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Critical factors affecting Artificial Intelligence in Supply Chain Management (Case study in Danang SMEs)

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Abstract: This paper aims to research the elements that affect the decision to implement Artificial Intelligence (AI) in supply chain management at SMEs in Da Nang, Vietnam. The application of new technologies in supply chain management is significant during the development period of industry 4.0. A more in-depth examination of the issues in implementing AI in the supply chain will provide a more objective perspective on the challenges and benefits of adopting AI to supply chain management in SMEs. This paper investigates the effect factors in implementing Artificial Intelligence (AI) technology by constructing a Technology-Organization-Environment (TOE) framework. To achieve the research objectives, this study used two approaches. First, a qualitative approach is used to build a research hypothesis framework. Second, the quantitative approach includes explanatory factor analysis, Pearson Correlation, and regression methods by utilizing survey data on 120 MSMEs in Da Nang. The results indicated that the complexity, compatibility, cost, and external pressure factors are not essential in AI implementation. Referring to those technical factors (relative advantages), organization factors (top management support, organization readiness), and environmental factors (government support) have a positive influence on the technology implementation of AI in supply chain management.

Keywords: Artificial Intelligence; AI readiness; Supply chain management; SMEs; implementation.

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INTRODUCTION

Supply chain management (SCM) is one of the most crucial fundamentals among different sectors, primarily marketing, logistics, and production. Therefore, success in SCM is considered the overall success of any business (BusinessEssay, 2021). Even a tiny supply chain improvement can lead to a significant impact on bottom-line profits. However, improving performance is not always an easy matter.

People have developed numerous ideas and keys to managing supply chains effectively. One of those is Artificial Intelligence Technology, which can track supply and demand in the areas run by a particular business. Moreover, AI can adjust its inventory, moving it from low-demand to high-demand markets and setting the prices for products (Tina Jacobs, 2020). Due to that, worldwide organizations are working extremely hard to reduce supply chain complexity and increase adaptability using artificial intelligence (AI) technologies. AI is now the core issue of global technology developed by governments worldwide, and Vietnam is not an acceptance. In early 2021, the Vietnam Prime Minister issued the National Strategy on Research, Development, and Application of AI to 2030, intending to bring Vietnam into the top four groups of ASEAN countries in the field of artificial intelligence that successfully has ten prestigious AI brands in the region (MIC, 2021).

Besides, small and medium enterprises in Vietnam face many difficulties and challenges in applying and deploying artificial intelligence in supply chain activities. According to the Vietnam Industry and Trade Journal, SMEs enterprises account for a large proportion of the Vietnamese business community, accounting for about 97% (Bui, 2021). The number of enterprises is large, but most of the capital and financial resources are still limited, unable to access new technologies. Specifically, in logistics transport, 90% of logistics enterprises, when registered, have a capital of less than 10 billion VND, lower than the average registered capital of enterprises in the country (Le, 2019). The capital potential is the main issue that makes businesses consider whether to invest in supply chain management software and applications for their businesses. According to a study conducted by Accenture Strategy, "about 90% of surveyed executives said that human resources in the supply chain will be enhanced with skills, knowledge and equipped with modern tools to cope with working with machines effectively " (So Tay Doanh Tri, n.d.).

Meanwhile, lacking digital skills and knowledge prevents Vietnamese businesses from starting technological innovation strategies. Small and medium-sized enterprises are very vague about digital transformation and have not been exposed to and applied much to technical elements in their operations (Bui, 2021). In particular, it is still mainly using cheap and limited human resources. However, developing the economy in the 4.0 revolution requires many human resources to possess new skills.

Da Nang is one of Vietnam's most important commercial and service cities (Danang Portal, 2022). However, the Covid 19 outbreak resurfaced in April 2021, severely reducing company capacity. According to the VCCI Da Nang, businesses encounter three significant challenges while maintaining operations during the epidemic: poor mobility owing to epidemic control efforts, high transportation expenses, financial issues, and resources (Tuan Vy, 2021). It can be shown that the social distancing measures used to avert the outbreak have had a significant impact on corporate output and commercial activity. Therefore, besides enhancing facilities and factories, businesses in Da Nang are also focusing on strengthening supply chains to increase efficiency in the operational process between suppliers and provide the best customer satisfaction. With the growth of technology, the corporate rivalry is becoming increasingly fierce. AI implementation at the organizational level may boost supply chain productivity and efficiency, allowing Da Nang firms to become market leaders in their fields.

