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Integrated Quality and Food Safety Management Implementation in China's Food Processing SMEs in China

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Abstract

Purpose: This study aims to refine the critical success factors (CSFs) for Integrated Quality and Food Safety Management (IQSM) in food processing small and medium-sized enterprises (SMEs) in China, focusing on their impact on operational and safety performance. Design/methodology/approach: Utilizing a survey questionnaire, data was collected from 259 food processing SMEs in Hengshui City, China. Stratified random and simple random sampling techniques were employed, with data analysis conducted using SPSS version 23.0 and Smart PLS 4.0. Findings: The research identified leadership (LS), training and education (TE), employee involvement (EI), customer focus (CF), process management (PM), supplier management (SM), teamwork (TW), and strategic planning (STP) as the CSFs for IQSM. It revealed a significant relationship between these CSFs and the operational performance (OP) of the SMEs. However, CF, PM, SM, and STP were not significantly related to safety performance (SP). Research limitations/implications: While the data is specific to Hengshui City, it offers invaluable insights for identifying CSFs necessary to implement IQSM effectively in food processing SMEs, thereby enhancing their performance. This study provides a foundation for future research in similar industrial settings and contributes to the broader understanding of quality and safety management in the food industry.

Keywords: Critical Success Factors, Food Processing, China, SMEs

Introduction

Small and medium-sized enterprises (SMEs) serve as a crucial driving force for economic growth in any nation, including China. According to the Yearbook of China Small & Medium Enterprises 2018, there are about 30 million business enterprises that account for more than half of China's tax revenue, over 60% of its GDP, over 70% of its scientific and technological innovations, over 80% of its urban employment, and over 90% of the total number (Yearbook of China Small and Medium Enterprises 2018, 2019). However, SMEs are always under substantial pressure coming from large corporations, which rely more on small businesses to guarantee the quality of their products (Georgiev & Ohtaki, 2019). At the same time, due to lack of resources, capacity, and diseconomies of scale, SMEs face more severe challenges in establishing appropriate quality management systems (Dora *et al*., 2013).

The food industry plays a crucial role in China's economic growth and public health, with SMEs being a significant driving force in this sector. However, some food SMEs have frequent food safety and quality problems due to the cost and their weak awareness of quality (Jose & Shanmugam, 2019; Talib et al., 2014). Moreover, some food processing SMEs in China cannot establish appropriate food quality and safety management systems, which hinders their business performance(Morrow, Kenneth Koves and Barnes, 2014; Feng *et al.*, 2014; Stemn *et al.*, 2019).

Various research projects have been carried out within the food industry. Talib et al. (2014), conducted a study on food processing SMEs, primarily concentrating on quality management (QM) practices and identifying critical success factors (CSFs) for QM alone. The authors suggested that these identified CSFs could be applied to evaluate SMEs' performance. Tzamalis et al (2016), discussed food quality and safety management systems (FSQMSs), but their research centered on creating an assessment tool for FSQMSs. They acknowledged the challenges SMEs faced in distinguishing specific differences between FSQMSs. There is a noticeable lack of research in the food processing sector, particularly regarding SMEs and their implementation of integrated quality and safety management (IQSM) systems. To address this research gap, the current study focuses on the food industry, specifically targeting food processing SMEs in China.

The study is conducted in food processing SMEs in China, Hebei Province, Hengshui City. The reason for choosing the study in Hengshui City is due to hundreds of famous food SMEs moving into the Hengshui New Industrial Zone to relocate labour from the capital, Beijing, according to the policy of “Coordinated development of Beijing-Tianjin-Hebei region”. This study is considered to be the first of its kind to identify the CSFs of integrated quality and food safety management (IQSM) and examine their impact on operational performance (OP) and safety performance (SP) in food processing SMEs in China. China's food industry is a critical sector, closely tied to the nation's food safety and public health concerns, with substantial export potential. This underscores the pressing need to bolster comprehension of quality and safety management systems among Chinese SMEs.

Hypothesis Development

Problem Statement

In China, the food processing industry includes three major parts: agricultural and side-line food processing industry, food manufacturing industry, wine & beverage & refined tea manufacturing industry.

According to the China Food Industry Association， by the end of 2022， China's food processing industry realised a total profit of more than 6815.3 billion yuan, with a year-on-year increase of 9.6%. It has become one of the most critical industries in China. In addition to the enormous domestic demand market, the import and export food trade volume has maintained a continuous growth rate of more than 10% in the past ten years. According to research by Willer & Lernoud (2019), China became the fourth-largest organic food market in the world in 2013.

However, in the past years, food quality and safety issues continued to emerge, and food quality and safety events frequently hit the headlines worldwide (Xue & Zhang, 2013). According to WHO estimates, 600 million people worldwide suffer from food-borne diseases every year, leading to 420,000 deaths (WHO, 2015).

