

Development of a DEMATEL-ANP Model for Analyzing Determinants of Artificial Intelligence Adoption Intention among SMEs

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Abstract

Artificial Intelligence (AI) adoption provides significant opportunities for Small and Medium Enterprises (SMEs) to improve operational efficiency, decision-making, and competitiveness. However, SMEs still face various challenges in adopting AI technologies, including limited financial resources, digital capability, technological readiness, and organizational preparedness. This study aims to develop a DEMATEL-ANP model to identify causal relationships and prioritize determinants influencing AI adoption intention among SMEs. A quantitative approach using Multi-Criteria Decision-Making (MCDM) was applied by integrating the Decision-Making Trial and Evaluation Laboratory (DEMATEL) and Analytic Network Process (ANP) methods. The proposed model incorporates technological, organizational, and environmental factors based on the Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) framework. Data were collected through expert judgment from five experts with knowledge and experience in artificial intelligence, digital transformation, SME development, and technology adoption. The DEMATEL results indicate that all evaluated factors belong to the cause group, with Digital Capability (DC) identified as the most influential factor. Furthermore, ANP results reveal that Cost (0.15) and Digital Capability (0.15) are the highest priority factors, followed by Competitive Pressure (0.14) and Perceived Usefulness (0.13). The consistency evaluation confirms that all ANP comparison matrices meet the consistency requirement with a Consistency Ratio below 0.10. This study contributes by providing a comprehensive decision-making framework for understanding AI adoption determinants among SMEs and identifying key factors that should be prioritized to support successful AI implementation

Keywords: Artificial Intelligence Adoption, SMEs, DEMATEL, ANP, Technology Adoption

INTRODUCTION

Small and Medium Enterprises (SMEs) play an important role in economic development through their contribution to employment creation, innovation, and regional economic growth. However, SMEs often face limitations in adopting advanced technologies due to restricted financial resources, limited digital capabilities, insufficient technological infrastructure, and lack of organizational readiness (Kraus et al., 2021; Lokuge & Duan, 2021). Digital transformation requires SMEs to develop not only technological capabilities but also organizational competencies and strategic readiness to integrate digital technologies into business processes (Del Giudice et al., 2021; Verhoef et al., 2021). Therefore, improving digital readiness has become a critical factor for SMEs to enhance competitiveness and participate effectively in the digital economy.

Artificial Intelligence (AI) has emerged as a key technology supporting digital transformation by enabling organizations to improve business processes, enhance decision-making capabilities, increase operational efficiency, and develop competitive advantages (Mikalef & Gupta, 2021; Verhoef et al., 2021). For Small and Medium Enterprises (SMEs),

AI adoption provides opportunities to optimize business activities through automation, predictive analytics, improved customer interaction, and data-driven decision-making (Badghish & Soomro, 2024; Dwivedi et al., 2021). Nonetheless, in spite of the advantages of AI, its implementation in SMEs is problematic due to some challenges such as low level of digital skills, lack of technical knowledge, financial restrictions, lack of data, and readiness problems (Badghish & Soomro, 2024; Hussain & Rizwan, 2024). Additionally, the successful implementation of AI in SMEs requires sufficient technological infrastructure, management support, and help from an ecosystem (Ayinaddis, 2025; Badghish & Soomro, 2024). Use of artificial intelligence in small and medium enterprises (SMEs) has become widespread in many areas such as marketing, customer relationship management, financial management, supply chain management, and operations. The use of AI-based applications helps SMEs to analyze the customer behavior, automate the routine processes, personalize the services, and facilitate business forecasting. For instance, AI applications used for digital marketing may help SMEs improve the promotion strategies using customer data analytics, while the AI-based analytics will help business owners to identify market trends and allocate resources (Mariani et al., 2022; Mikalef & Gupta, 2021). Furthermore, the integration of AI can help SMEs to become more competitive due to the ability to adapt to the changes in the market and innovate. However, the effective use of AI in SMEs demands the development of appropriate digital capabilities, skills of employees, and organizational readiness for AI technologies (Badghish & Soomro, 2024; Kraus et al., 2021)..