The research of supply chain management trends in small and medium firms and the recent use of Artificial Intelligence will assist in identifying the elements influencing AI's application in supply chain management in small

and medium enterprises based on the challenges mentioned above. As a result, small and medium businesses in Da Nang have better understanding of the importance and application of Artificial Intelligence in supply chain management, allowing them to develop appropriate short and long-term plans and strategies to keep up with the trend of technological advancements in the field of Artificial Intelligence in improving and enhancing supply chain management in The Industrial Revolution.

LITERATURE REVIEW

2.1 Artificial Intelligence

Artificial intelligence is a computer science that studies and simulates human behavior through mechanical or computational processes to perform tasks that require human intelligence. (Encyclopedia, 2018). The advent of artificial intelligence has made significant changes in businesses, explicitly helping to plan and build optimal production processes. Artificial technology has a high analytical ability, ensuring implementation progress and achieving work efficiency (Thach, 2021). AI has been around for a long time, but its potential for solving complex issues and finding data in supply chain administration has not been fully exploited (Helo, Petri & Hao, Yuqiuge, 2021). In this area, AI is making silent changes to logistics and transportation, especially in purchasing. Applications of AI in supply chain management can include: inventory control and planning, transportation network design, purchasing and supply management, or customer relationship management (Nguyen & Nguyen, n.d.).

2.2 Supply chain management

Supply chain management administers the stream of products and services, linking companies, suppliers, and stakeholders together. This activity includes the distribution of source materials from supplier to manufacturer, all the way to the creation of the final product for sale to the customer (Fernando, 2022). Artificial intelligence is one smart strategy to improve, accelerate and grow the supply chain in small and medium enterprises (European Commission, n.d.). The race for artificial intelligence is on, and the company is competing with the desire to provide the fastest and most personalized service compared to the competition in the market. Supply chain managers must apply and constantly update AI to improve their operations, or they risk losing out (Smartlog, 2017).

2.3. Factors affecting Artificial Intelligence implementation in supply chain management of Danang SMEs.

Complexity

Complexity is adversely related to AI selection aim, AI usage expectation, and AI mechanization aim in Supply Chain Risk Management (SCRM) Souma Kanti Paul, Sadia Riaz, and Suchismita Das, 2020). The application of AI in SCM operations requires exceedingly experienced individuals, driving the complexity of this innovation considerably.

Hypothesis 1 (H1): Complexity has a negative impact on Artificial Intelligence Implementation in Supply Chain Management.

Compatibility

Compatibility alludes to the degree of development and its capacity to provide esteem and encounter to clients. At the same time, compatibility encompasses a positive impact on the aiming application of fake insights in SMEs (A. Kalse and A. Kumar, 2021).

Hypothesis 2 (H2): Compatibility has a positive impact on Artificial Intelligence Implementation in Supply Chain Management.

Relative advantage

Relative advantage alludes to the benefits of receiving AI at the firm level (Souma Kanti Paul, and all 2020). The comparative advantage positively affects the purpose of receiving counterfeit insights in SMEs (Souma Kanti Paul, and all 2020). Applying AI innovation makes a difference in businesses spare working costs, in this manner expanding income (Tatjana Vasiljeva, 2021)

Hypothesis 3 (H3): Relative advantage positively impacts Artificial Intelligence Implementation in Supply Chain.

*Management.***Top management support**

Best administration bolster alludes to the engagement of a top-level pioneer for IS/IT usage.

Top administration commitment can positively impact unused innovation appropriation in articulating a vision, giving capital reserves, and apportioning resources (Praveen R.S. Gummadidala, and all 2020).

The selection of counterfeit insights isn't conceivable without top-quality infrastructural bolster and organizational backing from top pioneers within the organization (Souma Kanti Paul, and all 2020).

Hypothesis 4 (H4): Top management support positively impacts Artificial Intelligence Implementation in Supply Chain Management.

Cost

This variable refers to how excessive technology adoption will lead to costly consequences. It is necessary to control the technology use process because it is easy to increase the costs of hardware equipment, operation, and maintenance (Lin, Danping and all, 2016). Cost in this study refers to cost-effectiveness, a condition where the cost of adopting technology is relatively lower than the benefits obtained. Even so, cost remains a major barrier to technology adoption, despite falling software and hardware prices (Puklavec, and all 2017). The high cost of adopting this technology is related to the need to train end-users to ensure that the technology is fully applicable to MSMEs. (Wong, and all 2019).

Hypothesis 5 (H5): Cost has a negative impact on Artificial Intelligence Implementation in Supply Chain Management.

