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The Effect of the Implementation Level of the Serious Accidents Punishment Act on Safety Performance in Public Institutions

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Abstract

This study examines the relationship between the implementation of the Serious Accidents Punishment Act and safety performance in public institutions, with particular attention to organizational capability, risk assessment, safety education, and safety culture. It also investigates the mediating role of safety culture in the relationships between safety-management factors and safety performance. Data were collected from 250 valid respondents, including employees of a public institution and workers from partner companies. SPSS 29.0 and AMOS 29.0 were employed for reliability analysis, confirmatory factor analysis, structural equation modeling, and bootstrapping analysis. The results showed that organizational capability (β=.28, p<.001), risk assessment (β=.32, p<.001), and safety education (β=.27, p<.001) significantly influenced safety culture. Organizational capability (β=.68, p<.001), risk assessment (β=.47, p<.001), and safety education (β=.12, p<.05) also had significant positive effects on safety performance. Safety culture demonstrated a significant positive effect on safety performance (β=.56, p<.001), while bootstrapping confirmed its significant mediating effects. These findings indicate that effective implementation of the Act requires an integrated safety-management approach that strengthens organizational capability, systematic risk assessment, safety education, and a participatory safety culture. Such integration can contribute to sustainable improvements in safety performance in public institutions.

Keywords: Serious Accidents Punishment Act, Risk Assessment, Safety Education, Safety Culture, Safety Performance.

JEL Classification Code : K32, J28, H83, M12, M54

1. Introduction

1.1. Research Background and Rationale

Despite technological advances and increasing industrial complexity, serious industrial accidents continue to occur in Korea, generating substantial social and economic costs.

In particular, serious accidents threaten workers' lives and safety and negatively affect organizational sustainability, public trust in public institutions, and the national safety management system.

To address these issues, the government strengthened preventive safety management systems

and enacted the Serious Accidents Punishment Act in 2022.

The Serious Accidents Punishment Act emphasizes not only accountability following accidents but also the duty of responsible management personnel to secure occupational safety and health and establish preventive management systems at the organizational level.

Accordingly, strengthening organizational capability, conducting risk assessments, providing safety education, and operating occupational safety and health management systems have become important management tasks for public institutions.

However, formal compliance with the system does not necessarily ensure improved safety performance. It is therefore necessary to examine the mechanism through which institutional safety-management activities are translated into employees' safety behaviors and organizational outcomes.

Recent safety-management research has identified safety culture—grounded in employee participation, leadership commitment, mutual trust, and communication—as a key determinant of safety performance. Because public institutions bear responsibilities for both public service delivery and social accountability, they should establish preventive safety-management systems that extend beyond minimum legal compliance.

1.2. Research Purpose

This study investigates whether and how compliance with the Serious Accidents Punishment Act contributes to safety performance in public institutions, with particular attention to the mediating influence of safety culture. Specifically, the study examines the effects of organizational capability, risk assessment, and safety education on safety culture and safety performance and tests whether safety culture mediates these relationships.

2. Theoretical Background and Literature Review

2.1. Serious Accidents Punishment Act and Occupational Safety and Health Management Systems

Rather than focusing solely on sanctions following workplace accidents, the Serious Accidents Punishment Act emphasizes proactive prevention by requiring organizations to establish and operate systematic occupational safety and health management practices.. Fulfilling the statutory responsibility for workplace safety and health requires organizations to develop and operate an effective management framework, systematically assess and address potential hazards, allocate adequate resources for safety and health, incorporate employees' views into safety-related decisions, and ensure appropriate training and education. This system can be understood in connection with the principles of top management leadership, risk-based thinking, and continual improvement presented in ISO 45001.

2.2. Safety Culture and Safety Performance

Safety culture refers to the shared values, beliefs, attitudes, and behavioral patterns regarding safety within an organization. It extends beyond compliance with rules or completion of training to encompass top-management leadership, voluntary employee participation, mutual trust, communication, and continuous learning. Accordingly, organizational capability, risk assessment, and safety education may contribute to safety-culture development, which in turn may enhance safety performance.

