

A Study on the Construction of Chinese Food Enterprises' Integrity Evaluation System: A Consumer Perspective

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Abstract

With the heightened awareness of global public health issues, which has increasingly drawn attention to the topic of food safety, the integrity of food enterprises has emerged as a central focus in society. Previous research on corporate integrity in the food industry has largely been conducted from the perspectives of government and management. This paper attempts to construct a corporate integrity evaluation system from the consumer perspective, thereby addressing a gap in the current research landscape. In this study, we collected consumers' views on corporate integrity through a questionnaire survey and analyzed the data using SPSS 25.0 and AMOS 24.0. This paper ultimately constructs a corporate integrity evaluation system comprising four factors, six dimensions, and thirty-two indicators. Notably, a newly identified factor arising from the COVID-19 pandemic, termed "epidemic prevention integrity," clearly demonstrates its significant influence on corporate integrity.

Keywords: corporate integrity, integrity evaluation system, Chinese food enterprises, a consumer perspective

1. Introduction

The outbreak of COVID-19 has significantly impacted China's politics, economy, culture, and even integrity. Integrity is one of the core values of traditional Chinese culture (Sun, 2003). Since the Ming and Qing Dynasties, Confucian Merchant Culture has been a fundamental aspect of Confucianism (Zhan and Yang, 2022). The integrity of enterprises essentially embodies faith through honesty. Honesty involves adherence to broad principles, including legal and moral norms; credit is the public's recognition of an enterprise, represented as enterprise credit, and is established through a dynamic process (Pan and Cha, 2006). In the West, integrity is defined by Brown and Treviño (2006) as "the adherence to moral and ethical principles, which involves honesty, fairness, and consistency" (p. 595-616). They differentiate between an individual's integrity, which pertains solely to that person's word, and the integrity of a group or organization, defined by what is said on behalf of that group or organization. Erhard et al. (2016) assert that for these entities to possess integrity, it is essential that they honor their commitments.

Since the outbreak of COVID-19, the root cause of frequent food safety incidents has been the myopic business practices stemming from the lack of integrity among production enterprises, which are directly responsible for food safety (Wang and Ma, 2016). In recent years, food safety issues have emerged in several prominent brands, including Heytea, Masterkong, and Nayuki. These incidents have revealed a decline in corporate ethics, and the lack of integrity in the economic field has become an indisputable fact. Particularly during the current COVID-19 pandemic, consumers, with their diverse consumption perspectives and the influence of highly developed social media, have raised higher expectations for corporate integrity.

Under the impact of COVID-19, the positive role of corporate integrity has been widely recognized by society, while corporate dishonesty has faced significant criticism. The authors of this study contend that the construction of enterprise integrity should not solely depend on the supervisory mechanisms of national industry standards, government oversight, or legal frameworks, but also require public scrutiny from consumers, who are the primary stakeholders of enterprises. This study aims to clarify consumer concerns regarding the factors influencing corporate integrity and to identify the core components of corporate integrity from the consumer perspective. A questionnaire survey was conducted to gather information about enterprise integrity indicators

from consumers. Subsequently, SPSS 25.0 and AMOS 24.0 were employed to analyze the questionnaire data. Finally, recommendations for building an enterprise integrity system in the food industry during the COVID-19 pandemic are presented.

The issue of diminished corporate integrity has significant implications for various stakeholders, including consumers, businesses, and regulatory bodies. Consumers encounter risks pertaining to food safety and quality, while businesses may experience reputational harm and a loss of trust. The findings in the study are advantageous for all stakeholders, as the proposed solutions foster higher ethical standards and enhance transparency in corporate practices. This, in turn, leads to improved consumer confidence and a strengthened corporate reputation.

2. Literature Review

2.1 Review of Studies on Corporate Integrity

Western researchers associate corporate integrity with business ethics and corporate performance. Prior literature has examined the relationship between corporate integrity and corporate behavior, finding that corporate integrity facilitates the transmission and exchange of information, resulting in higher-quality financial reporting (Shu et al., 2018). Additional research in this area has investigated the effects of corporate integrity on mergers and acquisitions (M&A) activities (Bargeron et al., 2015) and earnings management (Biggerstaff et al., 2015). Domestic scholars primarily focus on the lack of enterprise integrity, the construction of an integrity culture, integrity management, integrity marketing, and the development of an enterprise integrity evaluation index system. Many scholars have analyzed the reasons for the insufficiency of enterprise integrity (Leng and Li, 2013; Song, 2011; Wang, 2011) and proposed governance measures and countermeasures to address this issue (Huang, 2011; Luo, 2009). Wang (2022) analyzed that the root causes of insufficient accounting integrity in enterprises during the COVID-19 pandemic stem from commercial profit motives and information asymmetry. The study proposed corresponding countermeasures, including promoting corporate innovation, accelerating the development of financial sharing platforms, enhancing regulatory frameworks, and strengthening penalties. Wang and Xia (2019) disclosed that the main reasons for the lack of integrity in Chinese private enterprises include the ambiguity of Confucianism and the decline of traditional morality. Enterprise owners exhibit weak integrity awareness, lack a robust enterprise credit system, face asymmetric transaction information and fragmented social credit information, encounter imperfect laws and regulations, and deal with ineffective supervision and punishment. Furthermore, the government credit management system is inadequate, and the behavior of some officials requires improvement. Therefore, the measures to enhance the integrity of China's private enterprises in the new era include strengthening integrity education and consolidating the concept of integrity, leveraging the role of industry organizations to bolster self-discipline, improving the social credit system to restrict market dishonesty, and reinforcing the legal system to ensure economic order. Many scholars have also focused on corporate integrity culture. Specific research areas include the impact of corporate integrity culture on firms' accrual and real earnings management behavior (Zuo et al., 2020), the analysis and training of corporate integrity culture (Wang, 2013), and the connotation and cultivation of corporate integrity culture (Xu, 2012). In recent years, numerous scholars have conducted research on the construction of enterprise integrity (Peng and Wang, 2021; Yang and Ding, 2020; Wu and Zha, 2020). Wang (2019) proposed enhancing corporate integrity through virtue, collaboration, and law. Li (2019), based on the essence of Confucian traditional integrity culture, suggested that the construction of an enterprise integrity system should promote the heritage of integrity culture, shape the integrity character of enterprise management, and simultaneously facilitate social supervision. Jiang et al. (2019) studied corporate culture related to integrity and found that firms with an integrity-focused culture exhibit lower investment–cash flow sensitivity, even after addressing endogeneity concerns. Garrett et al. (2014) assessed the organizational culture of integrity in terms of employees' trust in management and conducted empirical research on the link between corporate integrity and financial reporting.

