

Guidelines for Preparation for Social Standard Responsible Certification of Industrial Business

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Abstract

This study aims to examine the guidelines for preparedness in obtaining certification for social responsibility standards within the industrial sector and to develop a corresponding structural equation model. A mixed-methods approach was employed, combining both qualitative and quantitative research. The qualitative phase involved in-depth interviews with 9 experts and focus group discussions with 11 specialists, while the quantitative phase surveyed 500 industrial business executives using questionnaires, with analyses based on descriptive statistics, inferential statistics, and multivariate statistical methods. Results indicated that the four most significant factors in study guidelines for preparedness in obtaining certification for social responsibility standards within the industrial sector can be prioritized into four key components: 1) Industrial Management ($\bar{X} = 4.22$, $SD = 0.730$), with the most important aspect being the maintenance of customer relationships through effective services, support, and activities that enhance customer connectivity and loyalty. 2) Leadership ($\bar{X} = 4.22$, $SD = 0.732$), where the critical factor is adapting tools and machinery to improve operational efficiency. 3) Social Responsibility ($\bar{X} = 4.20$), highlighted by the clear communication of the organization's vision and goals to its employees. 4) Knowledge Management ($\bar{X} = 4.07$) emphasizes the development of an organizational culture that fosters continuous learning about social responsibility. The hypothesis testing indicated that there is no statistically significant difference (at the 0.05 level) between small and medium-sized enterprises and large businesses in terms of their prioritization of these preparedness guidelines for preparedness in obtaining certification for social responsibility standards within the industrial sector. The analysis of the developed structural equation model demonstrated a good fit with the empirical data, as evidenced by a chi-square probability of 0.090, a chi-square relative ratio of 1.150, a comparative fit index of 0.955, and a root mean square error of approximation of 0.048.

Keywords: Corporate Social Responsibility (CSR), Organizational Preparedness, CSR Certification, Industrial Sector, Organizational Sustainability

INTRODUCTION

Fast economic expansion, particularly in the industrial sector, plays a vital role in driving economic growth. It leads to advancements in production, resource management, and adaptation to technological changes, which not only enhance the country's competitiveness in the global market but also help create jobs and improve the quality of life at various levels (Thaipat Institute, 2021). However, the growth of the industrial sector can also result in undesirable impacts, especially on the environment and natural resources, leading to air and water pollution as well as loss of biodiversity (Keeble, 1988). This leads to long-term environmental and ecological degradation. Sustainable development has become a key factor in global industrial business operations. The concept of Corporate Social Responsibility (CSR) has gained popularity, emphasizing environmental conservation, the creation of social value, and the

responsible development of the economy (Carroll, 1991; OECD, 2000). The United Nations has promoted this concept through the Sustainable Development Goals (SDGs), which address all aspects of human life without depleting natural resources (United Nations, 2015).

In Thailand, the concept of CSR has been promoted since 2006, and in 2008, the Ministry of Industry issued social responsibility guidelines aligned with ISO 26000:2010 to reduce environmental impacts. These efforts are also consistent with Thailand's 20-Year National Strategy (2018–2037). This is stipulated in the Constitution of the Kingdom of Thailand (2017), Article 65, which promotes sustainable development based on the principles of good governance (National Strategy, 2018). The strategy emphasizes not only economic profit but also maintaining a balance between society, the environment, and the quality of life, ensuring that development does not harm natural resources in the long term while fostering national stability, prosperity, and sustainability (Thaipat Institute, 2021). However, Thailand continues to focus heavily on economic development and places relatively little emphasis on environmental protection. This is evident from the national budget allocated for environmental protection, which ranged from only 8,361 to 12,868 million baht per year between 2017 and 2023, equivalent to just 0.270–0.491% of the total national budget. In 2023, the allocation was only 0.33%, which is half that of Malaysia and five times lower than that of the European Union. Historical data on the economic damage caused by PM_{2.5} dust in Thailand from 2019 to 2023 shows a continuous upward trend. In 2019, the estimated damage was approximately 42 billion USD (about 3.75% of GDP). This figure rose to around 43.2 billion USD in 2020 (3.78% of GDP), 44 billion USD in 2021 (3.84% of GDP), and 45 billion USD in 2022 (3.88% of GDP). In 2023, the damage value peaked at approximately 45.334 billion USD (3.89% of GDP), placing Thailand 20th globally and 2nd in ASEAN, after Indonesia (Pollution Control Department, 2021; World Bank, 2020; Wisanu Attavanich, 2023). In 2019, PM_{2.5} dust caused economic damage to Thai households amounting to 2.173 trillion baht, or approximately 9% of GDP, which translates to an average household expense of about 6,800 baht per household per year for every 1 microgram of PM_{2.5} exceeding the standard. However, if all pollutants, including PM₁₀, PM_{2.5}, CO, NO_x, and NO₂, are taken into account, the total damages to Thai households in 2019 would rise to 4.616 trillion baht, equivalent to approximately 14–15% of GDP, or tens of thousands of baht in household expenses per month.

When analyzed by province, it was found that households in every province in Thailand (except Phuket) were affected by air pollution. The top five provinces with the highest household damages were led by Bangkok, with PM_{2.5}-related damages totaling 436.33 billion baht per year. When all pollutants were considered, Bangkok's damage value rose to 927.362 billion baht per year, followed by Chonburi, Nakhon Ratchasima, Chiang Mai, and Khon Kaen, respectively. According to pollution complaint statistics received by the Pollution Control Department during fiscal years 2019–2023 (Pollution Control Department, 2023), most complaints originated from industrial factories, totaling 448 cases (40%), followed by establishments with 314 cases (28%). Considering these issues above, the researcher is interested in studying "Guidelines for Preparing for Certification of Social Responsibility Standards for the Industrial Sector" The aim is to develop guidelines for helping industrial businesses achieve sustainable success by analyzing the significance of related factors that promote maximum efficiency in business operations, while also ensuring long-term balance and stability.

