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Factors Influencing Organizational Commitment to Food Safety Management System Implementation in the Food Industry

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Abstract

Purpose: This study evaluates the effects of knowledge management, transformational leadership, and interpersonal communication on organizational commitment to Food Safety Management System (FSMS) implementation through work motivation in the agar-agar powder industry in Bogor Regency, Indonesia.

Research Methodology: This study followed a causal research design. Responses from 142 employees were collected and processed through PLS-SEM use SmartPLS 4.

Results: The findings indicate that knowledge management and transformational leadership significantly enhance organizational commitment, whereas interpersonal communication influences it only indirectly through work motivation. Work motivation significantly mediated all indirect relationships but showed an unexpected negative direct effect on commitment. Knowledge management was identified as the strongest predictor of organizational commitment to FSMS implementation.

Conclusions: Organizational commitment to FSMS implementation is primarily strengthened by knowledge management and transformational leadership. The negative effect of work motivation indicates that motivation alone is insufficient to build an organizational commitment. Therefore, organizations should integrate motivational initiatives with knowledge management, transformational leadership, and organizational values.

Limitations: This study was limited to employees of agar-agar powder industries in Bogor Regency and did not include other factors that may influence organizational commitment, such as organizational culture, perceived organizational support, job satisfaction, employee engagement, and food safety climate.

Contributions: This study extends FSMS commitment theory by showing how knowledge management, transformational leadership, and work motivation jointly shape organizational commitment.

Keywords: *Food Safety Management System, Interpersonal Communication, Knowledge Management, Organizational Commitment, Transformational Leadership*

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1. Introduction

Food safety has become a strategic priority for the food processing industry because it directly affects consumer health, product quality, organizational reputation and business sustainability. Among food processing sectors, the agar-agar powder industry plays an important role because its products are widely used in the food, pharmaceutical, cosmetics, and biotechnology industries. Food manufacturers therefore adopt Food Safety Management Systems (FSMS), such as Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Point (HACCP), ISO 22000, and BRCGS, to strengthen food safety, meet regulatory requirements, and remain competitive. However, the effectiveness of the FSMS depends not only on technical controls and documented procedures but also on employee commitment to consistently implement food safety practices.

Despite the widespread adoption of FSMS, food safety remains a significant global challenge. WHO (2026) reported that approximately 866 million people are estimated to suffer from foodborne illnesses, while 1.52 million deaths occur annually due to the consumption of unsafe food. In Indonesia, foodborne illnesses and food safety incidents continue to occur despite the implementation of increasingly stringent food safety regulations. These conditions indicate that regulatory compliance alone is insufficient, as the success of FSMS is shaped equally by human and organizational factors. In the agar-agar powder industry in Bogor Regency, external FSMS certification audits conducted in 2025 revealed that more than 50% of audit nonconformities were associated with employee-related factors, including procedural compliance, documentation practices, and adherence to food safety requirements. Furthermore, a preliminary survey conducted on 13–November 15 2025,, 2025 involving 30 production employees, found that 11.34% of employees had not demonstrated the expected degree of organizational commitment, particularly regarding their intention to remain with the organization. These findings suggest that strengthening employees' organizational commitment remains a major challenge in achieving sustainable FSMS implementation.

Organizational Commitment describes the psychological attachment employees develop towards their organization, shaping both their willingness to remain and their contribution to organizational objectives (Meyer & Allen, 1991). In the context of FSMS, organizational commitment is essential because employees are expected to consistently comply with food safety procedures, actively participate in continuous improvement initiatives, and help realize organizational food safety objectives. Therefore, identifying the organizational factors that strengthen organizational commitment is essential for improving the long-term effectiveness of FSMS implementation. In particular, Knowledge Management, Transformational Leadership, and Interpersonal Communication may shape employees' commitment through their influence on Work Motivation.

Previous studies have identified Knowledge Management, Transformational Leadership, and Interpersonal Communication as important organizational factors associated with Organizational Commitment. Knowledge Management supports the acquisition, sharing, and application of food safety knowledge; Transformational Leadership encourages employees to embrace organizational goals and continuous improvement; and Interpersonal Communication facilitates the coordination, information sharing, and collaboration required for effective FSMS implementation. Although these relationships have been widely examined, most previous studies have been conducted in general organizational settings, such as education, healthcare, banking, and manufacturing, while empirical evidence from the food processing industry remains limited.

Another issue that has received relatively little attention is the mechanism through which these organizational factors influence commitment. According to the Integrative Model of Organizational Behavior, organizational factors influence organizational outcomes through individual mechanisms, one of which is Work Motivation (Colquitt, Wesson, & LePine, 2018). From this perspective, employees who experience effective knowledge management, supportive leadership, and high-quality interpersonal communication are expected to become more motivated, and this motivational process may subsequently influence Organizational Commitment. Therefore, Work Motivation was selected as the mediating variable because it provides a theoretical explanation of how organizational practices are translated into employee commitment during FSMS implementation.

Although previous studies have reported significant relationships among Knowledge Management, Transformational Leadership, Interpersonal Communication, Work Motivation, and Organizational Commitment, several research gaps remain. First, empirical studies examining these relationships within the context of FSMS implementation are limited, particularly in the food processing industry. Second, previous studies have predominantly focused on direct relationships among organizational factors and Organizational Commitment, whereas the mediating role of Work Motivation has received relatively limited empirical attention. Third, few studies have integrated Knowledge Management, Transformational Leadership, Interpersonal Communication, and Work Motivation into a single structural model to explain Organizational Commitment in the context of FSMS implementation.

Therefore, this study developed an integrated structural model to examine the effects of Knowledge Management, Transformational Leadership, and Interpersonal Communication on Organizational Commitment through Work Motivation in the context of FSMS implementation. Unlike previous studies that mainly focused on direct relationships, this study investigates Work Motivation as the mediating mechanism linking organizational factors to Organizational Commitment. The findings are expected to extend the food safety management system and strategic management literature while providing practical guidance for strengthening employee commitment to FSMS implementation.

2. Literature Review and Hypotheses Development

2.1 Food Safety Management System (FSMS)

The FSMS is an integrated management methodology intended to protect food safety from production to the final product. The FSMS combines prerequisite programs, HACCP principles, and risk-based management approaches to identify, prevent, and control food safety hazards. International standards, such as ISO 22000, CXC 1-1969, and BRCGS, provide a framework for effective FSMS implementation.