2.3. Literature Review and Research Gap

Previous studies have mainly discussed the legal and institutional effects of the Serious Accidents Punishment Act, the role of responsible management personnel, and

approaches to establishing occupational safety and health management systems.

In contrast, relatively few studies have examined public institutions by integrating organizational capability, risk assessment, and safety education as implementation factors and testing the mediating role of safety culture using structural equation modeling.

Therefore, this study seeks to connect law and institutions, organizational management, safety culture, and safety performance within a single structural model.

2.4. Research Model and Hypotheses

This study conceptualizes the implementation level of the Serious Accidents Punishment Act through organizational capability, risk assessment, and safety education, with safety culture as the mediating variable and safety performance as the dependent variable.

H1 Organizational Capability → Safety Culture (+);

H2 Risk Assessment → Safety Culture (+);

H3 Safety Education → Safety Culture (+);

H4 Organizational Capability → Safety Performance (+);

H5 Risk Assessment → Safety Performance (+);

H6 Safety Education → Safety Performance (+);

H7 Safety Culture → Safety Performance (+);

H8–H10 specify the respective mediation effects of safety culture.

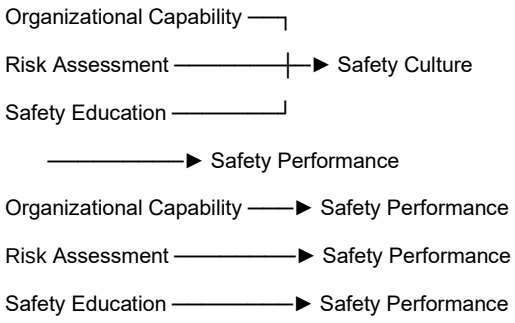


Figure 1: Research Model

2.5. Operational Definitions and Measurement of Variables

To empirically examine the structural relationship between implementation of the Serious Accidents Punishment Act and safety performance in public institutions, this study specified organizational capability, risk assessment, safety education, safety culture, and safety performance as the principal constructs.

The measurement framework was developed by drawing on established instruments in the existing literature and subsequently tailoring the individual items to align with the research objectives and institutional setting examined in this study..

All questionnaire items were administered using a self-report format, and respondents' perceptions were measured on a five-point Likert scale.

Specifically, the scale consisted of (1: strongly disagree, 2: disagree, 3: neutral, 4: agree, and 5: strongly agree).

a 5-point Likert scale is widely used in social-science and safety-management research because it permits systematic quantification of attitudes and perceptions.

The development of the measurement instrument followed established findings in the literature, while a preliminary survey was administered prior to the full-scale data collection to verify the comprehensibility of the items and evaluate their initial reliability. First, organizational capability refers to the managerial and institutional capacity required to establish and effectively operate an organizational safety-management system.

Five items were used to measure organizational capability, as follows.

・Top management recognizes safety management as a core management element.

・Safety management responsibilities and authority are clearly defined within the organization.

・Safety-related decisions are made promptly.

・Sufficient organizational support is provided for on-site safety management.

・ Safety performance is reflected in organizational evaluation.

The measurement items were modified and supplemented based on Reason (1997)'s organizational safety theory and Cooper (2000)'s safety culture research.

Second, risk assessment refers to the extent to which workplace hazards are proactively identified and evaluated and appropriate preventive measures are established.

Five items were used to measure risk assessment.

・Workplace hazards are systematically identified before work begins.

・Risk assessment results lead to actual improvement measures.

- Workers participate in the risk assessment process.
- The hazard management system is continuously operated
- Risk assessment results are shared at the worksite.

