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Guidelines for Applying Artificial Intelligence Technology to Control Quality in the Manufacturing Industry to Enhance Competitiveness.

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Abstract

Technology is growing and changing rapidly. This causes the organization to face challenges that have never been faced before. The organization will survive as an innovative organization. The purpose of this research was to study the application of artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness. In order to develop a structural equation model Conduct both qualitative and quantitative research. A survey of quantitative data from the questionnaire responses of 500 industrial business enterprises that have a quality management or sustainability system in the organization, using both descriptive statistics, reference statistics, and multiple statistics.The results of the research revealed that the approaches for applying artificial intelligence technology to quality control in the manufacturing industy to enhance competitiveness. The 4 elements are prioritized as follows: 1) Organizational support ($\bar{X} = 4.14$) 2) Learning and growth ($\bar{X} = 4.13$, S.D. = 0.46) 3) Cooperation network ($\bar{X} = 4.13$, S.D. = 0.48) 4) Intelligence centric ($\bar{X} = 4.12$) As for the results of the hypothesis test, it was found that 2 business groups as a whole not difference was statistically significant at the level of 0.05.The results of the analysis of the developed structural equation model were found to pass the evaluation criteria is consistent with empirical data The chi-squared probability value was 0.060, the relative chi-squared value was 1.105, the concordance index was 0.942, and the root mean squared value of the error estimate was 0.014.

Keywords: *Structural equation modeling, organize support, learning and growth, collaboration network, artificial intelligence technology*

Introduction

Artificial intelligence technology is currently garnering significant attention. AI technology brings benefits to various types of work support and aids in enhancing the competitiveness of the organization. It is often used in conjunction with Cloud Computing and Big Data technologies, leading to the transfer of data across machines on the Internet network. When a machine can create new knowledge. This knowledge can be transferred to other machines within a short time.

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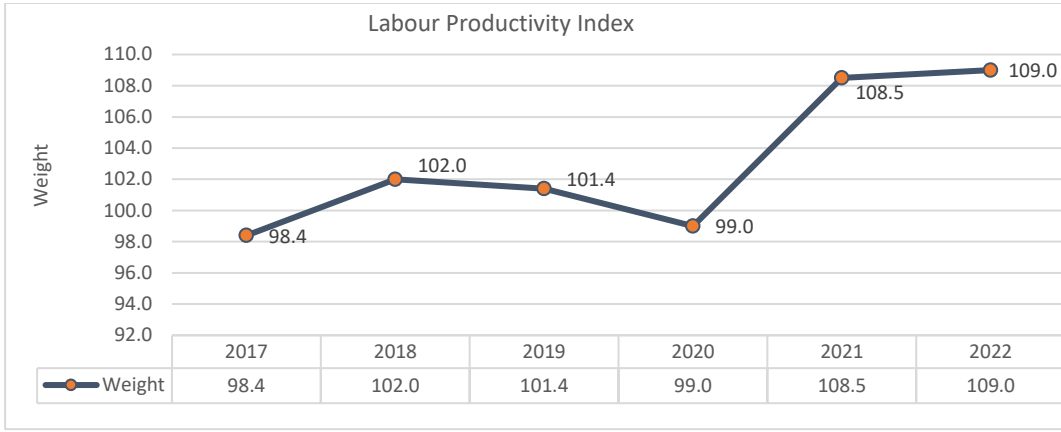

Figure1: Industrial Production Labor Force Index (Bank of Thailand, 2023)

From Figures 1 and 2, it can be observed that the Industrial Production Labor Force Index of Thailand increased from 2017 to 2018 and then exhibited a declining trend from 2019 to 2020 This decline was primarily attributed to the significant impact of the Covid-19 pandemic that emerged towards the end of 2019. The pandemic had substantial repercussions, leading several sectors of production to temporarily halt operations in 2020. This, in turn, prompted a shift towards the 'New Normal,' characterized by changes in people's daily lifestyles and technology-driven transformations across industries. In response to these challenges, the years 2019 to 2022 witnessed an increase in the Industrial Production Labor Force Index due to the adoption of automated systems and robotics technology to enhance productivity per unit of labor.

