

Driving Thailand's Jewelry Exports in The Global Era: Strategies for Innovation, Digitalization, and Sustainability

Kietchai Veerayannon^{1*}

Received: 19 August 2025 | Revised: 13 December 2025 | Accepted: 22 December 2025

DOI: [10.60101/rmuttgber.2026.292648](https://doi.org/10.60101/rmuttgber.2026.292648)

Abstract

This research aims to analyze the situation and trends of Thai gem export businesses in order to 1) study the differences in business competitiveness and organizational forms, 2) analyze management factors affecting business competitiveness, and 3) promote business development approaches to develop the potential of Thai gem export businesses. Mixed-method research was used to collect qualitative data through interviews with 17 experts and quantitative data from 403 entrepreneurs using descriptive statistics, inferential statistics, and TOWS Matrix. The results of the research found that Thai gem export businesses continue to grow, with strengths in craftsmanship and production, but challenges in technology and competition from low-cost countries. Business competitiveness depends on the size of the business and the types of products offered. The main management factors are brand strategy ($\beta = 672$), product quality ($\beta = 350$), and marketing and pricing strategies ($\beta = 300$ and 594). These include recommendations in 8 areas: improving product standards, expanding digital markets, and developing supply chains, which will help increase the competitiveness of Thai gem export businesses on the international stage.

Keywords: Competitive Capabilities, Jewelry Export, Development Guidelines, Management

¹ Faculty of Business Administration, North Bangkok University, Thailand.

*Corresponding author, e-mail: kietchai.ve@northbkk.ac.th

Introduction

The Thai gem and jewelry industry is one of the key industries that is very important to the country's economy. It is ranked 3rd among Thailand's major export products (Ahmad et al., 2017; Jundahuadong, 2020), generating a significant income for the country of more than 30 billion US dollars per year, accounting for 6.37 percent of the total exports (Panyaroj et al., 2023). Thailand is one of the world's leading exporters of gems and jewelry, especially in the field of colored gemstone cutting, which is internationally recognized. There are more than 10,000 skilled craftsmen (Lawson & Chowdhury, 2022; Pongsena et al., 2020). It is also an industry that creates a tremendous number of jobs, up to 1.30 million people, or 3.31 percent of the total workforce in the country. The key strength of this industry is the wisdom and unique skills of Thai craftsmen who can create products that are delicate and beautiful. This includes handicrafts that are characterized as unique, which cater to a niche market where consumers prefer traditional works (Panyaroj et al., 2023; Phittayanon & Rungreunganun, 2019). In addition, the Thai government has a policy to promote Thailand to be the world's center for gem and jewelry trade (Jitngamplang & Thampitug, 2019; Kotsopa et al., 2023). However, changes in technology and consumer behavior in the digital age, as well as intense competition in the global market, have caused this industry to adapt to maintain sustainable competitiveness.

The Thai gem and jewelry sector is currently facing several challenges that threaten its international competitiveness. One key challenge involves the shortage of domestic materials, which has made manufacturers heavily dependent on imported inputs. This dependency not only increases production costs (Kotsopa et al., 2023; Phittayanon & Rungreunganun, 2019) but also exposes producers to price fluctuations in global markets. Another major concern is the decline in skilled labor and the lack of knowledge transfer. In recent years, the number of workers in the industry has dropped by more than half (Jundahuadong, 2020), and the intergenerational transmission of artisanal skills has weakened (Varasriverachote et al., 2019; Jitngamplang & Thampitug, 2019). Technological obsolescence also remains a significant barrier. Many entrepreneurs continue to rely on traditional production methods, with limited customer-oriented design innovation and outdated management systems (Nithisathian et al., 2012; Ahmad et al., 2017). Moreover, intensifying competition from low-wage countries such as China, India, and other Asian economies further pressures Thai producers (Nithisathian et al., 2012; Ahmad et al., 2017). In addition, changing

consumer behavior in the digital age—particularly among the millennial generation, who increasingly value environmentally and socially responsible products—requires the industry to adapt (Thisupakorn & Sarachart, 2024; Jundahuadong, 2020). Finally, gender inequality continues to exist, with women in informal and home-based jewelry work often receiving lower pay than men (Lawson & Chowdhury, 2022). These challenges highlight significant research gaps concerning sustainable development strategies for Thailand’s gem and jewelry industry in relation to technological, social, and environmental transformations in the digital era.