The measurement instrument was constructed by incorporating relevant criteria from the Ministry of Employment and Labor's guidelines on risk assessment, together with the measurement framework proposed by Jung et al. (2021). Third, safety education refers to the extent of training designed to enhance employees' safety awareness, knowledge, and safe work behavior.

It was measured in terms of training frequency, effectiveness, experiential training, and applicability to the workplace.

Four items were used to measure safety education.

- Regular safety education is provided.
- The content of safety education is helpful for actual workplace tasks.
- Training is conducted using accident cases.
- Emergency response training is systematically conducted.

The measurement items were developed with reference to previous studies on occupational safety and health education and the Korea Occupational Safety and Health Agency's educational guidelines.

Fourth, safety culture refers to the shared safety-related values, attitudes, and behavioral patterns held by organizational members.

Six items were used to measure safety culture.

- Safety is recognized as the highest priority within the organization.
- Workers voluntarily participate in safety activities.
- Employees can freely express safety-related opinions.
- When an accident occurs, a prevention-oriented approach is taken rather than focusing on assigning blame.
- Safety information is actively shared among organizational members.
- Compliance with safety rules has become established as part of the organizational culture.

The measurement items were developed based on Cooper (2000)'s safety culture model and ISO 45001 safety culture principles.

Fifth, safety performance represents the degree to which an organization's safety-related practices effectively support the prevention of accidents, reduction of safety incidents, and ongoing enhancement of workplace safety conditions.

Four items were used to measure safety performance.

- The occurrence of occupational accidents is decreasing.
- Accident prevention activities are being carried out effectively.
- The level of workplace safety is continuously improving.
- Overall organizational safety performance is improving.

The safety performance measures were formulated by integrating the performance management perspective introduced by Kaplan and Norton with established empirical research addressing organizational safety performance.

Overall, the measurement items for all constructs were developed based on established literature and adapted to the context of public institutions and safety management under the Serious Accidents Punishment Act. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The adequacy of the measurement model was subsequently evaluated using Cronbach's alpha coefficients and confirmatory factor analysis (CFA) to assess the internal consistency and construct validity of the measurement instruments.

The measurement items were developed with reference to Kaplan and Norton's performance management concepts and previous studies on safety performance.

For the measurement of the variables, all variables were operationalized using measurement items based on previous studies, and a five-point Likert scale was applied to enable quantitative analysis.

The measurement model was assessed using Cronbach's alpha coefficients and confirmatory factor analysis (CFA), thereby providing evidence of the reliability and construct validity of the study variables.

Through these analyses, the internal consistency of the

measurement instruments and the construct validity of the measurement model were verified.

Table 1: Operational Definitions of Variables

Construct	Operational Definition	Key Measurement Items	Source
Organizational Capability	Management capability to develop and maintain an effective occupational safety and health management system	Top management leadership; safety budget; organizational support; safety management system	ISO 45001; Kline; Hair et al.
Risk Assessment	Level of activities for identifying and improving hazards	Hazard identification; improvement measures; continuous management	ISO 45001; KOSHA
Safety Education	Training level for improving safety knowledge and safe behavior	Training participation; satisfaction; training effectiveness	MOEL; KOSHA
Safety Culture	Level of shared safety values and safety behaviors among members	Safety awareness; participation; communication; leadership	Cooper; IAEA
Safety Performance	Level of rganizational safety management outcomes	Accident prevention; safety behavior; improved safety level	Neal & Grifn

3. Research Methodology

3.1 Study Participants and Data Collection Procedures

The study obtained survey responses from employees of K Public Corporation and workers of partner companies, yielding 250 valid questionnaires for the final analysis.

The respondents primarily comprised managers and working-level personnel at a public institution subject to the Serious Accidents Punishment Act, with respondents completing a structured questionnaire independently.