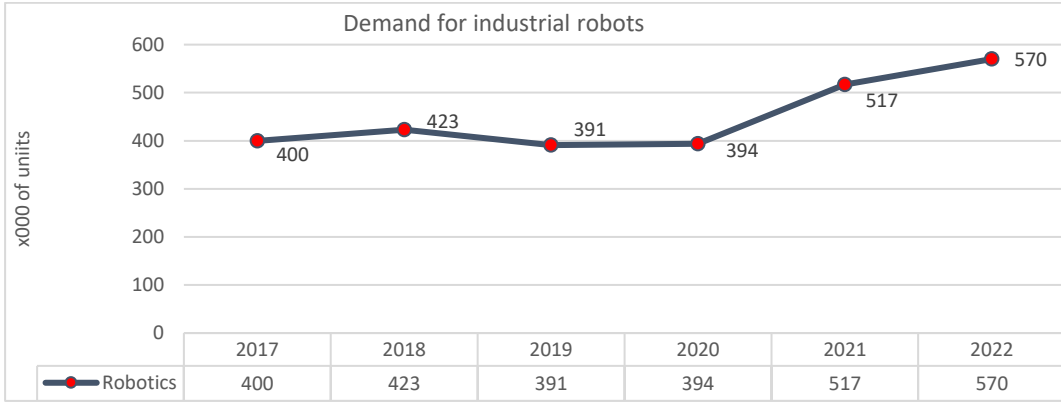

Figure 2: Industrial Robot Demand Quantity (International Federation of Robotics, 2022)

According to data from the International Federation of Robotics (IFR), the global demand for robots has been on the rise. In 2018, approximately 423,500 robots were sold worldwide. However, in the years 2019 - 2020, robot sales experienced a decline due to the impact of the Covid-19 pandemic. There was a significant rebound in robot sales in 2021, with a sales volume of 517,000 units, marking a 31% increase. Furthermore, in 2022, sales increased by an additional 10%, with a continued upward trend expected in the foreseeable future. This growth in global robot demand can be attributed to several factors. On one hand, there is an increasing need for robots in manufacturing processes. On the other hand, advancements in technology have led to cost reductions in the application of robots and automation systems in production processes. As a result, a shift has shifted towards more intelligent factory systems, moving away

from traditional labor-intensive manufacturing processes. The increasing adoption of industrial robotics technology highlights the potential for competitiveness in the manufacturing industry. This includes the use of artificial intelligence (AI) technology for quality control processes in production. Given these reasons, it has become essential to leverage AI technology in manufacturing to gain a competitive edge in terms of both quality and production efficiency. This forms the basis for research on "Guidelines for Applying Artificial Intelligence Technology to Control Quality in the Manufacturing Industry to Enhance Competitiveness."

Research objectives

1. To investigate the structure and operational characteristics of the manufacturing industry that utilizes artificial intelligence (AI) technology for quality control.
2. To examine the components and guidelines for implementing AI technology in control quality within the manufacturing industry with the aim of enhancing competitiveness.
3. To develop a mathematical model that represents the structural framework for the implementation of AI technology in control quality within the manufacturing industry to improve competitiveness.

Research hypothesis

Based on the research objectives and relevant literature, the researchers have established the research hypotheses following the theoretical framework, which can be summarized into six hypotheses for the research work:

H1: *Organization Support directly influences Learning and Growth (Piwowar-Sulej, 2018), (Nisula, et al., 2022)*

H2: *Organization Support directly influences Collaboration Network (Enholm, et al.,2021), (Wade et al., 2016)*

H3*: Organization Support directly influences Intelligent Centric (Perifanis and Kitsios, 2023), (Correia Loureiro, 2020)*

H4: *Learning and Growth directly influences Intelligent Centric (Azam, et al (2022), (Kadam and Sudarsan, 2019)*

H5: *Intelligent Centric directly influences Collaboration Network (Duangekanong, 2022), (Enholm, et al., 2021)*

H6: *Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness does not differ significantly when categorized by business size. (Gartner, 2017), (Masood and Sonntag, 2020)*

Research Methodology

This research is an Inductive Research that includes a mixed research approach consisting of 3 parts: qualitative research using in-depth interview techniques, quantitative research using survey data collection methods, and qualitative research using Focus Group Discussion techniques to confirm the validity of the research model.