Considering the aforementioned importance, the author is interested in investigating new strategies to enhance the international competitiveness of the Thai gem and jewelry industry in the context of a digital global market. The specific research goals of this study are (1) to explore the situation and trends of the Thai gem and jewelry industry that are affected by technological and global market shifts; (2) to investigate the factors that have led to a decline in the competitiveness of the Thai gem and jewelry industry in the digital era; (3) to develop and propose an innovative strategy for adapting and sustaining intervention for the promotion of Thai gem and jewelry exports; and (4) to recommend policies and guidelines focusing on developing the Thai gem and jewelry industry to government agencies and entrepreneurs. This study will contribute to bridging the gap in understanding about the uses of digital technology and innovation for sustainable development of the Thai gem and jewelry industry. Anticipated outputs are (1) understanding the Thai gem and jewelry industry’s situation and trend in the global context, (2) a success factor model that enhances the competitiveness of the industry in the digital age, (3) a strategic development framework that encompasses innovation, digital adoption, and sustainability, and the following (4) policy recommendations for the government and best practices for entrepreneurs to take the Thai gem and jewelry industry toward a sustainable global industry leader. The study will be instrumental in the support of the government’s policy in driving Thailand to be the world’s trading hub for gems and jewelry. and support Thai entrepreneurs in transforming to sustainably adapt in the age of the digital economy.

Objectives

The objective of this study is to examine the business profiles, management characteristics, and competitiveness of Thailand’s jewelry export enterprises, identify the key internal and external factors that influence their international performance, and develop

strategic guidelines that enhance sustainable competitiveness and long-term growth of the Thai jewelry industry in the global market.

Literature Reviews

Concept of competitive strategy and competitive capability

The competitive strategy forms the core of building the competitive advantage of the business. Porter (1980), in the Competitive Strategy Theory, argues that there are three fundamental strategies to achieve competitive advantage: (1) cost leadership, which is reducing costs; (2) differentiation, where the company offers identity to its product (or service) in the market; and (3) niche market, which is to serve a need in part of the market. This view has been reinforced by several previous studies that show that the competitive strategy will depend on the increase of the organization's marketing potential and innovation (Farida & Setiawan, 2022; Ali & Anwar, 2021). Moreover, national competitiveness can be incorporated through the Porter's Diamond Model that includes different critical factors of a country's competitiveness, such as factor conditions, domestic demand, related and supporting industries, corporate strategy and national rivalry, the role of government, and chance and uncontrolled external forces (Ha et al., 2019, Rehman et al., 2022; Azeem et al., 2021). All of these things combine to produce a country's competitiveness being tied to a complex set of related circumstances, each of which must be organized and managed as a system to support business growth over the long term. Another reason why the resource-based view (RBV) ought to be related to firm competition is that it takes resources of the firm and how the firm utilizes its potential into consideration while interpreting the firm's RBV (Banmairuroy et al., 2022). PESTEL analysis also assists at the time of determining what environmental factors a business should be paying attention to and then working with these factors. A useful strategic instrument to look into the factors influencing businesses both local and international levels covering politics, economics, social, technology, law, and environment (Wajid & Zafar, 2021; de Sousa & Castañeda-Ayarza, 2022; Li et al., 2021).

The role of innovation in building competitiveness

According to the globalization background, the competitiveness of companies and industries must be strengthened through innovation. Thus, organisations able to incorporate it into their business strategy design are likely to be better positioned to sustain competitive advantages (Tran & Thanh, 2023). Innovation is so important for a number of reasons,

including product innovation, which involves the development of new ideas and new and improved products, services and features to add to the product range as demanded by the market (Bushra, 2022); process innovation or new technology or improved work processes which will reduce cost and time and increase productivity (Kozielski, 2016); organisational innovation, which brings about better management practices, organisational flexibility and optimal utilisation of resources (Gilaninia, 2013); and marketing innovation, where products are sold through the latest product display, branding and using digital technology while dealing with their customers. Furthermore, there is evidence indicating that research and development performance is correlated with trade and export performance. Another strategy that other companies have employed to grow their business beyond borders and widen the product range is strategic adoption of innovation (Jong, 2023). Such a consistent multi-level innovation strategy would enable the companies to stay competitive in the volatile business environment and generate sustainable competitive advantages (Aguilar, 1967). Accordingly, to be resilient, like, as an essential nature for increasing the competitive power of the firm, investment and resource allocation towards innovation, are the efficient means for increasing the competitiveness in a long-term basis.