Various research studies have been conducted on the integration of AI within SMEs from the perspectives of technological readiness, organizational readiness, innovation readiness, and environmental readiness. Jöhnk et al. have studied organizational readiness for AI and emphasized the need for proper technological readiness, competency of employees, and organizational readiness for AI implementation to be successful. AI's contribution to the creation of business value was studied by Enholm et al (Enholm et al., 2022), who stressed the need for complementary skills in organizations that want to use AI. Also, Chatterjee et al (Chatterjee et al., 2022) examined the effect of digital transformation and AI-based customer relationship management capability in SMEs and found that AI capability and strategic planning play a part in the development of digital entrepreneurship. Vrontis et al. (Vrontis et al., 2023) demonstrated that adoption of digital technology helps SMEs increase their sustainability and business value creation. More recently, Ayinaddis (Ayinaddis, 2025) proved that adoption of AI research in SMEs is poorly systematized and faces problems with resource, knowledge, skill, and organizational readiness issues. As one can see, the adoption

of AI in SMEs depends on a number of technological, organizational, and environmental factors, but prior research is mainly dedicated to finding out determinants of adoption without studying causality and ranking factors.

Some recent researches keep analyzing the adoption of AI in SMEs in the light of technological readiness, organizational capability, and environmental facilitation. For example, Sánchez et al. (2025) have used the integrated TOE-DOI approach and proved that the adoption of AI is affected by different internal and external aspects. Still, existing literature uses survey approaches mostly for discovering adoption determinants and provides little knowledge about their interactions and prioritization (Hasani et al., 2024; Sánchez-Rodríguez et al., 2025; Sharma et al., 2024; Thomas et al., 2025). Thus, there is a need for an approach allowing discovering causal dependencies between adoption determinants.

The Decision-Making Trial and Evaluation Laboratory (DEMATEL) method is a multi-criteria decision-making approach developed to analyze complex problems involving interdependent factors. Unlike conventional statistical approaches that mainly examine relationships among variables, DEMATEL focuses on identifying causal relationships by distinguishing between influential factors (cause group) and affected factors (effect group). This capability makes DEMATEL suitable for analyzing complex decision-making problems where multiple factors interact with each other (Gabus & Fontela, 1972; Ocampo et al., 2019; Si et al., 2018). In recent studies, DEMATEL has been widely applied in technology adoption, innovation management, and strategic decision-making because it can reveal the structural relationships among critical factors and support the identification of key drivers (Govindan & Chaudhuri, 2016; Shieh et al., 2010), organizational, and environmental determinants influencing Artificial Intelligence adoption intention among SMEs.

The DEMATEL-ANP technique has gained popularity as an effective multi-criteria decision-making technique in the study of complicated problems characterized by the existence of many interrelated factors. Through the use of DEMATEL, researchers can establish the causative relationship of the determinants through identifying influential and dependent factors, while the priority weights of ANP can be provided using the dependency relationships among criteria. The literature indicates that the combination of DEMATEL and ANP has led to the improvement of decision-making process accuracy in complicated environments with many interrelated factors (Büyüközkan et al., 2017; Lee et al., 2011). For this reason, the DEMATEL-ANP is appropriate in investigating AI adoption intention in SMEs due to many interrelated factors.

The combination of Decision-Making Trial and Evaluation Laboratory (DEMATEL) and Analytic Network Process (ANP) techniques has been widely used in various complex decision-making issues with different interrelated criteria. The DEMATEL technique is used to recognize causality between the factors, and the ANP technique is used to evaluate the priority weights of the factors by taking into account the dependencies between criteria (Utomo & Asdi, 2025). It is a more comprehensive way of solving problems related to weight determination as compared to traditional weighting approaches because it not only identifies the causality but also measures the importance level of the decision-making factors (Utomo & Asdi, 2025). Several research works have shown that the DEMATEL technique is useful in the identification of critical barriers, drivers, and priorities in technology adoption and implementation processes (Ahmad et al., 2024). However, there is a lack of research on the use of a combined DEMATEL-ANP technique to identify AI adoption intention among SMEs. Mostly, researchers try to identify influencing factors through statistical techniques while very few researchers study causality and prioritize determinants. Therefore, the development of a DEMATEL-ANP model provides an opportunity to address this research gap by identifying the most influential determinants of AI adoption intention among SMEs.

