and reliability

Content validity refers to the assessment process in which a group of professionals or a small sample is requested to provide input regarding the appropriateness of the measurement tools used in the research (J. F. Hair *et al*., 2019). According to Bagozzi *et al*. (1991), content validity should be determined by three to ten experts. In this study, five experts from three universities and two exporters were involved to evaluate the research items to ensure their validity. In accordance with J. Hair *et al*. (2012); J. F. Hair *et al*. (2019), these experts were asked to assess the relevance of the items and their association with the measured variables. Based on the feedback provided by the experts, several aspects of the measurement were refined before the questionnaire was distributed to respondents, with the aim of ensuring that the questions in the questionnaire could be clearly understood by the participants. The results of the validity and reliability tests of the instruments for each variable are fully presented (See Table 1):

**Table 1**

*Results of the Instrument Validity and Reliability Test*

| Variables | *Average Variance Extracted (AVE)* | Description |
|---|---|---|
| Knowledge sharing | 0,715 | Valid |
| Innovation | 0,672 | Valid |
| Environmental Uncertainty | 0,601 | Valid |
| Cultural Quality | 0,651 | Valid |
| Competitive Advantage | 0,725 | Valid |
| Manufacturing Industry | 0,651 | Valid |
| Variables | *Composite Reliability* | Description |
| Knowledge sharing | 0,938 | *Reliable* |
| Innovation | 0,958 | *Reliable* |
| Environmental Uncertainty | 0,938 | *Reliable* |
| Cultural Quality | 0,903 | *Reliable* |
| Competitive Advantage | 0,929 | *Reliable* |
| Manufacturing Industry | 0,957 | *Reliable* |
| Variables | *Cronbach's Alpha* | Description |
| Knowledge sharing | 0,920 | *Reliable* |
| Innovation | 0,951 | *Reliable* |
| Environmental Uncertainty | 0,926 | *Reliable* |
| Cultural Quality | 0,866 | *Reliable* |
| Competitive Advantage | 0,905 | *Reliable* |
| Manufacturing Industry | 0,951 | *Reliable* |

Base on table above, it can be observed that the AVE values for all variables meet the required threshold, which is above 0.5. The lowest AVE value is found in the Environmental Uncertainty variable, with a value of 0.601 > 0.5. By considering the

loading factor values in Table 4.9 and the AVE values in Table 5.9, the data from this study can be declared to have met the requirements for convergent validity testing. Based on, it can be seen that all variables in this research model are reliable because the composite reliability > 0.7. Furthermore, based on it above, it can be observed that all variables in this research model are reliable because Cronbach's alpha > 0.7 (J. F. Hair *et al*., 2019).

## 4 RESULTS

### 4.1 Respondent characteristics and manufacturing industry characteristics

This study took a population of managers (Operational/Production, Directors/General Managers, and Operational Managers) of large and medium manufacturing industries in Southeast Sulawesi Province, with a sample of 118 respondents. Data on respondent characteristics include education level, gender, position, and age. Most respondents had a bachelor's degree (75 people), were male (93 people), served as Operational/Production (83 people), and were aged 31-40 years (46 people).

Business characteristics were analyzed based on the type of product and number of workers. The majority of companies are engaged in the Food Industry, dominated by Rice Mill products with 24 companies (32%), followed by Crab Processing with 19 companies (25.3%). The Base Metal Industry has the largest number of workers, 16,261 people (59%), due to the presence of three nickel processing smelter companies in Konawe and Kolaka Districts.

The Food Industry ranked second in terms of employment at 7,682 people (28.2%), in line with the dominance of the number of companies in the sector. Other industries are spread across sectors such as beverages, textiles, furniture, and chemicals, with significant variations in the number of companies and employment.