Organization readiness

Organizational readiness refers to how well a company has prepared its resources for adopting new technological applications (Orut Puklavec, and all 2018). When small and medium businesses plan correctly and in depth, they will simply and efficiently achieve their objectives. Knowledge, skills, and financial resources, in particular, are sufficient to be ready to implement artificial intelligence (Anjali Kalse, Anuj Kumar, 2021).

Hypothesis 6 (H6): Organizational readiness positively impacts Artificial Intelligence Implementation in Supply Chain Management.

External pressure

Competition, for example, is an external threat that encourages a business to adopt a breakthrough by risking a competitive advantage (Danping Lin, and all 2016). Individuals and corporations may benefit from AI's potential to promote innovation and offer new possibilities. AI adoption is influenced by the capacity to apply AI to improve decision-making and customer experience (Souma Kanti Paul, and all 2020).

Hypothesis 7 (H7): External pressure positively impacts Artificial Intelligence Implementation in Supply Chain Management.

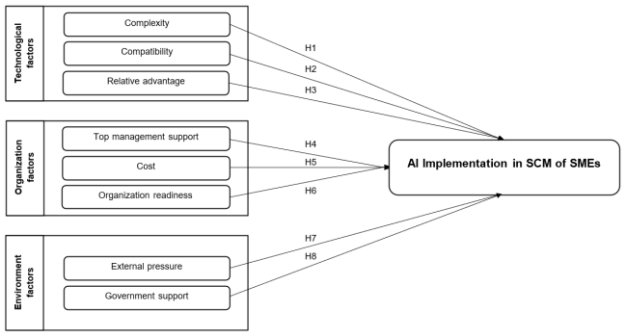
Government support

In addition to external pressure, one of the things that businesses must consider is the government (Anjali Kalse & Anuj Kumar, 2021). Regulatory difficulties relate to the government's support in encouraging the implementation of AI technologies at the organizational level in this study. In the context of AI, different governments have different policies.

Hypothesis 8 (H8): Government support positively impacts Artificial Intelligence Implementation in Supply Chain Management.

Conceptual Framework and Hypotheses

Figure 1: Research model

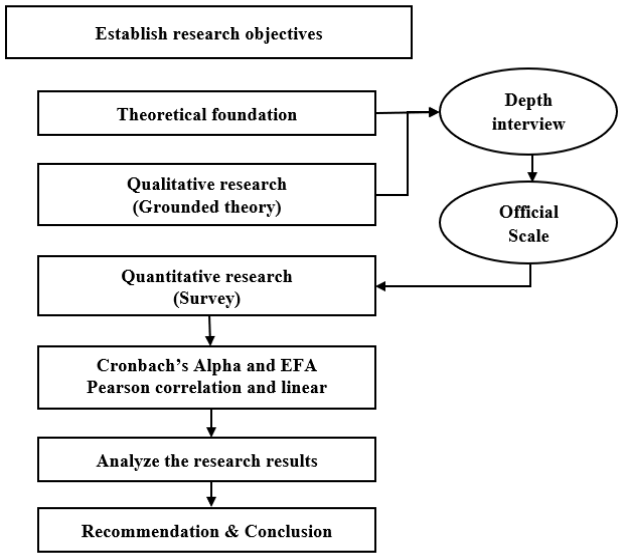


Source: Authors

METHOD

The main objective of this study is to identify the determinants of the application of artificial intelligence (IA) in supply chain management in SMEs in Da Nang city. By answering the research objectives, the preparation of appropriate plans and strategies in the application of technology to improve the operational efficiency of SMEs. Furthermore, there are two approaches used in this research.

Figure 2: Research process



Source: Authors

3.1. Qualitative research

In the qualitative research process, two methods were applied to find suitable research models and scales. To accomplish the above objectives, we have used the grounded theory to approach the theories with basis and quality. Specifically, this is the process of collecting, synthesizing, and analyzing data and evidence from a large number of articles related to the topic "application of artificial intelligence in supply chain management" (n >30).

The second qualitative method aims to adjust and develop the scales of previous studies to suit the context and research environment in Vietnam, specifically in the Da Nang city area. The focus group interviews were chosen to transform the proposed model into a formal research model. We hold a group meeting with 5 participants, and the group leader introduces relevant content in the study for members to discuss, critique, and adjust accordingly. The information and opinions in the discussion help identify and integrate the content used in the research paper. From there, use the factors and scales in qualitative research to complete the questionnaire and conduct the survey.