OBJECTIVE OF THE RESEARCH

1. To study the structure and characteristics of the industrial business sector.
2. To study the components of the preparation guidelines for applying for certification of social responsibility standards.
3. To develop a structural equation model of the preparation guidelines for applying for certification of social responsibility standards.

The research period was between September and December 2024. It presents the scope as in Figure 1.

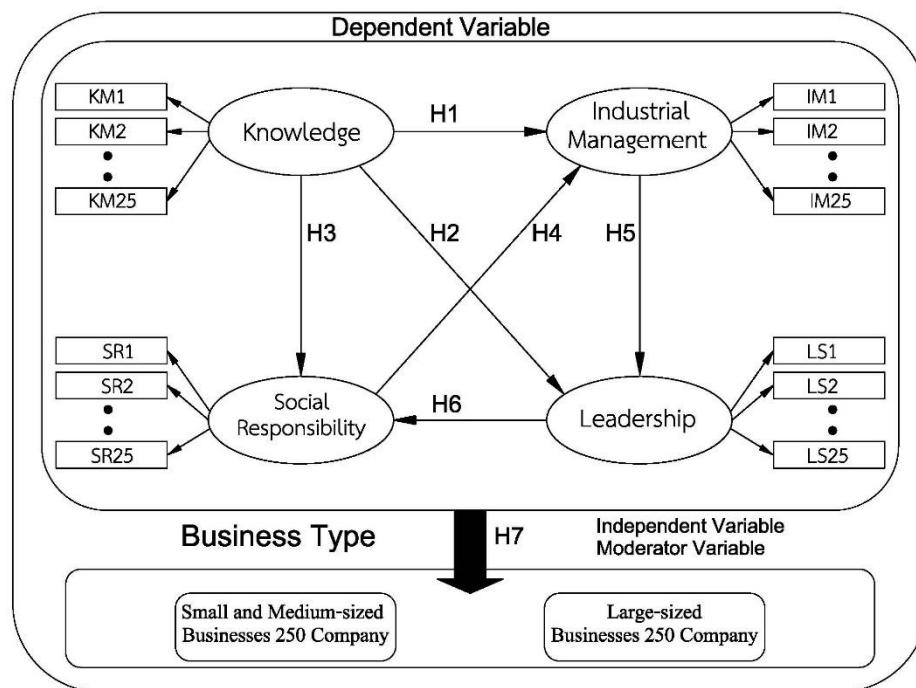


Figure 1: Conceptual framework of the research

In Figure 1, the researchers conduct a mixed-methodology approach, combining qualitative and quantitative methods. It includes qualitative research using in-depth interviews, quantitative research through survey techniques, and qualitative research through focus group discussions. The goal is to develop a structural equation model for the preparation guidelines of social responsibility certification. This will contribute to the creation of knowledge regarding the preparation guidelines for achieving social responsibility certification.

RESEARCH HYPOTHESIS

H1: The Knowledge Management component directly influences the Industrial Management component.

H2: The Knowledge Management component directly influences the Leadership component. **H3:** The Knowledge Management component directly influences the Social Responsibility component.

H4: The Social Responsibility component directly influences the Industrial Management component.

H5: The Industrial Management component directly influences the Leadership component.

H6: The Leadership component directly influences the Social Responsibility component. **H7:** The perceived importance of the components in the preparation guidelines for applying for certification of social responsibility standards in the industrial sector does not significantly differ by business size.

RESEARCH METHODOLOGY

1. Population and Samples

The key informants for the in-depth interviews were nine experts, including three industrial business executives, three academics, and three advisors, lecturers, and assessors in the industrial business sector. The focus group discussion for model certification consisted of 11 experts, all industrial business executives, who were different from those involved in the in-depth interviews. Purposive sampling was used, and the qualifications of the experts followed the criteria established by the Committee for the Administration of the Doctor of Business Administration Program in Industrial Business Administration, Faculty of Business Administration, King Mongkut's University of Technology, North Bangkok, Thailand. In the quantitative research using survey techniques, the population consisted of industrial entrepreneurs who received awards in the project to promote socially responsible industrial factories. This included entrepreneurs from small,

medium-sized, and large enterprises, totaling 5,814 individuals (Department of Industrial Works, 2023). The sample group included 500 industrial entrepreneurs who received awards in the same project, selected using a multi-stage sampling method (Thanin, 2024). This method involved cluster sampling and probability sampling through the lottery method.

2. The Variables Used

Quantitative research can be divided into two types as follows:

1. Independent variables include large, medium, and small industrial business operators.
2. Dependent variables include the structure and nature of operations of industrial businesses that have applied for certification of industrial social responsibility standards. These are presented in the form of a checklist and guidelines for preparing to apply for certification, measured using a rating scale. They can be classified into two types:

- 1) Observed Variable is a variable obtained from data collection on the preparation guidelines for the application for certification of social responsibility standards in the industrial sector.

- 2) Latent Variable is a variable derived from observational variables. It is divided into two types, which are: Exogenous Latent Variable, including the knowledge management component (Knowledge), and Endogenous Latent Variable, including the industrial management component (Industrial Management), the social responsibility component (Social Responsibility), and the leadership component (Leadership).