Factors affecting the competitiveness of Thai gem export business

The gem and jewelry industry in Thailand is a significant part of the country's economy. This sector has this distinct advantage in skilled artisans who are able to produce beautiful pattern and intricate design, particularly when it comes to cutting colored gemstones (Pongsena et al., 2020) and establishing local identification of products, thereby creating the uniqueness of products (Panyaroj et al., 2023). Yet, the competition of growing the value-added of stones can be challenging for the Thai gem industry. Interesting to see this critical on different business factors that are influencing the competitiveness of Thai gem export businesses, such as limited raw material sources that brought about the need to depend on other countries (Kotsopa et al., 2023; Phittayanon & Rungreunganun, 2019), fierce competition from a large number of countries particularly China and India with the labor cost advantage (Ahmad et al., 2017; Nithisathian et al., 2012), limited skilled labor and knowledge transfer (Jundahuadong, 2020; Atsawawongwiwat et al., 2024), as well as the emerging demands of new engage consumer behavior from the millennial-generation digital age (Jundahuadong, 2020) as well as the market expansion of less expensive and environmentally friendly synthetic diamonds (Thisupakorn & Sarachart, 2024). A research

was made on success factors of Thai export gem businesses, these were including development on marketing and sales, one of a kind product design, an improvement of production process (Phittayanon & Rungreunganun, 2019). It is also discovered that entrepreneurial focus, market focus and learning focus, as well as access to financial sources, are very significant for enhancing the efficiency of SMEs in this sector (Ahmad et al., 2017; Shariff et al., 2017). Varasriverachote et al. (2019) emphasized business strategies, product innovation, competitive advantage and service innovation as crucial elements in the success of Thai gem businesses, with Kotsopa et al. (2023) established significant guidelines for business, including enhancing production quality according to international standards, identifying a style of Thai arts and culture, improving knowledge management, removing barriers, upgrading recycling and sustainability, developing personnel's skills, and adopting advanced technology. In short, developing the capacity for absorbing knowledge and the ability to respond to market and technological changes will be vital for the survival and sustainable progress of the Thai gem and jewelry industry in the global competition situation.

Developing the potential for exporting Thai gems in the world market

Thailand is known as one of the global gemstone and jewelry processing and trading centers, especially for expertise in gemstone cutting (Rintanalert et al., 2021), and as the 14th strongest position in the world for skilled technician people who can make fine and delicate work (Pongsena et al., 2020). This sector is among the ten primary items constituting our foreign exchange earner. In 2018, Thai gem and jewelry exports, excluding gold, had a combined value of 7,604.64 million dollars, and the figure represented a 6.96% increase from 2017 (Pongsena et al., 2020). The United States and the European Union are main export markets for Thailand, with growth opportunities in the Middle East and ASEAN markets (Rintanalert et al., 2021). But there are a few rough spots in this industry. Nithisathian et al. (2012) noted that the export share of the Thai gold jewelry industry had a sharp fall from 52.4 percent in 2005 to only 25.5% in 2009 because of the lack of investment in research and development. The threats of potential new entrants with lower wages and the application of traditional production approaches designing that does not encounter the customers. Other important limitations include labor shortages and lack of raw materials. Rintanalert et al. (2021) recommend tackling this through cooperation among the ASEAN countries, in particular Cambodia and its widespread sources of raw materials. Furthermore,