3.2. Quantitative research

It's all about numbers in quantitative research. It employs data and statistical analysis to illuminate essential information about the company and market.

A quantitative data-based investigation developed a survey questionnaire as a data collection device. The questionnaire has been methodically constructed to meet the study's objectives. The respondents' degree of agreement was measured using a 5-point Likert Scale (Babakus, and all 2000). The data processing method in this study has been through a reliability evaluation based on the Cronbach Alpha coefficient.

Exploratory factor analysis (EFA) is generally used to discover a measure's factor structure and examine its internal reliability. EFA exploratory factor analysis based on KMO coefficient (Kaiser - Meyer - Olkin) and Bartlett test of sphericity; correlation analysis and regression analysis - checking the suitability of the research model.

3.2.1. Design a scale: Likert Scale

A likert scale (generally) provides five ways to respond to a statement or question, allowing respondents to indicate their level of agreement or feeling about the topic or comment on a positive-to-negative scale. (Babakus, and Mangold, 1992).

A Likert scale posits that an attitude's strength/intensity is linear, i.e., on a scale ranging from strongly agree to disagree strongly, and that attitudes can be evaluated.

Table 1. Official scale

Variables	Items	Sources
Complexity (CX)	CX1: The actual operation of AI system is relative complex	Souma Kanti Paul, and all (2020)
	CX2: It is inconvenient to use AI system	Souma Kanti Paul, and all (2020)
	CX3: Using the AI system requires rich relevant experience	Souma Kanti Paul, and all (2020)
Compatibility (CB)	CB1: AI technology may easily integrate into SCM Processes	Anjali Kalse, Anuj Kumar (2021)
	CB2: The AI technology can blend in the enterprise business flows well	Danping Lin, C. and all (2016)
	CB3: AI system is compatible with the work content in SCM	Anjali Kalse, Anuj Kumar (2021)
Relative advantage (RA)	RA1: AI can help supply chains run more efficiently and save time	Anjali Kalse, Anuj Kumar (2021)
	RA2: AI can help reduce operations cost	Anjali Kalse, Anuj Kumar (2021)
	RA3: AI can enhance worker safety	Anjali Kalse, Anuj Kumar (2021)
Top management support (TS)	TS1: Senior management's pay attention and actively discuss when embracing AI technology	Praveen R.S. Gummadidala, and all (2020)
	TS2: Senior managements provide support to implementing AI technology	Praveen R.S. Gummadidala, and all(2020)
	TS3: Senior managements is willing to bear the risks of deploying AI technology	Praveen R.S. Gummadidala, and all (2020)
Cost (CO)	CO1: Adopting AI technology will increase hardware equipment cost	Tatjana Vasiljeva, and all (2021)
	CO2: Adopting AI technology will increase operating cost and maintenance cost	Tatjana Vasiljeva, and all (2021)
	CO3: Adopting AI technology will increase business, technical consulting cost	Tatjana Vasiljeva, and all (2021)
Organization readiness (OR)	OR1: Our enterprise has a good understanding of how AI can be used in SCM	Danping Lin, C. and all (2016)
	OR2: Our employees have the necessary technical, managerial and	Danping Lin, C. and all (2016)

	other skills to implement AI	
	OR3: Our enterprise possesses sufficient resources (financial, technological…) to adopt AI	Danping Lin, C. and all (2016)
External pressure (EP)	EP1: Competitive pressures drive businesses have to adopt AI technology	Chen, Hong and all (2020)
	EP2: AI vendors support businesses in adopting AI technology	Chen, Hong and all (2020)
	EP3: Cooperative partners request to apply AI technology	Danping Lin, C. and all (2016)
Government support (GS)	GS1: Government provides financial support to the businesses that implement AI technology	Lai-Wan Wong, and all (2020)
	GS2: Government publishes related policies to strongly support the development of AI technology	Lai-Wan Wong, and all (2020)
	GS3: Government support to build AI research centers	Lai-Wan Wong, and all (2020)
Implementation willingness (IW)	IW1: Plan to adopt AI technology within the next years	Danping Lin, C. and all (2016)
	IW2: Plan try out AI technology within the next years	Danping Lin, C. and all (2016)
	IW3: Willingness to take time to research how to adopt AI	Danping Lin, C. and all (2016)

Source: Authors

3.2.2. Sampling

Business owners in Danang City, Vietnam will be our target responders. The questionnaires were sent to the research subjects in person and through the Internet. Convenient data choosing methods belonging to the non-probability sampling method were used for data collection. The sample calculation formula can be used in this research to determine the minimum sample size. Using the formula of (Tabachnick, Fidell 1996).

$$n = 50 + 8m$$

Based on the results from the formula with n is the quantity of sample, m = 8 hypotheses (m is the number of independent factors, not the number of separate questions). The number of official respondents used for analysis was 120 respondents. Roscoe suggested that sample sizes greater than 30 and less than 500 are appropriate for most studies (Roscoe, 1975).