3. Research Tools

1. Structured Interview: The researcher has developed the interview guideline with four components: Knowledge Management, Industrial Management, Social Responsibility, and Leadership.

2. Quantitative research using survey techniques involves questionnaires divided into four sections as follows:

Section 1: General status of industrial businesses, consisting of 5 items. The questionnaire includes a checklist with 4 items and an open-ended question with 1 item.

Section 2: General structure and operational characteristics of industrial businesses. The questionnaire is a checklist with 20 items.

Section 3: Guidelines for preparing for certification of social responsibility standards in the industrial sector. The questionnaire uses a rating scale with a 5-point Likert scale, as follows (Thanin, 2024). This section consists of 100 items.

Section 4: Opinions and suggestions on guidelines for preparing for certification of social responsibility standards in the industrial sector. The questionnaire includes 5 open-ended items.

3. Focus Group Discussion: The research instrument is a conversation log.

4. Tool Creation And Quality Management

1. In-depth Interview: The researcher studied relevant concepts, theories, and related research to guide the interview process. They reviewed knowledge on qualitative research methods, researcher ethics, data collection techniques, and data analysis methods, and consulted with a qualitative research advisor to ensure the study was accurate and comprehensive. The study focused on four components: Knowledge Management, Industrial Management, Social Responsibility, and Leadership. For each component, the researcher prepared 5 sample questions to guide the interview.

2. The researcher reviewed information from books, documents, articles, and related research works as a guideline for creating questions in Sections 1, 2, and 4. Section 3 was based on the in-depth interviews. The researcher then presented the draft questionnaire, along with the evaluation form, to 5 experts with knowledge and experience in the field. These experts assessed the quality of the instrument by checking

the index of consistency between the questions and the research objectives (Index of Item-Objective Congruence: IOC). For this research, the IOC values ranged from 0.60 to 1.00. The questionnaire was then tested (Try-Out) with a sample group of 30 individuals with characteristics similar to the target population. The results from the Try-Out were analyzed using a ready-made program (SPSS: Statistical Package for the Social Sciences for Windows).

For this research, the questions in the form of a checklist, analyzed using standard deviation (Standard Deviation: S.D.), had values ranging from 0.40 to 3.00. The questions in the form of a rating scale, analyzed using the Correlated Item-Total Correlation, had values ranging from 0.65 to 0.96. The reliability of the questionnaire, measured using Cronbach's Alpha Coefficient, was 0.99.

3. Focus Group Discussion: Prepare a research report form for the focus group discussion, along with a summary of the issues to be discussed, to be submitted to the experts for their consideration and preparation at least 30 days before the meeting date.

5. Data Collection

1. Set the date, time, and location, and interview with experts according to the specified structure. During the interview, the researcher must record data at all times, transcribe the in-depth interviews and conversations verbatim, organize the meanings into themes, interpret or assign meaning to groups of words, texts, or sentences obtained, and analyze the data characteristics, classifying them into sub-topics while ensuring their consistency with the research questions.

2. In quantitative research, the researcher contacts participants for cooperation in completing the questionnaire. If meeting in person is inconvenient, the questionnaire will be sent and returned via mail or electronic media. The completed questionnaires will be checked for accuracy and completeness. The data will then be converted into numerical codes (Code), which will be recorded in a computer for use in statistical data analysis.

3. Group discussions will use a conversation record form, with a moderator who will present discussion topics to encourage the group to think critically and express their opinions on issues or discussion methods in a broad and detailed manner. The discussion will be conducted according to the specified date, time, and location. During the group discussion, the researcher must record data at all times and collect information from the experts' discussions to be used in data analysis.

6. Statistics Used In Data Analysis

1. In-depth interviews will use content analysis to summarize the guidelines for preparing for certification of social responsibility standards in the industrial sector, organized by component.

2. Quantitative research, this research analyzed general basic data using descriptive statistics, inferential statistics, and multivariate statistics, with the SPSS (Statistical Package for the Social Sciences) and AMOS (Analysis of Moment Structures) programs, as detailed below:

1) Data analysis using descriptive statistics was conducted with a checklist questionnaire by calculating the frequency and percentage values. For the rating scale, the mean ($\bar{X}$) and standard deviation (S.D.) values were used. For the open-ended questionnaire, content analysis was applied, and the results were summarized as frequencies.

2) Data analysis using inferential statistics was conducted to analyze the relationship between pairs of variables related to the approach for preparing for the certification of social responsibility standards in the industrial sector using bivariate correlations. The relationship between the structure and operational characteristics of industrial businesses and the approach to preparing for certification was analyzed using the Pearson Chi-square test. For testing differences in the approach to preparing for certification, classified by business size, the analysis was performed using the t-test.

3) Structural equation model analysis was conducted using multivariate statistics. The analysis and development of the structural equation model (Structural Equation Model: SEM) for the guidelines on preparing for certification of the industrial sector's social responsibility standards were carried out using the advanced statistical analysis program AMOS. This program helped obtain the relevant statistical data, along with the interpretation of the results from testing the research hypotheses. The model

underwent adjustments to the values of the components or latent variables (Latent Variable Adjustment) to ensure completeness. The model's consistency was evaluated until each component or latent variable aligned with the empirical data according to all established criteria.

The model's fit with empirical data is evaluated using multiple indices, including the Chi-square probability level ($CMIN-\rho$), Relative Chi-square ($CMIN/DF$), Goodness of Fit Index (GFI), and Root Mean Square Error of Approximation (RMSEA), each offering complementary insights into model-data consistency.