Table 2: General Characteristics and Descriptive Statistics of the Survey Respondents

Category	Description
Survey Population	Employees of K Public Corporation and workers of partner companies
Valid Sample	250
Managers	34.0%
Operations/Working-level Staff	48.0%
Partner-company Workers	18.0%

3.2. Data Analysis Procedures

Data processing and statistical analyses were performed using SPSS 29.0 and AMOS 29.0. The characteristics of the respondents were summarized through frequency distributions and descriptive measures, while the internal consistency of the measurement scales was evaluated using Cronbach's alpha coefficients.

Following the evaluation of convergent and discriminant validity within the measurement model, structural equation modeling (SEM) was subsequently employed to evaluate the hypothesized relationships among the study constructs..

Mediation effects were assessed using bootstrapping to determine the statistical significance of direct, indirect, and total effects.

4. Results

4.1. Descriptive Statistics

Organizational capability had the highest mean score at 3.62 (SD=.58), followed by safety culture at 3.55 (SD=.60), risk assessment at 3.45 (SD=.63), safety performance at 3.40 (SD=.65), and safety education at 3.28 (SD=.71).

Table 3: Descriptive Statistics of Major Variables

Construct	Mean	SD
Organizational Capability	3.62	.58
Risk Assessment	3.45	.63

Safety Education	3.28	.71
Safety Culture	3.55	.60
Safety Performance	3.40	.65

4.2. Measurement Model Assessment

Confirmatory factor analysis yielded Cronbach's α ranging from .872 to .918, composite reliability (CR) values from .892 to .931, and average variance extracted (AVE) values from .621 to .642, supporting convergent validity.

The results provided evidence of adequate discriminant validity, as the AVE square-root values associated with each construct were greater than their respective correlations with the other constructs.

Table 4: Reliability and Validity Analysis (CFA)

Construct	Item	Cronbach's α	CR	AVE
Organizational Capability	OC1–OC5	.892	.912	.621
Risk Assessment	RA1–RA5	.896	.916	.640
Safety Education	SE1–SE4	.872	.892	.628
Safety Culture	SC1–SC6	.918	.931	.642
Safety Performance	SP1–SP4	.886	.906	.633

Construct	Organizational Capability	Risk Assessment	Safety Education	Safety Culture	Safety Performance
Organizational Capability	.848				
Risk Assessment	.620	.831			
Safety Education	.550	.580	.812		
Safety Culture	.680	.650	.600	.871	
Safety Performance	.640	.610	.570	.720	.843

Note: Values shown on the diagonal represent the square root of the average variance extracted (AVE) for each construct.

4.3. Evaluation of the Structural Model

The structural model was evaluated using AMOS 29.0. The model demonstrated an acceptable overall fit, with χ^2=356.842 (df=164), CMIN/DF=2.175, CFI=.952, TLI=.941, IFI=.953, RMSEA=.048, and SRMR=.037. These indices indicate that the proposed structural model provides an acceptable representation of the observed data.

The standardized path coefficients were examined to assess the hypothesized relationships among Organizational Capability, Risk Assessment, Safety Education, Safety Culture, and Safety Performance. The results indicated significant positive relationships between Organizational Capability and Safety Culture (β=.28, p<.001), Risk Assessment and Safety Culture (β=.32, p<.001), and Safety Education and Safety Culture (β=.27, p<.001). Safety Culture also demonstrated a significant positive effect on Safety Performance (β=.56, p<.001), while Safety Education had a significant direct effect on Safety Performance (β=.12, p<.05).

In addition, the structural model analysis confirmed significant direct effects of Organizational Capability on Safety Performance (β=.68, p<.001) and Risk Assessment on Safety Performance (β=.47, p<.001). Accordingly, H4 and H5 were supported.