The incidents related to food quality and safety not only directly harm people's health, but also cause great economic losses. For example, in China, the notorious incidents of smuggled imported frozen meat and outbreaks of African swine fever, have aroused people's grave concern about the food safety situation (Song *et al*., 2020). Now the most important practical problem of food safety is food-borne illnesses; the number and rate of reported food-borne disease outbreaks by the year 2010–2017 increased at an exponential rate in China (Li *et al*., 2020).

Given the above, China's national leaders and competent departments have attached great importance to the construction of the regulatory systems and laws and regulations. Effectively improving the quality control in food processing and ensuring food safety is an important content and measure related to the development of people's livelihood in China and is the fundamental guarantee for China to take the road of sustainable development. Though China's food safety situation is gradually improved overall, due to high cost, high personnel investment, and other reasons, most of the SMEs still lack food quality and safety awareness. There is no comprehensive food quality and safety system, which led to numerous food incidents affecting both operational performance (OP) and safety performance (SP) (Zhao et al., 2021). Hence, this research is vital in identifying and examining the influence of CSFs for IQSM on OP and SP within food processing SMEs.

Quality Management

Quality is increasingly acknowledged as an essential strategic advantage for enhancing organizational performance. In the modern competitive landscape, the long-term viability of manufacturing firms hinges on their ability to deliver superior-quality products. Many scholars have emphasized the significance of quality management (QM), as it enhances organizational effectiveness, fosters competitiveness, promotes innovation and ensures customer satisfaction (Dora et al., 2013b; Kafetzopoulos and Fotopoulos, 2013)). Various empirical analyses have explored the link between quality management practices and organizational performance, uncovering a significant correlation. Consequently, existing research suggests that QM is a pivotal factor in achieving organizational excellence and profoundly influences overall business performance.

Food Safety Management

Food safety management refers to the system or process used by organizations to guarantee that the food they manufacture is safe for consumption. This includes recognizing and assessing potential hazards, putting safeguarding mechanisms and preventative steps in place, and assessing the effectiveness of these measures. Food safety management is critical to assure that food products are free from harmful contaminants and comply with food safety regulations. Widely utilized food safety management systems encompass Hazard Analysis and Critical Control Points (HACCP), ISO 22000, and Good Manufacturing Practices (GMPs). Effective food safety management not only protects consumers from potential health risks but also helps to build consumer trust and confidence in the food products and the organizations that produce them.

Integrated Quality Safety Management (IQSM)

Both QM & food safety management practices are acknowledged as important tools for the performance of the organization (Rebelo et al., 2014). QM systems are concerned more with customers' needs and satisfaction, while safety management systems pay more attention to management of man, material, machine, method, and environment (Zhang et al., 2020). By integrating QM and food safety management practices, a single IQSM (Integrated Quality and Food Safety Management) system would work more efficiently. IQSM systems provide organizations with perceived benefits in terms of cost reduction, time-saving, increased productivity, better communication, alignment in objectives and workflows, minimization of redundant duties and procedures, advancement in technological capabilities, higher operational outcomes and the fortification of a favorable corporate image in the marketplace (Dahlin & Isaksson, 2017; Ikram et al., 2020; Vashishth et al., 2021). In addition, for food sectors, food safety is the paramount facet of food quality, given that its absence can result in grave repercussions, including severe injuries or even fatalities. Therefore, prioritizing food safety not only is imperative for public well-being but also trumps the enhancement of other quality dimensions. As Gianni et al. (2017) found that the adoption of combined quality and food safety standards made a significant contribution to food quality and operational performance. Therefore, IQSM is a single complete system covering both food quality and safety issues.

In accordance with existing literature, my previous study presents the CSFs of IQSM like leadership (LS), training and education (TE), employee involvement (EI), customer focus (CF), process management (PM), supplier management (SM), teamwork (TW) and strategic planning (STP), as well as their related constructs.

Research has indicated that these factors are widely acknowledged as crucial in both in QM and food safety management. Consequently, these factors have been selected as CSFs for IQSM in this study. The research aims to explore how these CSFs impact operational and safety performance among Chinese SMEs in the food processing industry. Additionally, both Sreedharan et al (2018), and Nguyen & Li (2021), have underscored their importance in shaping quality and food safety management practices.

