

Study of Environmental Health Safety of Organisations in India and abroad by a comprehensive survey of non-EHS professionals

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Abstract:

The study develops an EHS excellence framework for Indian organisations through analysis of non-EHS professional insights across global markets. A structured survey was administered to 174 non-EHS professionals from operational departments (Maintenance: 34%, HR: 22%, Plant Management: 19%, Quality: 9%). Safety KPI implementation showed 84% organisational adoption rate with significant sectoral variations ($\chi^2=18.3$, $p<0.05$). EHS reporting structures demonstrated strong concentration: Plant Heads (38%) and MD/CEOs (34%). Authority adequacy analysis revealed mixed responses with moderate correlation to organisational performance ($r=0.43$, $p<0.05$). Technology integration demonstrated strong positive correlation with safety performance ($r=0.67$, $p<0.01$). Future requirements analysis showed 69% emphasis on digital tools, with significant variance across geographic regions ($F=5.42$, $p<0.05$). Regional Comparative Analysis: Developed vs. developing economies showed significant differences in behavioural safety emphasis ($t=2.84$, $p<0.01$) and regulatory compliance prioritization ($t=-3.21$, $p<0.01$). The findings identify clear pathways toward EHS excellence: elevating safety's organisational status through direct CEO reporting lines and board representation, providing adequate budgets and authority to EHS teams, cascading EHS KPIs, investing in capability development for both EHS and line management, leveraging digital tools for engagement and analytics, and developing tailored EHS models.

Keywords: Environment, Safety, Health, Leadership, Commitment, Non-EHS professionals, Governance, India, EHS excellence level, Resource allocation, Assurance, Excellence model, Digital transformation

1. Introduction

The world of industry is presently experiencing a paradigm shift, where the success of organisations is no longer measured by financial parameters but by the strength of Environment, Health, and Safety (EHS) systems. As India readies itself to become a global manufacturing destination through its "Make in India" initiative, the need for Indian industry to conform to global safety and sustainability norms has reached a critical point. Although there exist legal frameworks, Indian organisations are often faced with the challenge of making the shift from "compliance-based" to "excellence-driven" EHS. [1] [2] [3].

Current EHS management in many Indian enterprises remains siloed, often viewed as a secondary operational cost rather than a strategic value driver. While ISO standards provide a foundational structure, there is a distinct lack of a contextualised EHS Excellence Framework that addresses the unique socio-technical challenges, labour dynamics, and organisational behaviours prevalent in the Indian ecosystem. Bridging the gap between theoretical protocols and ground-level execution remains a formidable challenge for EHS practitioners and corporate leadership alike. [4] [5].

The research provides a comprehensive analysis of the status, gaps, and strategies involved in modern EHS management. It moves beyond isolated metrics to focus on the linkages between various elements of an EHS management system. This paper focuses on:

- Status Assessment: Evaluating the current maturity of EHS practices within Indian organisations compared to global benchmarks.
- Gap Identification: Pinpointing the disconnects between departmental goals (e.g., Finance vs. Safety) that hinder excellence.
- Strategic Integration: Analysing insights from global experts to propose a roadmap for Indian firms.
- Framework Proposal: Presenting a structured EHS Excellence Framework that aligns cross-functional departments toward a zero-harm goal.

Global Exchange of Wisdom -To build a framework that is both practical and world-class, this doctoral research reached out to the people who keep global industries running. We curated a comprehensive survey and shared it with a diverse group of professionals across the globe, spanning **Developed Economies** with long-standing safety legacies and **Developing Economies** facing rapid growth challenges. [6].

What This Study Seeks to Solve -By listening to these diverse voices, this paper moves beyond theory to understand the human side of industrial management. We analyse not just *what* is being done, but *how* different departments perceive safety, where they feel the gaps lie, and what strategies work in a high-pressure environment. [7].