The success of FSMS relies on more than documented procedures and technical controls, as active employee involvement is equally essential. Daily activities, such as complying with standard operating procedures, maintaining personal hygiene, monitoring critical control points, and reporting nonconformities, require consistent employee participation. Zanin, da Cunha, de Rosso, Capriles, and Stedefeldt (2017) emphasized that formal food safety systems may not achieve their intended outcomes without adequate commitment and involvement of employees.

Recent studies have identified human factors as critical determinants of FSMS effectiveness. Employee knowledge, leadership, communication, motivation, and organizational commitment influence compliance with food safety requirements and support continuous improvement efforts (Johnson, Tennant, Newsome, Verrill, Lando, & Liggans, 2022). Therefore, organizational commitment is a key factor in ensuring the sustainable implementation of FSMS in the food processing industry.

2.2 Organizational Commitment

Describes the level of employees' emotional and mental bond to their organization, shaping both their intention to stay and their willingness to contribute to organizational performance. According to (Colquitt, Wesson, & LePine, 2018), organizational commitment is a key organizational outcome that develops through the combined influence of organizational practices, team dynamics, individual characteristics, and personal psychological processes. Employees with higher commitment levels are generally more loyal, engaged, and accountable in fulfilling their responsibilities.

According to Meyer and Allen (1991), organizational commitment reflects the psychological bond employees develop with their organization, influencing whether they choose to remain part of it. Their Three-Component Model divides commitment into three separate dimensions. Affective commitment arises from employees' emotional attachment and sense of belonging; calculative commitment is driven by the perceived consequences of leaving the organization; and normative commitment develops from an internal feeling of responsibility or personal obligation to continue employment.

In the context of FSMS implementation, organizational commitment plays a critical role in ensuring consistent application of food safety procedures and standards. Employees with strong organizational commitment are more inclined to comply with food safety requirements, actively participate in food safety programs, identify potential risks, and support continuous improvement initiatives. Taha, Osaili, Vij, Albloush, and Nassoura (2020) emphasized that organizational commitment is reflected in employees' dedication to implementing food safety practices and maintaining food safety. This is supported by Urfa and Tarigan (2026), who stated that organizational commitment holds a significant position in human resource management and influences how effectively employees perform their duties. EC (2022) identified employee commitment and engagement as fundamental elements of food safety culture and effective FSMS.

Previous studies have consistently demonstrated that organizational commitment contributes to organizational effectiveness and employee performance. Herrera and De (2021), Naig and Borbon (2021), and Al-Dossary (2022) reported that employees with strong organizational commitment exhibit greater loyalty, stronger organizational identification, and a higher willingness to contribute to business success. Organizational commitment is a key factor in supporting the sustainable implementation of FSMS in the food processing industry.

Based on the literature, Organizational Commitment is measured using the following indicators: Pride in being part of the organization ; Alignment between personal and organizational values ; Strong intention to remain in the organization; Sense of moral responsibility toward the organization ; Willingness to exert extra effort for organizational success.

2.3 Knowledge Management

Refers to a structured approach to developing, capturing, retaining, exchanging, and utilizing knowledge to enhance organizational performance and support the achievement of strategic goals. Nonaka and Takeuchi (1995) describe knowledge management as a dynamic process involving the formation and adaptation of knowledge through continuous interaction between tacit and explicit information. The SECI model transforms individual knowledge into organizational knowledge that can be documented, shared, and utilized throughout the organization. Similarly, Grant (1996) emphasized that knowledge is a strategic organizational resource and that organizational effectiveness depends on the ability to integrate and utilize knowledge collectively.

In FSMS implementation, knowledge management plays a critical role in ensuring that employees understand and consistently apply food safety standards. Effective knowledge management facilitates continuous learning, enables employees to access relevant food safety information, and supports informed decision making. Consequently, employees are better equipped to perform their responsibilities and contribute to the successful implementation of the FSMS.

Earlier studies have emphasized the significance of knowledge management in improving organizational effectiveness and employee outcomes. Lu et al. (2021) emphasized that knowledge sharing and learning enhance food safety practices and organizational performance. Likewise, Tan and Nawawi (2021), Faeq (2022), and Idrees, Xu, Haider, and Tehseen (2023) found that effective knowledge management contributes to improved organizational performance, innovation, and employee engagement. Furthermore, Kawiana, Cempaka, Supartha, and Dewi (2023) reported that knowledge management positively influences organizational commitment because employees who have access to relevant knowledge and learning opportunities tend to feel more involved, competent, and valued within the organization.

Based on the literature, Knowledge Management is measured using the following indicators: Knowledge Creation; Acquisition; Storage; Sharing; Application.

2.4 Transformational Leadership

Refers to a leadership style that motivates and empowers employees to achieve organizational goals beyond their personal interests. Bass and Avolio (1994) describe transformational leadership as a style

that motivates employees to achieve beyond standard expectations by fostering a common vision, encouraging innovative thinking, providing individual attention, and demonstrating positive role modelling. Option 3: Rather than focusing solely on task completion, transformational leaders inspire employees through trust-based relationships, greater commitment, and stronger alignment with the organization's vision. In the context of FSMS implementation, transformational leadership plays a critical role in promoting food safety values and encouraging employee participation in food safety activities. Effective leaders communicate a clear vision of food safety, support continuous learning, and motivate employees to adhere to food safety requirements. Fujisaki, Shimpo, and Akamatsu (2019) reported that participative and transformational leadership styles contribute to developing a strong food safety culture by enhancing employee involvement and ownership of food safety practices. That leadership is a key driver of transforming food safety culture from a reactive to a proactive approach.

Earlier research has repeatedly found that transformational leadership has a positive effect on organizational commitment. Ausat, Suherlan, Peirisal, and Hirawan (2022) and Syihabudhin, Nora, Prohimi, and Bhaskoro (2022) found that transformational leaders strengthen employee commitment by providing inspiration, support, and motivation. Likewise, Efendi, Butarbutar, Wakhyuni, Romy, and Sudirman (2022) reported that leaders communicates a clear vision and building trust are more likely to foster employee loyalty and commitment. EC (2022) and Notarnicola et al. (2024) state that in the food industry, effective leadership is essential for ensuring employee engagement, compliance with food safety requirements, and continuous improvement of FSMS performance.

Based on the literature, Transformational Leadership is measured using the following indicators: Exemplary Leadership; Visionary Motivation; Creative Thinking Encouragement; Personalised Support; Workforce Empowerment and Positive Work Environment.