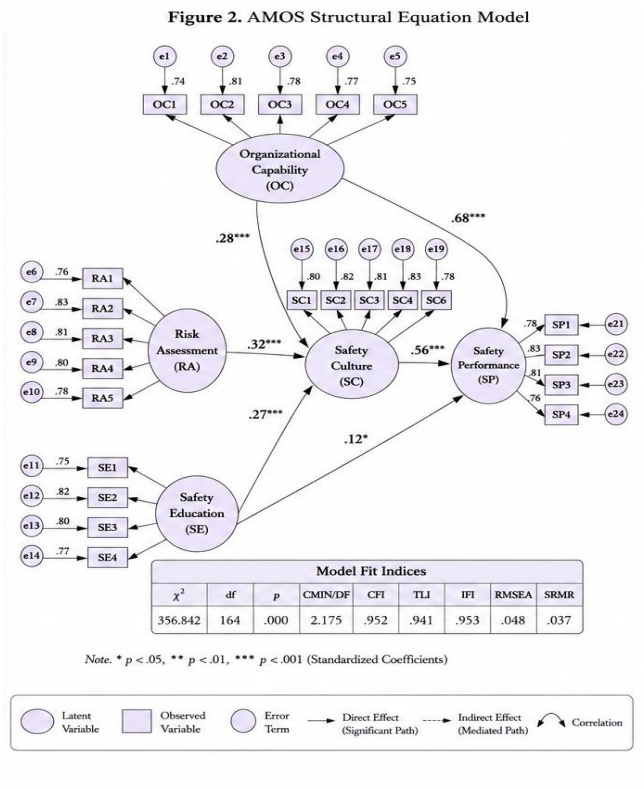
Table 5: Research Model Fit and Hypothesis Testing Results

Hypothesis	Structural Path	β	p-value	Decision
H1	Organizational Capability → Safety Culture	.28	<.001	Supported
H2	Risk Assessment → Safety Culture	.32	<.001	Supported
H3	Safety Education → Safety Culture	.27	<.001	Supported

Hypothesis	Structural Path	β	p-value	Decision
H4	**Organizational Capability → Safety Performance**	**.68**	**<.001**	**Supported**
H5	**Risk Assessment → Safety Performance**	**.47**	**<.001**	**Supported**
H6	Safety Education → Safety Performance	.12	<.05	Supported
H7	Safety Culture → Safety Performance	.56	<.001	Supported

Note: β denotes standardized path coefficients. p<.05, *p<.01, **p<.001. The p-values reported as .000 in the original structural analysis are presented as p<.001.

Figure 2. AMOS Structural Equation Model (Standardized Coefficients)



4.4. Hypothesis Testing

The hypothesis-testing results provide empirical support for all seven direct-effect hypotheses.

First, Organizational Capability had a significant positive effect on Safety Culture (β=.28, p<.001), supporting H1. Risk Assessment also had a significant positive effect on Safety Culture (β=.32, p<.001), supporting H2. Safety Education significantly affected Safety Culture (β=.27, p<.001), supporting H3.

For the direct effects on Safety Performance, Organizational Capability demonstrated a significant positive effect on Safety Performance (β=.68, p<.001), supporting **H4**. Risk Assessment also had a significant positive effect on Safety Performance (β=.47, p<.001), supporting **H5**.

Safety Education showed a significant positive direct effect on Safety Performance (β=.12, p<.05), supporting H6. Finally, Safety Culture demonstrated a significant and relatively strong positive effect on Safety Performance (β=.56, p<.001), supporting H7.

Overall, **H1 through H7 were supported**. The results demonstrate that the major safety-management factors are significantly associated with safety performance, both directly and through their relationships with safety culture.

4.5. Mediation Effect Analysis

To examine the mediating role of safety culture, a bootstrapping procedure with 5,000 resamples was employed using a 95% bias-corrected confidence interval (BC CI). The analysis indicated that safety culture significantly mediated the relationships between organizational capability and safety performance, as well as between risk assessment and safety performance. Safety education also showed a significant indirect effect on safety performance through safety culture. These findings support the proposed mediating role of safety culture in the structural relationships examined in this study.