Perceived usefulness (PU), perceived ease of use (PEOU), and technology compatibility (TC) are some of the significant technological determinants that affect AI adoption intention of SMEs. The concept of PU refers to the level at which SMEs think AI technology can enhance business performance, efficiency, and effectiveness of decision-making. According to several recent studies, organizations are more likely to adopt AI technology if they find it useful and valuable for their business operations (Enholm et al., 2022; Jöhnk et al., 2021). Besides, the PEOU is another technological determinant since SMEs are not willing to embrace technology that requires advanced technological knowledge and efforts for its implementation (Jöhnk et al., 2021). Furthermore, TC is also one of the important determinants because SMEs prefer adopting AI technology that is compatible with existing business processes, organizational requirements, and technology infrastructure (Badghish & Soomro, 2024).

COST, DC, and FR can be considered organizational factors that affect the SME's capacity to adopt AI technologies (Hussain & Rizwan, 2024). To use AI technology, organizations should invest in building digital infrastructure, installing proper software, managing data, and developing employees' skills, which could turn into a barrier for SMEs with limited financial resources (Badghish & Soomro, 2024). It is crucial for organizations to have proper digital capability since to use AI technologies properly, organizations should

possess enough knowledge, skills, and capacity. According to (Khin & Ho, 2019), DC is vital for organizations that want to be able to use digital technology and develop their innovative performance. Financial readiness refers to the ability of organizations to have enough resources to implement AI technologies and build digital capabilities in order to manage them (Awa et al., 2017).

Government support (GS), competitive pressure (CP), and vendor support (VS) are examples of environmental factors that impact on AI adoption intention for SMEs. Government interventions, digitalization policies, incentives, and regulations can mitigate adoption challenges since they help SMEs get better access to technology and knowledge resources (Awa et al., 2017). Competitive pressure is another driver of adoption for SMEs because rising competition in the market forces companies to be more efficient, innovative, and responsive (Badghish & Soomro, 2024). Moreover, vendor support gives SMEs technical support, consultations, training, and implementation of new technologies, which is especially important since many SMEs have no such competence inside their company (Jöhnk et al., 2021). The recent researches highlight the role of environmental conditions and ecosystem support in making decisions about AI adoption (Ayinaddis, 2025; Sánchez et al., 2025). All these technological, organizational, and environmental factors combined determine the adoption intention (INT) for SMEs to use Artificial Intelligence.

METHOD

This study employed a quantitative research approach using a Multi-Criteria Decision-Making (MCDM) method to develop a model for analyzing and prioritizing determinants influencing Artificial Intelligence (AI) adoption intention among Small and Medium Enterprises (SMEs). The research integrates the Decision-Making Trial and Evaluation Laboratory (DEMATEL) and Analytic Network Process (ANP) methods. DEMATEL is used to identify causal relationships among determinants, while ANP is applied to determine priority weights among interconnected criteria (Büyüközkan et al., 2017; Si et al., 2018).

The research framework integrated the Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) framework. TAM explains technology acceptance through perceived usefulness and perceived ease of use (Davis, 1989), while TOE explains organizational technology adoption through technological, organizational, and environmental contexts (Awa et al., 2017; Tornatzky, 1990).

This research conducted among Small and Medium Enterprises (SMEs) located in Samarinda City and Kutai Kartanegara Regency, East Kalimantan, Indonesia. The research

object includes SMEs operating in trade, services, food and beverage, manufacturing, and creative industries.

Each factor is measured using indicators adapted from previous studies. The DEMATEL questionnaire uses an influence scale from 0 to 4, where 0 represents no influence and 4 represents very high influence (Büyüközkan et al., 2017; Si et al., 2018).

Table 1. Factors influencing the intention to adopt AI in MSMEs

Factor	Code
Perceived Usefulness	PU
Perceived Ease of Use	PEOU
Technology Compatibility	TC
Technology Cost	COST
Digital Capability	DC
Financial Readiness	FR
Government Support	GS
Competitive Pressure	CP
Vendor Support	VS
AI Adoption Intention	INT

This study applied expert judgment using five experts selected through purposive sampling. The experts are selected based on knowledge and experience related to artificial intelligence, digital transformation, SME development, and technology adoption. Expert-based evaluation is appropriate for DEMATEL-ANP because the method requires informed judgments to analyze complex relationships among criteria (Si et al., 2018)(Si et al., 2018; Büyüközkan & Güteryüz, 2020).