2.5 Interpersonal Communication

Interpersonal communication refers to the process of exchanging verbal and nonverbal messages between individuals to create a shared understanding and facilitate effective interaction. According to Robbins and Judge (2016), interpersonal communication is a two-way process through which individuals transfer and interpret information to achieve mutual understanding. Similarly, Daft and Lengel (1986), through Media Richness Theory, argue that effective communication reduces uncertainty and ambiguity by enabling timely feedback, message clarity, and personal interaction. Consequently, interpersonal communication plays an essential role in supporting coordination, collaboration, and relationship building within organizations.

In the context of FSMS implementation, interpersonal communication is critical because food safety information must be communicated accurately and consistently across all organizational levels. Effective communication facilitates the dissemination of food safety policies, operational procedures, risk information, and corrective actions, thereby reducing misunderstandings and improving compliance with food safety regulations. (GFSI, 2018), the European Commission (EC, 2022), and (BRCGS, 2022) emphasize that open and transparent communications is a fundamental element of food safety cultures and effective FSMS implementation.

Existing studies have identified interpersonal communication as a key factor in strengthening employee participation and enhancing organizational performance. Nyarugwe et al. (2020) found that active communication and employee participation in food safety discussions increase responsibility and engagement in food safety practices. Likewise, Onyeaka et al. (2021) reported that effective communication improves employees' understanding of food safety requirements and supports the consistent implementation of food safety procedures. Recent studies by Faras, Setiadi, Khoerunnisa, and Nastiyar (2023), Ie, Maupa, and Madris (2023), and Alamsyah and Fauzi (2024) indicate that communication characterized by openness, clarity, trust, and constructive feedback contributes to stronger collaboration, motivation, and employee engagement within organizations.

Based on the literature, Interpersonal Communication is measured using the following indicators: Open Communication; Information Clarity; Equal Access to Information; Two-Way Feedback; Communication Consistency.

2.6 Work Motivation

Work motivation can be understood as the psychological and situational factors that stimulate employees to perform particular actions and continue working towards desired organizational outcomes. A strong motivational level supports employee dedication, perseverance, and effective completion of assigned responsibilities. According to Sinambela (2021), work motivation is a driving force that stimulates employees to work enthusiastically and contributes to organizational success. Similarly, Riyanto, Endri, and Herlisha (2021) describe work motivation as the willingness of individuals to exert effort in order to satisfy personal needs while achieving organizational objectives.

The concept of work motivation is rooted in several theories. Maslow (1943) introduced the Hierarchy of Needs Theory, explaining that human behavior is influenced by the pursuit of different levels of needs, beginning with basic physiological requirements and progressing towards security, social belonging, esteem, and self-fulfilment. Herzberg, Mausner, and Snyderman (1959) further explained that motivation is influenced by intrinsic factors, such as achievement, recognition, responsibility, and personal growth, as well as extrinsic factors that prevent job dissatisfaction. More recently, Ryan and Deci (2020) argued that motivation can be strengthened over time when employees perceive independence, personal effectiveness, and social belonging as part of their work environment.

In the context of FSMS implementation, work motivation is an essential factor that supports employees in consistently applying food safety standards and procedures, participating in training activities, and supporting continuous improvement initiatives. Highly motivated employees are more likely to take responsibility for food safety practices, demonstrate proactive behavior, and contribute to achieving organizational food safety objectives. Furthermore, motivated employees tend to develop stronger organizational commitment as they view their roles as valuable and consistent with their individual aspirations and organizational objectives.

Previous studies have regularly highlighted a positive relationship between work motivation and organizational commitment. Manalo, de Castro, and Uy (2020) found that motivated employees exhibit higher levels of involvement, loyalty, and commitment to their organizational goals. Likewise, Vo, Tuliao, and Chen (2022) and Nugraha (2023) reported that employees whose needs for achievement, recognition, and personal development are fulfilled tend to exhibit deeper involvement and greater willingness to help advance organizational performance.

Based on the literature, Work Motivation is measured using the following indicators: Achievement Competence; Autonomy and Responsibility; Recognition and Esteem; Relatedness and Social Needs; Growth and Self-Actualization.

2.7 The Relationship Between Knowledge Management and Organizational Commitment

Knowledge management enables organizations to create, acquire, store, share, and apply knowledge effectively to support organizational goals. In the context of FSMS implementation, knowledge management helps employees understand food safety requirements, improve their competencies, and consistently apply food safety procedures. Employees who possess adequate knowledge and participate in knowledge-sharing activities tend to feel more valued and involved in organizational activities.

Previous studies have demonstrated that knowledge management positively influences organizational commitment. Ikechukwu and Callystus (2018) found that knowledge acquisition and knowledge sharing significantly improve affective commitment. Kawiana, Cempaka, Supartha, and Dewi (2023) reported that knowledge management positively affects organizational commitment. In food safety settings, Taha, Osaili, Vij, Albloush, and Nassoura (2020) found that food safety knowledge contributes to stronger employee commitment and responsible food safety behavior.

H_1: Knowledge Management has a positive and significant effect on organizational commitment

2.8 The Relationship Between Transformational Leadership and Organizational Commitment

Transformational leaders encourage employees by creating a clear collective direction, stimulating new ways of thinking, providing personal guidance, and acting as role models for their subordinates. Through supportive leadership practices, managers can build stronger relationships with their teams, increase their confidence, and develop greater dedication among employees towards achieving the organization's objectives.

Previous studies have consistently reported a positive relationship between transformational leadership and organizational commitment. Ausat, Suherlan, Peirisal, and Hirawan (2022), Jiatong, Wang, Alam, Murad, Gul, and Gill (2022), and Yuliani, Hamzah, and Lazuardi (2021) found that transformational leadership significantly enhances organizational commitment. Pai, Jaiswal, and Jaiswal (2024) emphasized that strong leadership enhances employee commitment to food safety and quality objectives.

H_2: Transformational Leadership has a positive and significant effect on organizational comitment

2.9 The Relationship Between Interpersonal Communication and Organizational Commitment

Interpersonal communication facilitates information exchange, collaboration, and mutual understanding among organizational members. Effective communication helps employees understand organizational expectations, develop trust, and strengthen their workplace relationships.

Yusnita (2020) found that open communication creates a sense of trust and belonging that strengthens organizational commitment. Likewise, Min and Hong (2021), Efendi, Butarbutar, Wakhyuni, Romy, and Sudirman (2022), and Syihabudhin, Nora, Prohimi, and Bhaskoro (2022) reported that effective communication positively influences employee commitment and organizational performance. In FSMS implementation, communication is essential to ensure that food safety information is clearly understood and consistently applied.