3. Group discussions use content analysis to summarize the comments and suggestions obtained from the discussions.

RESULTS

1. Qualitative research results using in-depth interview techniques.

Knowledge Management Components

To enhance social responsibility within the organization, it is essential to manage an online knowledge database that allows personnel to access up-to-date resources and best practices from successful organizations, which is consistent with the research of Uywattana et al. (2023). Developing a standardized social responsibility manual, facilitating internal knowledge sharing, and organizing seminars and forums encourage ongoing learning and engagement. Providing basic environmental knowledge to nearby communities, selecting skilled and engaging lecturers, and assessing personnel's understanding all contribute to cultivating a strong foundation. In addition, identifying necessary competencies guides the direction of personnel development and supports effective application of social responsibility practices.

Industrial Management Components

Effective industrial management includes systematic production planning by setting clear targets, schedules, and allocating adequate resources, continuously improving production processes to reduce time, costs, and enhance product quality, which is consistent with the research of Pongsuwan et al. (2024). Moreover, efficient raw material procurement and storage must align with production needs to prevent shortages or excess. Cost analysis at each stage helps identify opportunities for expense reduction without compromising standards. Furthermore, strong supplier relationships and the use of inventory tools like Warehouse Management Systems (WMS) ensure timely material delivery and optimized stock levels. Comprehensive supply chain management, including risk planning for disruptions, supports smooth operations. In addition, aligning recruitment with organizational goals and evaluating personnel through clear, objective criteria helps develop workforce capabilities and improve overall performance.

Social Responsibility Elements

It involves implementing measures to reduce pollution emissions, particularly greenhouse gases, by transitioning from fossil fuels to renewable energy sources like solar, wind, or biomass. Organizations should adopt policies that promote the efficient use of natural resources, such as reducing water usage and incorporating recyclable or reusable materials, and managing waste through environmentally friendly methods. In addition, engaging employees through projects, training, and educational activities that encourage awareness and commitment to environmental conservation.

Leadership Components

Effective leadership involves setting a clear and inspiring vision with strategic, long-term plans that are consistent with organizational goals. Leaders should remain open to feedback before making key decisions, demonstrate strong problem-solving skills tailored to each situation, and minimize the impact of challenges. In addition, they must prioritize tasks and establish clear guidelines for effective work distribution, ensuring that the team performs efficiently and in line with organizational objectives.

2. Analysis of Data on the Structure and General Operating Characteristics of Industrial Businesses

Medium and small businesses (with no more than 200 employees) account for 50.00%, while large businesses (with more than 200 employees) also account for 50.00%, equally. Moreover, the form of business registration in the organization is limited companies, accounting for 71.80%, followed by public limited companies at 18.60%. The petrochemical and chemical industry accounts for 23.40%, followed by the automotive industry at 15.40%. Furthermore, the proportion of companies registered in the Stock Exchange of Thailand shows that the majority, 69.40%, are not registered in the Stock Exchange of Thailand, while 30.60% are registered. In addition, the most common period of business operation is less than 10 years, accounting for 31.40%, followed by 10–20 years at 30.60%. The results indicated that the development of business learning skills occurs most frequently in collaboration with external organizations, at 48.40%, followed by internal organizational development at 32.40%. Knowledge development primarily targets personnel at all levels, 52.00%, and supervisors, 19.60%, managed mainly by HR departments in partnership with unit representatives, 50.40%, or directly by HR, 20.00%. The most popular development formats are training and workshops with practical activities, 41.80%, and internal team knowledge sharing via mentoring systems, 25.20%. Moreover, data is typically stored on internal websites and in a central database, 41.60%, and in HR storage areas, 38.20%. Furthermore, important internal operational factors include personnel, 34.60%, and capital, 24.60%, while external factors encompass the economy, 37.20%, and competition, 20.40%. In addition, the main funding sources consist of own or shareholder capital, 55.00%, and loans from domestic financial institutions, 37.00%. Organizational strengths include product or service quality, 52.80%, and reputation and experience, 31.20%, while weaknesses concentrate on tools and production or service technology, 42.80%, and skilled labor shortages, 37.60%. The analysis of structural and general characteristics revealed that business type, construction operations, knowledge management structure, data collection, and external operational factors were statistically independent of business size at the 0.05 level ($p = 0.78$). Moreover, the form of knowledge development, operational factors, funding sources, organizational strengths, and weaknesses significantly influenced on business size at the 0.05 level, for the medium- and small-sized businesses most commonly used training or workshops, 34.80%, and team mentoring, 28.80%, while large businesses also training or workshops, 48.80%, and mentoring, 21.60%. Furthermore, personnel was the most influential operational factor for medium and small businesses, 34.80%, and large businesses, 34.40%, followed by capital, 28.00%, and machinery, 26.00%, respectively. Owners or shareholders provide mostly funding capital for medium or small businesses, 58.00%, and large businesses, 52.00%, with bank loans at 39.20% and 34.80%, respectively. In addition, the most strength across business sizes was product or service quality, 58.00% for medium or small businesses, 47.60% for large businesses, followed by reputation and experience, 24.00% and 38.40%. The leading weaknesses were modern tools, equipment, and technology, 46.80% for medium or small businesses, 38.80% for large businesses, followed by skilled labor shortages, 37.20% and 38.00%.