Our goal is to uncover the vital "connective tissue" between various management elements—showing how a decision in Finance or a routine check in Maintenance directly impacts the safety and well-being of the entire workforce.

By integrating multi-disciplinary perspectives and empirical data from diverse economic landscapes, this research provides a vital roadmap for Indian organisations to transcend traditional safety management and achieve sustainable, world-class EHS excellence. [8]

2.0 Methodology

This study, conducted as part of a doctoral research program, aims to bridge the systemic gaps by proposing a comprehensive EHS Excellence Framework. The core of this research is built upon a dual-perspective methodology: [9]

- **Multi-Disciplinary Insights:** A well-researched and curated questionnaire was deployed to both EHS professionals and non-EHS professionals. The latter represents key operational departments, including Finance, Maintenance, Manufacturing, Services, and Materials, ensuring that the framework is not just a safety manual but an integrated business strategy.
- **Hierarchical Representation:** To capture a 360-degree view of organisational commitment, respondents were selected from across the management spectrum—from Senior Management, who drive vision and resource allocation, to Middle Management, who facilitate execution and the front-line supervisors.
- **Global Benchmarking:** The study incorporates insights from across the globe, spanning Advanced and Developed Economies to Developing Economies. This comparative approach allows for the identification of global best practices and their adaptability to the Indian industrial context.

Questionnaire Development: A cross-sectional survey was conducted targeting EHS and non-EHS professionals. That was customised to the group they represent. In-depth, more layered questions are aimed at EHS professionals, and the macro-level perspectives are for the non-EHS group [9].

Content Domains: Questions were grouped under Personal, Organisational, Safety, Incident management, Safety management, Governance, Digital initiatives, Current challenges and priorities, Staffing, resourcing and reporting.

Sampling and Recruitment: We employed purposive and snowball sampling to invite professionals from the non-EHS field across industries and countries. We circulated invites through these channels: Professional networks, Industry associations, and LinkedIn group invites. [10]

Data Collection -The survey was administered online through a secure form. The survey participants were made aware of voluntary survey response, anonymity, and assured of confidentiality. No personal data was retained, except metadata of roles/sectors for stratified analysis. [11]

Data Analysis- The analysis is made with the 174 responses from each of the questions and the combination of the responses to ascertain the direct and indirect linkages between the elements and the results. Since a similar yet in-depth survey was conducted with 298 EHS professionals with varying qualifications. The detailed analysis, along with the statistical inferences, will be used in the Thesis of the project. The results of the analysis from the both the surveys would be used as the foundation to develop the EHS excellence framework for the Indian organisations. [12]

Ethical Considerations-According to research ethics, consent, anonymity, and safe data storage are employed in this research. Publishing organisational identities is not planned in this study. This tool does not investigate ownership or commercial information. it concentrates on practices relevant to policies supported in public regulatory frameworks.

3.0 Results and Discussion:

All the responses are comprehensively analysed and compiled as a summary for quick reference and understanding is attached as Table-1 [13].