RESULTS AND DISCUSSION

4.1 Result

4.1.1 Characteristics

A total of 120 questionnaires were issued to all persons working in SMEs in Danang City for the research. The answers to the research were collected via Google Form between February 25 and March 5, 2022. The data is subsequently processed using the SPSS 20 program.

Table 3: Descriptive statistics of demographic factors

	Categories	Frequency	Percentage (%)
Type	Private enterprise	54	45
	Joint venture enterprise	32	26.7
	Foreign-invested enterprise	6	5
	State-owned enterprise	18	15
	Other	10	8.3
Labor	Under 50 employees	34	28.3
	51 - 100 employees	48	40
	101 - 500 employees	38	31.7
Areas	Agriculture - Forestry - Fisheries	16	13.3
	Mining industry	9	7.5
	Manufacturing and processing industry	23	19.2
	Construction industry	16	13.3
	Transportation - Warehousing industry	27	22.5
	Tourism	21	17.5
	Other	8	6.7
Years	Under 3 years	28	23.3
	4 - 6 years	36	30
	Over 6 years	56	46.7
Location	Hai Chau	18	15
	Thanh Khe	14	11.7
	Son Tra	30	25
	Lien Chieu	20	16.7
	Ngu Hanh Son	21	17.5
	Hoa Vang	17	14.2
	Hoang Sa	0	0

Source: Authors

4.1.2 Assessing the Reliability of the Scale (Cronbach's Alpha)

Because of the large Cronbach's Alpha coefficient (more than 0.6), the test results demonstrate that the scale with factors is reliable. In addition, the corrected item-total correlation is better than 0.4, and the Cronbach's Alpha if Item Deleted coefficient of observed variables is less than Cronbach's Alpha coefficient except for CB3. As a result, the EFA analysis did not include the observed variable CB3. The remaining observed variables are employed in the EFA analysis that follows.

Table 4. Summary table of Cronbach's Alpha coefficients of the scales

No	Items	N of items	N of items satisfying	Cronbach's Alpha
1	Complexity factor	3	**3**	**0.916**
2	Compatibility factor	3	**2**	**0.738**
3	Relative advantage factor	3	**3**	**0.820**
4	Top management support factor	3	**3**	**0.842**
5	Cost factor	3	**3**	**0.873**
6	Organization readiness	3	**3**	**0.752**
7	External pressure factor	3	**3**	**0.932**
8	Government support factor	3	**3**	**0.815**
9	Implementation willingness factor	3	**3**	**0.891**

Source: Authors

4.1.3 Exploratory factor analysis EFA

23 independent variables were sorted into 5 groups after the EFA analysis round 1. The coefficients of factor loading are all larger than 0.5. The variables CB1 and CB2 upload both factors simultaneously, and the load factor difference is smaller than 0.3. As a result, while assessing EFA, the factors cannot guarantee convergence and differentiation values. We re-analyze independent variables after removing CB1, CB2.

After the second EFA analysis, the remaining 21 independent variables were sorted into four groups. OR1 uploads both components simultaneously, with a load factor difference of less than 0.3. As a result, the OR1 Factor was eliminated, and EFA was re-analyzed.

Use Varimax rotation to do factor analysis based on Principal Components. The EFA model is adequate since the Eigenvalue is 1.428 and the total value of variance retrieved is 68.585 percent (greater than 50%). As a result, 4 factors account for 68.585 percent of the observed variance.

According to the factor analysis result, the KMO index of 0.814 is larger than 0.5, and Sig Bartlett's Test of 0.000 is less than 0.05, this demonstrates that the data utilized for factor analysis is completely appropriate.

Factor loading coefficients are still more than 0.5 when excluding factors CB1, CB2, CB3, OR1, and there is no case of variable uploading both factors at the same time with the loading factor close to each other. Therefore we have 20 observed variables that were initially grouped into 4 groups.