3. Results of the importance levels analysis components.

The preparation guidelines for applying for certification of social responsibility standards in the industrial sector are overall in four aspects: 1) Knowledge Management, 2) Industrial Management, 3) Social Responsibility, and 4) Leadership. The results of the analysis revealed that overall were rated at a high level of importance, with an average score of 4.18. The components were ranked in order of importance, with Industrial Management, with an average score of 4.22 (S.D. = 0.730), and individual item scores ranging from 4.32 to 4.11. Leadership also with an average score of 4.22 (S.D. = 0.732), with individual item scores ranging from 4.38 to 4.12. Social Responsibility, with an average score of 4.20, and individual item scores ranging from 4.28 to 4.14. In addition, Knowledge Management also with an average score of 4.20, but with individual item scores ranging from 3.87 to 4.18, and a mean item score of 4.07.

When classified by business size, medium and small businesses place a high importance on the guidelines for preparing for certification of the industrial sector's social responsibility standards at a high

level, with an average of 4.17. Leadership was highest at 4.24, followed by Industrial Management at 4.19 (S.D. = 0.70), Social Responsibility at 4.19 (S.D. = 0.74), and Knowledge Management at 4.06. Moreover, large businesses also rated the overall importance at a high level, with an average of 4.19, ranking Industrial Management highest at 4.26, followed by Social Responsibility at 4.21, Leadership at 4.20, and Knowledge Management at 4.07. In addition, the components of the preparation are classified by the size of the industrial business. It was found that, overall, when classified according to the size of the industrial business, there was no statistically significant difference at the 0.05 level. The results of the analysis for each aspect, which are: Knowledge Management, Industrial Management, Social Responsibility, and Leadership, also showed no statistically significant differences at the 0.05 level when classified by the size of the industrial business.

4. Data analysis on opinions and suggestions of this study.

The guidelines for preparing for additional industrial social responsibility certification focus on setting clear goals with continuing evaluation, aligning social responsibility activities with organizational characteristics and objectives for meaningful impact, also training on the CSR-DIW Award application process to increase certification success and encourage sustainable development. Moreover, social responsibility in the industrial sector helps trust and collaboration with communities, improves organizational image and consumer confidence, and promotes transparency while reducing environmental impacts for long-term social acceptance. The major issues and obstacles affecting social responsibility in the industrial sector include an insufficient understanding of social responsibility requirements, the absence of clear indicators for goal setting, and personnel training, government support, all of which effective implementation and sustainability. Furthermore, the government agencies should be promoting social responsibility in the industrial sector by setting clear goals and guidelines, stating supportive policies, helping collaboration and knowledge development, and integrating social responsibility as a key for evaluating organizational performance across all sectors. In addition, leaders in the organization should be promoting tangible and sustainable social responsibility in the industrial sector by setting a clear direction, establishing dedicated departments with appropriate resources, and increasing personnel capacity, such as training, seminars, and experience sharing.

5. Results of structural equation model analysis before and after the model improvement.

The results of the structural equation model analysis for preparing the application for certification of the industrial sector's social responsibility standards, presented in both the Unstandardized Estimate mode and the Standardized Estimate mode, before the model improvement, are shown in Figures 2 and 3.

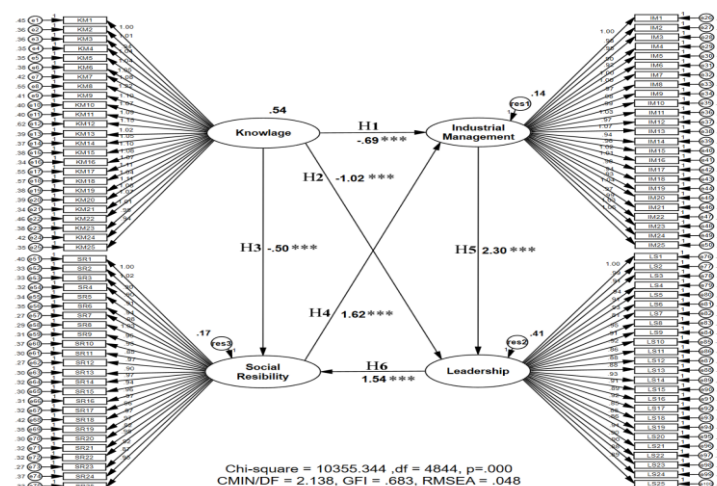


Figure 2: Structural equation model for the preparation of the application for the certification of the industrial sector's social responsibility standards in the Unstandardized Estimate mode, before the model improvement.

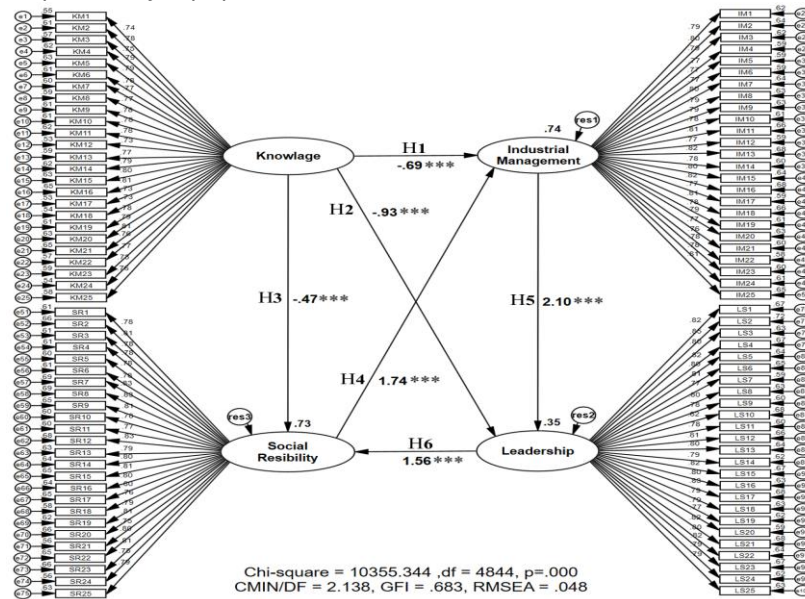


Figure 3: Model equations for the preparation of the application for the industrial sector's social responsibility standard in the Standardized Estimate mode, before the model improvement.