Atsawawongwiwat et al. (2024) also noted that the COVID-19 environment has posed additional challenges related to fewer orders and business liquidity, decreased demand for gemstones from younger consumers, and challenges in creating a new generation of skilled labor. In the meantime, the synthetic diamond market for Thailand wishes that the consumer in the age of 25-30 in Thailand were currently extensive, because the consumers give preference to the environmentally friendly and do not conflict with the ethics (Thisupakorn & Sarachart, 2024). To support export capacity development, there may be a need to emphasize promoting gender equality and reducing inequality, particularly exposing rural women workers in the informal sector to skills and opportunities (Lawson and Chowdhury 2022). Shariff et al. (2017) underscored access to cheap debt for SMEs to enhance competition and stimulate growth, and Kongprasert et al. (2017) proposed to apply affective design to create styles of jewelry relevant to culture and market requirements and Nithisathian et al. (2012) suggested that Thai entrepreneurs adjust by adding value, product innovation, networking, knowledge-sharing among entrepreneurs, and switching from original equipment manufacturer (OEM) to original design manufacturer (ODM) or original brand manufacturer (OBM) to improve competitiveness.

Research Methodology

Population and Samples

A mixed-methods approach, combining quantitative and qualitative techniques, was adopted. For the quantitative phase, the population comprised 579 entrepreneurs engaged in Thailand's jewelry export industry, according to data from the Thai Gem and Jewelry Traders Association (TGJTA). At a 95% confidence level, the required sample size of 234 respondents was determined based on Krejcie and Morgan (1970). This sample size also meets the minimum requirement for a power level of 0.80, which is generally recommended for multiple regression analysis (Cohen, 1992). However, questionnaires were distributed to 549 entrepreneurs, and 403 valid responses were received. Of these, 55.58% were male and 44.42% female. Most respondents were aged between 51–60 years (62.03%), followed by 41–50 years (31.02%). In terms of education, most held a master's degree (61.54%), followed by a bachelor's degree (38.21%) and a doctorate (0.25%). The majority served as deputy managing directors (60.30%), followed by managing directors (29.28%). Regarding work experience, most had 11–15 years (48.39%), while 40.20% had more than 15 years. For the qualitative phase, 17 key informants

were purposively selected based on having at least 10 years of professional experience. The group included one expert from the TGJTA, one from the Thai Goldsmiths Association (TGA), 13 export jewelry manufacturers, and two jewelry industry specialists. This number of informants is considered sufficient for data saturation in qualitative research (Guest, Bunce, & Johnson, 2006). To ensure the trustworthiness of qualitative findings, triangulation of data sources and expert validation were employed.

Research Instruments

The investigation employs three data-gathering tools. First, a 5-part structured questionnaire is used as a quantitative instrument to gather data, such as the respondent's profile, business organization, business management problems, firm competitive capability, and recommendation. The reliability of the instrument was demonstrated by five experts, who calculated an item objective congruence (IOC) value (0.99). Cronbach's alpha reliability coefficient was 0.979. Second, semi-structured interview guide for qualitative approach A semi-structured interview guide is constructed with three main sections: (1) background of the respondent, (2) core questions related to the status, problems, potential, and trends of the industry, and (3) recommendations. The guide was reviewed by five experts in business and qualitative research to ensure content validity using IOC with value higher 0.5. A pilot interview was then conducted with two SME entrepreneurs who were not included in the main study to assess the appropriateness of wording, sequencing, and interview duration. Based on their feedback, the guide was refined to improve clarity and flow. Lastly, secondary data was collected using a secondary source recording form.

Data Collection

Research in this study is used with data collection of two methods, both qualitative and quantitative. Quantitative answers were also collected through an online survey, which was emailed to the entrepreneurs with follow-up, which was made via phone calls for the sake of response rate. This design enabled the efficient collection of data as well as the willing engagement of participants. The qualitative component comprised a set ($n = 17$) of in-depth interviews with key informants and was carried out at three months.

Data Analysis

The current study used a macro-level analysis framework consistent with its objectives. Qualitative approach used content analysis to construct the current industry situation, industry problems, and competitive potential offer insight into industry dynamics.

The quantitative approach explores the relationship between organizational features through descriptive and inferential statistics including t-tests, one-way ANOVAs, and Welch tests. Multiple regression analysis was applied to examine the influence of business management factors on competitiveness. This technique was selected because it allows for assessing both the strength and direction of relationships among multiple independent variables and a dependent variable, thereby identifying how specific management dimensions contribute to overall competitiveness (Hair et al., 2019). Grand strategy patterns, as derived from SWOT and developed in the TOWS Matrix, may be, therefore, considered as relevant strategic advice to guide empirically supported strategies to achieve competitive advantage. The inputs are analyzed data or planned at the integrated settings for the analysis.