Table 5. Results of the EFA analysis from independent observation variables:

Items	Factor loading			
	1	2	3	4
GS2	0.789			
GS1	0.771			
GS3	0.769			
TS1	0.755			
OR3	0.737			
TS3	0.708			
TS2	0.671			
OR2	0.598			
EP3		0.892		
EP2		0.884		
EP1		0.867		
CX3		0.787		
CX2		0.782		
CX1		0.777		
CO3			0.856	
CO2			0.854	
CO1			0.851	
RA3				0.809
RA1				0.740
RA2				0.711
The coefficient satisfy the conditions				
Eigenvalue	5.805	4.836	1.911	1.165
Cumulative %	68.585			
KMO	0.814			
Barlett's Test	Sig.=0.000			

Source: Authors

According to the EFA results, the dependent variable is extracted into three observed variables. With the total extracted variance of 82.133 percent, all observed dependent variables had factor loading coefficients larger than 0.5, KMO and Sig indices of 0.744 and 0.000, and an Eigenvalue number of 2.464. As a result, these.

Table 6. EFA analysis results for the dependent variables

Items	Factor loading
IW1	0.792
IW2	0.829
IW3	0.843
The coefficient satisfies the conditions	
Eigenvalue	2.464
Cumulative %	82.133
KMO	0.744
Barlett's Test	Sig.=0.000

Source: Authors

According to the final rotation matrix results, we redefine the factors and presented in Table 7

Table 7 . Final rotation matrix table results

No	Factor	Observable variables	Type
1	IW	IW1, IW2, IW3	Dependent
2	GTOR	GS1,GS2,GS3,TS1,TS2,TS3,OR2,OR3	Independent
3	EPCX	EP1,EP2,EP3,CX1,CX2,CX3	Independent
4	CO	CO1,CO2,CO3	Independent
5	RA	RA1,RA2,RA3	Independent
Total number of independent observed variables: 20			
Total number of dependent observed variables: 3			

Source: Authors

4.1.4 Correlation Matrix

independent and dependent representative variables obtained from the EFA factor analysis.

According to the correlation matrix in table 11, Pearson's correlation Sig of independent variables GTOR and RA with dependent variable IW is less than 0.05. As a result, these independent variables and the dependent variable IW have a linear relationship.

Furthermore, the Pearson's correlation Sig value of IW with EPCX, CO is more prominent than 0.05, indicating that these three variables do not have a linear relationship. The EPCX and CO variables will be deleted when doing multiple linear regression analyses.

Table 8. Correlation between variables

		IW	GTOR	EPCX	CO	RA
IW	Pearson Correlation	1	0.695**	-0.41	-0.45	0.760**
	Sig. (2-tailed)		0.000	0.655	0.626	0.000
	N	120	120	120	120	120
GTOR	Pearson Correlation	0.695**	1	-0.87	-0.174	0.600**
	Sig. (2-tailed)	0.000		0.346	0.058	0.000
	N	120	120	120	120	120
EPCX	Pearson Correlation	-0.041	-0.087	1	-0.348**	-0.37
	Sig. (2-tailed)	0.655	0.346		0.000	0.690
	N	120	120	120	120	120
CO	Pearson Correlation	-0.45	-0.174	-0.348**	1	-0.044
	Sig. (2-tailed)	0.626	0.058	0.000		0.631
	N	120	120	120	120	120
RA	Pearson Correlation	0.760**	0.600**	-0.037	-0.044	1
	Sig. (2-tailed)	0.000	0.000	0.690	0.631	
	N	120	120	120	120	120

***. Correlation is significant at the 0.01 level (2-tailed); Source: Authors*

4.1.5 Multiple regression analysis

The detailed results of regression analysis and calculation results of the importance of each Factor in the model are presented in Table 9 as follows:

Table 9. Estimate the beta coefficient of the model by the Enter method

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-0.115	0.261		-0.442	0.660		
RA	0.637	0.079	0.535	8.016	0.000	0.639	1.564
GTOR	0.397	0..071	0.374	5.598	0.000	0.639	1.564
Adjusted R Square	0.661						
F (ANOVA)	116.880						
Sig. (ANOVA)	0.000b						
Durbin - Watson	2.081						

Source: Authors

We conclude that the multiple linear regression model is adequate for the data set since the ANOVA result is 116,880 with a sig of ANOVA of 0.000b (less than 0.05). According to the Durbin-Watson statistical table, the study includes 120 samples and two independent variables in the linear regression analysis. As a result, the dU and dL values are 1.651 and 1.598. There is no first-order autocorrelation since the Durbin Watson coefficient is 2.081 and falls between 1.651 and 2,349. The independent variables' sig t values are all less than 0.05, demonstrating that they are all significant in explaining the dependent variable. Accordingly, no variable is omitted from the model. There is no multicollinearity since all the independent variable VIF coefficients are smaller than 2.