### 4.2 Descriptive statistics of the variables

Based on the analysis of six research variables knowledge sharing, innovation, environmental uncertainty, quality culture, competitive advantage, and manufacturing industry performance, all variables were found to fall within the high category, with mean scores ranging from 3.686 to 3.865. The knowledge sharing variable (mean = 3.686) indicates a generally positive perception among respondents, although there remains a need to further encourage active knowledge exchange among employees. Innovation (mean = 3.742) reflects strong capabilities in product development and production process efficiency, yet the organization demonstrates relatively lower performance in raw material innovation. Environmental uncertainty (mean = 3.865) suggests that companies are effectively managing external dynamics, particularly through technological opportunities for product innovation. Quality culture (mean = 3.858) highlights the organization's commitment to customer orientation and quality principles, though improvements are needed in terms of human resource availability. Competitive advantage (mean = 3.849) underscores the firm’s strength in product innovativeness relative to competitors, but pricing strategies require further refinement to enhance market competitiveness.

Lastly, manufacturing industry performance (mean = 3.799) is generally strong, especially in human resource development, yet greater attention is needed to improve production process efficiency. Collectively these findings provide a comprehensive overview of the strategic factors influencing manufacturing sector performance amid environmental uncertainties.

### 4.3 Analysis of data and hypothesis testing

#### *4.3.1 Evaluation of outer model*

The evaluation of the outer model aims to assess the validity and reliability of the research instrument. In this study, the evaluation was conducted through convergent validity, discriminant validity, and reliability testing.

*4.3.2 Convergent validity*

Convergent validity was evaluated using outer loading and Average Variance Extracted (AVE). Based on Chin (2010) an indicator is valid if its outer loading value > 0.7. The validity test results showed that all indicators had outer loading values above the threshold, thus declared valid. Additionally, the AVE value for each variable met the criteria (>0.5), with the lowest value being 0.601 for the Environmental Uncertainty variable.

**Table 2**

*Reliability Coefficient and Average Variance Extracted*

| Variable | *Average Variance Extracted (AVE)* | Description |
|---|---|---|
| Knowledge sharing | 0,715 | Valid |
| Innovation | 0,672 | Valid |
| Environmental Uncertainty | 0,601 | Valid |
| Cultural Quality | 0,651 | Valid |
| Competitive Advantage | 0,725 | Valid |
| Manufacturing Industry | 0,651 | Valid |

*4.3.3 Discriminant validity*

Discriminant validity was assessed through three methods: cross-loading, Fornell-Larcker criterion, and Heterotrait-Monotrait Ratio (HTMT). Cross-loading: The test results showed that the cross-loading value of each indicator on its construct was greater than the loading value on other constructs, indicating no discriminant validity issues. Fornell-Larcker Criterion: The square root of AVE for each construct was greater than its correlation with other constructs, indicating good discriminant validity. HTMT: The HTMT value should be <0.85 (ideally <0.90). The HTMT test results showed that all values met this criterion, thus fulfilling discriminant validity (See Table 3).

**Table 3**

*Discriminant Analysis Heterotrait- Monotrait Ratio (HTMT)*

| Variable | KS | IN | EU | CQ | CA | MIP |
|---|---|---|---|---|---|---|
| Knowledge sharing | **0,845** | | | | | |
| Innovation | 0,518 | **0,820** | | | | |
| Environmental Uncertainty | 0,455 | 0,478 | **0,775** | | | |
| Cultural Quality | 0,514 | 0,511 | 0,545 | **0,807** | | |
| Competitive Advantage | 0,489 | 0,492 | 0,464 | 0,399 | **0,851** | |
| Manufacturing Industry | 0,653 | 0,682 | 0,684 | 0,654 | 0,713 | **0,807** |

*4.3.4 Reliabily*

Instrument reliability was tested using composite reliability and Cronbach's alpha. According to Ghozali & Latan (2014); J. Hair *et al*., (2012); Van Zyl (2014) a composite reliability value >0.7 and Cronbach's alpha >0.7 indicate that the instrument is reliable and consistent. The test results showed that all variables had composite reliability and Cronbach's alpha values above the threshold, with the highest reaching 0.957 (composite reliability) and 0.951 (Cronbach's alpha). This indicates that the questionnaire used in this study has a very high level of reliability.