The results of the structural equation model analysis for the preparation guidelines for the application for certification of the industrial sector's social responsibility standards in the Unstandardized Estimate mode and Standardized Estimate mode, after model improvement, are shown in Figures 4 and 5.

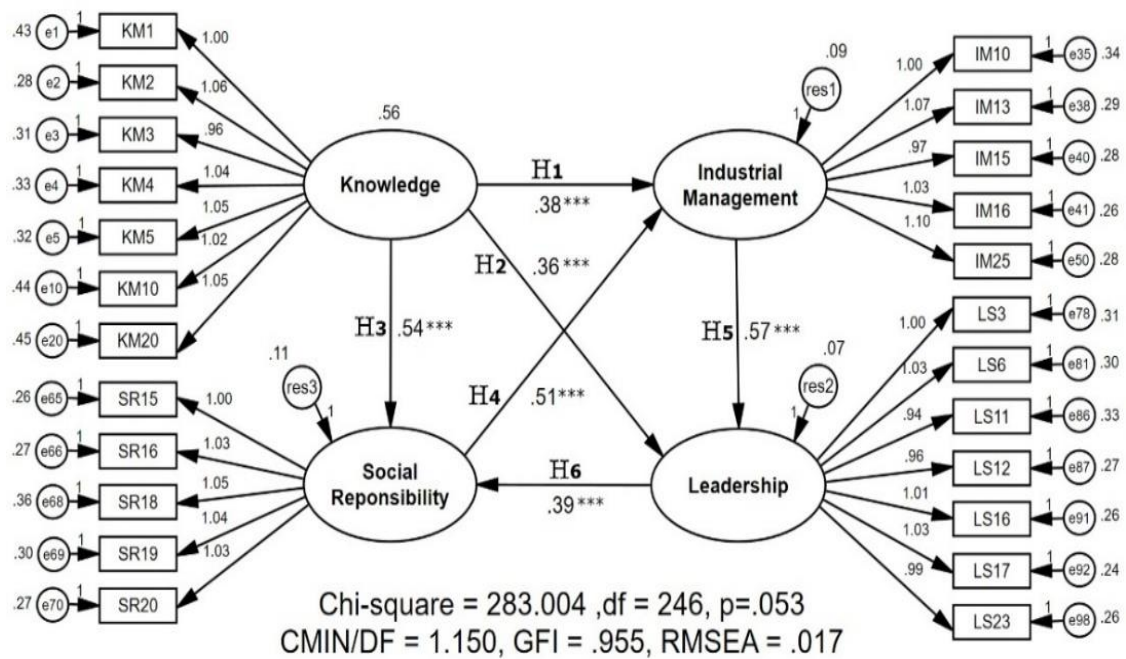


Figure 4: Structural equation model of the preparation approach for the application for certification of the industrial sector's social responsibility standards in the Unstandardized Estimate mode after model improvement.

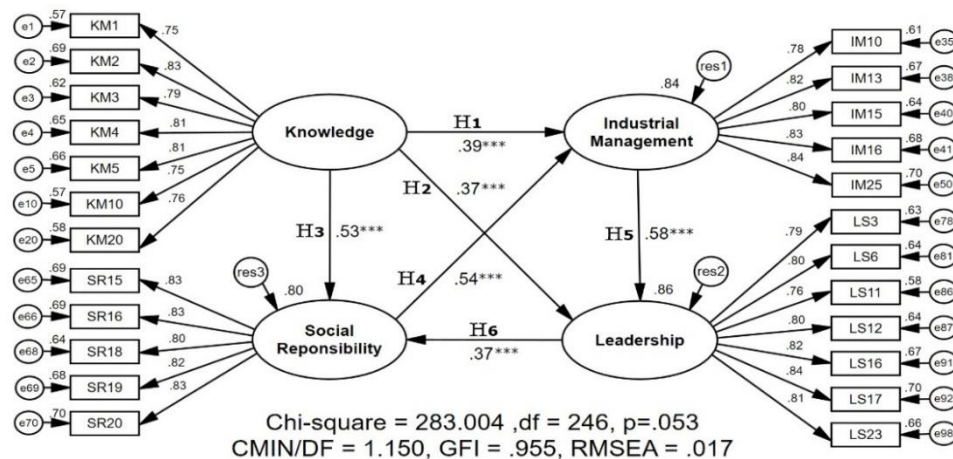


Figure 5: Model equations for the preparation of the application for the industrial sector's standardized social responsibility certification after model improvement in the Standardized Estimate mode.

The structural equation model for the preparation guidelines to request certification of the industrial sector's social responsibility standards, after model improvement, consisted of four latent variables: one exogenous latent variable, the knowledge management component, and three endogenous latent variables, industrial management, social responsibility, and leadership components.

The Knowledge Management component was found to have a direct influence on the Industrial Management component, with a Standardized Regression Weight of 0.39, a statistical significance level of 0.001, a multiple correlation coefficient (R^2) of 0.84, and a variance of 0.09. It also directly influenced the Leadership component, with a Standardized Regression Weight of 0.37, a statistical significance level of 0.001, a multiple correlation coefficient (R^2) of 0.86, and a variance of 0.07. Additionally, it directly influenced the Social Responsibility component, with a Standardized Regression Weight of 0.53, a statistical significance level of 0.001, a multiple correlation coefficient (R^2) of 0.80, and a variance of 0.11.