Description of the Independent Variables

Leadership. As a cornerstone for effective TQM execution, leadership embodies the dedicated engagement, financial backing, and active oversight from top-level management across the organization's entire management system (Dora et al. 2013b). It involves the process of developing a future vision, such as the quality and safety plan or policies as well as rewards and punishments, then disclosing and communicating it all levels of the organization, motivating and encouraging subordinates, and engaging in strategy-supportive exchanges with colleagues and associates (Rebelo et al., 2014; Shao, 2019; Machfudiyanto et al., 2019; Grinerud et al., 2021)

Based on the available literature, leadership is undoubtedly one of the most important factors in QM or food safety management practices' success. In light of the significance of leadership

in the literature, this study has chosen to investigate its correlation with the OP and SP of the food processing SMEs in China. Accordingly, the following hypotheses are put forward based on the aforementioned literature:
H1a. There is a significant statistical relationship between LS and OP within food processing SMEs.
H1b. There is a significant statistical relationship between LS and SP within food processing SMEs.

Training and education. Education and training provide employees with the necessary professional knowledge, skills, and abilities to make them conversant with their roles and effectively complete their work, while correctly diagnosing and encountering problems in daily work, and finally realizing the organization's goals, visions and missions (Mohsadeghard, 2013; Georgiev & Ohtaki, 2019; Asante & Ngulube, 2020). This study holds the view that TE is a critical factor that impacts an organization's overall performance. Drawing from the previous literature, the subsequent hypotheses have been developed:

H2a. There is a significant statistical relationship between TE and OP within food processing SMEs.
H2b. There is a significant statistical relationship between TE and SP within food processing SMEs.

Employee involvement. Employee involvement, also known as employee participation or participative management, is to create an environment such as shared values, trust and empowerment in which employees influence decisions and actions that may influence their jobs. Participation can help employees release their full potential, improve their abilities, increase their self-esteem, help them acquire new knowledge, devote themselves to the success of the organization, and gain a sense of achievement from solving practical problems(Kutlu & Kadaifci, 2014; Kulenović et al., 2021) It was seen as a method or system for assigning tasks and sharing responsibility for a company's successes and failures (Georgiev & Ohtaki, 2019). Based on the focus on EI, the study proposes the following hypotheses:

H3a. There is a significant statistical relationship between EI and OP within food processing SMEs.
H3b. There is a significant statistical relationship between EI and SP within food processing SMEs.

Customer focus. Customer focus means the organization should comprehend both current and future customer necessities, fulfil these demands, and aim to go beyond their anticipations. In order to achieve quality and safety, it is crucial to know what customers want, what the reason for complaints and provide products or services that meet their requirements(Kumar et al., 2011). According to Talib et al (2014), organizational performance is directly influenced by the focus on the customer. Kharub & Sharma (2016), state that aligning product production with consumer needs is an organization's ultimate objective, and satisfying customers remains its fundamental responsibility. This study aims to delve deeper into the importance of CF. Based on the existing literature, the following hypotheses are presented:

H4a. There is a significant statistical relationship between CF and OP within food processing SMEs.
H4b. There is a significant statistical relationship between CF and SP within food processing SMEs.

Process management. Process management is one core dependent variable for the successful implementation of QM (Kr Singh, 2011; Eriksson, 2016). It aims to enhance processes, boost individual efficiency, cut operational expenses and cycle duration, and elevate the organisation's operational quality. By emphasizing process models, organizations can reach long-term development goals. (Jraisat et al., 2016; Abbas & Kumari, 2021). The implementation of process management has a statistical influence on organizational performance, especially the operational performance of food processing SMEs (Talib et al., 2013; Shah et al., 2019) .The literature highlights the significance of PM as a crucial factor. As a result, the subsequent hypotheses are proposed:

H5a. There is a significant statistical relationship between PM and OP within food processing SMEs.
H5b. There is a significant statistical relationship between PM and SP within food processing SMEs.

Supplier management. Creating and maintaining a good relationship with suppliers is an important aspect of TQM. Since food raw materials and packaging materials are often a major source of quality and safety problems so choosing reliable suppliers such as strategic partnerships is always one of the prerequisites for successful production process management (Georgiev & Ohtaki, 2019; Kulenović et al., 2021). And regular supplier assessments facilitate information sharing and mutual understanding, while long-term partnerships with suppliers also enhance collaborative problem-solving and investments in quality and risk mitigation. Therefore, this study is intrigued by the vital role of SM and aims to explore its significance. The ensuing hypotheses are thus posited:

H6a. There is a significant statistical relationship between SM and OP within food processing SMEs.
H6b. There is a significant statistical relationship between SM and SP within food processing SMEs.

Teamwork. Teamwork refers to achieving common goals; the team members effectively coordinate, collaborate, and communicate, gaining a better synergy and overall performance than when they work alone. It includes the attitude towards working as a team, such as the willingness to share technical experiences (Georgiev & Ohtaki, 2019; Shih Chi Kuo & Hsiao, 2021). Thus, given the importance of TW, this factor is deemed worthy of investigation with regard to its effects on the OP and SP of SMEs in the food processing industry. Consequently, the ensuing hypotheses are posited:

H7a. There is a significant statistical relationship between TW and OP within food processing SMEs.
H7b. There is a significant statistical relationship between TW and SP within food processing SMEs.