Data Collection and Expert Evaluation

Data were collected through structured expert judgment using a DEMATEL questionnaire. The questionnaire was developed based on the identified determinants from the Technology Acceptance Model (TAM) and Technology–Organization–Environment (TOE) framework. The assessment aimed to evaluate the degree of influence among determinants affecting AI adoption intention among SMEs.

Five experts were selected using purposive sampling based on their knowledge and professional experience related to artificial intelligence, digital transformation, SME development, and technology adoption. Expert evaluation is appropriate for DEMATEL–ANP analysis because the method requires informed judgments to analyze complex relationships among interdependent criteria.

Each expert was asked to evaluate the influence relationship between criteria using a five-level DEMATEL scale ranging from 0 to 4, where 0 indicates no influence, 1 indicates low influence, 2 indicates moderate influence, 3 indicates high influence, and 4 indicates very

high influence. The individual expert assessments were aggregated using the arithmetic mean to construct the initial direct relation matrix.

Integrated DEMATEL–ANP Framework

DEMATEL Analysis

The DEMATEL technique has been used for identifying the causal relationships among various determinants that affect the adoption intention of AI. The DEMATEL technique is useful in the analysis of complex systems by separating out the influential factors, called cause group, from dependent factors, called effect group. This technique includes four steps, which include formation of the direct relationship matrix, normalization of the matrix, total relationship matrix formation, and cause-effect relationship identification.

(1) Construction of the direct relation matrix

The initial direct relation matrix was developed based on expert evaluations. The matrix can be expressed as:

$$A = [a_{ij}]_{n \times n}$$

Where a_{ij} represents the degree of influence of factor i on factor j , and n represents the number of evaluated factors.

(2) Normalization of the direct relation matrix

The direct relation matrix was normalized to transform the original values into a comparable scale. The normalized matrix is calculated as:

$$X = \frac{A}{s}$$

Where:

$$s = \max \left(\max_i \sum_{j=1}^n a_{ij}, \max_j \sum_{i=1}^n a_{ij} \right)$$

X represents the normalized direct relation matrix.

(3) Calculation of the total relation matrix

The total relation matrix, which considers both direct and indirect relationships among factors, is calculated as:

$$T = X(I - X)^{-1}$$

Where I represents the identity matrix.

Values of D and R are derived from the total relation matrix, where D stands for the total influence exerted by each factor, and R stands for the total influence that each factor receives. The prominence index D+R shows the significance of each factor, while the relation

index D–R is used to classify the factors causally. The positive D–R value shows that the factor is a cause factor, and vice versa.

ANP Analysis

After DEMATEL, the Analytic Network Process (ANP) approach was used to identify the priority weightings of interdependent determinants. ANP differs from AHP in the sense that ANP enables the inclusion of interdependencies and feedback among decision criteria during the evaluation process (Saaty, 1996). The ANP process is as follows:

(1) Development of the pairwise comparison matrix

Pairwise comparisons were conducted among interconnected criteria using Saaty's fundamental scale. The comparison matrix is represented as:

$$A = [a_{ij}]$$

Where a_{ij} represents the relative importance of criterion i compared with criterion j . The reciprocal relationship between elements is defined as:

$$a_{ji} = \frac{1}{a_{ij}}$$

(2) Calculation of priority vectors

The priority vector was obtained using the eigenvector approach:

$$Aw = \lambda_{max}w$$

where w represents the priority vector and λ_{max} represents the maximum eigenvalue of the comparison matrix.

(3) Construction of the supermatrix

The interdependent relationships among criteria were structured into a supermatrix:

$$W = [W_{ij}]$$

Where W_{ij} represents the influence priority of elements within the network structure.

(4) Calculation of the limit supermatrix

The final priority weights were obtained by raising the weighted supermatrix to limiting powers until convergence:

$$W^{\infty} = \lim_{k \rightarrow \infty} W^k$$

The resulting limit supermatrix provides the final priority weights and ranking of determinants influencing AI adoption intention among SMEs.

The suggested framework includes the integration of technological, organizational and environmental dimensions in examining the determinants that affect AI adoption intention by

SMEs. Technological dimensions comprise of Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Technology Compatibility (TC), and Technology Cost (COST) that reflect the beliefs of SMEs on benefits, usefulness, compatibility and cost of AI technology adoption respectively.