1. The qualitative research using in-depth interview techniques involved a population of 9 experts selected through Purposive Sampling. The qualifications of the experts were as specified by the Administrative Committee of the Doctoral Program in Business Administration for Industrial Management, Faculty of Business Administration, King Mongkut's University of Technology North Bangkok. The experts consisted of three groups:

a group of entrepreneurs or managers in business organizations, numbering 3 individuals; a group from the government sector and related agencies, also 3 individuals; and a group of academics, comprising 3 individuals.

2. The quantitative research in this study was conducted with a population of 3,928 registered executives in the Stock Exchange of Thailand who are responsible for quality systems or sustainable development of artificial intelligence technology in their organizations. (Industrial Factory Department, 2022) The sample size was determined using the criteria of the research, which is of the analytical or structural equation modeling type. A sample size of 500 samples, which is considered excellent, has been specified. (Comrey and Lee, 1992, as cited in Thanin, 2020) Use a multistage sampling method. (Babbie, 2010 as cited in Thanin, 2020) The process consists of the following steps: random sampling by dividing industrial businesses into two sizes: large businesses (with more than 200 employees) and medium to small businesses (with no more than 200 employees). The probability sampling method was used to select the sample, and data were collected from the sample groups.

3. The qualitative research, using the focus group discussion technique to validate the model, was conducted with a sample population of 11 highly qualified individuals. The purposive sampling method was employed to select the sample group with purposive sampling.

Results

Table 1 Overall means and standard deviations of importance levels of the guidelines for applying artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness categorized by the size of the industrial business sector.

Guidelines for Applying Artificial Intelligence Technology to Control Quality in the Manufacturing Industry to Enhance Competitiveness.		Small to medium size			large size		
		$\bar{X}$	S.D.	Sig. level	$\bar{X}$	S.D.	Sig. level
	Overall	4.11	0.42	High	4.15	0.42	High
1.	Intelligent Centric	4.11	0.48	High	4.13	0.51	High
2.	Learning and Growth	4.12	0.47	High	4.15	0.45	High
3.	Collaboration Network	4.11	0.48	High	4.15	0.48	High
4.	Organization Support	4.11	0.42	High	4.16	0.43	High

The results of the analysis of the importance level of components in the guidelines for applying artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness, categorized by the size of the manufacturing industry, are presented in the following table.

It was found that the guidelines for applying artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness in medium and small-sized businesses, overall, are highly important, with an average score of 4.11. When analyzing the importance level by individual aspects, it was found that each aspect is highly important, ranked in descending order of importance as follows: 1) Learning and Growth with $\bar{X}$ = 4.12 2) Organization Support with $\bar{X}$ = 4.11 (S.D. = 0.42) 3) Collaboration Network with $\bar{X}$ = 4.11 (S. D = 0.478) and 4) Intelligent Centric with $\bar{X}$ = 4.11 (S.D = 0.479) For large-sized organizations overall, it was found that the guidelines for applying artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness are

highly significant, with $\overline{X}$ = 4.15. When analyzing the importance levels by dimension, it was found that each dimension holds high significance, ranked in descending order as follows: 1) Organization Support with $\overline{X}$ = 4.16, 2) Learning and Growth dimension with $\overline{X}$ = 4.15 (S.D.= 0.45), 3) Collaboration Network with $\overline{X}$ = 4.15 (S.D.= 0.48), and 4)Intelligent Centric with an $\overline{X}$ = 4.13

The results of the comparative analysis of the differences in the importance levels of the components of the guidelines for applying artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness, does not differ significantly when categorized by business size.

Table 2 The statistical values that assess the consistency and coherence of the structural equation model are compared before and after the modification of the model.