Table 9 shows that the Adjusted R square value is equivalent to 66.1 percent. As a result, the independent factors explain 66.1 percent of the variance in the dependent variables. The non-model variables and random error account for the remaining 33.9 percent. The dependent variable is influenced in the same direction by all of the independent variables in the regression analysis. The order of influence degree from strongest to weakest of the independent variables to the dependent variable is RA (0.535) > GTOR (0.374) based on the magnitude of the normalized regression coefficient Beta.

The groups of factors affecting the application of artificial intelligence in supply chain management of SMEs in Da Nang city are as follows:

- *RA:* Perception of AI's relative advantage has the strongest impact on the application of AI in supply chain management for SMEs businesses in Da Nang city.
- *GTOR:* Government and top management support, as well as enterprise readiness for AI implementation, has the second strongest impact.

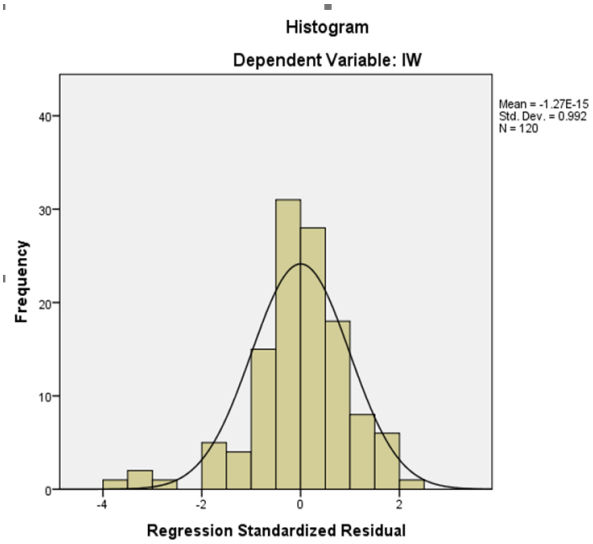
To conclude, the results of the regression function are as follows:

IW = 0.535RA + 0.374GTOR

4.1.6 Verification of Conformity of the Model

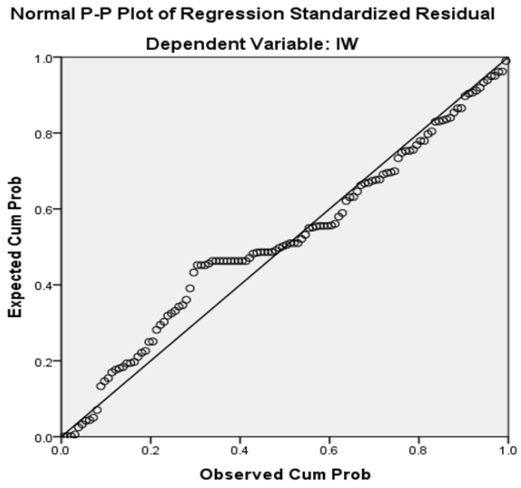
The histogram shows that the mean value of -1.27E-15 is near 0, while the standard deviation of 0.992 is also near 1. As a result, the residual distribution is considered to be essentially standard. The P-P plot also reveals that the perspectives do not deviate too much from the expected straight line, indicating that the normal distribution of residuals assumption is not violated.

Figure 3: Histogram



Source: Authors

Figure 4: Normal P-P Plot of Regression Standardized Residual



Source: Authors

4.1.7 One-Way Mean Difference Analysis

Table 10: One-Way Mean Difference results

Factors	Meaning	Test of Homogeneity of Variances	ANOVA
		Sig	Sig
Loaihinh	Business type	0.272	0.043
Laodong	Number of employees	0.745	0.403
Linhvuc	Business area	0.126	0.840
Kinhnghiem	Experience	0.149	0.235
Truso	Headquarter	0.177	0.220

Source: Authors

Based on One-Way Mean Difference results (table 10), the research team summarizes the following conclusions:

- The Levene-tested Sig coefficient is larger than 0.05 for variables like employee quantity, business area, experience, and headquarters. There is no

difference in invariance across the groups above with the dependent variable. The F-test Sig values are all more than 0.05, indicating that the factors described above have no statistically significant effect on AI implementation willingness.

- The Levene-tested Sig coefficient for the business type factor is more than 0.05, whereas the F-test Sig value is less than 0.05. As a result, there is a statistically significant variation in the propensity of various company types to use AI. with the abovementioned factors.