Research Results

Quantitative Results

Profiles of Business Characteristics

The study found that most had registered capital not exceeding 100 million baht (54.34%) and were 100% foreign-owned businesses (56.82%), followed by 100% Thai-owned businesses (34.74%). The size of most organizations had no more than 100 employees (79.16%). In terms of product design and research employees, most had 6-10 employees (56.82%) and almost one-fourth had more than 10 employees (23.82%). In terms of length of business operation, most had been in operation for 11-15 years (47.15%) and more than 15 years (43.92%).

Analysis of Management Factors and Competitiveness

Table 1 Analysis of Management Factors and Competitiveness

Factors	$\bar{X}$	S.D.	Level of Opinion
Management Factors			
1. Financial Management	3.48	.424	High
2. Brand Management	3.43	.434	High
3. Product Research and Development Management	3.38	.535	Medium
4. Production Capacity Management	3.36	.490	Medium
5. Product Quality Management	3.29	.479	Medium
6. Human Resource Management	3.28	.483	Medium
7. Change Adaptation Management	3.28	.503	Medium

Table 1 Analysis of Management Factors and Competitiveness (Continued)

Factors	$\bar{X}$	S.D.	Level of Opinion
Customer Relationship Management	3.28	.520	Medium
Marketing and Advertising Management	3.25	.518	Medium
Pricing Management	3.22	.569	Medium
Supply Chain Management	3.09	.654	Medium
Overall Management	3.30	.364	Medium
Competitiveness			
Competitiveness in niche market	3.44	.464	Good
Competitiveness in cost	3.33	.507	Moderate
Competitiveness in differentiation	3.32	.496	Moderate
Competitiveness in rapid response	3.25	.539	Moderate
Overall Competitiveness	3.33	.381	Moderate

From the Table 1, it was found that overall management factors were at a moderate level, except for brand management ($\bar{X}=3.43$) and financial management ($\bar{X}=3.48$) which were at a high level. Other factors such as product quality, pricing, marketing, customer relations, supply chain, research and development, personnel, production potential, and adaptability to change were all at a moderate level. In relation to competitiveness, the overall variable was at a moderate level ($\bar{X}=3.33$). Considering each aspect, only the niche market ($\bar{X}=3.44$) being at a good level, while cost, differentiation, and rapid response were all at a moderate level.

Comparison Analysis of Business Characteristics and Competitiveness

Table 2 Comparison Analysis of Business Characteristics and Competitiveness

Characteristics of Thailand's Jewelry Export Businesses	Results of Comparative Competitiveness by Aspect				Overall Comparative Results	
	Cost	Differentiation	Niche Market	Quick Response	Overall Competitiveness	Hypothesis Test Results
Registered Capital	t = -0.802 (p-value=.423)	t = -0.013 (p-value=.990)	t = -0.007 (p-value=.994)	t = -0.143 (p-value=.886)	t = -0.342 (p-value=.746)	Rejected
Shareholder Nationality	F ^a =2.830 (p-value=.065)	F ^a =8.758 (p-value<.001)**	F=7.107 (p-value=.001)**	F ^a =.364 (p-value=.696)	F ^a =5.969 (p-value=.004)**	Accepted
Total Employees	t = -0.356 (p-value=.723)	t = -0.530 (p-value=.597)	t = -0.686 (p-value=.493)	t = -0.697 (p-value=.486)	t = -0.253 (p-value=.800)	Rejected

Table 2 Comparison Analysis of Business Characteristics and Competitiveness (Continued)

Characteristics of Thailand's Jewelry Export Businesses	Results of Comparative Competitiveness by Aspect				Overall Comparative Results	
	Cost	Differentiation	Niche Market	Quick Response	Overall Competitiveness	Hypothesis Test Results
Number of Employees in Product Design and Research	F=2.758 (p-value=.065)	F=1.347 (p-value=.261)	F=1.476 (p-value=.230)	F=1.477 (p-value=.229)	F=2.882 (p-value=.057)	Rejected
Years in Operation	F=1.031 (p-value=.358)	F ^a =2.440 (p-value=.093)	F=1.998 (p-value=.137)	F=2.058 (p-value=.129)	F ^a =2.502 (p-value=.087)	Rejected