*4.3.5 Evaluation of inner model*

The evaluation of the inner model aims to assess the relationships between exogenous (independent) and endogenous (dependent) variables based on the concepts and theories outlined in the conceptual framework (Ghozali & Latan, 2014; J. F. Hair *et al*., 2019). The tests included analysis of the coefficient of determination ($R^2$), effect size ($f^2$), predictive relevance ($Q^2$), and significance of relationships through t-statistics.

*4.3.6 Coefficient of determination ($R^2$)*

The $R^2$ value measures how well the independent variables explain the variation in the dependent variable. According to Kwong & Wong (2103), $R^2$ values are categorized as "strong" (>0.67), "moderate" (0.33–0.67), or "weak" (<0.33). Based on the test results: 1) Competitive Advantage: $R^2$ = 0.355, categorized as "moderate." 2) Manufacturing Industry Performance: $R^2$ = 0.788, categorized as "strong."(See Table 4).

**Table 4**

*Analysis Coefficient of Determination ($R^2$)*

| | R Square | R Square Adjusted |
|---|---|---|
| Competitive Advantage | 0,355 | 0,332 |
| Manufacturing Industry | 0,788 | 0,778 |

*4.3.7 Effect size ($f^2$)*

Effect size ($f^2$) evaluates the substantive impact when an exogenous variable is removed from the model. According to J. F. Hair *et al*., (2019); Kwong & Wong (2013), $f^2$ values are categorized as "small" (0.02), "medium" (0.15), or "large" (0.35).

**Table 5**

*Effect size ($f^2$) Analysis*

| | Competitive Advantage | Manufacturing Industry |
|---|---|---|
| Knowledge sharing | 0,061 | 0,079 |
| Innovation | 0,058 | 0,129 |
| Environmental Uncertainty | 0,047 | 0,172 |
| Cultural Quality | 0,001 | 0,099 |
| Competitive Advantage | | 0,341 |

*4.3.8 Predictive relevance ($Q^2$)*

The $Q^2$ value measures the model's ability to predict observed values based on parameter estimates. The range of $Q^2$ is $0 < Q^2 < 1$, with higher values indicating a better model. If $Q^2 > 0$, the model has predictive relevance; if $Q^2 \leq 0$, the model lacks relevance; 1) Competitive Advantage: $Q^2 = 0.242$, indicating moderate predictive relevance; 2) Manufacturing Industry Performance: $Q^2 = 0.503$, indicating strong predictive relevance.

*4.3.9 Hypothesis testing*

Hypothesis testing in this study was conducted using t-statistic coefficients obtained through bootstrapping. According to F Hair *et al*., (2017), an indicator or relationship between variables is significant if the t-statistic value exceeds 1.96 (t-statistic > 1.96) at a 95% confidence level. Additionally, according to Ghozali & Latan (2014),

significance can also be assessed based on the p-value, where an indicator or relationship between variables is significant if the p-value < 0.05.