Strategic planning. Strategic planning involves formally setting long-term organisational goals and implementing them (Asante & Ngulube, 2020). Enterprises should have a good plan, including the objectives, costs and policies for implementing quality and safety management (Machfudiyanto et al., 2019). In fact, there is a significant correlation between strategic planning and quality performance (Prajogo & Cooper, 2017). In this study, the element of STP is of particular interest, and thus, the following hypotheses are formulated:

H8a. There is a significant statistical relationship between STP and OP within food processing SMEs.
H8b. There is a significant statistical relationship between STP and SP within food processing SMEs.

Dependent Variable: Performance
The organisation's goal is to maintain a competitive advantage. Organizational performance is how an organisation gains a competitive advantage (Choudhary, Akhtar, & Zaheer, 2013). There are many ways to evaluate an organisation's performance, such as financial profitability and growth, cost reduction, and product development. In this study, organizational performance is measured by operational performance and safety performance.

Operational performance. Operational performance refers to a manufacturing entity's capacity to enhance production, elevate product quality, and guarantee timely delivery (H. Zhang & Yang, 2016). Lean manufacturing application boosts OP in European food processing SMEs (Dora et al., 2013b). The implementation of QM and food safety practices is significantly related to OP. Dora et al (2013b), Saumyaranjan Sahoo & Yadav (2018a) and Hardcopf et al. (2021), found that successful implementation of lean production practices can improve OP. There is a positive correlation between TQM and OP (Abbas & Kumari, 2021), and TQM factors involving customers, employees and leadership significantly affect the OP (Psomas & Jaca, 2016). The depth of halal standards implementation has resulted in improved OP (Giyanti et al., 2020). Moreover, HACCP certification has a short-term and long-term impact on the profitability, production efficiency and asset turnover of the enterprises (Liu et al., 2021). What's more, IMS maturity is positively correlated with operational performance (Vashishth et al., 2021). As demonstrated by Shah et al (2019), in food processing SMEs, all CSFs of IMS have a significant relationship with OP. Therefore, to assess SMEs' performance, it is necessary to examine their OP further.

Safety performance. Tong et al (2020), showed that SP helps reduce workers' unsafe behaviour. Feng et al. (2014) reported that SP is influenced by the combined impact of safety investments, safety culture, and project hazard, like Morrow, Kenneth Koves and Barnes (2014), emphasized that there is a significant statistical relationship between safety culture and SP. To improve SP, managers need to encourage their employees to actively participate in safety-related affairs and training actively. They have a positive food safety culture in place (Nyarugwe et al., 2016), so as to enhance their ability to make independent decisions in daily work(Lu et al., 2020). Moreover, Yunshuo Liu et al (2019), found that Occupational calling has a direct positive effect on the SP of train drivers. Liu et al (2021), proposed that HACCP certification has great importance in OP and future studies should include variables like SP.
Conceptual Framework

The suboptimal OP and SP might have a direct impact on a firm's financial performance. Therefore, this study aims to identify and analyse the impact of IQSM CSFs on the OP and SP of Chinese food processing SMEs. Following an extensive literature review and problem identification, a conceptual framework has been developed for the investigation. The framework illustrates the eight factors that comprise the CSFs of IQSM practices, namely LS, TE, EI, CF, PM, SM, TW and STP. The overall impact of these factors on the OP and SP within food processing SMEs in China will be examined, as depicted in Figure 1.