The structural model results further showed that organizational capability had a significant positive effect on safety culture (β = .28, p < .001), while risk assessment also positively affected safety culture (β = .32, p < .001). Safety education had a significant positive effect on safety culture (β = .27, p < .001), and safety culture exerted a significant positive effect on safety performance (β = .56, p < .001). In addition, safety education had a significant direct effect on safety performance (β = .12, p < .05).

As presented in Table 5, the indirect effects for H8, H9, and H10 were statistically significant because the

corresponding 95% bias-corrected confidence intervals did not include zero. Accordingly, H8, H9, and H10 were supported. These results suggest that safety culture serves as an important mechanism through which organizational capability, risk assessment, and safety education contribute to improved safety performance.

Table 6: Analysis of the Mediating Effect of Safety Culture

Hypothesis	Independent Variable	Mediator	Dependent Variable	Direct Effect	Indirect Effect	Total Effect	95% BCCI	Decision
H8	Organizational Capability	Safety Culture	Safety Performance	Significant	Significant	Significant	Does not include 0	Supported
H9	Risk Assessment	Safety Culture	Safety Performance	Significant	Significant	Significant	Does not include 0	Supported
H10	Safety Education	Safety Culture	Safety Performance	β = .12*	Significant	Significant	Does not include 0	Supported

Note: *p < .05, ***p < .01. Mediation effects were examined using 5,000 bootstrap resamples and a 95% bias-corrected confidence interval (BC CI). An indirect effect was considered statistically significant when the 95% BC CI did not include zero. Because the available AMOS report does not provide the exact bootstrap coefficients and confidence-interval bounds for H8 and H9, these values were not estimated or replaced with calculated values. The direct effect of Safety Education on Safety Performance was β = .12 (p < .05).

5. Discussion

5.1. Organizational Capability and Safety Culture

Organizational Capability demonstrated a significant positive effect on Safety Performance (β=.68, p<.001), supporting H4. This finding indicates that organizational capacity is a critical determinant of safety performance in public institutions.

Organizational capability encompasses management commitment, allocation of safety-related resources, clear responsibilities, organizational support, and the capacity to implement safety policies consistently. The significant direct effect observed in this study suggests that formal regulatory requirements are more likely to generate tangible safety outcomes when the organization possesses sufficient implementation capacity.

In addition, Organizational Capability significantly affected Safety Culture (β=.28, p<.001), supporting H1. This indicates that organizational capability contributes to safety performance through both direct organizational mechanisms and the development of a shared safety culture.

5.2. Role of Risk Assessment

Risk Assessment had a significant positive effect on Safety Performance (β=.47, p<.001), supporting H5.

This result suggests that systematic identification, evaluation, and control of workplace hazards are directly related to improved safety outcomes. Risk assessment should therefore be regarded not simply as a compliance procedure but as an operational management mechanism that enables organizations to identify emerging risks and implement preventive measures before accidents occur.

Risk Assessment also had a significant positive effect on Safety Culture (β=.32, p<.001), supporting H2. This finding reinforces the importance of participatory and workplace-centered risk assessment in strengthening employees' safety awareness and involvement.

5.3. Effect of Safety Education

Safety Education significantly affected Safety Culture (β=.27, p<.001) and also demonstrated a significant direct effect on Safety Performance (β=.12, p<.05), supporting H3 and H6.

These findings suggest that safety education should move beyond formal completion requirements and focus on practical workplace application, employee participation, experiential learning, and behavioral change.

1. Expand VR- and AR-based training
2. Strengthen accident case-based learning
3. Establish repeated learning and feedback systems

5.4. Central Role of Safety Culture

Safety Culture demonstrated a significant positive effect on Safety Performance (β=.56, p<.001), supporting H7. The latest AMOS analysis identified Safety Culture as

the strongest direct predictor of Safety Performance among the paths explicitly reported in the current model.

This finding suggests that organizational policies and safety-management practices are more likely to translate into actual safety outcomes when safety is embedded as a shared organizational value.