H_3: Interpersonal Communication has a positive and significant effect on organizational commitment

2.10 The Relationship Between Work Motivation and Organizational Commitment

Work motivation drives employees to apply greater effort, remain committed when facing challenges, and support the achievement of organizational goals. Individuals with strong motivation generally display higher engagement, accountability, and a deeper sense of dedication to their organization and assigned responsibilities. Manalo et al. (2020) found that work motivation positively affects organizational commitment both directly and indirectly. Similar findings were reported by Rachman (2022), Septiyani and Fauzan (2023), and Nurdiana (2026), who concluded that motivated employees are more committed to organizational objectives.

H_4: Work Motivation has a positive and significant effect on organizational commitment

2.11 The Relationship Between Knowledge Management and Work Motivation

Knowledge management provides employees with opportunities to learn, develop competencies, and improve job performance. Access to knowledge and continuous learning can increase employees' confidence and enthusiasm in carrying out their job responsibilities. Tan and Nawawi (2021) found that knowledge management positively influences work motivation because it supports learning and competency development. Employees with access to relevant knowledge are generally more motivated to contribute to organizational success.

H_5: Knowledge Management has a positive and significant effect on work motivation

2.12 The Relationship Between Transformational Leadership and Work Motivation

Transformational leaders motivate employees by communicating compelling visions, providing support, and encouraging personal growth. Such leadership behaviors increase employees'

enthusiasm, confidence, and willingness to perform beyond their expectations. Basahel (2021) found that leadership positively affects employee motivation in safety-related work. Leadership is a key factor in encouraging employee engagement and motivation regarding food safety practices.

H_6: Transformational Leadership has a positive and significant effect on work motivation

2.13 The Relationship Between Interpersonal Communication and Work Motivation

Effective interpersonal communication creates a supportive work environment by facilitating feedback, reducing uncertainty, and strengthening social ties. Employees who receive clear information and constructive feedback are more likely to be motivated to perform their duties. Syihabudhin et al. (2022) reported that interpersonal communication positively influences work motivation by enhancing role clarity, trust and perceived organizational support. Effective communication also promotes employee engagement and participation in organizational activities.

H_7: Interpersonal Communication has a positive and significant effect on work motivation

2.14 The Mediating Role of Work Motivation in the Relationship Between Knowledge Management and Organizational Commitment

Knowledge management can enhance employees' motivation by improving their competencies, increasing their confidence, and creating learning opportunities. Motivated employees tend to establish stronger bonds and greater commitment to achieving organizational goals. Previous studies by Tan and Nawawi (2021) and Kawiana et al. (2023) suggest that knowledge management contributes to organizational commitment through motivational mechanisms. Therefore, work motivation is expected to mediate the relationship between knowledge management and commitment.

H_8: Knowledge Management has a positive and significant indirect effect on organizational commitment through work motivation

2.15 The Mediating Role of Work Motivation in the Relationship Between Transformational Leadership and Organizational Commitment

Transformational leaders inspire employees and foster a positive workplace climate that strengthens employee motivation. Increased motivation subsequently strengthens employees' emotional attachment and commitment to the organization. Basahel (2021) reported that leadership influences employee motivation, while Ausat, Suherlan, Peirisal, and Hirawan (2022) found that transformational leadership enhances organizational commitment. These findings indicate that work motivation may act as a mediating mechanism linking transformational leadership and organizational commitment.

H_9: Transformational Leadership has a positive and significant indirect effect on organizational commitment through work motivation

2.16 The Mediating Role of Work Motivation in the Relationship Between Interpersonal Communication and Organizational Commitment

Interpersonal communication facilitates information exchange, trust, and social support in the workplace. These factors contribute to higher work motivation, which, in turn, strengthens employees' commitment to organizational goals. Syihabudhin et al. (2022) found that effective communication increases motivation and organizational outcomes, whereas Min and Hong (2021) reported that communication positively affects employee commitment. Therefore, work motivation is expected to mediate the relationship between interpersonal communication and organizational commitment

H_{10}: Interpersonal Communication has a positive and significant indirect effect on organizational commitment through work motivation

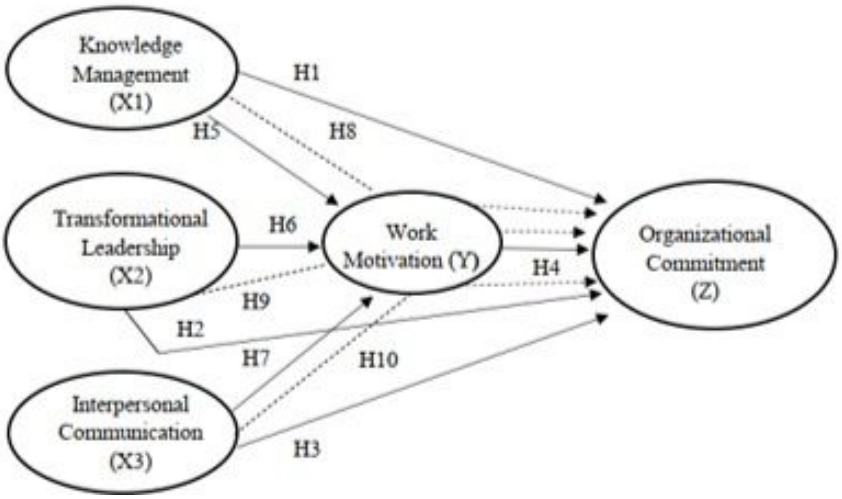


Figure 1. Conceptual framework of the study

The proposed relationships among the variables and hypotheses are illustrated in the conceptual framework shown in Figure 1.

3. Research Methodology

This study adopted a causal design to investigate the relationships between knowledge management, transformational leadership, and interpersonal communication and organizational commitment, while examining work motivation as a mediating factor within the agar-agar flour manufacturing sector in Bogor Regency. Data were collected using structured questionnaires administered directly to selected production employees who met the predetermined criteria. The questionnaire items were measured on a five-point scale. For knowledge management, transformational leadership, and interpersonal communication, the responses ranged from 1 ("never") to 5 ("always"). Work motivation and organizational commitment were assessed using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The study population consisted of production workers with a minimum employment period of three years, as this duration was considered sufficient to reflect their level of organizational involvement and commitment to the organization. Data collection was carried out through offline questionnaire distribution to ensure direct participation of respondents. The sample size was determined based on the guidelines proposed by Hair et al. (2021), which suggest that the number of respondents should be between five and ten times the total measurement indicators used in the research model. As this study involved 25 indicators, the minimum sample size was calculated as 25 × 5, resulting in 125 respondents. The final dataset comprised 142 completed questionnaires. Respondents were identified using a purposive sampling technique under a non-probability framework, ensuring their suitability for the research.