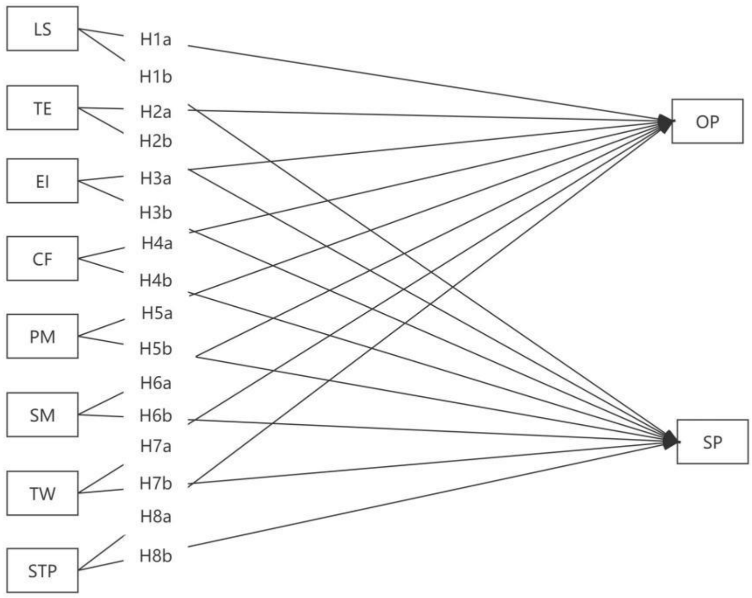

Figure 1Conceptual framework

Methodology

Data Collection Methods

Several data collection techniques are available, including online surveys, email, postal surveys, and in-person surveys. In this study, a quantitative research design was adopted, and data was collected through a self-administered questionnaire survey using a structured questionnaire. The data was collected from Hengshui City, Hebei Province, China.

Questionnaire Design

The questionnaire used in this study was adapted from previous research studies, including G. Singh & Singh (2020); Kaur et al.(2019); Silva et al.(2019); Georgiev & Ohtaki (2019); Siegel et al. (2019); Sahoo & Yadav (2018b); A. N. Ahmad et al.(2017); Dora et al.(2013b). The questionnaire's content validity was verified through consultations with academia and industry experts. Based on their feedback, the questionnaire was modified, refined, and tailored to the unique circumstances of food processing SMEs in China. The questionnaire's reliability was measured using Cronbach's α, with values between 0.917 and 0.982, which exceeds the minimum recommended value of 0.7 (Nunnally, 1978). The unit of analysis was the SMEs, with responses provided by owners/managers or individuals knowledgeable about the company's quality and food safety management practices and performance. Responses were measured on a five-point Likert scale, with strongly disagree rated as "1" and strongly agree rated as "5."

Sample Size

The population of interest in this study comprised food manufacturing SMEs operating in Hengshui City, Hebei Province. Since complete records of these SMEs were available from various districts or counties, stratified random sampling was used to select the participants. This approach is consistent with previous research conducted by (Sekaran, 2003). The stratification process was utilized, followed by a random selection of samples from each stratum, which was deemed appropriate for this study.

According to the Market Supervision Administration of Hengshui City, there are 306 food processing enterprises; among them, 303 are SMEs. So, the sample size for this research is at least 170 units. In order to further determine the sample size, this study also used the G*Power version 3.1.9.7 application. Based on the G*Power parameters of the two-tailed test, a medium effect size (0.50), α err probability 0.05, and a power of 0.90, the total required minimum sample size was set at 172 firms. However, this study aimed to collect a sample size larger than the minimum required. The data were collected, and 259 were available for analysis.

Data Analysis Methods

The primary data analysis in this study involves using IBM-SPSS to detect outliers and missing values and assess normality. For hypothesis testing, PLS-SEM is employed, which is renowned for effectively predicting relationships between constructs (Hair et al., 2021). The measurement and structural models were assessed using SmartPLS 4.0 with a one-stage approach, following the recommendation of (Anderson and Gerbing, 1988).

Results and Discussion

Respondents Demographics

Table 1 outlines the demographic details of both the SMEs and the participating respondents. Of the 259 SMEs, 17.37% had 1-5 years of industry experience, 38.22% had 5-10 years, 29.23% spanned 11-20 years, and 15.06% had over 20 years of experience. Out of the 259 SMEs surveyed, 29.73% had less than 20 employees, 67.18% had 20-299 employees, and only 3.09% had 300-1000 employees, according to the results presented in Table 1. The result shows that the majority of food processing SMEs in the sample have a moderate number of employees, with 20-299 being the most common range. And a significant proportion of SMEs in the food processing industry in Hengshui City have been operating for more than one decade, indicating a relatively stable market and potentially higher levels of expertise in the sector.

Table 1

Demographics of SMEs and respondents

Demographics	No. of participants (259)	Percentage（%）
About SME		
Years engaged in food production		
Less than 5 years	45	17.37
5-10 years	99	38.22
11-20 years	76	29.34
More than 20 years	39	15.06
Number of Permanent Employees		
Less than 20	77	29.73
20-299	175	67.18
300-1000	8	3.09
About respondent		
Current Working Department		
CEO	60	23.17
General manager	45	17.37
Quality director	120	46.33
Food safety administrator	46	17.76
Manager of Quality Management Department	123	47.49
Manager of Food Inspection Department	30	11.58
Manager of Food Production Department	15	5.79
Manager of Other Departments (please specify)	4	1.54
Working Experience		
1-3 Years	19	7.34
3-5 Years	61	23.55
More than 5 Years	179	69.11
Respondents Education Background		
Technical secondary school/high school	52	20.08
Junior college	118	45.56
Undergraduate	86	33.20
Postgraduate and above	3	1.16

With regards to the current working department/position, 46.33% of the respondents were from the quality department, 11.48% were from the inspection department, 5.79% from the production department, and 40.54% were either General manager or chief executive officers (CEOs), as presented in Table 1. Out of the 259 respondents, only 7.34% had 1-3 years of experience, 23.55% had 3-5 years of experience, and 69.11% had more than 5 years of experience in SMEs. For their education background, a relatively small proportion (20.08%) held technical secondary school or high school certificates. A larger proportion (45.56%) held Junior college certificates, while a significant minority (33.20%) held bachelor's degrees. Postgraduates and those with higher qualifications were relatively uncommon, with only 1.16% of respondents falling into this category.