The organizational factors can be classified as Digital Capability (DC) and Financial Readiness (FR). Environmental factors can be seen as Government Support (GS), Competitive Pressure (CP), and Vendor Support (VS). These are the external conditions that help SMEs to adopt AI technology.

These factors will then be analyzed through the use of DEMATEL in order to determine their causality and categorize them into either causal or effect factors. Finally, ANP will be used to calculate the weights of these factors based on interdependencies among them. The combination of DEMATEL-ANP offers an effective approach for finding out critical drivers and determining determinants of AI adoption intention.

RESULTS AND DISCUSSION

Table 2 depicts the matrix of direct relationship that has been calculated from the results of DEMATEL mean analysis. It is a matrix depicting the average degree of influence between criteria through expert judgment. Each number in the matrix gives an indication of the degree to which one criterion directly influences the other with higher numbers indicating greater influence. This information will later be used to determine the cause-and-effect relations and priority factors in the system.

Table 2. Results in Geomatrix Means

	PU	PEOU	TC	COST	DC	FR	GS	CP	VS	INT
PU	0.00	3.37	2.77	1.15	2.55	1.74	1.00	2.17	1.32	4.00
PEOU	3.18	0.00	3.37	1.00	2.17	1.15	0.00	1.15	1.74	4.00
TC	2.55	2.55	0.00	2.00	3.57	2.00	1.74	2.77	3.37	3.18
COST	1.15	1.15	2.00	0.00	1.74	3.57	2.55	2.17	1.52	2.17
DC	3.37	2.55	3.78	1.74	0.00	3.18	2.55	3.00	2.55	4.00
FR	1.74	1.15	2.00	3.57	2.77	0.00	2.77	2.17	1.74	3.00
GS	1.00	1.00	1.74	2.55	2.55	2.77	0.00	2.77	3.57	2.77
CP	2.17	1.15	2.77	2.17	3.00	2.17	2.05	0.00	2.77	3.78
VS	1.32	1.74	3.37	1.52	2.55	1.74	3.57	2.77	0.00	3.00
INT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3 shows the normalized direct-relation matrix resulting from the DEMATEL technique. Normalization was done to convert the original direct-relation matrix to a similar scale using either the highest row sum or highest column sum. The normalized matrix is used in deriving the total relation matrix in the next DEMATEL analysis. Table 3. Normalization Results

PU	PEOU	TC	COST	DC	FR	GS	CP	VS	INT
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PU	0.00	0.13	0.10	0.04	0.10	0.07	0.04	0.08	0.05	0.15
PEOU	0.12	0.00	0.13	0.04	0.08	0.04	0.00	0.04	0.07	0.15
TC	0.10	0.10	0.00	0.07	0.13	0.07	0.07	0.10	0.13	0.12
COST	0.04	0.04	0.07	0.00	0.07	0.13	0.10	0.08	0.06	0.08
DC	0.13	0.10	0.14	0.07	0.00	0.12	0.10	0.11	0.10	0.15
FR	0.07	0.04	0.07	0.13	0.10	0.00	0.10	0.08	0.07	0.11
GS	0.04	0.04	0.07	0.10	0.10	0.10	0.00	0.10	0.13	0.10
CP	0.08	0.04	0.10	0.08	0.11	0.08	0.08	0.00	0.10	0.14
VS	0.05	0.07	0.13	0.06	0.10	0.07	0.13	0.10	0.00	0.11
INT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The findings for the total relation matrix (T) have been tabulated below (Table 4). This is the matrix that shows the relationship amongst the different criteria analyzed through the DEMATEL approach. It is made up of both the direct and indirect effects that exist between these criteria.