**Figure 2**

*Bootsraping Results for a Direct Relationship*

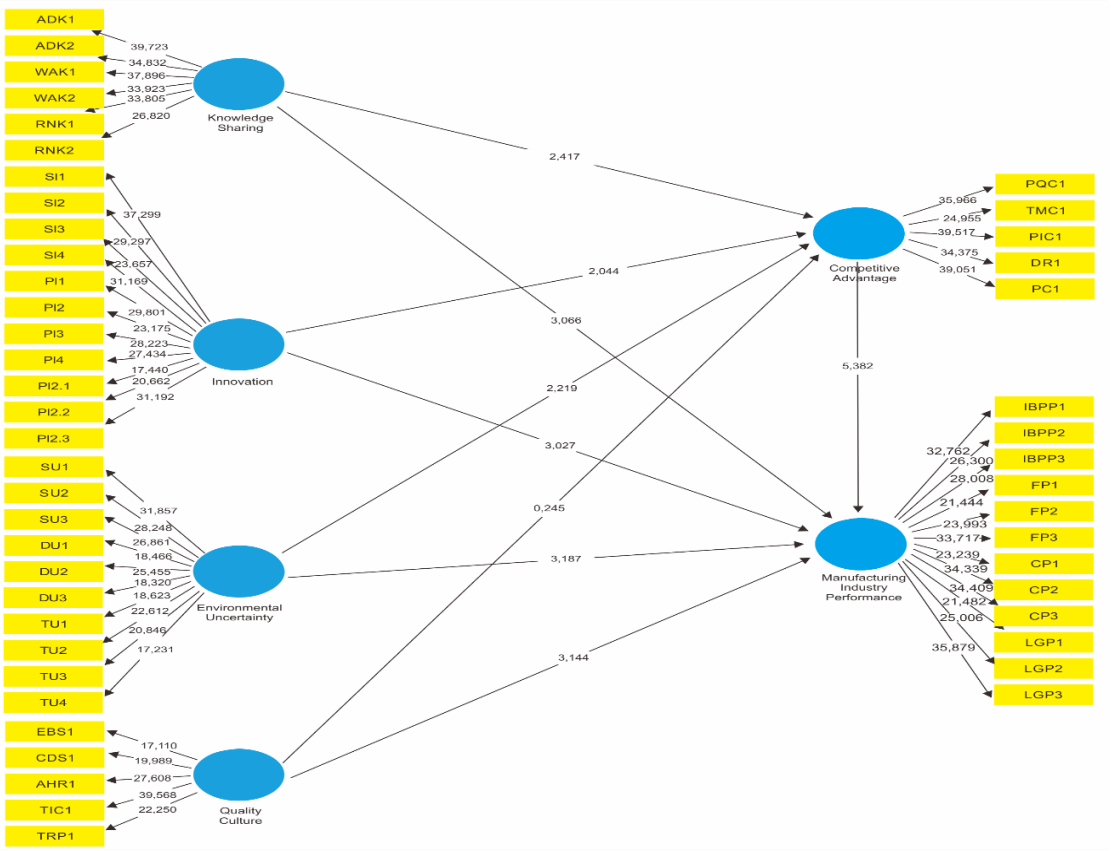


**Table 6**

*Results of the Direct Relationship Hypotheses*

| Hypothesized paths | | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|---|
| H1 | KS -> CA | 0,249 | 0,231 | 0,103 | 2,417 | 0,016 |
| H2 | KS -> MIP | 0,168 | 0,161 | 0,055 | 3,066 | 0,002 |
| H3 | IN -> CA | 0,245 | 0,247 | 0,120 | 2,044 | 0,041 |
| H4 | IN -> MIP | 0,216 | 0,221 | 0,071 | 3,027 | 0,003 |
| H5 | EU -> CA | 0,219 | 0,220 | 0,103 | 2,129 | 0,034 |
| H6 | EU -> MIP | 0,246 | 0,254 | 0,077 | 3,187 | 0,002 |
| H7 | QC -> CA | 0,027 | 0,034 | 0,109 | 0,245 | 0,807 |
| H8 | QC -> MIP | 0,190 | 0,191 | 0,060 | 3,144 | 0,002 |
| H9 | CA -> MIP | 0,335 | 0,321 | 0,062 | 5,382 | 0,000 |

*Note*. $p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$
KS= Knowledge Sharing, CA= Competitive Advantage, MIP= Manufacture Industry Perfomance, IN=Innovation, EU= Environmental Uncertainty, QC= Quality Culture

According to the results of hypothesis testing in Table 6 it is found that knowledge sharing, innovation, and environmental uncertainty have a positive and significant effect on competitive advantage (KS ->CA, IN ->CA, EU ->CA) and manufacturing performance (KS ->MIP, IN ->MIP, EU ->MIP), with a t-statistic value > 1.96, p-value <0.05, and the original sample shows a positive direction.