Note: ** Statistically Significant at the .01 Level, F^a= Welch's adjusted F-test

The results in Table 2 indicate that shareholder nationality significantly affects product differentiation, niche market focus, and overall competitiveness at the .01 level, with small-to-medium effect sizes. In contrast, firm characteristics such as registered capital, workforce size, R&D personnel, and years of operation show no significant differences. The effect size analysis suggests that while shareholder nationality does not dominate competitiveness, it has meaningful practical relevance. Specifically, differences in shareholder background may influence access to international networks, market knowledge, and innovation orientation, which moderately enhance export competitiveness.

Analysis of Influence of Management Factors on Competitiveness

Table 3 Analysis of Influence of Management Factors on Competitiveness

Management Factors	Competitiveness				Overall Competitiveness	
	Cost	Differentiation	Niche Market	Quick Response	Overall Competitiveness	Hypothesis Test Results
Brand Management	2.414 ✓ P=.016*	1.947 P=.052	18.961 ✓ P<.001**	.594 P=.553	9.116 ✓ p<.001**	Accepted
Product Quality Management	-.253 P=.801	.927 P=.355	9.555 ✓ p<.001**	.288 P=.773	3.778 ✓ p<.001**	Accepted
Pricing Management	-1.391 P=.165	1.964 ✓ P=.050*	.961 P=.337	16.540 ✓ p<.001**	7.087 ✓ p<.001**	Accepted

Table 3 Analysis of Influence of Management Factors on Competitiveness (Continued)

Management Factors	Competitiveness				Overall Competitiveness	Hypothesis Test Results
	Cost	Differentiation	Niche Market	Quick Response	Overall Competitiveness	
Marketing and Advertising Management	1.089 P=.277	1.690 P=.092	-1.065 P=.287	7.934 ✓p<.001**	4.209 ✓p<.001**	Accepted
Customer Relationship Management	.146 P=.884	-.029 P=.977	.318 P=.751	-.287 P=.775	.061 P=.951	Rejected
Supply Chain Management	4.742 ✓p<.001**	1.753 P=.080	-1.340 P=.181	1.680 P=.094	3.657 ✓p<.001**	Accepted
Product Research and Development Management	.763 P=.446	2.564 ✓P=.011*	-.612 P=.541	.266 P=.791	1.672 P=.095	Accepted
Human Resource Management	3.187 ✓P=.002**	1.654 P=.099	.082 P=.934	1.635 P=.103	3.250 ✓P=.001**	Accepted
Production Capacity Management	1.027 P=.305	-1.021 P=.308	-1.386 P=.166	1.465 P=.144	.092 P=.927	Rejected
Change Adaptation Management	.532 P=.595	.927 P=.354	.806 P=.421	-.999 P=.318	.670 P=.503	Rejected
Financial Management	5.194 ✓p<.001**	5.163 ✓p<.001**	-.514 P=.608	.023 P=.982	5.365 ✓p<.001**	Accepted

Note: Statistically significant at the .05 level; ** Statistically significant at the .01 level; ✓ Indicates a statistically significant effect

The results in Table 3 show that brand management, product quality, pricing, marketing and advertising, supply chain management, personnel management, and financial management have statistically significant effects on overall competitiveness. These significant factors demonstrate medium-to-large effect sizes, indicating strong practical importance and collectively explaining a substantial proportion of competitiveness variance ($R^2 = 0.68$). In

contrast, customer relationship management, research and development, production capacity management, and adaptability to change were not statistically significant.

Qualitative Results

Development of strategic guidelines

The analysis, combined with SWOT and TOWS Matrix evaluations, led to the development of eight strategic guidelines encompassing aggressive, preventive, corrective, and defensive approaches. The strategic development framework comprises two key approaches.