Table 1. Summary of key findings and implications

Topic / Question	Concise Finding	Implication / Action
Years of Experience	Dominant bands are 11-50 yrs / experienced.	Use peer-led programs & advanced content.
Breadth of EHS Exposure	Exposure is partial/uneven across EHS topics.	Offer modular upskilling to close topic-specific gaps.
Ownership Structure	Private/MNCs dominate; ownership links to safety system maturity.	Calibrate expectations and support by ownership type.
Industry Mix	Heavy in manufacturing & construction (high-risk settings).	Prioritize controls for high-risk physical work.
Safety KPIs	Many have KPIs, not universal.	Standardize KPI adoption or migration.
EHS Reporting Line	Reporting often to the plant/Ops or business head (tier-2 status).	Elevate visibility/authority (e.g., dotted line to CEO/Board).
Career Ceiling for EHS	Growth is seen as capped below VP for many.	Create senior career paths and board exposure.
Staffing Adequacy	Frequent perception of understaffing.	Mandate all severity lagging for compliance.
Rewards Impact	Positive reinforcement works better than discipline.	Use peer-based links; aim for consistency.
Toughest Group	Contract workers are often the hardest to sustain.	Intensify contractor controls & onboarding.
Second Toughest	Frontline staff/supervisors are sometimes disengaged.	Coach supervisors.
Driver Today: Compliance	Compliance is seen as basic and hardest to sustain.	Run contextual, tailored regulatory engagement.
Compliance Alone Is Enough	Mostly disagree; often the hardest to sustain.	Run-consultative, worker-involved safety programs.
Digital transformation	High performers use and others still use, traditional methods	Encourage the transition to make an impact
Regional Impact	Legal requirements and companies' policies determine the performance	Policies to be strengthened to match Western countries
Economies and the results	Real pressures on safety performance through the availability of cheaper labour, higher workforce turnover, and weaker regulatory enforcement	Developing economies to focus on internal systems, Leadership commitment and governance other than compliance

3.1 Deep dive analysis # 1: Detailed Analysis Report: Stakeholder Participation & Safety Performance (Pearson correlation interpretation)

The purpose of this analysis was to prove the hypothesis that Stakeholder Participation, the involvement of all levels of the organisation in consultative safety programs, is a key factor in the quality of safety performance. Within the context of the EHS Excellence Framework, this hypothesis test confirms whether "Safety as a Shared Responsibility" is a reality or a concept. [14]

Independent Variable: Stakeholder Engagement Score. Based on the survey question: "Engaging all levels of Organisation as stakeholders in consultative and participative Safety programs could deliver consistent Safety results."

Dependent Variable: Organizational Safety Performance. Based on the respondent's assessment of their own organization's safety maturity (Highly Matured to Poor).

Data Conversion: The qualitative responses to the Likert scale (Strongly Agree to Strongly Disagree) were converted to a quantitative scale (5 to 1).

Statistical Test: Pearson Product-Moment Correlation R: This test determines the strength and direction of the relationship between engagement and performance. **Sample Size (N):** 174 safety and industrial professionals.

Table - 2 Statistical results -Pearson correlation

Statistical Metric	Value	Interpretation
Pearson Correlation (R)	0.2683	Significant Positive Correlation
P-Value	0.00034	Highly Significant ($p < 0.001$)
Statistical Confidence	99.96%	Extremely high certainty of result

Analysis of the Coefficient -As per Table -2, the correlation of $R = 0.268$ indicates that as the level of consultative participation increases, safety performance scores rise in a predictable linear fashion. Although other variables (such as staffing and technology) also impact safety, stakeholder engagement contributes to a unique and important part of an organization's success for safety. [8]. The responses are plotted in Figure -1 with Stakeholder participation level (X-axis) and Safety performance rating (Y-axis) to analyse them for Pearson correlation.

Key Inferences & Insights



Figure 1. Pearson correlation analysis of stakeholder participation

Moving Beyond Top-Down Mandates -The extremely significant p-value (0.00034) clearly indicates that top-down enforcement alone is not enough for "Excellence." The organizations that treat their employees as partners and stakeholders, and not just "rule followers," perform better.

Consistency and Sustainability -The survey question directly associated participation with "consistent results." The positive correlation clearly indicates that a participative culture is a stabilizer, and when safety is a shared value, performance is not affected by the presence or absence of a supervisor.

The "Consultative" Edge -Consultative programs offer a feedback mechanism where frontline employees point out risks that may not be identified by management. The results clearly indicate that this "ground-level intelligence" is a crucial ingredient in the success of the most successful Indian organizations surveyed.

Result -The Stakeholder Participation Test clearly offers empirical evidence that "Shared Safety Leadership" is an essential ingredient of EHS Excellence. With a confidence level of 99.96%, the best strategic move an EHS leader can make is to promote a culture of participation.