The statistical values	Criteria for consideration	Before improvement	After improvement
CMIN-p	Higher than 0.05	0.000	0.060
CMIN/DF	Less than 2	1.657	1.105
GFI	Higher than 0.90	0.756	0.942
RMSEA	Less than 0.08	0.036	0.014

The researcher proceeded to refine the model, taking into consideration the Modification Indices values based on the recommendations by Arbuckle (2016). The values were processed using statistical software and theoretical principles to systematically remove some inappropriate observed variables one at a time. (Silpcharu T., 2020) After the model has been successfully refined and adjusted, it was found that CMIN-ρ= 0.060 which is greater than 0.05, CMIN/DF= 1.105 less than 2.00, GFI= 0.942 greater than 0.90 and RMSEA= 0.014 less than 0.08. The model, after the adjustments, is in good alignment with the empirical data.

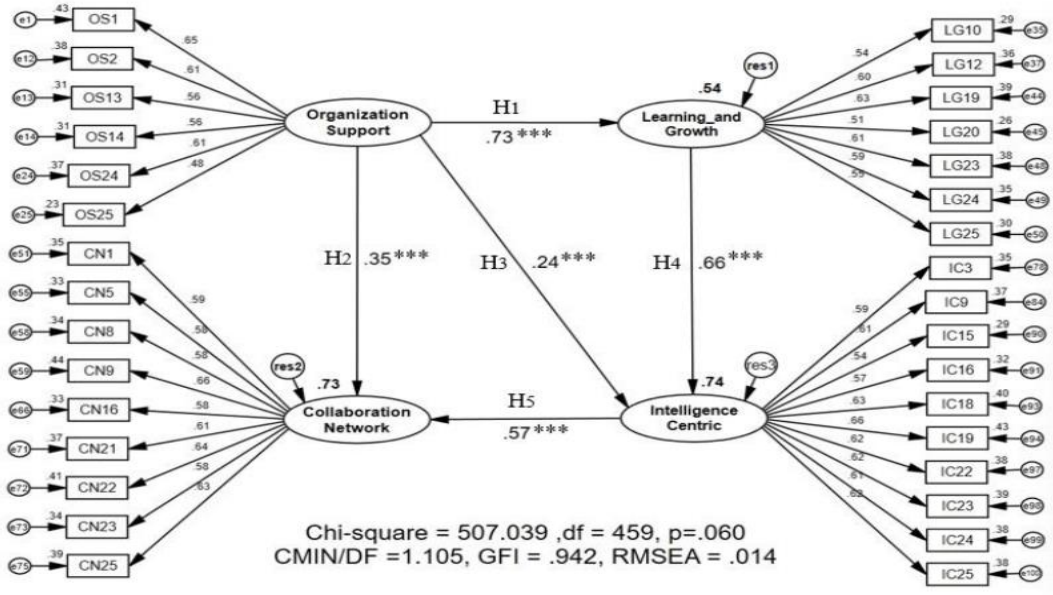

Figure 3 The structural equation model of the guidelines for applying artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness in the

standardized estimate mode after modification.

The results of hypothesis testing to analyze the causal influence between latent variables in the structural equation model of the guideline for the use of artificial intelligence technology to enhance quality control in the industrial manufacturing sector for improved competitiveness yielded five hypotheses as follows:

1. The hypothesis testing revealed that the Organization Support component significantly influences Learning and Growth with a statistically significant level of 0.001 and a Standardized Regression Weight of 0.73, in line with the research hypothesis.
2. The hypothesis testing showed that Organization Support has a significant direct influence on Collaboration Network with a statistically significant level of 0.001 and a Standardized Regression Weight of 0.35, aligning with the research hypothesis.
3. The hypothesis testing indicated that Organization Support has a significant direct influence on Intelligent Centric with a statistically significant level of 0.001 and a Standardized Regression Weight of 0.24, consistent with the research hypothesis.
4. The hypothesis testing found that Learning and Growth have a significant direct influence on Intelligent Centric with a statistically significant level of 0.001 and a Standardized Regression Weight of 0.66, in accordance with the research hypothesis.
5. The hypothesis testing revealed that intelligence Centric has a significant direct influence on Collaboration Network with a statistically significant level of 0.001 and a Standardized Regression Weight of 0.57, supporting the research hypothesis.