Assessment of the Measurement Model (Outer Model)

Two essential metrics for gauging the effectiveness of a measurement model are reliability and validity (Ramayah et al., 2011). The model's reliability is gauged through outer loadings and composite reliability (CR), with item loading indicating item reliability and CR indicating construct reliability. Chin (1998) suggests that item loadings should be 0.60 or higher, while

Hair et al (2017), suggest that CR should be 0.70 or higher. Convergent and discriminant validity serve as the indicators for assessing the model's validity. Convergent validity is measured through the Average Variance Extracted (AVE), with a threshold value of 0.5 or greater deemed acceptable, as suggested by Hair et al. (2017). Table 2 confirms that every latent variable in this research meets the required criteria.

The Fornell-Larcker criterion serves as the benchmark for assessing discriminant validity. According to this criterion, the square root of each latent variable's AVE should be greater than its correlations with other latent variables, as established by Fornell and Larcker (1981). As shown in Table 2, the data confirms that the square root of each AVE exceeds its respective correlations with other latent variables.

Table 1
Measurement model

Const.	CR	AVE	LS	TE	EI	CF	PM	SM	TW	STP
LS	0.934	0.639	0.765							
TE	0.929	0.622	0.461	0.789						
EI	0.914	0.571	0.501	0.388	0.756					
CF	0.934	0.639	0.602	0.55	0.472	0.799				
PM	0.942	0.621	0.506	0.443	0.536	0.576	0.788			
SM	0.937	0.651	0.323	0.358	0.325	0.441	0.429	0.807		
TW	0.922	0.596	0.477	0.591	0.39	0.53	0.457	0.333	0.772	
STP	0.925	0.639	0.456	0.31	0.499	0.492	0.535	0.401	0.404	0.799

Henseler et al. (2016) introduced the Heterotrait-Monotrait Ratio (HTMT) as a new criterion for assessing discriminant validity. This method gauges the genuine correlation between two latent variables. Henseler et al. (2016) suggested a 0.85 threshold for HTMT, with values exceeding this indicating insufficient discriminant validity. Table 3 shows that all figures fell under the benchmark, confirming that the measurement model met the HTMT standard.

Table 2
Heterotrait-Monotrait Ratio (HTMT)

Const.	LS	TE	EI	CF	PM	SM	TW	STP
LS								
TE	0.498							
EI	0.548	0.424						
CF	0.651	0.6	0.514					
PM	0.544	0.481	0.584	0.62				
SM	0.338	0.382	0.35	0.469	0.454			
TW	0.516	0.65	0.432	0.579	0.499	0.358		
STP	0.497	0.338	0.553	0.537	0.578	0.435	0.445	

Furthermore, the PLS algorithm was used to obtain the item's loadings and path coefficients, which are presented in Figure 2.