Meanwhile, quality culture has no significant effect on competitive advantage (QC ->CA rejected), but has a positive and significant effect on manufacturing performance (QC ->MIP accepted). In addition, competitive advantage is also shown to have a positive and significant effect on manufacturing performance (CA -> MIP accepted). Overall, these results indicate that these variables play an important role in improving the performance of the manufacturing industry through the mechanism of competitive advantage, except for the effect of quality culture on competitive advantage, which is not significant.

**Table 7**

*Results of the Non-direct Relationship Hypotheses*

| Hypothesized paths | | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|---|
| H10 | KS -> CA -> MIP | 0,083 | 0,077 | 0,042 | 1,997 | 0,046 |
| H11 | IN -> CA -> MIP | 0,082 | 0,079 | 0,041 | 2,013 | 0,045 |
| H12 | EU -> CA -> MIP | 0,073 | 0,070 | 0,034 | 2,147 | 0,032 |
| H13 | QC -> CA -> MIP | 0,009 | 0,012 | 0,035 | 0,252 | 0,801 |

*Note*. $p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$
KS= Knowledge Sharing, CA= Competitive Advantage, MIP= Manufacture Industry Perfomance, IN=Innovation, EU= Environmental Uncertainty, QC= Quality Culture

According to the results of hypotheses testing, it is found that competitive advantage acts as a significant mediating variable in the relationship between knowledge sharing, innovation, and environmental uncertainty on manufacturing industry performance. This is indicated by the t-statistic value > 1.96, p-value < 0.05, and positive direction in the original sample for all three relationships (KS -> CA -> MIP, IN -> CA -> MIP, and EU -> CA -> MIP).

In contrast, competitive advantage does not have a significant mediating role in the relationship between quality culture and manufacturing industry performance, as the t-statistic value < 1.960, p-value 0.081 > 0.05, and a very small contribution in the original sample (QC -> CA -> MIP rejected). Thus, competitive advantage significantly mediates the relationship of the first three independent variables, but does not mediate the relationship of quality culture to manufacturing industry performance.

## 5 DISCUSSION

This research investigates the relationship between knowledge sharing, innovation, environmental uncertainty, quality culture, and their impact on competitive advantage and the performance of the manufacturing industry in Southeast Sulawesi Province. Using a Structural Equation Modeling (SEM) approach based on Partial Least Squares (PLS), this study confirms that the independent variables significantly influence competitive advantage and company performance. However, the findings also reveal that quality culture does not have a significant impact on either competitive advantage or the performance of the manufacturing industry.

Knowledge sharing and innovation are proven to be dominant factors in enhancing competitive advantage and industrial performance. These findings align with previous studies by Z. Wang & Han (2017) which state that knowledge sharing supports organizational innovation capabilities, which in turn improve company performance. Additionally, innovation is confirmed as a crucial element for addressing dynamic market competition, consistent with Valdez-Juárez *et al*., (2018) findings. This underscores that practices of knowledge sharing and innovation should be prioritized as strategic initiatives for large and medium-sized manufacturing companies to create competitive advantages.

Environmental uncertainty is also found to have a positive influence on competitive advantage and industrial performance. Hatani (2023) and Pashutan *et al*., (2022) studies support these findings, emphasizing that a company's ability to adapt to environmental changes can be a key driver of business success. In the context of Southeast Sulawesi, where the basic metals and food sectors dominate labor contributions, the capacity to adapt to external uncertainties becomes particularly critical.

However, an intriguing result is the lack of a significant influence of quality culture on competitive advantage, despite this variable having a significant direct relationship with the performance of the manufacturing industry. This factor may be attributed to product variation and the relatively small sample size in this study.