2.2 Review of Studies on Corporate Integrity Management

Integrity management is the most widely advocated approach for managing organizational ethics within the public sector. It seeks to balance compliance and value-oriented strategies for implementing appropriate controls, methods, instruments, and procedures that promote ethical behavior among organizational members. The debate between compliance-based and value-based approaches is central to integrity management. Compliance-based approaches focus on monitoring and punishing wrongdoing, while value-based approaches encourage adherence to integrity norms and enhance moral competence (Scott & Gong, 2015). However, achieving a balance between these approaches remains challenging, as organizations lack effective tools to measure this balance effectively (Tremblay et al., 2017). Tremblay et al. (2017) highlight the primary limitations of the integrity management

framework, arguing that the absence of such a tool stems from the inherent difficulty in establishing a balance between these two approaches. Empirical studies in Malaysia reveal that integrity practices are significantly related to risk management, accountability, and managerial commitment (Johari et al., 2020). The implementation of integrity mechanisms, such as the CIAQ, has shown varying levels of success across different public sector organizations, with some achieving high integrity scores (Zainal et al., 2020). These findings underscore the need for comprehensive strategies that involve all organizational levels to improve ethics and integrity (Wook et al., 2023). Some researchers (Brewer et al. 2015; Heywood, 2012; Hoekstra, 2015; Hoekstra, et al., 2016; Huberts, 2014) have deepened the exploration of the integrity management framework (IMF) in greater depth.

2.3 Review of Studies on Corporate Integrity of Food Enterprises

Given the specific research field, this study reviews corporate integrity in the food industry. Jiang et al. (2022) summarized the background, development process, and current status of the integrity management system for food industry enterprises in China. They analyzed the relationship between the integrity management system and other management systems within the food industry, identified problems in the construction process of the integrity management system, and proposed development suggestions. Zhou (2021) examined the current situation and consequences of the lack of integrity among food enterprises. He found that this deficiency stems, on one hand, from the negative influence of profit-seeking behavior and the asymmetric market information inherent in an imperfect market. On the other hand, it arises from the inadequacies of the integrity system and the anomie of government supervision resulting from failures in external oversight. The author further proposed constructing a food corporate integrity system by shaping the integrity management concept, developing a market credit management system, and formulating relevant laws and regulations (Zhou, 2021). Bai and Li (2019) analyzed the basic characteristics and existing issues of large-scale food production enterprises. Through their analysis, they proposed strengthening supervision by implementing the main responsibilities of enterprises, enhancing the demonstration and leadership roles of these enterprises, and improving food safety risk management.

2.4 Review of Studies on Corporate Integrity Evaluation System

It is worth noting that in recent years, scholarly research on enterprise integrity systems has shown a notable trend (Wang and Li, 2021; Jiang, 2020; Yang and Peng, 2020). These studies primarily focus on the construction of enterprise integrity index systems or evaluation frameworks. Yang and Deng (2020), based on stakeholder theory, collected a total of 479 valid questionnaires and ultimately developed a four-dimensional, eight-factor enterprise integrity evaluation system from the perspective of enterprises seeking partners. Tang (2020) examined the integrity development of logistics enterprises, taking into account the current developmental opportunities available to them, and established a logistics enterprise integrity evaluation index system to provide a foundational basis for the integrity construction of logistics enterprises. Zhang et al. (2020) utilized the Analytic Hierarchy Process to create an integrity evaluation system comprising three levels of evaluation indicators, making a significant attempt at evaluating the integrity of domestic enterprises. Zhao (2022) analyzed the fundamental characteristics of current start-ups, introducing a method that combines the Analytic Hierarchy Process and Fuzzy Comprehensive Evaluation to construct an integrity index system, which explored the evaluation of start-ups' integrity levels, thereby attempting to address existing issues in the integrity management of start-ups by improving the "integrity rating-elimination" mechanism. Yang and Zhang (2011) developed an enterprise integrity evaluation index system through an analysis of enterprise integrity capabilities, internal and external environments, and social responsibility. They employed the Analytic Hierarchy Process and subsequently established a two-level Fuzzy Comprehensive Evaluation model, which facilitates a reasonable assessment of enterprise integrity. They further applied the system to the analysis of specific cases. An and Tian (2017) focused on the integrity of leading agricultural enterprises as their research subject and established corresponding integrity evaluation indicators from three dimensions: basic integrity, characteristic integrity, and public welfare integrity. They also quantitatively analyzed the weight of evaluation indicators within each level structure using expert opinion methods and the Analytic Hierarchy Process. Ultimately, through the overall ranking of levels, they concluded that product quality management indicators, service integrity indicators, and integrity culture construction indicators are key elements affecting enterprise integrity. In the West, numerous researchers have also investigated integrity evaluation frameworks or systems. Ali et al. (2017) discussed the development of a food supply chain (SC) integrity framework through triangulation of insights gained from interviews and literature, proposing a framework that includes four dimensions in the context of halal food. Chiu and Hackett (2017) constructed an inductive-descriptive theory-building framework based on three interrelated streams of inquiry for evaluating individual ethicality or moral character, providing insights into both formal and