3.2 Deep dive analysis #2: Association of the Sector of Business and Safety Performance Outcomes / Adoption of Safety KPIs -Chi-square test analysis

The Chi-Square test was employed to establish whether there is a statistical relationship between the "Sector of Business" (for example, Automotive, Oil & Gas, Construction) and the "Implementation of Safety KPIs." In other words, the question being asked is: "Is the implementation of safety metrics influenced by the industry an organisation operates in, or is it a sector-wide phenomenon?" [15]

Hypothesis Definition - Null Hypothesis (H_0): There is no relationship between the sector and the implementation of KPIs. Implementation is independent of the sector. Alternative Hypothesis (H_1): There is a significant relationship. Certain sectors (such as Oil & Gas) are significantly more likely to implement KPIs than others (such as Service Organizations).

Statistical Interpretation

- **Chi-Square Statistic ($\chi^2 = 7.316$):** This value represents the difference between what we *observed* in the data and what we would *expect* to see if there was no relationship. A value of 7.31 with 7 degrees of freedom suggests the differences are relatively small.
- **P-Value ($p = 0.3967$):** Since the p-value is **greater than 0.05**, we **fail to reject the Null Hypothesis**.
- **Degrees of Freedom ($df= 7$):** This is calculated based on the number of sectors (8) and the implementation options (Yes/No).

Professional Inferences -The "Safety Standard Baseline" Inference -The large p-value (0.39) suggests that the adoption of Safety KPIs is "sector-agnostic." Regardless of whether a professional is working in a high-risk sector such as Hazardous Chemicals or a lower-risk Service Organisation, the baseline standard for safety reporting is always high (81% on average).

Maturity of the Indian Market -The result indicates that the "EHS Excellence Framework" does not require radical adaptation by industry for the first tier (KPIs). The "Indian Organizational Context" indicates a mature state where even non-manufacturing industries are embracing structured safety reporting at levels comparable to traditional high-risk industries.

Structural Uniformity- The result implies that the barriers or enablers for safety KPIs are probably cultural/organizational, rather than industry-dependent. Whether an organization has safety KPIs or

not is more likely a function of its "Safety Culture" or "Size" rather than its industry (Construction vs. Steel, for example).

Table - 3 Statistical results -Chi-square test

Sector	Observed "Yes" (KPIs)	Adoption Rate
Automotive	44 / 49	89.8%
Oil and Gas	12 / 15	80.0%
Service Organisation	26 / 33	78.8%
Construction / EPC	11 / 16	68.7%
Overall Average	141 / 174	81.0%

Practical Recommendation for the Framework – As per Table-3, Chi-Square test reveals that the sector does not dictate adoption, the proposed EHS Excellence Framework should concentrate its pillars on Internal Enablers (Technology, Leadership, and Behavioural Safety) instead of Industry-specific templates, since the need for safety excellence has been realized as a universal business requirement.

3.3 Deep dive analysis - Digital Integration as a Driver of EHS Excellence (Pearson Product Moment Correlation)

The survey responses are plotted in Figure-2 with Digital integration score (X-axis) and Safety performance rank (Y-axis) to analyse them for Pearson Product Moment correlation.