This study applied SEM using SmartPLS 4 to assess the measurement and structural models illustrated in Figure 1. The analysis consisted of several stages, including descriptive analysis, assessment of validity and reliability, and hypothesis testing to examine the proposed relationships between the variables. Descriptive statistics were used to present the respondent profiles and summarize the questionnaire responses using mean values, frequency distributions, and standard deviations. The dataset was obtained from participants' answers to the research instrument, which were organized and tabulated before further analysis. The processed results were interpreted to evaluate the relationships between the investigated constructs.

An evaluation of the outer model was conducted to establish the soundness of the measurement instrument. The assessment of convergent validity relied on Outer Loading coefficients greater than 0.70 and AVE values above 0.50, indicating acceptable measurement quality. Discriminant validity was verified using the cross-loading approach, ensuring that each indicator demonstrated a stronger association with its intended construct than with other variables. The reliability of the constructs was determined based on Cronbach alpha values above 0.60 and Composite Reliability exceeding 0.70.

Indicators that satisfied these conditions were accepted as appropriate measures for further evaluations of the structural model. (Hair et al., 2021).

After validating the measurement model, the structural model (inner model) was analyzed to evaluate the hypothesized relationships between the research constructs. This evaluation aimed to determine the predictive capability and explanatory strength of the model using several statistical measures, including the coefficient R^2, f^2, and Q^2. The R^2 value was used to identify how effectively the exogenous variables accounted for variations in the endogenous constructs within the SEM-PLS framework. A higher coefficient value indicates a stronger explanatory ability, meaning that the independent variables provide greater insight into the changes occurring in the dependent variables. Therefore, the inner model assessment provides an overview of the model's predictive performance and the extent to which the proposed relationships are supported. According to Sarstedt, Ringle, and Hair (2021), R^2 values are interpreted on a scale between zero and one, with scores of 0.75, 0.50, and 0.25 reflecting strong, medium, and limited model capability, respectively. The f^2 evaluation was conducted to measure the contribution of each external construct in explaining changes in endogenous constructs in the SEM-PLS. The f^2 value indicates the extent to which an independent construct contributes to increasing the R-squared value of the dependent variable. According to Sarstedt et al. (2021), the contribution of each exogenous variable to the endogenous constructs was examined using the f^2 effect size measure. According to the established criteria, f^2 values of 0.02, 0.15, and 0.35 correspond to weak, moderate, and substantial effects, respectively. Values below 0.02 are regarded as negligible, suggesting that the related exogenous variables have minimal influence on the endogenous constructs being examined.

The Q^2 assessment was performed to examine the predictive relevance of the structural model within the SEM-PLS approach. This evaluation determines whether the model can produce reliable predictions based on the observed data and estimated parameters. The Q^2 value is generated using the blindfolding technique and focuses on assessing the predictive performance of endogenous constructs. A positive Q^2 result (above zero) suggests that the model has a satisfactory predictive ability for the related construct, whereas a value below zero indicates that the model lacks sufficient predictive accuracy. (Sarstedt et al., 2021).

A hypothesis test was then conducted, consisting of direct and indirect effects. Hypothesis testing of the direct effect between latent variables was conducted using the path coefficients generated from the SEM-PLS structural model. Path coefficient analysis was performed to identify the nature and strength of the relationships among the constructs within the proposed model. The direction of influence was interpreted through the β coefficient, where positive and negative values represented the pattern of association between the latent variables. Hypothesis testing was conducted using bootstrapping analysis by examining the path coefficient magnitude, t-statistic, and p-value results. A hypothesis was considered supported when the t-statistic exceeded 1.96 or the p-value was below 0.05, based on a 5% significance level. Conversely, the hypotheses were rejected when the t-statistic was equal to or lower than 1.96 or when the p-value reached or exceeded 0.05. This procedure was applied to evaluate the direct relationships between knowledge management, transformational leadership, interpersonal communication, work motivation, and organizational commitment within this research framework.

The bootstrapping approach was applied to examine the indirect relationships and determine whether work motivation mediates the relationship between knowledge management, transformational leadership, interpersonal communication, and organizational commitment. This mediation analysis was conducted within the SEM framework to evaluate the significance of indirect effects. Bootstrapping was selected as the testing procedure because it provides a reliable estimation without requiring the assumption of normally distributed data. The results were used to identify the extent to which work motivation explains the connection between the antecedent variables and organizational commitment. Hypothesis evaluation followed specific statistical thresholds. A proposed relationship was supported when the t-statistic value exceeded 1.96 or when the p-value was below 0.05, with a significance level of 5% ($\alpha = 5\%$). Conversely, the hypothesis was considered unsupported when the

t-statistic value was equal to or lower than 1.96, or when the p-value reached 0.05 or higher. The mediation assessment was classified into three categories: full mediation, which occurs when the direct relationship is insignificant but the indirect pathway is significant; partial mediation, where both direct and indirect relationships achieve significance; and no mediation, which is identified when the indirect relationship does not reach statistical significance

4. Results and Discussions

4.1 Respondents Characteristics

Table 1. Characteristics of respondents

Category	Item	∑	%
Gender	Male	110	77.46
	Female	32	22.54
	Total	142	100.00
Age	<25 years	5	3.52
	25-35 years	85	59.86
	36-45 years	48	33.80
	>45 years	4	2.82
	Total	142	100.00
Length of work	3-5 years	103	72.54
	5 years	39	27.46
	Total	142	100.00
Last education	SD	7	4.93
	SMP	19	13.38
	SMA/SMK	113	79.58
	D3/S1	3	2.11
	Total	142	100.00

The study respondents were production employees who met the sample requirements, namely having worked for at least three years in the agar-agar flour processing industry to demonstrate their commitment to the organization. The respondent characteristics are presented in Table 1. Of the 142 respondents, 110 were male (77.46%) and 32 were female (22.54%). The number of female workers was lower because, in the agar-agar flour industry, female production operators are only assigned to the drying and flouring processes, while male operators handle other processes. The age profile of respondents was as follows: 5 (3.52%) under 25 years old, 85 (59.86%) between 25-35 years old, 48 (33.80%) between 36-45 years old, and 4 (2.82%) over 45 years old. Based on length of service, 103 (72.54%) had 3-5 years of service and 39 (27.46%) had 5 years of service. Meanwhile, based on the last education, there were seven people (4.92%) in elementary school, 19 people (13.38%) in junior high school, 113 people (79.58%) in high school/vocational school, and three people (2.11%) in D3/S1 (Diploma/ Bachelor's degree).