informal assessment instances. Ongsakul et al. (2021) explored the effect of hostile takeover exposure on corporate integrity by utilizing an innovative measure of corporate integrity based on machine learning and textual analysis. The study employed a novel text-based measure of corporate integrity.

Based on the reviewed literature, this study has identified the following key findings: 1) Existing research on corporate integrity has comprehensively addressed its theoretical and practical dimensions, ranging from exploring its conceptual foundations to analyzing its socioeconomic impacts, integrity gaps, management strategies, and the development of evaluation frameworks. 2) From the perspective of research subjects, scholars have examined enterprises across a variety of industries and sizes, encompassing both industry-wide studies on integrity and analyses of specific enterprise cases. 3) Regarding research methodologies, the majority of scholars have integrated qualitative and quantitative approaches to enhance the scientific rigor of their findings. In summary, statistical methods such as Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation (FCE) have been frequently employed. 4) In the review of enterprise integrity evaluation indicators, it is observed that the construction of evaluation indicator systems predominantly stems from top entities such as government oversight, laws and regulations, industry norms, or expert recommendations, which contrasts with the perspective of this study that aims to develop an evaluation indicator system based on consumer ratings. 5) Another notable research gap is the context of this study. This research has been conducted during the widespread impact of COVID-19, and we aim to identify unique influencing factors that differ from those in previous studies, reflecting the characteristics of the COVID-19 era.

3. Research Methodology

3.1 Research Question

In this study, there is only one research question as follows:

What is the corporate integrity evaluation system from the perspective of consumers during the situation of COVID-19?

As the research progresses, we have been particularly identifying the various integrity-influencing indicators, dimensions, and factors within this system.

3.2 Design of the Questionnaire

To address the aforementioned research question, the study designs a customer-oriented questionnaire. The questionnaire consists of two parts. The first part gathers demographic information, including the gender, age, and education level of the surveyed participants. The second part comprises the main section of the questionnaire, which contains 39 questions regarding the factors influencing corporate integrity in the food industry. Each question aims to assess the importance of a specific influencing factor from the customer perspectives, with five response options ranging from 1 to 5 in terms of importance. The importance increases from 1 to 5, with 1 representing the least important and 5 representing the most important. Participants are asked to select only one score that corresponds to the importance of the influencing factor based on their perception.

3.3 Principles of Constructing the Influencing Factors Questionnaire

As mentioned above, 39 questions encompass 39 influencing factors related to the integrity of food industry enterprises. These influencing factors are organized according to the following principles:

Based on the Credit Evaluation Norms for Food Industry Enterprises (GB/T 4112-2010), we primarily summarize the following evaluation elements: the basic situation of the enterprise, the financial status of the enterprise, the ability to ensure quality and integrity, and corporate social responsibility. We specifically adopt the evaluation indicators outlined in the credit evaluation norms for food industry enterprises, resulting in a total of 29 influencing factors pertaining to integrity.

We have thoroughly considered the impact of COVID-19 on the construction of corporate integrity and established an evaluation dimension focusing on COVID-19 control and prevention integrity. Consequently, we identified 6 influencing factors related to the epidemic and examined how consumers perceive the impact of the pandemic on corporate integrity.

Yang & Deng (2020) proposed that when evaluating integrity, it is essential to measure not only the contractual integrity of enterprises but also their moral integrity. We must ensure integrity not only through material and other objective conditions but also through moral development and character cultivation. The traditional Chinese Confucian merchant culture emphasizes moral integrity, which is the pursuit of quality cultivation in moral character. This integrity arises from the pursuit of personal development and emphasizes that individuals in society require not only external trust in others but also internal honesty to achieve self-sublimation. Therefore,

in designing this questionnaire, we have included a dimension for moral integrity to investigate 4 factors, such as the moral quality of corporate legal persons, management, and employees, as well as the corporate moral culture. In total, 39 indicators affecting the enterprise integrity of food industry under COVID-19 have been established (see Table 1)