Competitive advantage is found to be a significant mediator that strengthens the relationship between independent variables and the performance of the manufacturing industry. These results confirm Potjanajaruwit (2018) findings that competitive advantage is a key element in bridging technological capabilities, organizational collaboration, and company performance.

Overall, this research provides valuable insights into strategies that manufacturing companies can use to enhance their performance amidst global challenges. A focus on knowledge sharing, innovation, and adaptation to environmental uncertainty represents strategic steps that company leaders should consider. However, the role of quality culture needs to be further explored with larger and more homogeneous samples to gain deeper understanding. This study also highlights the importance of integrating theory and practice in addressing the complexities of modern industries, which are increasingly required to innovate and adapt rapidly.

### 5.1 Implication of the study

This research provides significant contributions to the development of theory and practice related to knowledge sharing, innovation, environmental uncertainty, quality culture, and competitive advantage as mediating variables in their relationship with the performance of large and medium-sized manufacturing companies in Southeast Sulawesi Province.

Directly, the findings of this research reinforce the knowledge-sharing models proposed by Eidizadeh *et al*., (2017); Hatani (2022); Z. Wang & Han (2017) and other related studies, which assert that knowledge sharing has a positive and significant impact on company performance. Additionally, the innovation model proposed by Alam (2006), environmental uncertainty by Hatani (2023), and quality culture by Pujianto & Evendi (2021) are empirically validated in this study. However, the results indicate that quality culture does not have a significant direct influence on competitive advantage. Indirectly, the findings confirm that competitive advantage mediates the relationship between knowledge sharing, innovation, environmental uncertainty, and quality culture with company performance, enabling the manufacturing industry to be more effective in addressing the dynamics of a competitive and uncertain business environment.

From a practical perspective, the results of this study provide important insights for manufacturing industry managers to enhance company performance through the implementation of knowledge sharing, innovation, adaptation to environmental uncertainty, and strengthening of quality culture. Several practical strategies that can be implemented by the manufacturing industry include: (1) strengthening the quality of human resources through equitable knowledge distribution via knowledge sharing; (2) fostering innovation, particularly service innovation, to enhance customer satisfaction; (3) managing environmental uncertainty with adaptive and proactive approaches; and (4) maintaining a quality culture oriented toward product and service excellence.

### 5.2 Conclusion and limitations of the study

This study has several limitations that can serve as a basis for the development of future research. First, the scope of the research is limited to large and medium-sized manufacturing industries in Southeast Sulawesi Province. To enhance the generalizability

of the results, it is recommended to expand the research location to other regions or focus on more specific manufacturing products. Second, the measurement of company performance relies on a qualitative approach based on the perceptions of owners, directors, or operational managers, which may introduce bias. Therefore, future research could employ alternative methodologies such as fsQCA (fuzzy-set Qualitative Comparative Analysis) to identify combinations of factors that influence company performance. Another alternative is to adopt a longitudinal approach to examine the long-term impacts of the research variables. Third, the variable of quality culture, both directly and when mediated by competitive advantage, did not yield significant results, likely due to the relatively small sample size and the variability in company characteristics.

This study examines the impact of knowledge sharing, innovation, environmental uncertainty, and quality culture on competitive advantage and the performance of large and medium manufacturing industries in Southeast Sulawesi Province. The results show that knowledge sharing, innovation, and environmental uncertainty have positive and significant effects on competitive advantage, which subsequently impacts the enhancement of company performance. However, the quality culture variable does not significantly influence competitive advantage, although it directly and positively affects manufacturing industry performance. Competitive advantage is also found to mediate the relationship between independent variables and company performance, highlighting the importance of competitive strategies in improving organizational performance. These findings align with previous studies emphasizing the critical role of knowledge sharing and innovation as primary drivers of competitiveness and company performance.

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**Authors' Contribution**

All authors contributed equally to the development of this article.

**Data availability**

All datasets relevant to this study's findings are fully available within the article.

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