4.2 Measurement Model (Outer Model)

Table 2. Validity and reliability test result

Variables	Indicators	Validity Test		Reliability Test		Descrip-tion
		OL	AVE	CA	CR	Descrip-tion
Knowledge Management (X_1)	Knowledge Creation (X_1.1)	0.905	0.716	0.899	0.926	Valid & Reliable
	Knowledge Acquisition (X_1.2)	0.927	0.716	0.899	0.926	Valid & Reliable
	Knowledge Storage (X_1.3)	0.713	0.716	0.899	0.926	Valid & Reliable
	Knowledge Sharing (X_1.4)	0.894	0.716	0.899	0.926	Valid & Reliable

Variables	Indicators	Validity Test		Reliability Test		Descrip-tion
Knowledge Management (X_1)	Knowledge Application (X_1.5)	0.771	0.716	0.899	0.926	Valid & Reliable
Transformati-onal Leadership (X_2)	Idealized Influence (X_2.1)	0.834	0.733	0.908	0.932	Valid & Reliable
	Inspirational Motivation (X_2.2)	0.851	0.733	0.908	0.932	Valid & Reliable
	Intellectual Stimulation (X_2.3)	0.810	0.733	0.908	0.932	Valid & Reliable
	Individualized Consideration (X_2.4)	0.946	0.733	0.908	0.932	Valid & Reliable
	Empowerment and Work Climate Enhancement (X_2.5)	0.832	0.733	0.908	0.932	Valid & Reliable
Interpersonal Communi-cation (X_3)	Open Communication (X_3.1)	0.937	0.843	0.954	0.964	Valid & Reliable
	Information Clarity (X_3.2)	0.930	0.843	0.954	0.964	Valid & Reliable
	Equal Access to Information (X_3.3)	0.946	0.843	0.954	0.964	Valid & Reliable
	Two-Way Feedback (X_3.4)	0.877	0.843	0.954	0.964	Valid & Reliable
	Communication Consistency (X_3.5)	0.900	0.843	0.954	0.964	Valid & Reliable
Work Motivation (Y)	Achievement Competence (Y_1)	0.924	0.904	0.974	0.979	Valid & Reliable
	Autonomy and Responsibility (Y_2)	0.976	0.904	0.974	0.979	Valid & Reliable
	Recognition and Esteem (Y_3)	0.967	0.904	0.974	0.979	Valid & Reliable
	Relatedness and Social Needs (Y_4)	0.927	0.904	0.974	0.979	Valid & Reliable
	Growth and Self-Actualization (Y_5)	0.959	0.904	0.974	0.979	Valid & Reliable
Organizati-onal Commit-ment (Z)	Pride in being part of the organization (Z_1)	0.915	0.840	0.952	0.963	Valid & Reliable
	Alignment between personal and organizational values (Z_2)	0.876	0.840	0.952	0.963	Valid & Reliable
	Strong intention to remain in the organization (Z_3)	0.919	0.840	0.952	0.963	Valid & Reliable
	Sense of moral responsibility toward the organization (Z_4)	0.935	0.840	0.952	0.963	Valid & Reliable
	Willingness to exert extra effort for organizational success (Z_5)	0.937	0.840	0.952	0.963	Valid & Reliable

Table 3. The cross-loading results

Indicators	Knowledge Manage-ment (X_1)	Transforma-tional Leadership (X_2)	Interpersonal Communica-tion (X_3)	Work Motivation (Y)	Organizational Commitment (Z)
X_1.1	0.905	0.192	0.427	0.293	0.767
X_1.2	0.927	0.369	0.505	0.447	0.517
X_1.3	0.713	0.564	0.792	0.785	0.457
X_1.4	0.894	0.202	0.407	0.534	0.342
X_1.5	0.771	0.114	0.125	0.067	0.664
X_2.1	0.184	0.834	0.613	0.567	0.383
X_2.2	0.343	0.851	0.537	0.695	0.292
X_2.3	0.362	0.810	0.817	0.803	-0.054
X_2.4	0.152	0.946	0.812	0.734	0.151
X_2.5	0.510	0.832	0.830	0.678	0.313
X_3.1	0.568	0.803	0.937	0.856	0.262
X_3.2	0.410	0.725	0.930	0.695	0.183
X_3.3	0.731	0.759	0.946	0.835	0.535
X_3.4	0.496	0.852	0.877	0.845	0.284

Indicators	Knowledge Manage-ment (X_1)	Transforma-tional Leadership (X_2)	Interpersonal Communica-tion (X_3)	Work Motivation (Y)	Organizational Commitment (Z)
X_3.5	0.318	0.727	0.900	0.643	0.025
Y_1	0.360	0.805	0.872	0.924	0.003
Y_2	0.637	0.813	0.850	0.976	0.290
Y_3	0.627	0.841	0.876	0.967	0.313
Y_4	0.280	0.693	0.691	0.927	-0.058
Y_5	0.574	0.708	0.757	0.959	0.166
Z_1	0.644	0.128	0.222	0.096	0.915
Z_2	0.475	0.149	0.107	-0.010	0.876
Z_3	0.492	0.102	0.234	0.084	0.919
Z_4	0.584	0.301	0.327	0.125	0.935
Z_5	0.773	0.409	0.481	0.423	0.937

Table 2 and Table 3 present the findings of the validity and reliability evaluations. The assessment of convergent validity through outer loading analysis revealed that each indicator achieved loading values within the range of 0.713–0.976. As these values surpassed the required criterion of 0.70, the indicators were considered to have satisfactory validity. The highest loading values were found for Knowledge Acquisition (0.927) in Knowledge Management, Individualized Consideration (0.946) in Transformational Leadership, Equal Access to Information (0.946) in Interpersonal Communication, Autonomy and Responsibility (0.976) in Work Motivation, and Willingness to Exert Extra Effort for Organizational Success (0.937) in Organizational Commitment. The findings suggest that all measurement items reliably captured their intended latent variables.