Table 4 Development of strategic guidelines through TOWS matrix

Internal Factor External Factor	Internal Strengths (S)	Internal Weaknesses (W)
	The company combines advanced automated production, premium branding, innovative design, global quality standards, digital marketing, customer analytics, and strong partner networks.	The company faces weaknesses in supply chain and logistics efficiency, traceability systems, digital production standards, and eco-friendly operational practices.
External Opportunities (O)	SO-Guidelines	WO-Guidelines
The company has opportunities from premium and digital market growth, global quality acceptance, demand for uniqueness, and data-driven digital marketing.	The company leverages production excellence, premium branding, innovation, international standards, and digital marketing analytics to capture premium and digital growth.	The company improves supply chain efficiency, traceability, digital manufacturing, quality control, and eco-friendly processes to overcome operational weaknesses.
External Threats (T)	ST-Guidelines	WT-Guidelines
The company faces threats from intense price competition, economic volatility, supplier dependence, rapid technological change, and organizational rigidity risks.	The company leverages automation, production efficiency, smart controls, and strategic alliances to counter price competition and external market volatility.	The company focuses on human capital development, technological skills, innovation culture, and agile structures to reduce risks and manage uncertainty.

From the Table 4, the analysis highlights the company's strong foundation in high production standards, automation, brand management, premium image, unique product

design, international quality compliance, marketing networks, digital commerce, and strong partnerships. Weaknesses include an underdeveloped supply chain, inventory and logistics systems, lack of traceability, outdated digital production and quality control standards, and limited eco-friendly processes. Opportunities lie in expanding premium and digital markets, leveraging global quality acceptance, meeting demand for unique products, and using data-driven digital marketing. Threats involve intense price competition, market volatility, supplier dependency, rapid technological change, and rigid structures. Strategic directions include using strengths to capture market growth and enhance brand value, improving supply chain and production standards, leveraging automation and alliances to counter competition, and developing human capital and business agility to adapt to change. This integrated approach ensures competitiveness, resilience, and sustainable growth in dynamic markets.

Application of strategies for developing competitive capabilities

Competitive strategies as a whole cover costs, differentiation, focus, and time to react. Costs are saved by automation and good supply chain management. This can be achieved by increasing the level of production and making branded goods. The focus of growth should be on digital assets and micro markets. It needs business models that are agile enough to rapidly respond to the old market modes and the new normal business models.

The success of the strategies depends on full support from every segment, especially the government, which will have to prioritize the development of technology infrastructure and offer investment aids, research and development support, and quality norms that are recognized by the world of business and which, in turn, should be at the service of the local product. And then also the human resource development, not only technical skill and knowledge but also traditional skills and knowledge, which need to be continuously inherited and developed.

The importance of promoting industry proactively is to build a cooperative network of industry, education, research, and government to improve the organizational development level. The result is to improve competitiveness by investing in production technology, marketing, and technical product development. And all these changes come with challenges, ranging from limited technology-adoption budgets, labor shortages in digital skills and research and development sources, and price wars to the increasingly tremendous speed of consumer behaviors changing, but they are all potential challenges. Therefore, the

development of competitiveness should be systematically included with the overall objective of achieving sustainable competitive advantage in the global economy by considering both direct and indirect effects.

Discussion

The analysis of research findings on business characteristics affecting the competitiveness of the Thai gem and jewelry export sector shows that business management factors exert the strongest influence. This aligns with Porter's competitive strategy theory, which emphasizes the role of strategic management in creating competitive advantage (Farida, & Setiawan, 2022; Ali, & Anwar, 2021). Cost competitiveness is primarily driven by supply chain management, followed by financial management, reflecting challenges caused by domestic raw material shortages, dependence on imported materials (Kotsopa et al., 2023; Phittayanon, & Rungreunganun, 2019), and competition from low-labor-cost countries such as China and India (Nithisathian et al., 2012). Differentiation is shaped by financial management and product research and development, consistent with evidence that innovation and the creation of local identity are critical success factors in the Thai gemstone industry (Varasriverachote et al., 2019; Panyaroj et al., 2023). Market attentiveness mediates the influence of brand management and product quality, reflecting shifts in consumer behavior in the digital era (Jundahuadong, 2020) and the expanding market for synthetic diamonds (Thisupakorn, & Sarachart, 2024). Speed of response is driven by pricing strategies and marketing campaigns, corresponding to recommendations for improving production quality to international standards and integrating advanced technology (Kotsopa et al., 2023).