Table 4. Total Relation Matrix (T)

	PU	PEOU	TC	COST	DC	FR	GS	CP	VS	INT
PU	0.14	0.24	0.27	0.17	0.26	0.21	0.17	0.23	0.20	0.39
PEOU	0.23	0.11	0.27	0.15	0.23	0.17	0.12	0.18	0.19	0.36
TC	0.26	0.24	0.23	0.23	0.33	0.26	0.23	0.29	0.31	0.42
COST	0.18	0.16	0.24	0.13	0.23	0.27	0.23	0.23	0.21	0.32
DC	0.30	0.26	0.37	0.24	0.24	0.31	0.27	0.32	0.30	0.47
FR	0.21	0.18	0.26	0.27	0.28	0.17	0.25	0.25	0.23	0.37
GS	0.19	0.17	0.26	0.24	0.28	0.27	0.16	0.27	0.29	0.37
CP	0.23	0.18	0.30	0.22	0.30	0.25	0.23	0.18	0.27	0.41
VS	0.21	0.20	0.32	0.21	0.29	0.24	0.28	0.28	0.18	0.39
INT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

The cause and effect analysis is illustrated through Table 5 using the DEMATEL technique. The value of D and R is used to show the total influence received and given by the individual criterion, respectively. D+R shows the prominence degree and denotes the total significance of the criterion in the system; however, D-R is the measure used to show the cause and effect group. Positive D-R values of criteria show that the criteria fall under the category of cause criteria because their influence exceeds the influence of other criteria. However, negative D-R values of criteria show that the criteria fall under the category of effect criteria.

Table 5. Cause-and-Effect Relationship Analysis

	D	R	D+R	D-R
PU	2.28	1.95	4.23	0.32
PEOU	2.01	1.75	3.76	0.26
TC	2.81	2.51	5.33	0.30
COST	2.19	1.86	4.05	0.33
DC	3.09	2.43	5.52	0.65
FR	2.47	2.14	4.61	0.34
GS	2.49	1.94	4.43	0.55
CP	2.57	2.23	4.80	0.34

VS	2.58	2.19	4.77	0.39
INT	0.00	3.49	3.49	-3.49

Figure 1 shows the connection between the factors that affect the adoption intention of AI among MSMEs through DEMATEL. This diagram is an illustration of how the factors affect one another, indicating the direction and degree of influence of the variable factors to each other. From this result, it can be seen what the effect of each factor is in affecting the adoption intention of AI

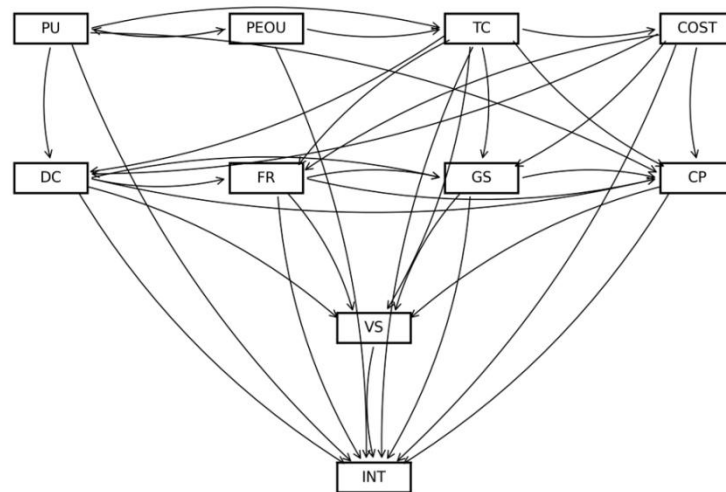


Figure 1. Results of the relationship between factors of AI adoption intention for MSMEs
Based on the Consistency Ratio (CR) analysis in the Analytic Network Process (ANP) model, all obtained values are below the acceptable threshold of 0.10, indicating that all pairwise comparison judgments are considered consistent and can be used for further analysis. The highest Consistency Ratio value was found in the Cost node with a value of 0.098, followed by CP and DC with values of 0.095 each, and TC with a value of 0.093. Although these values are relatively higher compared to other nodes, they still satisfy the consistency requirement because they remain below the recommended limit.

Meanwhile, the lowest Consistency Ratio value was observed in the PEOU (Perceived Ease of Use) node at 0.052, followed by FR at 0.062 and VS at 0.066. Other nodes, including PU (Perceived Usefulness) with 0.082 and GS with 0.090, also demonstrated acceptable consistency levels.

These results indicate that the respondents' judgments across all nodes in the ANP model have a good level of agreement and reliability (see Table 6). Therefore, the pairwise comparison matrices are considered valid, and the derived priority weights can be used for subsequent ANP analysis. The overall consistency evaluation confirms that there are no significant inconsistencies affecting the reliability of the decision-making model.