Discriminant validity was verified using the Average Variance Extracted (AVE) values presented in Table 2 and the cross-loading assessment reported in Table 3. The AVE results obtained for each construct ranged from 0.716 to 0.904, which surpassed the accepted minimum requirement of 0.50. These findings confirm that each construct successfully captures a greater proportion of variance from its respective indicators, indicating adequate discriminant validity within the measurement model. Furthermore, the cross-loading results demonstrate that each indicator loads higher on its corresponding construct than on other constructs. For example, Knowledge Acquisition (X1.2) shows the highest loading on Knowledge Management (0.927), Individualized Consideration (X2.4) loads highest on Transformational Leadership (0.946), Equal Access to Information (X3.3) loads highest on Interpersonal Communication (0.946), Autonomy and Responsibility (Y2) loads highest on Work Motivation (0.976), and Willingness to Exert Extra Effort for Organizational Success (Z5) loads highest on Organizational Commitment (0.937). These results confirm adequate discriminant validity and indicate that each construct is empirically distinct.

The findings of the reliability analysis indicated that each construct demonstrated satisfactory consistency. The Cronbach alpha results varied from 0.899 to 0.974, surpassing the accepted cut-off point of 0.60, while the Composite Reliability values were between 0.926 and 0.979. These outcomes confirm that the measurement model has strong reliability. The highest reliability was observed for Work Motivation (CA = 0.974; CR = 0.979), followed by Interpersonal Communication (CA = 0.954; CR = 0.964), Organizational Commitment (CA = 0.952; CR = 0.963), Transformational Leadership (CA = 0.908; CR = 0.932), and Knowledge Management (CA = 0.899; CR = 0.926). Therefore, all constructs were considered valid and reliable, providing a robust basis for subsequent structural model evaluation and hypothesis testing.

4.3 Structural Model (Inner Model)

Table 4. R-square

Variable	R-square	R-square adjusted
Work Motivation (Y)	0.776	0.771

Variable	R-square	R-square adjusted
Organizational Commitment (*Z*)	0.569	0.557

Table 4 presents the coefficient of determination (R^2) findings, revealing that the proposed structural model provides a meaningful level of predictive explanation for the constructs examined. Work Motivation obtained an R^2 value of 0.776, suggesting that 77.6% of its variation can be accounted for by Knowledge Management, Transformational Leadership, and Interpersonal Communication, while the remaining 22.4% originates from external factors beyond the research framework. For Organizational Commitment, the R^2 value reached 0.569, indicating that 56.9% of its changes were predicted by Knowledge Management, Transformational Leadership, Interpersonal Communication, and Work Motivation, with 43.1% attributed to other unobserved influences. These results confirm that the model provides adequate explanatory capability for describing employee motivation and commitment within FSMS practices.

Table 5. f-square

Relationship	f-square
Knowledge Management (X_1)→Organizational Commitment (*Z*)	1.016
Transformational Leadership (X_2) →Organizational Commitment (*Z*)	0.153
Interpersonal Communication (X_3) →Organizational Commitment (*Z*)	0.001
Work Motivation (*Y*)→Organizational Commitment (*Z*)	0.255
Knowledge Management (X_1) →Work Motivation(*Y*)	0.049
Transformational Leadership (X_2) →Work Motivation (*Y*)	0.166
Interpersonal Communication (X_3) →Work Motivation (*Y*)	0.195

The f-square results in Table 5 show varying effect sizes for the predictor variables. Knowledge Management has a large effect on Organizational Commitment ($f^2 = 1.016$), indicating that it is the most influential factor in strengthening employees' commitment to the organization. Transformational Leadership had a medium effect on Organizational Commitment ($f^2 = 0.153$), while Work Motivation also demonstrated a medium effect ($f^2 = 0.255$). In contrast, Interpersonal Communication has a negligible effect on Organizational Commitment ($f^2 = 0.001$). Regarding Work Motivation, Interpersonal Communication ($f^2 = 0.195$) and Transformational Leadership ($f^2 = 0.166$) showed medium effects, whereas Knowledge Management had a small effect ($f^2 = 0.049$). These findings suggest that organizational commitment is primarily driven by knowledge management practices, whereas work motivation is more strongly influenced by leadership and communication factors.

Table 6. Q-square

Variables	SSO	SSE	Q^2 (1-SSE/SSO)
Work Motivation (*Y*)	710.000	224.274	0.684
Organizational Commitment (*Z*)	710.000	381.499	0.463

In addition, according to the Q-squares results in Table 6, the model possesses strong predictive relevance. Work Motivation has a Q^2 value of 0.684, meaning that the model can predict 68.4% of the observed variance in Work Motivation. Organizational Commitment has a Q^2 value of 0.463, indicating that 46.3% of its variance can be predicted by the model. Both values were greater than zero, confirming that the model had a satisfactory predictive capability. Furthermore, the higher Q^2 value for Work Motivation suggests that the model predicts employee motivation more accurately than organizational commitment. Overall, these results demonstrate that the structural model has good predictive relevance and is suitable for explaining the relationships among the variables of this study.

Table 7. Hypotheses testing

Hypotheses	Relationship	Original sample (O)	Sample mean (M)	Standard deviation	T statistics	P values	Description
H_1	Knowledge Management (X_1) →Organizational Commitment (Z)	0.773	0.785	0.052	14.791	0.000	Accepted
H_2	Transformational Leadership (X_2) → Organizational Commitment (Z)	0.517	0.528	0.066	7.818	0.000	Accepted
H_3	Interpersonal Communication (X_3) → Organizational Commitment (Z)	-0.018	-0.031	0.123	0.148	0.882	Not accepted
H_4	Work Motivation (Y) → Organizational Commitment (Z)	-0.616	-0.625	0.131	4.690	0.000	Accepted
H_5	Knowledge Management (X_1) → Work Motivation(Y)	0.130	0.134	0.028	4.665	0.000	Accepted
H_6	Transformational Leadership (X_2) → Work Motivation (Y)	0.399	0.405	0.059	6.788	0.000	Accepted
H_7	Interpersonal Communication (X_3) → Work Motivation (Y)	0.439	0.427	0.080	5.498	0.000	Accepted
H_8	Knowledge Management (X_1) → Work Motivation(Y) → Organizational Commitment (Z)	-0.080	-0.083	0.023	3.446	0.000	Accepted
H_9	Transformational Leadership (X_2) → Work Motivation (Y) → Organizational Commitment (Z)	-0.245	-0.254	0.068	3.615	0.000	Accepted
H_{10}	Interpersonal Communication (X_3) → Work Motivation (Y) → Organizational Commitment (Z)	-0.270	-0.266	0.072	3.739	0.000	Accepted

Based on the hypothesis testing results using the bootstrapping method shown in Table 7 , nine of the ten hypotheses were accepted. The accepted hypotheses had T-statistic values greater than 1.96 and p-values lower than 0.05, indicating significant relationships among the variables. Hypothesis 1 (H_1) shows that Knowledge Management significantly and positively affects Organizational Commitment ($\beta = 0.773$; $t = 14.791$; $p < 0.001$). This finding supports the studies of Ikechukwu and Callystus (2018) and Kawiana et al. (2023), who demonstrated that effective knowledge acquisition, sharing, and application strengthen employees' commitment to the organization.