Table 1. Influencing factor indicators

<u>Question items</u>	<u>Indicators</u> (<u>Measurement index</u>)
<u>Q1</u>	<u>Moral quality of enterprise legal person</u>
<u>Q2</u>	<u>Moral quality of enterprise management</u>
<u>Q3</u>	<u>Moral quality of enterprise employees</u>
<u>Q4</u>	<u>Enterprise culture that stresses moral integrity</u>
<u>Q5</u>	<u>The employees of the enterprise have a clear division of labor and match their positions</u>
<u>Q6</u>	<u>Regular training plans and records of enterprise employees</u>
<u>Q7</u>	<u>Establishment and improvement of food quality and safety assurance system</u>
<u>Q8</u>	<u>Establishment of food integrity management system</u>
<u>Q9</u>	<u>Enterprise integrity record</u>
<u>Q10</u>	<u>Enterprise financial status</u>
<u>Q11</u>	<u>Enterprise tax credit</u>
<u>Q12</u>	<u>Financing credit of financial institutions</u>
<u>Q13</u>	<u>Raw and auxiliary material management</u>
<u>Q14</u>	<u>Production environment and equipment</u>
<u>Q15</u>	<u>Quality of food products</u>
<u>Q16</u>	<u>Food product processing and packaging</u>
<u>Q17</u>	<u>Food product inspection system</u>
<u>Q18</u>	<u>Food product storage</u>
<u>Q19</u>	<u>Transportation of food products</u>
<u>Q20</u>	<u>Food product sales and after-sales service</u>
<u>Q21</u>	<u>Food related industry certification</u>
<u>Q22</u>	<u>Traceability system and recall system of food production and operation</u>
<u>Q23</u>	<u>Food safety incidents</u>
<u>Q24</u>	<u>Government regulation</u>
<u>Q25</u>	<u>Consumers' word of mouth</u>
<u>Q26</u>	<u>Industry self-discipline</u>
<u>Q27</u>	<u>Social supervision</u>
<u>Q28</u>	<u>Abiding by national labor security and employment policies and regulations</u>
<u>Q29</u>	<u>Quality commitment performance</u>
<u>Q30</u>	<u>Stakeholder contract performance</u>
<u>Q31</u>	<u>Salary and payment</u>
<u>Q32</u>	<u>Participating in social public welfare undertakings</u>
<u>Q33</u>	<u>Strong awareness of environmental protection and energy-saving and emission reduction measures</u>
<u>Q34</u>	<u>Complying with COVID-19 control and prevention requirements of units at all levels with good performance in COVID-19 control and prevention of personnel and plant area without epidemic prevention incidents</u>
<u>Q35</u>	<u>Employees of the enterprise shall be vaccinated according to COVID-19 control and prevention requirements</u>
<u>Q36</u>	<u>Employees of the enterprise should regularly carry out nucleic acid testing according to the requirements of COVID-19 control and prevention requirements</u>
<u>Q37</u>	<u>Employees of the enterprise properly wear masks to comply with daily epidemic control and prevention requirements</u>
<u>Q38</u>	<u>Food transportation and sales in accordance with epidemic control and prevention requirements to prevent novel coronavirus from polluting food</u>
<u>Q39</u>	<u>Enterprises participate in public welfare activities to fight the epidemic</u>

3.4 Research Methods and Procedure

This study utilizes SPSS 25.0 and Amos 24.0 to analyze the questionnaire data, with the specific steps outlined as follows: 1) Reliability and validity analysis, which primarily assesses the validity and consistency of the scale preparation and the measurement results of the questionnaire. 2) Exploratory factor analysis (EFA), aimed at identifying the number of factors influencing the observed variables and the degree of correlation between each factor and the observed variables through a "dimension reduction" method (Guo et al., 2019). In this paper, Principal component analysis (PCA) and Varimax rotation are employed to extract factors with eigenvalues greater than 1, and factor loadings exceeding 0.5 are selected for further data interpretation. 3) Confirmatory

factor analysis (CFA) is conducted to address the limitations of exploratory factor analysis regarding the assessment of theoretical model fit. CFA tests whether the collected data aligns with the predetermined structure, thereby determining the fit of the theoretical model to the actual data.

3.5 Data Collection

The questionnaire survey was conducted online using the Questionnaire Star Network app, which was deployed to distribute the questionnaires and collect the resulting data. A total of 486 questionnaires were collected; however, after excluding incomplete or inconsistent responses, only 357 questionnaires were deemed valid. The percentage of valid questionnaires is 73.46%.

4. Results and Discussion

4.1 Demographic Information of the Surveyed Consumers

The data from the first part clarify the basic information about the surveyed participants. The following presents the demographic descriptions of the surveyed consumers. The survey pertains to the food industry, which is highly relevant to daily necessities. The gender ratio indicates that females are more concerned about food issues and are more willing to share their views. Among the 357 surveyed consumers, 261 are female, accounting for 73.1%, while 96 are male, making up 26.9%. To encompass a wide age range of consumers, the questionnaires do not set an age limit. All consumers with internet access who can fully read and understand the questions in the questionnaire are invited to share their perspectives. Figure one illustrates the age distribution of the surveyed consumers, indicating that the majority are under 30 years old. This age group is expected to have the strongest food consumption needs.