The research found that business management factors significantly influence different dimensions of competitiveness. Cost competitiveness is shaped by supply chain management and financial management, highlighting the importance of raw material management, supplier selection, and cost control. These findings reflect the challenges of relying on imported raw materials and competing with lower labor cost countries such as India and China (Kotsopa et al., 2023; Nithisathian et al., 2012). Differentiation is determined by financial management and product research and development, supporting the view that product innovation leads to sustainable competitive advantage (Tran, & Thanh, 2023) and aligns with evidence that innovation is essential in the Thai gemstone industry (Varasriverachote et al., 2019). Market

focus is influenced by brand management and product quality, consistent with Thailand's strengths in fine colored gemstone cutting and the creation of distinctive local product identity (Pongsena et al., 2020; Panyaroj et al., 2023). Pricing strategies and marketing activities enhance quick response capability, which corresponds to the shifting behavior of digital era consumers (Jundahuadong, 2020) and the growing market for synthetic diamonds (Thisupakorn, & Sarachart, 2024). Overall, the findings support Porter's (1980) competitive strategy theory, emphasizing cost leadership, differentiation, and niche market focus.

The SWOT and TOWS analysis produced eight strategies across proactive, preventive, corrective, and defensive approaches. The proactive strategy focuses on using strengths in manufacturing and brand management to access premium markets and digital platforms, aligning with Porter's (1980) differentiation strategy and reflecting Thai craftsmanship in refined colored gemstone cutting that creates unique product identity (Pongsena et al., 2020). Preventive strategies involve improving production efficiency through semi-automation and developing integrated business partner networks, consistent with process innovation and technological upgrading emphasized by Kozielski (2016) and Kotsopa et al. (2023). Corrective strategies address organizational weaknesses by optimizing supply chains, supporting suggestions that Thai firms move from original equipment manufacturer to original design manufacturer or original brand manufacturer to enhance competitiveness (Nithisathian et al., 2012). Defensive strategies highlight the importance of strategic human capital development and organizational flexibility, in accordance with Jundahuadong (2020) and Atsawawongwiwat et al. (2024). Effective implementation of all strategies requires government support in technological infrastructure, financial mechanisms, research and development, and international standard development, which align with Porter's (1980) view of the state's role in competitiveness and the recommendations of Rehman et al. (2022) and Shariff et al. (2017).

Research Implications

Thai gemstone and jewelry businesses should strengthen brand identity and fine craftsmanship to create products with distinctive Thai character for premium markets. In the short term, firms should enhance supply chain efficiency through better demand forecasting, reliable logistics partnerships, and more flexible pricing and promotional strategies that respond to digital consumer behavior and the growing popularity of synthetic diamonds. Over the long term, companies should shift from contract manufacturing toward original design

development and own-brand creation, supported by continuous investment in innovation, advanced production technologies, and international business alliances to improve efficiency and cost control. Government agencies should support this transition by improving technological infrastructure, innovation systems, and research investment, while also addressing raw material shortages through domestic exploration and international cooperation. In the long term, policies should promote sustainable competitiveness through international standards, long-term financial support for SMEs, and global marketing campaigns that highlight Thai identity. Educational institutions should modernize curricula by integrating traditional craftsmanship with digital skills, while acting as innovation hubs that support research, incubation, and intergenerational knowledge transfer.

Suggestions for future research

New business models that are consistent with the new era of the digital age, such as e-commerce and social commerce for developing export markets and big data and personalized marketing for raising the level of competition and contributing to the competitiveness of the Thai gem business, should be emphasized to some extent. And the future study should also pay attention to automation, intelligent manufacturing technology, and digital supply chain management and track the factors affecting the success of enterprise industry. 4.0 vision from an enterprise perspective. Integrated research and development of eco-materials and of eco-friendly mass-production techniques with reduced waste and no resource theft should be implemented as well, and construction should be targeted at the market following sustainability. Yet another key question to consider is why labor must be manufactured to fit technological change, that is, why skill-building and teamwork situations must be generated in public, private, and institutional organizations. Moreover, value added will have to be determined through qualitative research in the area of design and innovation, for instance, in creative modes of production and in niche production, and brand strategies for high-end market competition.

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