Table 3 The observed variables obtained from structural equation modeling after model modification

Variables	Estimate		R^2	Variance	C.R.	P
	Standard	Unstandard				
Organization Support				0.24		
OS01	0.65	1.00	0.43	0.33		
OS02	0.61	0.97	0.38	0.38	11.29	***
OS13	0.56	0.89	0.31	0.43	10.42	***
OS14	0.56	0.89	0.31	0.42	10.48	***
OS24	0.61	1.00	0.37	0.41	11.24	***
OS25	0.48	0.75	0.23	0.47	9.08	***
Learning and Growth				0.08		
LG10	0.54	1.00	0.29	0.40		
LG12	0.60	1.16	0.36	0.39	9.88	***
LG19	0.63	1.26	0.39	0.40	10.14	***
LG20	0.51	1.04	0.26	0.50	8.86	***
LG23	0.61	1.21	0.38	0.40	10.00	***
LG24	0.59	1.12	0.35	0.39	9.75	***
LG25	0.55	1.03	0.30	0.40	9.31	***
Collaboration Network				0.05		
CN01	0.59	1.00	0.35	0.38		
CN05	0.58	1.00	0.33	0.41	10.54	***
CN08	0.58	1.02	0.34	0.41	10.67	***
CN09	0.66	1.14	0.44	0.34	11.65	***

Variables	Estimate		R^2	Variance	C.R.	P
	Standard	Unstandard				
CN16	0.58	0.97	0.33	0.39	10.56	***
CN21	0.61	1.11	0.37	0.43	10.97	***
CN22	0.64	1.07	0.41	0.34	11.38	***
CN23	0.58	1.04	0.34	0.43	10.63	***
CN25	0.63	1.03	0.39	0.34	11.21	***
Intelligence Centric				0.06		
IC03	0.59	1.00	0.35	0.42		
IC09	0.61	1.03	0.37	0.40	11.14	***
IC15	0.54	0.88	0.29	0.42	10.11	***
IC16	0.57	0.99	0.32	0.46	10.55	***
IC18	0.63	1.08	0.40	0.38	11.42	***
IC19	0.66	1.13	0.43	0.37	11.72	***
IC22	0.62	1.01	0.38	0.37	11.19	***
IC23	0.62	1.08	0.39	0.41	11.30	***
IC24	0.61	1.12	0.38	0.47	11.15	***
IC25	0.62	1.13	0.38	0.45	11.25	***

*** level of significance 0.001***

Table 3, The research found that the structural equation model for the guidelines of using artificial intelligence technology to control quality in the manufacturing industry to enhance competitiveness, after model adjustments, consists of 4 latent variables, divided into 1 exogenous latent variable, which is Organization Support, and 3 endogenous latent variables, namely Intelligent Centric, Learning and Growth, and Collaboration Network.

The component of Organization Support has a direct significant influence on Learning and Growth with a Standardized Regression Weight of 0.73 at a statistical significance level of 0.001. The squared multiple correlation is 0.54, and the variance explained is 0.08. It also has a significant direct influence on Collaboration Network with a Standardized Regression Weight of 0.35 at a statistical significance level of 0.001. The squared multiple correlation is 0.73, and the variance explained is 0.05. Additionally, Organization Support has a significant direct influence on Intelligent Centric with a Standardized Regression Weight of 0.24 at a statistical significance level of 0.001, R^2 = 0.74, and the variance explained is 0.06.

The Learning and Growth component directly influences on the Intelligent Centric with a Standardized Regression Weight of 0.66, which is statistically significant at the 0.001 level, R^2 = 0.74, and the variance is 0.06

The Intelligent Centric directly influences on the Collaboration Network with a Standardized Regression Weight of 0.57, which is statistically significant at the 0.001 level. R^2 =0.73 and the variance is 0.05.