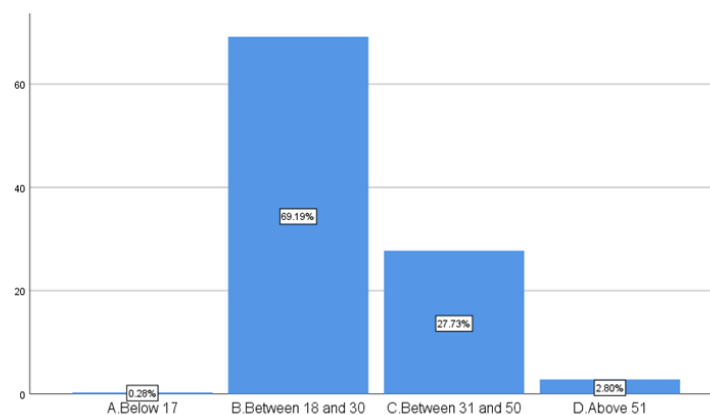


Figure 1. Age distribution of the surveyed consumers

The collected data also indicates that more than 95% of surveyed consumers have a good educational background, with a bachelor's degree or higher. It is widely accepted that consumers with higher education levels may have higher incomes that support their consumption and are likely to possess a clear understanding and judgment of food integrity.

4.2 Constructing Corporate Integrity Evaluation System

4.2.1 Reliability and Validity Analysis and EFA

Reliability is an index used to assess whether the results of questionnaire measurements are reliable and consistent (Feng et al., 2022). To evaluate the internal consistency reliability of the questionnaire structure, this paper employs Cronbach's alpha as the reliability test standard. Devellis (1991) suggests that a Cronbach's alpha coefficient greater than 0.7 is acceptable, and a coefficient greater than 0.8 is considered optimal. Since this questionnaire primarily consists of various measurement indicators, the overall reliability of the questionnaire is analyzed directly. The obtained Cronbach's alpha coefficient is 0.961, indicating a high level of reliability for the questionnaire, and confirming that the influencing factor scale has passed the test. The influencing factors demonstrate high reliability and consistency among the item titles, thus allowing for the subsequent validity analysis.

Validity refers to the degree to which the scale accurately measures the characteristics or functions it is intended to assess (Li, 2021). Validity analysis typically encompasses content validity and construct validity. Among these, construct validity analysis is further divided into exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). In this paper, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test are utilized to analyze the

validity of the scale.

After conducting an SPSS analysis, the questionnaire data reveal a KMO value of 0.947, indicating high validity. Furthermore, the significance of Bartlett’s test is 0.000, demonstrating a strong correlation among the variables, which makes the data highly suitable for factor analysis. Subsequently, this paper first performs an exploratory factor analysis (EFA) on the questionnaire data.

In this paper, principal component analysis (PCA) is used to study the common factor variance and extract principal components.

1) Common factor variance. Common factor variance refers to the degree to which information from each index can be extracted. The results indicate that the extracted values of common factor variance for 39 indicators range from 0.426 to 0.847, with Q5 (The employees of the enterprise have a clear division of labor and match their positions), Q24 (Government regulation), and Q33 (Strong awareness of environmental protection and energy-saving and emission reduction measures) being below 0.5, signifying poor interpretation. Overall, the explanatory power of most indicators remains within a reasonable range.

2) Extract principal components. The principal component extraction method employed in this study involves extracting components with eigenvalues greater than 1. The first eight results are presented in Table 2. Notably, starting from the seventh result, the eigenvalue does not meet the extraction criteria ($0.949 < 1$), indicating that the principal component of this item explains less data variation than a single variable. Consequently, this study selects six principal components, which collectively account for 65.64% of the data variation.

Table 2. Interpretation results of total variance

Component	Initial eigenvalue			Extract the sum of squares of loads			Sum of squares of rotating loads		
	Total	Variance percentage	Cumulative%	Total	Variance percentage	Cumulative%	Total	Variance percentage	Cumulative%
Production integrity	16.766	42.99	42.99	16.766	42.99	42.99	5.587	14.326	14.326
Contractual integrity	3.115	7.988	50.977	3.115	7.988	50.977	5.481	14.053	28.379
Epidemic prevention integrity	1.859	4.766	55.743	1.859	4.766	55.743	5.219	13.382	41.761
Management integrity	1.478	3.789	59.532	1.478	3.789	59.532	3.586	9.195	50.956
Moral integrity	1.241	3.182	62.714	1.241	3.182	62.714	2.937	7.53	58.486
Financial integrity	1.141	2.926	65.64	1.141	2.926	65.64	2.79	7.154	65.64
Employee integrity	0.949	2.435	68.075						
Corporate social responsibility	0.847	2.173	70.247						

According to the rotated component matrix, this paper eliminates the measurement items Q6 (Regular training plans and records of enterprise employees), Q11 (Enterprise tax credit), Q20 (Food product sales and after-sales service), Q22 (Traceability system and recall system of food production and operation), Q23 (Food safety incidents), Q25 (Consumers’ word of mouth), Q32 (Participating in social public welfare undertakings), and Q33 (Strong awareness of environmental protection and energy-saving and emission reduction measures), as their factor loadings are less than 0.5 and cannot be attributed to any factor. From the consumer’s perspective, the items “regular training plans and records of enterprise employees,” “enterprise tax credit,” “food product sales and after-sales service,” “traceability system and recall system of food,” “food safety incidents,” “consumers’ word of mouth,” “participating in social public welfare undertakings,” and “strong awareness of environmental protection and energy-saving and emission reduction measures” exhibit a low correlation with the overall evaluation of corporate integrity. Additionally, there are instances of overlapping meanings among different measurement indicators, such as “participating in social public welfare undertakings” (Q32, 0.635) and “participating in public welfare activities to fight the epidemic” (Q39, 0.671). Considering the common factor values, it is evident that, in the current social environment, consumers are more concerned about enterprises’ participation in public welfare activities related to the epidemic.