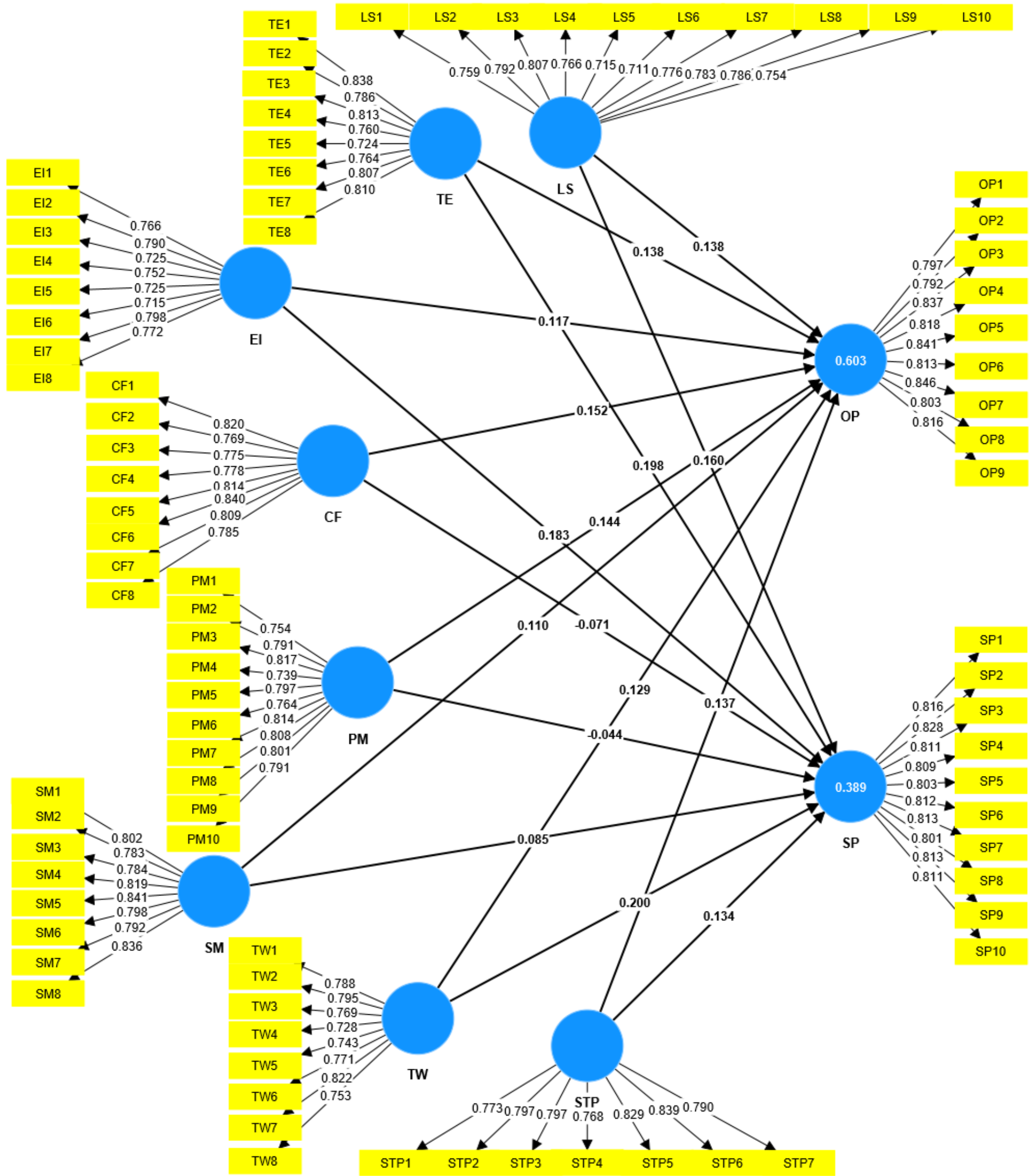

Figure 2 Measurement model through the PLS algorithm

Assessment of Structural Model (Inner Model)

The structural model depicts the inherent relationships among latent constructs (Mohammad & Khalid, 2016) (Hair et al 2017) highlighted the coefficient of determination R2 as a primary metric for this model's evaluation. The R2 value reveals the cumulative impact of the exogenous latent variables on the endogenous ones. R2 values of 0.67, 0.33, and 0.19 indicate substantial, moderate, and weak influences, respectively. This research's R2 values, 0.603 and 0.389, suggest moderate influence, accounting for 60.3% and 38.9% of the variance for OP and SP, respectively.

A bootstrapping method with 5000 replications was used to derive path coefficients, t-values, and p-values, following (Hair et al 2017). Given that all relationships formulated in this study were positive and direct, a two-tailed test was conducted, as suggested by (Mohammad et al, 2016). Critical t-values for a two-tailed test are set at 1.645 ($p < 0.10$), 1.96 ($p < 0.05$), and

2.58 (p < 0.01). The findings from the PLS analysis of the structural model are detailed in Table 4.

Table 3
Summary o f the structural model

Hypothesis	Path	Path coefficient	SE	t-values	p-values	Decision
H1a	LS→OP	0.152	0.07	1.975	0.048	Supported
H1b	LS→SP	0.138	0.079	2.034	0.042	Supported
H2a	TE→OP	0.138	0.068	2.023	0.043	Supported
H2b	TE→SP	0.198	0.085	2.32	0.02	Supported
H3a	EI→OP	0.117	0.059	1.99	0.047	Supported
H3b	EI→SP	0.183	0.082	2.245	0.025	Supported
H4a	CF→OP	0.152	0.074	2.061	0.039	Supported
H4b	CF→SP	-0.071	0.096	0.734	0.463	Not Supported
H5a	PM→OP	0.144	0.072	1.995	0.046	Supported
H5b	PM→SP	-0.044	0.083	0.534	0.593	Not Supported
H6a	SM→OP	0.11	0.055	1.984	0.047	Supported
H6b	SM→SP	0.085	0.068	1.256	0.209	Not Supported
H7a	TW→OP	0.129	0.063	2.037	0.042	Supported
H7b	TW→SP	0.2	0.082	2.442	0.015	Supported
H8a	STP→OP	0.137	0.067	2.04	0.041	Supported
H8b	STP→SP	0.134	0.084	1.596	0.111	Not Supported