4.2 Discussion

Through the application of research methods and data processing, the research results show that factors influence the decision to deploy artificial intelligence applications in supply chain management. Specifically, the elements are arranged in descending order of impact: Relative advantage factor, Factor about government and top management support, and enterprise readiness. Compared to the previously proposed research model, these factors have changed to suit the research topic, typically the second factor. Exploring these factors is expected to bring about positive effects and help strategic planners create policies to put artificial intelligence to serve the business's operational needs in the earliest and future.

4.2.1 Recommendations

Increase employee awareness of AI relative advantages

Agreeing to the investigation, the recognition of relative points of interest in AI has the most grounded effect on the application of AI for businesses. In this manner, endeavors are required to raise mindfulness among supervisors and laborers around the benefits of AI, the conditions of the move, and how dangers can best be overseen.

There are different points of interest in utilizing AI in undertaking learning. Cutting-edge methodologies such as AI-powered chatbots, personalized learning, sharp criticism, and learning analytics, among others, have demonstrated to be exceedingly accommodating in expanding efficiency. This appears to be the diverse highlights of AI compared to people. Workers have to be mindful of this contrast to plan to adjust.

Government support, top management support, and organization readiness

Beat administration must improve worker information and selection of AI in order to fathom these concerns and encourage workers to utilize AI.

Firstly, businesses may boost representative mindfulness by contributing to learning and advancement some time recently actualizing AI. This strategy will give workers the fundamental aptitudes to function, laying the basis for them to overcome their fear of AI immediately.

Besides, in terms of funds, businesses can make support to carry out POC ventures on AI or serve speculation preparing costs. Great money-related arrangements contribute to handling optimization. Agreeing to a later ponder by Infosys, AI is seen as a long-term vital need for development by worldwide organizations, and 84% arrange to prepare representatives. As a result, businesses must invest in learning and development and learning platforms in order to pave the path for lifelong learning.

The third is consistency within the preparation, to execute each step easily requires the availability of the undertaking from numerous angles—particularly the assurance of the authority to apply this innovation and the employees' belief in the company. There's got to raise mindfulness among SME proprietors, supervisors, and business people about the openings and challenges that fake insights (AI) can bring to their businesses, as well as how distinctive subfields of AI can be connected to diverse businesses, trade capacities, and commerce models.

Finally, but not slightest, government back is an imperative calculation impacting the issue. Through arrangements to bolster SMEs legitimately, organize classes between huge endeavors and SMEs to put them together,

making conditions and openings for improvement.

+ Supporting SMEs in creating an information culture, from information collected through administration, conservation, and examination, as well as guaranteeing that the AI move happens with way better-advanced chance administration hones in SMEs.

+ To educate SME supervisors, commerce proprietors, financial specialists, and money-related education, extra proof on the return on speculation of relocating to AI trade models and jones is being collected and built.

+ Finding ways to bridge the financing crevice until AI can convey its full potential.

4.2.2 Limitations

Limitation 1: This study focuses only on Da Nang, with future expansion to surrounding areas of Vietnam. The primary audiences involved include corporations using AI technology in Supply Chain Management.

Limitation 2: Due to the short research period, the sample size is relatively small and would not be able to identify significant relationships within the data set. The larger sample size could have generated more accurate results in this study.

Limitation 3: Because this study was conducted in the context of the Covid-19 epidemic, the results and research process will not be accurate with reality. And the actual survey with customers or related subjects is not feasible, so the research results will not reflect 100% of fact.

5. Conclusion

To analyze the factors affecting the application of artificial intelligence in supply chain management, an in-depth study was conducted with small and medium enterprises in Da Nang city. Information and data are consulted from documents, research articles, and websites related to the application of artificial intelligence and technology; these official sources are carefully reviewed and referenced. The research model is built based on qualitative and quantitative research methods and applies techniques for analysis and evaluation such as Cronbach's Alpha tools, EFA, correlation, and regression analysis. Based on survey results from a sample of n = 120, the study has adjusted and perfected the scale for two constitutive factors affecting the application of AI in businesses, including (1) Relative advantage; (2) Government support, top management support as well as organization readiness. In particular, the perception of the relative advantages of applying intelligence in supply chain management strongly influences SMEs enterprises in Da Nang city. Research results have helped businesses realize the importance of using artificial intelligence, come up with solutions and plans for the company to quickly enter the digital technology phase, thereby optimizing workflow and bringing efficiency in supply chain operations.

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