Hypothesis 2 (H_2) indicates that Transformational Leadership has a positive and significant effect on Organizational Commitment ($\beta = 0.517$; $t = 7.818$; $p < 0.001$). This result is consistent with Ausat et al. (2022), Jiatong et al. (2022), and Yuliani et al. (2021), who found that transformational leaders enhance employee involvement, loyalty, and commitment to organizational goals. Hypothesis 3 (H_3) is not accepted because Interpersonal Communication does not significantly affect Organizational Commitment ($\beta = -0.018$; $t = 0.148$; $p = 0.882$). This result indicates that effective communication among employees is insufficient to directly strengthen the organizational commitment. In the context of Food Safety Management System (FSMS) implementation, interpersonal communication primarily facilitates information sharing, coordination, and compliance with food safety procedures rather than fostering employees' psychological attachment to the organization. This finding is consistent with the organizational behavior model proposed by Colquitt et al. (2018), which suggests that communication may indirectly influence organizational outcomes through individual mechanisms. Supporting this argument, interpersonal communication significantly affected Work Motivation ($\beta = 0.439$; $p < 0.001$), indicating that its primary contribution lies in enhancing employee motivation rather than directly increasing organizational commitment.

Hypothesis 4 (H_4) reveals that Work Motivation significantly affects Organizational Commitment (β = -0.616; t = 4.690; p < 0.001). The negative coefficient indicates an inverse relationship between the two variables in the structural model. This finding suggests that employees' motivation may be more strongly directed toward task accomplishment, performance achievement, and competency development in supporting FSMS implementation than toward developing organizational attachment. Although previous studies have generally reported a positive relationship between work motivation and organizational commitment, the present findings indicate that motivation in this context may be predominantly performance-oriented rather than organization-oriented. Consistent with Self-Determination Theory, motivation focused on performance outcomes does not necessarily translate into stronger organizational commitment (Ryan & Deci, 2020).

Hypothesis 5 (H_5) shows that Knowledge Management positively and significantly affects Work Motivation (β = 0.130; t = 4.665; p < 0.001). This finding supports Tan and Nawawi (2021), who argued that effective knowledge management enhances employee competence, learning opportunities, and work motivation. Hypothesis 6 (H_6) indicates that Transformational Leadership has a positive and significant effect on Work Motivation (β = 0.399; t = 6.788; p < 0.001). This result is consistent with those of Basahel (2021), who found that transformational leadership increases employee enthusiasm, engagement, and work motivation. Hypothesis 7 (H_7) demonstrates that Interpersonal Communication positively and significantly affects Work Motivation (β = 0.439; t = 5.498; p < 0.001). This finding suggests that open communication, information clarity, equal access to information, and two-way feedback contribute to higher employee motivation.

The mediation analysis supported all indirect hypotheses. Work Motivation significantly mediated the relationship between Knowledge Management and Organizational Commitment (H8: β = -0.080; t = 3.446; p < 0.001), Transformational Leadership and Organizational Commitment (H9: β = -0.245; t = 3.615; p < 0.001), and Interpersonal Communication and Organizational Commitment (H10: β = -0.270; t = 3.739; p < 0.001). These findings indicate that Work Motivation is an important intervening mechanism through which organizational factors influence Organizational Commitment. Consistent with the organizational behavior model of Colquitt et al. (2018), organizational practices affect commitment through individual mechanisms, such as motivation. However, the negative indirect effects reflect the negative relationship between Work Motivation and Organizational Commitment observed in this study.

5. Conclusions

5.1 Conclusion

Based on the research findings, Knowledge Management and Transformational Leadership significantly strengthen Organizational Commitment in the implementation of Food Safety Management Systems (FSMS), whereas Interpersonal Communication does not have a direct significant effect. Knowledge Management, Transformational Leadership, and Interpersonal Communication positively influenced Work Motivation, and Work Motivation significantly mediated the relationships between these organizational factors and Organizational Commitment.

An important finding of this study is that Work Motivation has a significant negative effect on Organizational Commitment, which contrasts with most previous studies. This suggests that, in the agar-agar powder industry, employees' motivation is primarily directed toward achieving work performance, complying with food safety requirements, and improving competencies rather than strengthening their attachment to the organization.

This study contributes to the strategic management and food safety management literature by demonstrating that high work motivation alone is insufficient to strengthen organizational commitment in the context of FSMS implementation. Therefore, organizations should complement efforts to improve employees' motivation with stronger knowledge management and transformational leadership practices to encourage the internalization of organizational values and sustain long-term organizational commitment.

5.2 Research Limitations

This study was conducted in the agar-agar flour processing industry, which may limit the generalizability of the findings to other food industry sectors. In addition, the study only examined Knowledge Management, Transformational Leadership, Interpersonal Communication, Work Motivation, and Organizational Commitment. Other factors that may influence Organizational Commitment in FSMS implementation, such as organizational culture, perceived organizational support, job satisfaction, employee engagement, and food safety climate, were not included in the research model.

5.3 Suggestions and Directions for Future Research

Further studies could expand the investigation to various segments of the food industry by involving a wider range of organizations and a larger number of respondents to strengthen the applicability of the findings. Future studies may also consider introducing additional constructs, including organizational culture, perceived organizational support, job satisfaction, employee engagement, and food safety climate, to provide a deeper understanding of the factors influencing organizational commitment within FSMS implementation.

From a practical perspective, food processing companies should not focus solely on increasing employees' work motivation, as higher motivation does not necessarily translate into stronger organizational commitment. Instead, organizations should address barriers to commitment by strengthening knowledge management practices, promoting transformational leadership, and creating opportunities for employees to internalize organizational values through continuous learning, participation, and employee recognition. These efforts can help transform employees' motivation for job performance into stronger organizational commitment, thereby supporting the sustainable implementation of FSMS.

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Author Contributions

HDW developed the research concept, established the study framework, gathered empirical data, conducted analytical procedures, and prepared the initial manuscript with subsequent improvements. H was involved in verifying the research data, refining the methodological approach, and providing critical input for manuscript enhancement. DN provided academic guidance through research supervision, performed the final evaluation, and approved the manuscript prior to publication.

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