Bootstrapping outcomes revealed significant associations between leadership and OP (β=0.152, t=1.975) and SP (β= 0.138, t=2.034), and between TE and both OP (β=0.138, t= 2.023) and SP (β= 0.198, t=2.32). Similarly, EI exhibited significance with OP (β=0.117, t=1.99) and SP (β= 0.183, t=2.245). CF was related significantly with OP (β= 0.152, t=2.061) but not with SP (β= -0.071 t=0.734). PM correlated significantly with OP (β= 0.144, t=1.995) but lacked significance for SP (β= -0.044, t=0.534). SM was relevant for OP (β= 0.11, t=1.984) but not SP (β= 0.085, t=1.256), whereas TW was significant for both OP (β= 0.129, t=2.037) and SP (β= 0.2, t=2.442). Lastly, STP was related with OP (β= 0.137, t=2.04) but not with SP (β= 0.134, t=1.56). As a result, hypotheses H1a through H8a and H1b, H2b, H3b and H7b received support. In contrast, hypotheses H4b, H5b, H6b, and H8b, regarding CF, PM, SM, and STP's relation with SP, were not supported.

The current research has identified several critical success factors influencing the operational and safety performance of food processing SMEs in China. The CSFs include: LS, TE, EI, and TW. Furthermore, CF, PM, SM, and STP were also recognized as crucial for operational performance (OP). However, these latter factors did not show a significant impact on safety performance (SP). These findings share similarities with prior studies. For instance, Jaafar et al (2017), also emphasized the role of management commitment, safety training, and worker involvement in safety management. Fotopoulos et al (2011), noted challenges related to employee training as crucial for the implementation of HACCP systems, while Kuo & Hsiao (2021), found that teamwork positively correlates with successful HACCP implementation. Despite these similarities, the research diverges to some extent. One of the unique findings is the lack of significant impact of factors like CF, PM, SM, and STP on SP. This varies from the conclusions reached by Ahmad et al. (2017), who emphasised the significance of supplier and consumer considerations in the successful execution of halal food management systems. Additionally, Fotopoulos et al (2011), have indicated that insufficient planning serves as a barrier to implementing HACCP, a notion supported by Kafetzopoulos & Gotzamani (2014), in relation to ISO 9001 as well. Khalid et al (2021), further posited that separate planning for safety and operational projects could detrimentally affect safety outcomes.

Given that this research focuses on Chinese SMEs in the food processing sector, cultural elements unique to China may have influenced the results, such as differing attitudes toward safety and regulatory compliance. Moreover, the disparity between developed and developing countries may offer another explanation. Previous studies may not fully capture SMEs' operational intricacies and constraints in developing economies like China. The findings by Ahmad et al (2017), and Fotopoulos et al (2011), suggest that different food sectors have specific challenges that might not be universally applicable. However, our study suggests that in the context of China, these may not be the only or even the most critical factors for safety performance. By acknowledging these divergences and potential explanations, this research contributes a nuanced understanding that can help tailor strategies for improving both operational and safety performance in food processing SMEs, particularly in China.

Conclusions

While the importance of QM is underscored in the existing literature, QM, in isolation, doesn't wholly address customer needs. With a rising prominence of food safety concerns, there's an escalating demand for safety management from customers. Thus, the crux of this research zeroes in on pinpointing the CSFs of IQSM, encompassing both quality and safety dimensions. The study's empirical data affirms that the earmarked CSFs for IQSM, like leadership with p-values (0.048), TE (0.043), EI (0.047), CF (0.039), PM (0.046), SM (0.047), TW (0.042), and STP (0.041), exhibit a significant correlation with OP. Concurrently, factors such as LS, TE, EI, and TW demonstrated significance on the SP of food processing SMEs, with p-values being (0.042), (0.020), (0.025), and (0.015) respectively.

Implications of the Study

This study offers valuable insights for owners of food processing SMEs in China, particularly concerning the critical success factors (CSFs) for both operational and safety performance, including robust leadership vision, comprehensive training and education, active involvement of employees, an emphasis on customer needs, continuous process improvement, building and maintaining strong supplier relationships, and effective teamwork with well-defined strategic planning, can be pivotal. By understanding and integrating these IQSM determinants, food processing SMEs can develop a more effective and responsive approach to quality and safety, improve operational and safety performance, and gain the trust of increasingly safety-conscious consumers. This is particularly important in today's market, where consumers are increasingly focused on the safety and quality of the food they consume.

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