The Organization Support consists of 6 observed variables, ranked by Standardized Regression Weight from highest to lowest as follows: 1)Prepare machinery and equipment for artificial intelligence technology readiness within the organization (OS01) with a Standardized Regression Weight of 0.65. 2)Promote employee participation in the development of artificial intelligence technology systems (OS02) with a Standardized Regression Weight of 0.61 (C.R. =

11.29). 3)Support the use of electronic documents to enhance work efficiency, speed, and cost-effectiveness (OS24) with a Standardized Regression Weight of 0.61 (C.R. = 11.24). 4) Implement Work from Home for convenience in work (OS14) with a Standardized Regression Weight of 0.56 (C.R. = 10.48). 5)Prepare the necessary infrastructure for using artificial intelligence technology for quality control (OS13) with a Standardized Regression Weight of 0.56 (C.R. = 10.42). 6)Develop up-to-date software systems to work smoothly with artificial intelligence technology (OS25) with a Standardized Regression Weight of 0.48.

The Learning and Growth component consists of 7 observed variables, ranked in order of Standardized Regression Weight from highest to lowest as follows: 1)Transfer skills between technology experts and general employees through practical learning for future collaboration (LG19) with a Standardized Regression Weight = 0.63. 2)Support technology intelligence field study both locally and internationally to enhance knowledge (LG23) with a Standardized Regression Weight = 0.61. 3)Monitor the assessment of learning and continuous development of personnel (LG12) with a Standardized Regression Weight = 0.60. 4)Create a Big Data database of artificial intelligence for those involved and interested in knowledge acquisition (LG24) with a Standardized Regression Weight = 0.59. 5)Research and develop artificial intelligence technology to continuously generate new knowledge (LG25) with a Standardized Regression Weight = 0.55. 6)Promote employee involvement in providing input for collaborative work with artificial intelligence technology (LG10) with a Standardized Regression Weight = 0.54. and 7)Encourage the exchange of work experiences and teamwork systems (LG20) with a Standardized Regression Weight = 0.51.

The Collaboration Network component consists of 9 observed variables, ranked in order of Standardized Regression Weight from highest to lowest as follows: 1)Request support from government agencies to assist in the installation of artificial intelligence technology in factories (CN09) with a Standardized Regression Weight = 0.66. 2)Open opportunities for foreign partners to invest or jointly develop artificial intelligence technology (CN22) with a Standardized Regression Weight = 0.64. 3)Solicit feedback and suggestions from internal personnel and external partners and use them for continuous improvement to foster good cooperation (CN25) with a Standardized Regression Weight = 0.63. 4) Outsource specialized technology experts for certain tasks requiring expertise in artificial intelligence technology (CN21) with a Standardized Regression Weight = 0.61. 5)Collaborate with leading technology institutions on joint research and development of artificial intelligence technology (CN01) with a Standardized Regression Weight = 0.59. 6)Develop communication channels to access information from both public and private sectors regarding policies and practices related to technology investment (CN08) with a Standardized Regression Weight = 0.58 (C.R. = 10.67). 7)Organize relationship-building activities with stakeholders from all parties continuously (CN23) with a Standardized Regression Weight = 0.58 (C.R. = 10.63). 8)Integrate cooperation among all organizational personnel in utilizing artificial intelligence technology (CN16) with a Standardized Regression Weight = 0.58 (C.R. = 10.56). And 9)Send employees for training with government agencies to acquire knowledge and skills in artificial intelligence technology systems (CN05) with a Standardized Regression Weight = 0.58 (C.R. = 10.54).

The Intelligent Centric component consists of 10 observed variables, ranked in order of Standardized Regression Weight from highest to lowest as follows: 1)Plan for machinery maintenance, such as Preventive Maintenance, to ensure continuous production using artificial intelligence systems (IC19) with a Standardized Regression Weight = 0.66. 2)Utilize artificial intelligence technology to select high-quality raw materials from suppliers (IC18) with a