Table 6. Results of Consistency with ANP

Node	Consistency Ratio
Cost	0.098
CP	0.095
DC	0.095
FR	0.062
GS	0.090
PEOU	0.052
PU	0.082
TC	0.093
VS	0.066

Table 7 shows the Unweighted Super Matrix derived from the ANP analysis. The unweighted super matrix depicts the initial priority values of the relationships among elements and clusters in the ANP model prior to normalization and weighting procedures. The numbers represent the influence that each element has on other elements whereby high numbers signify strong relationships whereas zeros depict non-existent relationships between two elements. This super matrix is used to derive the weighted super matrix and the limit super matrix.

Table 7. Unweighted Super Matrix

Nodes	COST	CP	DC	FR	GS	INT	PEOU	PU	TC	VS
COST	0.00	0.00	0.13	0.36	0.34	0.00	0.00	0.00	0.38	0.00
CP	0.10	0.00	0.18	0.12	0.10	0.00	0.00	0.39	0.06	0.12
DC	0.15	0.13	0.00	0.10	0.06	0.00	0.49	0.27	0.05	0.24
FR	0.17	0.11	0.16	0.00	0.09	0.00	0.00	0.00	0.13	0.28
GS	0.13	0.07	0.15	0.08	0.00	0.00	0.00	0.00	0.11	0.07
INT	0.14	0.09	0.08	0.05	0.10	0.00	0.00	0.13	0.07	0.19
PEOU	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.12	0.10	0.00
PU	0.10	0.30	0.12	0.06	0.10	0.00	0.31	0.00	0.10	0.00
TC	0.11	0.19	0.10	0.13	0.12	0.00	0.20	0.09	0.00	0.11
VS	0.11	0.10	0.00	0.11	0.09	0.00	0.00	0.00	0.00	0.00

Table 8 is a representation of the Weighted Super Matrix of the ANP model, in which the influence value of each element or cluster has been normalized after cluster weights have been applied to them. The matrix indicates the importance of each of the factors, which will be used in the limit super matrix.

Table 8. Weighted Super Matrix

Nodes	COST	CP	DC	FR	GS	INT	PEOU	PU	TC	VS
COST	0.00	0.00	0.13	0.36	0.34	0.00	0.00	0.00	0.38	0.00
CP	0.10	0.00	0.18	0.12	0.10	0.00	0.00	0.39	0.06	0.12
DC	0.15	0.13	0.00	0.10	0.06	0.00	0.49	0.27	0.05	0.24
FR	0.17	0.11	0.16	0.00	0.09	0.00	0.00	0.00	0.13	0.28
GS	0.13	0.07	0.15	0.08	0.00	0.00	0.00	0.00	0.11	0.07
INT	0.14	0.09	0.08	0.05	0.10	0.00	0.00	0.13	0.07	0.19
PEOU	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.12	0.10	0.00
PU	0.10	0.30	0.12	0.06	0.10	0.00	0.31	0.00	0.10	0.00
TC	0.11	0.19	0.10	0.13	0.12	0.00	0.20	0.09	0.00	0.11
VS	0.11	0.10	0.00	0.11	0.09	0.00	0.00	0.00	0.00	0.00

Table 9 presents the Limit Matrix obtained from the ANP analysis. The limit matrix represents the final priority weights of each element after the weighted super matrix is raised to limiting powers until convergence is achieved. These values indicate the overall influence and priority of each factor within the ANP model, which are used to determine the final ranking of the evaluated criteria.

Table 10 presents the results of the ANP analysis, which shows the final priority weights of each factor based on the limit matrix. These results indicate the relative importance of each criterion within the decision-making model and provide the basis for identifying the most influential factors in the analysis

Table 9. Limit Matrix

Nodes	COST	CP	DC	FR	GS	INT	PEOU	PU	TC	VS
COST	0.14	0.14	0.14	0.14	0.14	0.00	0.14	0.14	0.14	0.14
CP	0.13	0.13	0.13	0.13	0.13	0.00	0.13	0.13	0.13	0.13
DC	0.14	0.14	0.14	0.14	0.14	0.00	0.14	0.14	0.14	0.14
FR	0.11	0.11	0.11	0.11	0.11	0.00	0.11	0.11	0.11	0.11
GS	0.08	0.08	0.08	0.08	0.08	0.00	0.08	0.08	0.08	0.08
INT	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10
PEOU	0.04	0.04	0.04	0.04	0.04	0.00	0.04	0.04	0.04	0.04
PU	0.12	0.12	0.12	0.12	0.12	0.00	0.12	0.12	0.12	0.12
TC	0.11	0.11	0.11	0.11	0.11	0.00	0.11	0.11	0.11	0.11
VS	0.05	0.05	0.05	0.05	0.05	0.00	0.05	0.05	0.05	0.05