After these deletions, this paper ultimately identifies six factors and 32 measurement indicators. Based on the results of the factor analysis and the characteristics of each measurement index, the following names and explanations are assigned to the six factors in sequence.

Factor 1: Production Integrity (X1). Production integrity refers to the integrity issues associated with the manufacturing process of products, including questions Q13-Q17 and Q19. Integrity in the production process is primarily related to the food itself, which is often the most significant factor influencing consumers' purchasing decisions; therefore, it has become a crucial aspect of corporate integrity.

Factor 2: Contractual Integrity (X2). Contractual integrity encompasses Q21, Q24, and Q26-Q30. It primarily addresses aspects related to the performance of contracts, certificates, moral standards, and professional ethics from the perspectives of government, industry, and society. The performance record of an enterprise serves as a compelling testament to corporate integrity and acts as a key reference for consumers assessing the level of corporate trustworthiness. Consequently, this paper posits that enterprises must strictly adhere to the terms of contracts and uphold professional ethics. Evidence indicates that corporate integrity and image are often directly influenced by contract performance.

Factor 3: Epidemic Prevention Integrity (X3). Indicators Q34-Q39 primarily assess the current epidemic prevention measures and contributions of enterprises. Given that the virus may spread unintentionally during the purchasing process, the adequacy of epidemic prevention and control has become a crucial factor for consumers to consider in the context of the epidemic era.

Factor 4: Management Integrity (X4). Indicators Q4 and Q7-Q9 mainly evaluate the structural management issues within enterprises. Integrity, as an abstract moral quality and a component of corporate culture, cannot be developed without a conducive environment and certain evidential cues. Therefore, the establishment of a sound management system can more convincingly demonstrate all aspects of corporate integrity to consumers.

Factor 5: Moral Integrity (X5). Indicators Q1-Q3 and Q5 focus primarily on the moral qualities of internal personnel within the enterprise. The ethical standards of management and employees will indirectly influence the overall integrity image of the enterprise in terms of production, operations, and communication. Hence, this paper refers to this aspect as moral integrity.

Factor 6: Financial Integrity (X6). This paper categorizes the three financial accounting indicators—Q10, Q12, and Q30—as financial integrity, with the factor coefficient indicating that “enterprise financial status” is the most significant. It is evident that consumers will comprehensively consider the financial situation of an enterprise before making a choice. Enterprises with sound financial conditions will contribute positively to enhancing the integrity image of the organization.

4.2.2 Confirmatory Factor Analysis

4.2.2.1 First-order Factor Analysis

Based on the results of the Exploratory factor analysis (EFA), a structural equation model was established to further test the proposed model. After importing the data, the analysis revealed that the Chi-Square degree of freedom ratio of the model was 3.67, and both the Root mean square residual (RMR) and the Comparative fit index (CFI) did not meet the acceptable standards, indicating a poor model fit. Consequently, the model was modified by adjusting factor loadings and utilizing Modification indices (MI). Observed variables with factor loadings less than 0.6 or MI values greater than 20 were removed. After repeated adjustments, the observed variables Q13, Q18, and Q37 were ultimately excluded, and correlations were established between the residual terms Q7-Q8 and Q30-Q31.

The correlation between “raw and auxiliary material management” (Q13) and “production environment and equipment” (Q14) was found to be excessively high, adversely affecting the overall fit of the model. The data indicated that respondents struggled to differentiate between these two indicators; therefore, Q13, which exhibited a low factor loading, was deleted. Additionally, “food product storage” (Q18) and “the employees of the enterprise properly wear masks to comply with daily epidemic prevention requirements” (Q37) also exhibited semantic redundancy or unclear expression in relation to other measurement indicators. Considering these factors, this article ultimately decided to remove these variables.

The correlation between the residual items in Q7-Q8 and Q30-Q31 is based on the consideration of content validity. Although these two groups of indicators differ in their linguistic expression and cannot completely substitute for one another, the measured constructs are indeed relatively similar and can even influence the model's fit. Therefore, this paper employs the establishment of relevant methods. This indicates that the two groups of indicators can not only be explained by their respective latent variables but also serve to elucidate each other.

Table 3. Comparison of first-order model fitting indicators

	CMIN	CMIN/DF	RMR	GFI	RMSEA	CFI
Ideal range	=	≤3	≤0.05	≥0.9	≤0.1	≥0.9
Calculation results						
Before model correction	1647.886	3.67	0.42	0.768	0.087	0.853
After model correction	874.841	2.627	0.35	0.901	0.068	0.918

According to the results of the statistical analysis, the Average variance extracted (AVE) and Composite reliability (CR) of the modified model were calculated. The AVE range of the six potential factors after the model modification is between 0.53 and 0.68, which exceeds the threshold value of 0.5. The CR range is between 0.82 and 0.91, which is greater than the threshold value of 0.7, indicating that the system exhibits good convergent validity. However, in the analysis of discriminant validity, it was observed that the correlation coefficients between latent factors exceeded the square root of the AVE, suggesting that the discriminant validity is moderate. After data sorting, as shown in Table 4, the highlighted portion indicates cases where the square root of the AVE is greater than the correlation coefficients, illustrating a high correlation between factors, such as X1 and X4 ($r=0.803$), X2 and X4 ($r=0.751$), X2 and X6 ($r=0.837$), and X4 and X6 ($r=0.774$). Clearly, since the correlation coefficients range from 0.373 to 0.837, there exists a moderate to high correlation among the six latent factors, making it reasonable to speculate that there may be a second-order latent factor in the model.