Standardized Regression Weight = 0.63. 3)Establish a system for notifying management of incidents or risks related to the use of artificial intelligence technology at regular intervals (IC23) with a Standardized Regression Weight = 0.62 (C.R. = 11.30. 4)Implement a Supervisory Control and Data Acquisition (SCADA) system in conjunction with artificial intelligence technology to connect with monitoring and control equipment for machinery or production systems (IC25) with a Standardized Regression Weight = 0.62 (C.R. = 11.25. 5)Promote patenting inventions related to technologies or systems developed by the organization (IC22) with a Standardized Regression Weight = 0.62 (C.R. = 11.19). 6)Use automatic remote control systems by Supervisory Control and Data Acquisition (SCADA) in conjunction with artificial intelligence technology (IC24) with a Standardized Regression Weight = 0.61 (C.R. = 11.1 7)Establish a clear vision and quality control policy for the organization regarding the use of artificial intelligence technology in production processes (IC09) with a Standardized Regression Weight= 0.61 (C.R. = 11.14). 8)Install artificial intelligence technology for defect inspection using real-time laser-based sensors (IC03) with a Standardized Regression Weight = 0.59. 9)Utilize artificial intelligence technology in production processes to accurately and efficiently control production costs and quality (IC16) with a Standardized Regression Weight = 0.57. And 10)Use AI robots in the production process to reduce waste and accidents in manual labor (IC15) with a Standardized Regression Weight=0.54.

Discussion

The key finding from the research on Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness is the emphasis on developing adaptability in the current rapidly changing technological environment. This research discusses and concludes with 5 points, supported or contradicted by related literature references.

1. From the research, when comparing the importance of Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness, categorized by the size of the industry, it was found that there is no statistically significant difference at the 0.05 level between medium, small, and large businesses. This means that the use of AI in quality control in the industrial manufacturing sector to increase competitive capabilities does not differ by industry size, with the sector focusing on strategies that emphasize cooperation between organizations, finding business partners that meet operational needs, and creating new value in the business ecosystem, as well as accelerating innovation. Businesses that cannot adapt and integrate transformative technology into their business models may eventually become obsolete. (Gartner, 2017) This aligns with Wasiritip (2018), who stated that AI (Artificial Intelligence) is a processing system modeled after the neural network of humans, capable of learning and improving processing efficiency as the amount of data increases through self-learning. It can recognize, analyze, learn, and connect complex information like deep learning, akin to the human brain, and thus can be referred to as an "Intelligent brain.

2. From hypothesis testing, it was found that the approach of Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness, after model refinement, showed that the most significant overall influence was the Organization Support component, impacting the Collaboration Network with a Standardized Regression Weight of 0.76. This indicates empirical evidence that the current

rapid growth and changes in technology present unprecedented challenges to organizations. Consequently, executives and stakeholders must understand how to manage business organizations in alignment with the workings of artificial intelligence (Katawut, Kriangkrai, and Pariyaphorn, 2017). These findings, supported by Sukhawatthanakun (2023), revealed that organizational management should begin with top executives questioning the organization's vision, goals, and policies to manage the long-term relationship with stakeholders involved in collaborative value creation successfully. Additionally, this aligns with the concepts of Wade et al. (2016) and Kultangwatana et al. (2023), stating that the ability to offer lower costs to customers, other economic benefits, creating new valuable experiences for customers that surpass traditional businesses, and developing new technological platforms that benefit customers more than previous businesses lead to new business models.

3. From hypothesis testing, it was found that the Organization Support component has the highest direct influence on Learning and Growth, with a Standardized Regression Weight of 0.73. This demonstrates empirical evidence that the importance of efficient work management has increased. This is consistent with the research "Industry 4.0 : Adoption challenges and benefits for SMEs," which states that technology systems are highly beneficial to the production process, both in terms of personnel knowledge and production processes, as well as the ability to access modern technology (Masood and Sonntag, 2020) In the current era, the interconnection between business organization management and artificial intelligence for business survival shows that technological advancements significantly affect the management of business organizations in both the present and future. This aligns with the research "Human resources development as an element of sustainable HRM with the focus on production engineers" (Piwowar-Sulej, 2021), which discusses sustainability and influence on the development of approaches towards employees, known as Sustainable Human Resources Management (SHRM). This includes aspects like employee cooperation and participation, human equality and environmental protection, motivation creation, flexibility, and the development of human resources.