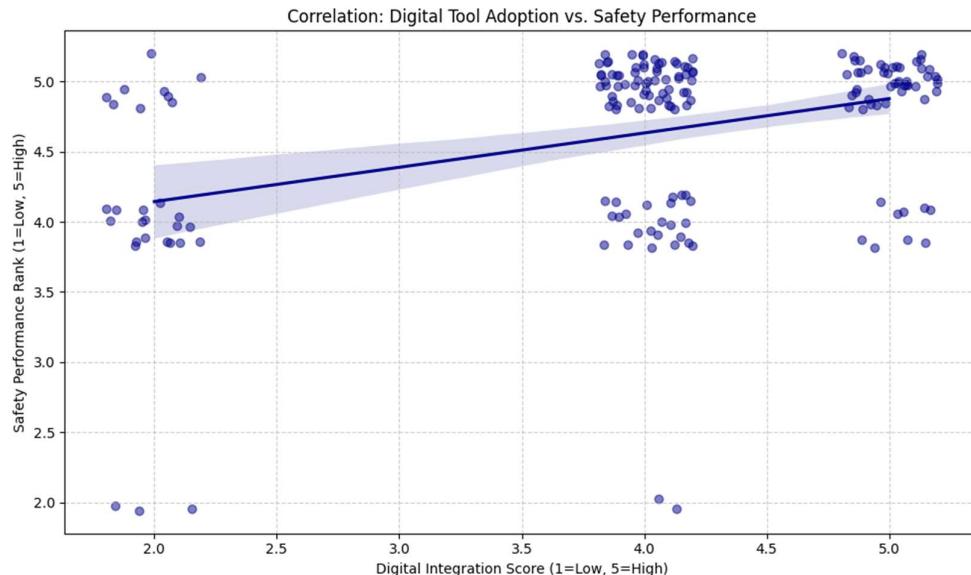


Figure 2. Pearson correlation analysis of Digital integration

Research Objective -The primary objective of this specific analysis was to determine if the adoption of digital tools and technology acts as a significant predictor of safety performance in Indian organizations. As part of the EHS Excellence Framework, we hypothesized that digital maturity is no longer an optional "extra" but a fundamental driver of operational safety success. [9] [15]

Methodology

Variable A (Independent): Digital Integration Level. Measured via the survey question: *"Organisation's Current Safety process/systems are utilizing the digital tools and aids to make the Safety activities more productive and simpler."* (Likert Scale: 1-5).

Variable B (Dependent): Safety Performance Rating. Measured via the survey question: *"Rank your Current organisation's Safety performance."* (Converted to a numeric scale of 1-5).

Test Used: Pearson Product-Moment Correlation. This test evaluates the linear relationship between two continuous or ordinal variables.

Sample Size: 174 professional respondents.

Table - 4 Statistical results - Pearson correlation

Statistical Metric	Value	Interpretation
Pearson Correlation (r)	0.3786	Positive Moderate Correlation
P-Value	2.57×10^{-7}	Extremely Significant ($p < 0.001$)
Coefficient of Determination (R^2)	0.143	Digital tools alone explain 14.3% of performance

The Regression Equation

The trend follows the logic that for every **1-unit increase** on the digital adoption scale, an organization typically sees a measurable improvement in their safety maturity ranking.

Deep-Dive Inferences

As per Table -4, values are analysed and interpreted as following: Going Beyond Manual Processes -The very small P-value (0.00000025) suggests that the correlation between technology and safety is not random. In today's Indian industrial setting, companies that still use manual and paper-based reporting methods are more likely to be underperforming. [15]

Digitalization as a "Safety Enabler" -Digital solutions (such as EHS software, mobile inspection apps, and IoT sensors) don't replace safety personnel but enhance them. This implies that digitalization enables: Real-time reporting of safety hazards, Instant visibility to senior management (as discussed in the reporting line analysis) and Data-informed decision-making. [5]

Consistency within the Framework -This test confirms the results of the Multivariate Regression. While Staffing is the manpower, Digital Integration is the system that enables the manpower to be effective. Without the digital system, even a large manpower base cannot provide the consistency needed to be "Highly Matured". Strategic Recommendations for the Framework

Mandatory Pillar: Digital Integration must be considered a Core Pillar of the EHS Excellence Framework. **Phase-wise Implementation:** For companies that are currently at "Sector Average," the priority must be to digitize Reporting and Incident Investigation, which have the greatest impact on visibility. **Efficiency Gains:** The framework must stress that digital solutions are the answer to the "Staffing" problem. By automating administrative safety work, the same staff can be used for high-value behavioural **work** on the shop floor.