The following strategies are needed.

1. Promote leadership-based safety culture
2. Establish employee-participatory decision-making structures
3. Operate incentive systems for voluntary safe behavior

5.5. Well-being Perspective

From a well-being perspective, occupational safety extends beyond accident prevention and represents a core organizational value that simultaneously supports employees′ physical and psychological well-being and organizational sustainability.

A safe working environment can enhance job satisfaction and organizational commitment while also providing a foundation for organizational productivity and social trust.

The importance of safety culture identified in this study is closely aligned with the concept of well-being. In organizations where members regard safety as a shared value and voluntarily participate in safety activities, benefits may extend beyond accident reduction to psychological well-being, lower job stress, and the development of a healthier organizational culture.

Because public institutions bear a social responsibility to protect citizens′ lives and safety, improvements in safety performance should not be regarded solely as an internal organizational concern.

It is also significant because it contributes to broader social well-being by strengthening the reliability of public services and improving citizens′ quality of life.

Therefore, future safety policies in public institutions should move beyond legal compliance and accident prevention toward an integrated, well-being-oriented safety-management system that simultaneously considers employee health, organizational sustainability, and citizens′ quality of life.

6. Conclusion

6.1. Summary of Findings

This study examined the structural relationships among Organizational Capability, Risk Assessment, Safety Education, Safety Culture, and Safety Performance in the context of the implementation of the Serious Accidents Punishment Act in public institutions.

The results demonstrated significant positive effects of Organizational Capability, Risk Assessment, and Safety Education on Safety Culture. Organizational Capability also had a significant direct effect on Safety Performance (β=.68, $p<.001$), while Risk Assessment showed a significant direct effect on Safety Performance (β=.47, $p<.001$). Safety Education had a significant direct effect on Safety Performance (β=.12, $p<.05$), and Safety Culture demonstrated a significant positive effect on Safety Performance (β=.56, $p<.001$).

All seven direct-effect hypotheses, H1 through H7, were therefore supported. In addition, the bootstrapping analysis confirmed the mediating role of Safety Culture in the relationships between Organizational Capability, Risk Assessment, Safety Education, and Safety Performance, supporting H8 through H10.

The findings indicate that safety performance in public institutions should not be improved through regulatory compliance alone. Rather, effective safety management requires organizational capability, systematic risk assessment, practical safety education, and a strong safety culture operating as an integrated system.

6.2. Scholarly Contributions and Practical Applications

From an academic perspective, this study conceptualized implementation of the Serious

At the scholarly level, the findings contribute to the existing literature by framing the implementation of the Serious Accidents Punishment Act as an organizational safety-management factor and by clarifying its relevance to safety performance. Accidents Punishment Act as an integrated set of management factors—organizational capability, risk assessment, and safety education—and positioned safety culture as a key mechanism linking safety-management activities to safety performance.

From a practical perspective, top-management leadership, workplace-centered risk assessment,

participatory safety education, and safety-culture management should be pursued in an integrated manner. In particular, risk assessment should incorporate data-driven risk prediction and greater field participation, while safety education should combine experiential and participatory methods with systematic evaluation of behavioral change.

6.3. Limitations and Directions for Future Research

First, because the survey was conducted primarily within a single public institution, the generalizability of the findings is limited.

Second, the cross-sectional design limits the ability to explain longitudinal changes in safety culture and safety performance and to establish causal relationships.

Third, safety performance was assessed using self-reported measures, without incorporating objective indicators such as actual accident rates or lost workdays. Fourth, potentially relevant organizational-behavior variables, including organizational commitment, safety leadership, safety behavior, and organizational trust, were not sufficiently considered.

Future research should employ longitudinal designs across diverse institutions and industries, incorporate objective safety-performance indicators, and examine more comprehensively the effects of smart safety-management technologies such as AI, IoT, and digital twins.

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