The Social Responsibility component has a direct influence on the Industrial Management component, with a Standardized Regression Weight of 0.54, statistically significant at the 0.001 level, a multiple correlation coefficient (R^2) of 0.84, and a variance of 0.09.

The Industrial Management component has a direct influence on the Leadership component with a standardized regression weight of 0.58, statistically significant at the 0.001 level, a multiple correlation coefficient (R^2) of 0.86, and a variance of 0.07.

The Leadership component has a direct influence on the Social Responsibility component with a standardized regression weight of 0.37, statistically significant at the 0.001 level, a multiple correlation coefficient (R^2) of 0.80, and a variance of 0.11.

However, after the model improvement, it was found that the probability of chi-square (CMIN- ρ) was 0.053, which was greater than 0.05. The relative chi-square (CMIN/DF) was 1.150, which was less than 2. The fit index (GFI) was 0.955, which was greater than 0.90. The root mean square error of approximation (RMSEA) was 0.017, which was less than 0.08. Therefore, it can be concluded that all four statistics passed the evaluation criteria. As a result, the structural equation model for the preparation of the application for the certification of social responsibility standards in the industrial sector after improvement is consistent with the empirical data.

6. The results of hypothesis testing.

To analyze the causal influence between latent variables in the structural equation model of the preparation guidelines for requesting certification of social responsibility standards in the industrial sector found as follows:

H1: The Knowledge Management component has a direct influence on the Industrial Management component, with statistical significance at the 0.001 level and a Standardized Regression Weight of 0.39, which is in line with the research hypothesis.

H2: The Knowledge Management component has a direct influence on the Leadership component, with statistical significance at the 0.001 level and a Standardized Regression Weight of 0.37, which is in line with the research hypothesis.

H3: The Opportunity Development component has a direct influence on the Social Responsibility component, with statistical significance at the 0.001 level and a Standardized Regression Weight of 0.53, which is in line with the research hypothesis.

H4: The Social Responsibility component has a direct influence on the Industrial Management component, with statistical significance at the 0.001 level and a Standardized Regression Weight of 0.54, by the research hypothesis.

H5: The Industrial Management component has a direct influence on the Leadership component, with statistical significance at the 0.001 level and a Standardized Regression Weight of 0.58, by the research hypothesis.

H6: The Leadership component has a direct influence on the Social Responsibility component, with statistical significance at the 0.001 level and a Standardized Regression Weight of 0.37, which is by the research hypothesis.

H7: the overall p-value = 0.77. Therefore, it can be concluded that the components of the preparation guidelines for requesting certification of social responsibility standards in the industrial sector, when classified by the size of the industrial business (medium and small businesses versus large businesses), are not significantly different at the 0.05 statistical level by the research hypothesis.

Moreover, the overall influence of both direct influence and indirect influence of the structural equation model on the standardized estimate model after improvement. It was found that the highest overall influence was on the Knowledge Management component, with the overall influence on the Leadership component weighing 0.85 ($0.37 + 0.04 + 0.17 + 0.02 + 0.23 + 0.03$).

The preparation guidelines for requesting certification of social responsibility standards in the industrial sector after model improvement. It was found that the relationship between the variables in the structural equation model for the preparation of the application for certification of the industrial sector's social responsibility standards, after model improvement, consisted of 276 pairs, and all pairs were statistically significant at the 0.001 level.

Additionally, the focus group discussion technique was conducted in this study to validate the structural equation model for preparing certification guidelines for social responsibility standards in the industrial sector. The model received unanimous approval from experts, along with valuable suggestions, such as enhancing industrial management through lean and digital transformation, developing a KPI-based evaluation system consistent with ESG and SDG standards, and creating a global knowledge exchange platform to share best practices in alignment with international social responsibility standards.

Discussion

Based on the research results regarding the importance of the components of the preparation guidelines for requesting certification of social responsibility standards in the industrial sector by aspect, it was found that the **Industrial Management** component had the highest mean score ($\bar{X} = 4.22$). This indicates that industrial management incorporating social responsibility approaches has become a key strategy that not only addresses current market demands but also builds long-term trust and sustainability for organizations. This aligns with the adoption of Industry 4.0 technologies, such as the Internet of Things and artificial intelligence, which enhance resource management and production efficiency, reduce waste, and support operations by social responsibility principles emphasizing environmental conservation (Shabnam et al., 2023). As organizations transition into the Industry 5.0 era, which focuses on integrating the circular economy with sustainable supply chain management, this

approach further enables companies to minimize resource usage, mitigate environmental impact, and create sustainable economic value through efficient resource utilization and environmentally conscious supply chain management (Santiago et al., 2024).

From the analysis of the structural equation model of the preparation for the certification of social responsibility standards in the industrial sector, using the Standardized Estimate mode after model improvement, it was found that the highest overall influence lies in the Knowledge Management component, which exerts a significant overall influence on the Leadership component. This indicates that knowledge plays a crucial role in shaping leadership, especially in the context of preparing for and obtaining certification for social responsibility standards. Knowledge management supports the promotion of sustainable practices and aligns with the principles of social responsibility. The sharing of accurate ethical information and the development of effective social responsibility models not only foster socially responsible operations but also contribute to building long-term trust and a positive reputation for the organization (Zoccali et al., 2024). This is consistent with the characteristics of responsible leaders who can leverage knowledge management to stimulate innovation within the organization. Knowledge management enhances the exchange of ideas and information, which is essential for the continuous development and improvement of organizational processes (Mazumder, 2023; Cheng & Chen, 2024).