Table 4. First-order latent factor correlation matrix

	X1	X2	X3	X4	X5	X6
X1	0.58					
X2	0.73**	0.57				
X3	0.463**	0.628**	0.68			
X4	0.803**	0.751**	0.373**	0.55		
X5	0.63**	0.701**	.487**	0.709**	0.53	
X6	0.664**	0.837**	0.656**	0.774**	0.67**	0.55
Ave square root	0.76	0.75	0.82	0.74	0.73	0.73

* $p<0.05$ ** $p<0.01$

4.2.2.2 Second-order Factor Analysis

Based on the above analysis, this paper establishes 5 models for comparative analysis, and the specific construction is as follows:

Model 1: 6 first-order factors are summarized into one higher-order factor.

Model 2: X1 and X5; X2, X4 and X6 are summarized into two higher-order factors respectively.

Model 3: X1 and X2; X4 and X6 are summarized into two higher-order factors.

Model 4: X1 and X4; X2 and X6 are summarized into two higher-order factors.

Model 5: Summarize X2, X4 and X6 into a high-order factor.

Through continuous adjustment of the model, the fitting indexes of the models are shown in Table 5.

Table 5. Comparison of indicators of fitting degree of second-order model

	Model 1	Model 2	Model 3	Model 4	Model 5
CMIN/DF	2.771	2.782	2.792	2.644	2.787
GFI	0.833	0.835	0.833	0.902	0.835
RMR	0.04	0.039	0.04	0.033	0.039
RMSEA	0.071	0.071	0.071	0.068	0.071
CFI	0.908	0.908	0.908	0.916	0.908

In general, the indicators of the five models show minimal differences; however, the fit of Model 4 is significantly superior to that of the other four models, with each parameter essentially meeting the judgment standards. Specifically, the factor loadings in Model 4 exceed 0.8, and both the Composite reliability (CR) and Average variance extracted (AVE) are also greater than 0.8, indicating good reliability and convergent validity. Based on the characteristics of the observed and latent variables, the second-order latent variables are defined as follows:

Factor 1: Institutional Integrity. Institutional integrity, which encompasses production integrity and management integrity, primarily stems from the internal integrity management of enterprise operations. This includes aspects such as the “food product inspection system and process,” “enterprise culture,” and the “establishment of an integrity management system.” The internal framework of the enterprise, seen as the primary entity responsible for production, significantly influences the level of integrity demonstrated, which is closely related

to the organization’s own institutional structure. Therefore, this paper designates the first second-order factor as institutional integrity, emphasizing conventional managerial integrity within the internal processes, rules, and regulations of enterprises.

Factor 2: Market Integrity. Market integrity can be categorized into contractual integrity and financial integrity. Given that the performance of contracts and financial transactions involves numerous stakeholders, consumers are also included in this analysis. The fulfillment of these two dimensions of integrity often necessitates communication with various market participants, requiring extensive enterprise information disclosure. This represents the most accessible aspect of corporate integrity for consumer groups. Consequently, this paper identifies the second second-order factor as market integrity.

4.2.2.3 Higher-order Model Test

Taking into account the ultimate latent variable of corporate integrity, this paper establishes a framework consisting of four factors, institutional integrity, market integrity, epidemic prevention integrity, and moral integrity to evaluate corporate integrity. A summary of the model reference indicators can be found in Table 6. The results indicate a small gap between each index and the first-order model index, which has met the basic judgment standard, suggesting that the model is acceptable with a medium level of adaptability. Both the Average variance extracted (AVE) of 0.7 (greater than 0.5) and Composite reliability (CR) of 0.9 (greater than 0.7) fall within a reasonable range, demonstrating good convergent validity. However, indicators such as the Goodness of fit index (GFI) are close to the basic judgment value, indicating that the system could further optimize the fit by increasing the sample size and modifying the model path.

Table 6. Summary of indicators of corporate integrity evaluation system from the perspective of consumers

	CMIN/DF	GFI	RMR	RMSEA	CFI	AVE	CR
Overall model	2.704	0.903	0.038	0.069	0.912	0.7	0.9

Finally, this paper obtains the corporate integrity evaluation model from the perspective of consumers, as shown in Figure 2.