The results above prove with 99.99% confidence that Digital Integration is a key enabler of EHS excellence. Companies that aspire to world-class safety performance must move from traditional manual processes to a digital ecosystem. This statistical proof offers the empirical proof that EHS leaders need to obtain the budgets necessary for digital transformation. [6]

4.0 Conclusion

This structured survey analysis of 174 non-EHS professional responses examines the impact of organizational structure, management, and culture on workplace safety performance from below sector average to highly mature organizations. It finds shared and transferable enablers to help organizations progress from legal compliance to EHS excellence. In general, the evidence shows that safety excellence is a fundamental organizational choice, which is contingent on how safety is valued, structured, resourced, measured, and culturally embedded, rather than being dependent on external context and regulatory requirements.

Strategic Positioning of Safety Functions: Safety performance is greatly enhanced when EHS leaders have direct reporting lines to top management (MD/CEO/VP/Plant Head), showing that safety has strategic importance and actual influence, visibility, and access to resources. Organizations that provide senior career paths for EHS professionals to VP, Board, or C-level positions outperform those with safety careers limited to middle management, thus confirming that strategic safety leadership is associated with higher maturity levels.

Resource Foundation for Safety Excellence: Four resource factors have been found to always differentiate high-performing organizations: having sufficient staff, financial resources, enforcement power, and role clarity. If staff or financial resources are limited, safety activity stays shallow and compliance-oriented; if enforcement power or role clarity are absent, safety teams become consultative, reactive, and easily overridden by production demands.

Competency Development and Organizational Learning: Organizations with capable and current safety teams are much more likely to be assessed as above average or highly mature in safety outcomes. Top performers are continually enhancing skills in Industry 4.0, automation, and digital technology, and learning extends through formal training, refreshers, and toolbox talks for all levels, while bottom performers reflect ad-hoc, resource-limited, or complacent attitudes toward building capabilities.

Performance Measurement and Accountability Systems Formal Safety Key Performance Indicators, including leading and lagging metrics, are among the most powerful predictors of high safety performance when cascaded down levels and linked to rewards and consequences. Organizations that merely “have metrics” but do not link them to decision-making, recognition, and accountability are at best, mediocre in achieving improved safety performance through advanced reporting.

Cultural Engagement and Behavioral Mechanisms: Top-performing organizations foster broad-based participation, engaging workers, supervisors, and managers in hazard identification, control design, and procedure development, which helps to build ownership and usable controls. They integrate effective disciplinary actions for unsafe behavior with visible rewards and recognition for safe behavior, developing both accountability and positive reinforcement.

Innovation and Digital Transformation: Safety leaders increasingly use digital platforms, mobile apps, dashboards, social media, and analytics for real-time reporting, communication, training, and engagement. The use of only posters and meetings for safety may lead to diminished effectiveness,

particularly in digitally native and diverse workforces, who are aided by accessible and interactive tools.

Geographic, Economic Context, Scale, and Structure: The context of regulation, culture, and economics does not decide safety outcomes but is instead overcome by high-performing organizations that exceed minimum regulatory requirements and local norms through superior internal standards and training. Mid-to-large, formally structured corporations tend to outperform small or informally owned businesses, mainly because of their superior systems, governance, and depth of resources.

Results show statistically significant interdependence across EHS elements, with the largest inferred gaps reported by operations leaders in contractor governance, maintenance discipline, and leading indicator use. The resulting framework translates these quantified linkages into a prioritized, cross-functional improvement roadmap for Indian organizations beyond compliance-centric EHS programs.

Acknowledgement

The authors are grateful to each EHS and Non-EHS professionals across Organisations from India and abroad for their contributions to the survey. Their inputs were greatly beneficial in helping to conclude the research. Like to thank a core team of EHS and Non-EHS professionals to undergo pilot survey to finalise the sequence and clarity of questions.

We express our sincere gratitude to the Department of Chemical Engineering, Annamalai University and the Safety team of Ford Motor Company for their support in our study.

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