From the results of hypothesis testing, it was found that, overall, when the components of the preparation guidelines for applying for certification of social responsibility standards in the industrial sector were classified by business size, there were no statistically significant differences. However, large businesses placed a higher level of importance on the components of the preparation guidelines for applying for certification of social responsibility standards than medium and small businesses. This suggests that effective marketing strategy planning should focus on responding to customer needs and adapting to continuous changes in the market (Redka & Ponomarenko, 2022). This aligns with competitive analysis and the creation of distinctive strengths, which enhance an organization's competitiveness and generate long-term strategic advantages (Duralia, 2022). Furthermore, it supports the use of real-time data, allowing organizations to accurately monitor customer feedback and market trends, enabling them to adjust their marketing strategies promptly to align with the situation.

Conclusion

1. This study, conducted through qualitative research using in-depth interviews with experts, identified four key components: Knowledge Management, Industrial Management, Social Responsibility, and Leadership, comprising a total of **100** items, with **25** variables managed to each component.
2. The general status of the establishments showed that **50.00%** were small and medium-sized enterprises (with no more than 200 employees), while the remaining **50.00%** were large businesses (with more than 200 employees). Most were registered as limited companies, **71.80%**. The predominant business type was in the petrochemical and chemical sector, **23.40%**, and **69.40%** were not listed on the Stock Exchange of Thailand. In addition, **31.40%** had been operating for less than 10 years.
3. The structure and general characteristics of industrial business operations found that most organizations develop learning skills through collaboration with external entities, **48.40%**, and engage personnel at all levels in knowledge development, **52.00%**. Knowledge development is primarily managed by the human resources department in coordination with unit representatives, **50.40%**, using methods such as training, workshops, and practical exercises, **41.80%**. Therefore, data is commonly stored via internal websites in centralized databases, **41.60%**. Key operational influences include internal personnel, **38.00%**, and external economic conditions, **37.20%**, with most funding sourced from shareholders, **55.00%**. Furthermore, Organizational strengths lie in product or service quality, **52.80%**, while weaknesses relate to modern tools and technology, **42.20%**. Centralized management with unified goals is typical, **30.40%**, and most organizations engage consistently in social responsibility, **64.40%**, concentrating on occupational health and safety standards, **38.80%**, and high-quality values, **29.80%**. Social, community, and environmental responsibility is often

demonstrated by minimizing environmental impacts, 37.40%. Leadership in social responsibility is promoted by encouraging a responsible culture, 29.60%, and building customer trust, 42.40%, with collaboration through community projects, 33.40%. In addition, Leaders typically support social responsibility by embedding ethics and responsibility throughout the organization, 32.80%, and contributing to positive community changes, such as job creation and economic development, 33.00%.

4. The level of importance of the components of the guidelines for preparing for certification of the industrial sector's social responsibility standards was found to be, overall, at a high level of importance, with an average value of 4.18.

5. The comparison of the importance level classified by business size by testing the difference between the mean of the population of 2 independent groups by testing the t-test found that, the importance level of the components of the preparation guidelines for requesting certification of the social responsibility standards of the industrial sector as a whole, when classified by business size, was not statistically significant at the 0.05 level. For the analysis of each aspect, there was no statistically significant difference at the 0.05 level. For the comparison of each item, found statistically significant difference was found at the 0.05 level. There were 3 items, divided into Industrial Management, 2 items, Social Responsibility, 1 item, with all 3 items, the size of the business, large businesses gave more importance to the preparation guidelines for requesting certification of the social responsibility standards of the industrial sector than medium and small businesses, with statistical significance at the 0.05 level.

6. The analysis results of the structural equation model of the preparation guidelines for the application of the certification of the social responsibility standards of the industrial sector found that the relative chi-square value (CMIN/DF) was 2.138 and the root mean square error of approximation (RMSEA) was 0.048, which passed the assessment criteria of the fit with the empirical data. However, the probability value of the chi-square (CMIN- p) was 0.000, and the fit index (GFI) was 0.683, which did not pass the assessment criteria of the fit with the empirical data. Overall, all 4 statistics passed the assessment criteria. Therefore, the structural equation model of the preparation guidelines for the application of the certification of the social responsibility standards of the industrial sector after the adjustment is consistent with the empirical data.

7. The results of the hypothesis testing to analyze the causal influence between the latent variables in the structural equation model, with 6 hypotheses, were found they be by the 7 hypotheses set.

8. The results of the analysis of the overall influence of the latent variables within the structural equation model after model improvement found that the highest overall influence was the knowledge management component (Knowledge) had an overall influence on Leadership a Standardized Regression Weight was at 0.85.

9. The results of the relationship analysis between the variables of the structural equation model found that there was a relationship between the variables of the structural equation model after the model improvement, with a total of 276 pairs, and all pairs were statistically significant at the 0.001 level.

10. Qualitative research results using focus group discussion techniques from inviting 11 qualified persons to consider approving the model and the structure of the guidelines for preparing for certification of social responsibility standards in the industrial sector.

SUGGESTIONS

1. The Ministry of Industry should create clear policies, laws, and collaborative mechanisms to encourage sustainable social responsibility aligned with international standards. moreover, Industrial business operators should strengthen management by supporting customer relationships and effective after-sales to build trust and satisfaction.

2. Further research should be conducted on the integration of social responsibility into industrial business strategies and the assessment of the impact of social responsibility certification on organizational performance.

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