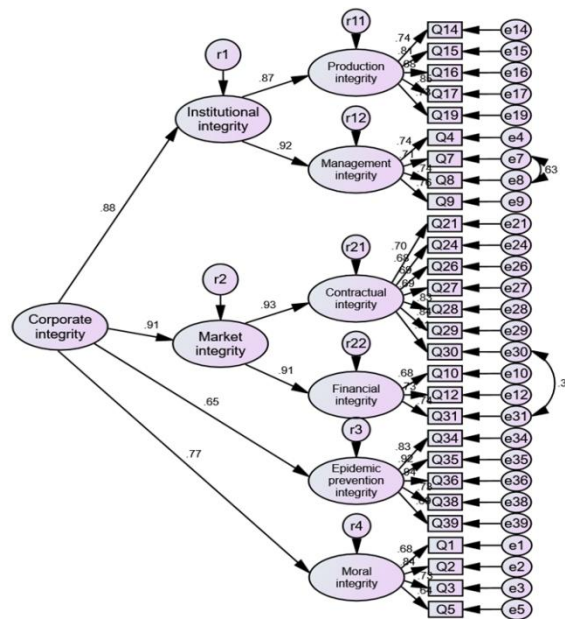


Figure 2. Corporate integrity evaluation system from the perspective of consumers

In general, the system combines the national standard framework with an analysis of consumer group perspectives. It demonstrates good reliability and validity, with a moderate fitting level, enabling a more scientific detection of the factors influencing consumer groups’ evaluations of corporate integrity. Although the system can still be optimized to enhance its interpretative capacity, the construction of this system has fulfilled the research objectives of this study, and therefore, no further theoretical revisions to the model are necessary.

5. Conclusion and Implication

This paper presents a bottom-up empirical research approach. The research data were collected through a questionnaire survey, and a structural equation model was established for factor analysis. Ultimately, an evaluation system comprising four factors, six dimensions, and thirty-two indicators was developed. During the analysis of the questionnaire data and the refinement and adjustment of the system, this paper identifies three main findings.

Market integrity exhibits a high factor loading of 0.91, indicating that among the four factors, consumers place the greatest importance on market integrity, followed by institutional integrity (0.88), moral integrity (0.77), and epidemic prevention integrity (0.65). Contractual integrity and financial integrity, as components of market factors, serve as the most direct sources of information accessible to consumers. The market integrity established by enterprises across different stakeholders can further influence public word-of-mouth, positively or negatively, thereby affecting corporate image and consumer judgment.

In the context of epidemic prevention, the frequency with which employees undergo nucleic acid testing (Q36) is the most critical indicator. Furthermore, it has the highest factor loading among all observed variables (0.94), indicating that Q36 exhibits the strongest correlation with the latent variable of epidemic prevention integrity. This underscores its significant role in establishing the overall integrity of the enterprise. Compared to several other observed variables, such as epidemic prevention measures and vaccination rates in production areas, the nucleic acid testing of enterprise employees poses the greatest potential safety risks. Given that employees' daily activities and behaviors—aside from their commute—are challenging to predict, regular nucleic acid testing not only assures the effectiveness of the enterprise's epidemic prevention efforts but also allows consumers to stay updated on the enterprise's epidemic prevention status, thereby enhancing trust.

The regular training plans and records of enterprise employees, food safety incidents, and the reputation of enterprises among consumers are inadequate bases for assessing corporate integrity. The common factor variance of these three indicators is less than 0.5. Additionally, in the exploratory factor analysis, the factor loadings of these six components are below 0.4, indicating that the aforementioned indicators can be extracted with minimal information, lack corresponding relationships, and are not suitable for inclusion in the evaluation system. Specifically, the employee training plan is part of the internal talent development program, and consumers typically lack access to this type of information. Furthermore, the broad nature of the term “training plan” does not align well with the theme of “corporate integrity,” leading consumers to disregard it as a basis for integrity evaluation. Although food safety incidents are established facts, consumers are more concerned with the enterprise's preventive measures, such as model construction or market supervision during the production process. Moreover, the various types of safety incidents make it challenging for consumers to attribute them to integrity factors; they tend to consider the impacts of food safety or the production environment itself. Additionally, consumer public praise is highly variable, significantly influenced by personal preferences and the independent marketing efforts of enterprises, often containing exaggerated elements. In an era of highly developed social media and diverse consumer demands, consumption increasingly tends to approach the word-of-mouth effect with a rational perspective, as consumers' judgments regarding corporate integrity are primarily derived from the behavior of the enterprises themselves.

This study still has some deficiencies that need to be addressed to provide a reference for future research. The model's fit level is moderate, indicating that it can be further optimized. The system construction presented in this paper is primarily based on national standards and data from a questionnaire survey. In the future, we can conduct in-depth interviews with consumers to enhance the model, adjust its structure, and improve its interpretation through qualitative research and other methods. Additionally, the discriminant validity of the system was generally acceptable. Possible reasons for this include: 1) the text description of the scale may not be sufficiently clear; 2) respondents' understanding of the questionnaire questions may have deviated from the designer's intent; 3) respondents may not have carefully considered their answers when completing the questionnaire. To optimize and improve the system data, in addition to modifying the scale language, we can also consider utilizing offline questionnaire collection methods to engage in thorough communication with respondents, ensuring that the meaning of the questionnaire questions is accurately conveyed.

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Authors' contributions

Dr. Xiaoqin Liu is responsible for constructing and innovating the research ideas of the article, designing the research questionnaire, formulating the research methods, and organizing the research findings. She is also in charge of the overall writing and proofreading of the article. Ms. Jie Qiu is responsible for sorting out, collecting and organizing the questionnaires, writing the first draft of the literature review, and proofreading the article.

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Obtained.

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Data sharing statement

No additional data are available.

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