The ANP results in Table 10 indicate that Cost and DC obtained the highest priority weights, each with a value of 0.15, followed by CP (0.14) and PU (0.13). The 0 values in the INT row indicate that INT is not a factor influencing other factors. The dominance of cost-related factors confirms that economic considerations remain an important determinant in decision-making processes. This finding is supported by Saaty (Saaty, 2005), who explained that ANP is designed to identify priority factors by considering complex relationships and interdependencies among decision criteria. In addition, cost considerations are frequently recognized as critical factors because decision-makers tend to assess the trade-off between expected benefits and required investments (Rogers, 2003).

Tabel 10. Result of ANP

Factor	Weight
COST	0.15
DC	0.15
CP	0.14
PU	0.13
TC	0.12
FR	0.12
GS	0.09
VS	0.06
PEOU	0.05
INT	0.00

The relatively high weight of Perceived Usefulness (PU) (0.13) indicates that the expected benefits and effectiveness of a system or technology significantly influence user preferences. This result aligns with the Technology Acceptance Model (TAM) introduced by Davis (Davis, 1989), which identifies perceived usefulness as one of the main determinants influencing technology acceptance. Previous studies have also confirmed that perceived usefulness has a strong relationship with users' intention to adopt and utilize technological systems because users are more likely to accept solutions that provide clear improvements in performance and productivity (Venkatesh et al., 2003).

The factors TC and FR, each with a weight of 0.12, demonstrate that technical capability and reliability remain important considerations. This finding supports the perspective of DeLone and McLean (DeLone & McLean, 2003), who stated that system quality, including reliability, functionality, and technical performance, is a fundamental component affecting the success and acceptance of information systems. Meanwhile, the lower weights obtained by GS (0.09), VS (0.06), and PEOU (0.05) indicate that these factors have relatively less influence compared with economic and performance-related factors. However, they remain important because technology acceptance and decision-making are multidimensional processes involving technological, organizational, and individual aspects (Venkatesh et al., 2003).

Overall, the ANP results contribute to the existing literature by demonstrating that decision priorities cannot be determined solely based on one criterion but must consider the interactions among multiple factors. The application of ANP provides a comprehensive framework for evaluating interconnected criteria and generating more accurate priority rankings compared with traditional hierarchical approaches (Saaty & Vargas, 2013). These findings reinforce previous research emphasizing the importance of integrating economic value, usefulness, system quality, and user-related factors in technology evaluation and adoption decisions.

CONCLUSION

The current study has proven that the combination of DEMATEL and ANP techniques can be used as an effective method to identify influential factors and their priority. In terms of DEMATEL technique outcomes, all considered factors were found to fall into the category of causes, which means that they directly influence the other factors in the system. Among the considered criteria, the most influential criterion is the one related to decision making, followed by the technical capability criterion.

In addition, the priority structure of the above-mentioned factors is reconfirmed through the ANP approach. From the results, it can be noted that the two most influential factors are Cost and DC with weight 0.15 for each, while CP and PU are third and fourth with weight 0.14 and 0.13 respectively. It can therefore be concluded that economic and decision-making issues as well as perceived usefulness are the key elements that affect the decisions regarding the adoption of artificial intelligence among MSMEs. Technical capability and system reliability are equally important with weight 0.12 each.

Moreover, the consistency check for the ANP model reveals that the Consistency Ratio (CR) values are less than 0.10, which is the threshold value indicating the validity of the comparisons made and the accuracy of the priority values derived through the model. Pasted text In conclusion, it can be said that the adoption of AI technology by MSMEs is driven by several interdependent factors including economic, technological, and end-user factors, and not by any one factor alone. Thus, the DEMATEL-ANP technique offers a strong decision-making model for such complex situations.

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