4. The approach to Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness, particularly in Organization Support, has an average score of 4.14, which is the highest among all aspects. It has been found that the advancement of technology significantly affects the management of business organizations in the present and future, including the management approach of business organizations by applying AI in operations to improve work efficiency and ensure business survival systematically (Amornrak, 2020) This result, supported by Senangkanikorn et al. (2020), insists on the development of effective technology management strategies for selecting partners. This is in line with the research by Perifanis and Kitsios (2023), which found that developing AI capabilities for IT business strategies increases business value. Sukhawatthanakun et al. (2023) insisted that organizations will succeed and gain a competitive edge in adapting to digital transformations in the current era by precisely implementing modern technologies. This also aligns with the study by Kultangwatana et al. (2023), which states that AI would be involved in adding product value for penetration into high-value markets, especially for SMEs.

5. In the approach of Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness, a detailed consideration revealed that fostering a sense of loyalty and readiness to accept changes among employees is of utmost importance, with an average value of 4.34. The reason is that employee loyalty in the industrial

sector significantly affects their learning ability, which in turn can contribute to business growth in a changing business environment. This is consistent with the research by Azam et al. (2022) and Aristana, Arsawan, & Rustiarini (2022), which stated that employee loyalty plays a crucial role in the success of a business.

Conclusion

Guidelines for applying artificial Intelligence technology to control quality in the manufacturing industry to enhance competitiveness includes four key components and has led to the discovery of new knowledge, namely the "Hierarchy of Implementing Artificial Intelligence Technology in Control Quality in the Industrial Manufacturing Sector.

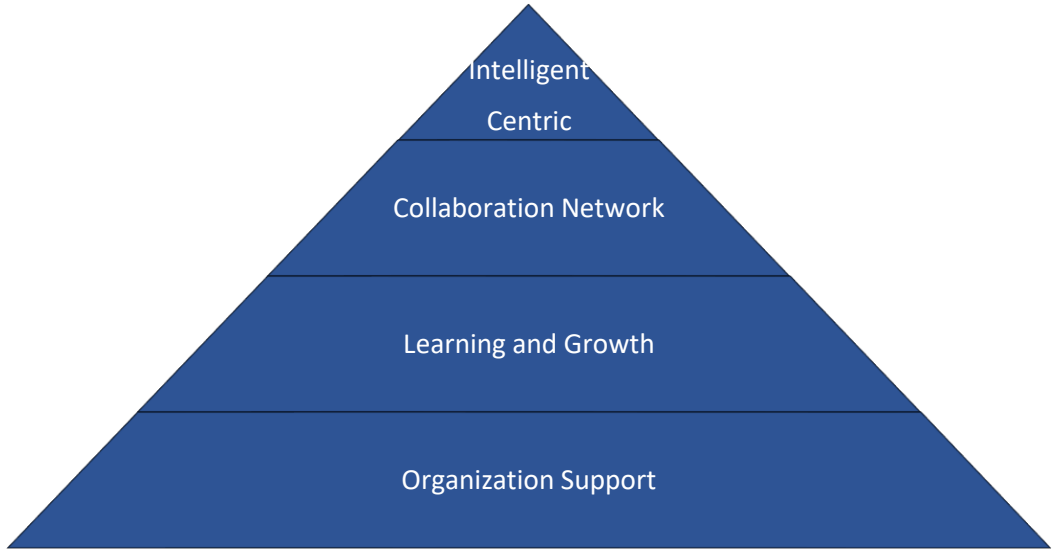

Figure3: Hierarchy of Implementing Artificial Intelligence Technology in Control Quality in the Industrial Manufacturing Sector.

The Organization Support aspect refers to organizational backing for implementing artificial intelligence technology in business operations. The Learning and Growth dimension involves employee learning and development within the organization to effectively work alongside AI technology. The Collaboration Network component signifies cooperation within the trade or industrial business network, both internally and externally, involving stakeholders to efficiently utilize AI technology within the organization. Lastly, Intelligent Centric pertains to the adoption of AI technology in the organization to enhance operational efficiency.

Suggestions for next research

1) It is advisable to study the guidelines for managing artificial intelligence technology to control quality in the manufacturing industry.
2) It is advisable to study the guidelines for dealing with crises using artificial intelligence technology to transition into a sustainable industrial business.
3) It is advisable to study the guidelines for elevating the standards of business development with artificial intelligence technology in the industrial sector.

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