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PESTLE Factors Affecting Project Management Efficiency in India's Steel Industry: A QUEST-Based Urgency–Impact Analysis

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Abstract
The aim of this study is to identify and prioritise important external drivers that influence project results by examining the impact of macro environmental factors on project management efficiency in India's steel sector. The study, which is based on the QUEST (PESTLE-based) framework, uses a structured questionnaire to gather information from experts in the field with a range of positions and degrees of experience. The correlations between variables are examined and components are categorised according to their relative importance using sophisticated analytical tools such as factor analysis (Principal Component Analysis with Varimax rotation), multiple regression, ANOVA, and an Urgency–Impact matrix.
The results show a clear six-factor structure that includes political, economic, social, technological, legal, and environmental aspects, all of which have a major impact on the effectiveness of project management. All macro environmental aspects have a considerable impact on project management efficiency, with legal and environmental factors having the biggest effects, according to regression and ANOVA data. The Urgency-Impact approach also emphasises that while certain elements require strategic or operational focus, others, like land acquisition, environmental restrictions, political stability, and price swings, require immediate managerial attention. Prioritisation is also greatly influenced by urgency, and even while perceived impact is modest, it has a considerable impact on improving project outcomes.
In order to proactively evaluate macro environmental threats and facilitate dynamic decision-making, the study suggests integrating AI-driven predictive analytics and real-time monitoring systems. This research provides a thorough framework for enhancing project performance in complex and uncertain industrial situations by fusing theoretical rigour with practical applicability. Readers are encouraged to investigate its findings for both academic progress and management application.

Keywords: *Macro Environmental Factors, PESTLE Analysis, Project Management Efficiency, QUEST Framework, Urgency–Impact Matrix, Project Prioritization*

1. Introduction

The necessity of the current study stems from the increasing significance of bolstering core sectors in order to establish India as a worldwide economic superpower. Among these, the steel sector is crucial since it is the foundation for industrial growth, infrastructure development, and national competitiveness. It is a major force behind economic development and independence due to its contributions to industries including manufacturing, transportation, energy, and construction. The effectiveness of project management in the steel industry is essential for guaranteeing on-time delivery, cost optimisation, and sustained growth as India moves closer to being a developed country.

The idea that the world is one family, or *Vasudhaiva Kutumbakam*, is also a fundamental component of India's development ideology. Through collaboration, sustainability, and shared wealth, this viewpoint stresses not only national development but also collective worldwide advancement. In this regard, increasing the efficiency of steel sector projects is not only economically necessary but also a step toward supporting infrastructure resilience and global development. However, political, economic, social, technological, legal, and environmental considerations form the complex macro environment in which steel projects operate, which frequently results in delays, cost overruns, and operational difficulties. The most important external effects must be identified and prioritised in order to address these problems in a methodical and planned manner. In order to assess the macro environmental factors influencing project management efficiency in India's steel industry, especially in India, this study uses a QUEST-based urgency-impact analysis. In line with India's larger objective of sustainable and equitable global growth, the research attempts to offer practical insights that improve project performance. In line with the aims of the study on QUEST factors affecting project management efficiency in India's steel industry using an urgency–impact approach, the following research question is formulated:

RQ1: How do political, economic, social, technological, legal, and environmental factors individually affect project management efficiency in steel sector projects?

RQ2: Which macro environmental factors fall under critical priority, strategic, operational, and low-priority categories based on the urgency–impact matrix?

RQ3: How can project managers in the steel sector utilize urgency–impact prioritization to improve decision-making and project outcomes?

The study's research objectives are formulated as:

- To identify key political, economic, social, technological, legal, and environmental factors affecting project management efficiency in steel sector projects.
- To assess the urgency and impact of macro environmental factors on project management efficiency.
- To propose a decision-support framework integrating QUEST analysis with urgency–impact prioritization for enhancing project outcomes.

The current study's remaining portions are organised as follows. With a focus on urgency and impact perspectives, Section 2 offers a thorough analysis of pertinent research on macro environmental (QUEST) factors and their impact on project management effectiveness in the steel industry. The research design, data collection methods, construct measurement, and the use of statistical techniques like factor analysis and regression/structural modelling are all described in Section 3. The data analysis and empirical results, including the outcomes of the urgency–impact matrix, factor analysis, and hypothesis testing, are presented in Section 4. Section 5 concludes by discussing the results in light of previous research, highlighting important theoretical and managerial ramifications, and offering tactical suggestions for improving project management effectiveness in India's steel industry.

2. Literature Review

External macro environmental factors have a major impact on project management performance in capital-intensive industries like steel. These elements, which together influence project planning, execution, and control in the context of India's steel industry, include political, economic, social, technological, legal, and environmental aspects. Because large-scale steel projects are extremely vulnerable to changes in regulations, market dynamics, resource availability, and technical breakthroughs, it is imperative to comprehend the role of these variables.

2.1.1 Political Factors

By establishing industrial priorities, investment incentives, and regulatory frameworks, government policies have a significant impact on how projects are carried out in the steel industry. According to studies, supporting industrial policies increase project viability and lower regulatory uncertainty, which boosts project efficiency(Shen & Stewart, 2025). Because changes in tariffs and trade barriers impact the availability and cost of raw materials, import-export rules can have an impact on project timing and cost structures. According to research, trade restrictions can cause supply chain disruptions and postpone project completion dates(Thor et al., 2025). Additionally, by lowering financial burdens and promoting private investment, government incentives and subsidies support large-scale steel and infrastructure projects(Aramali et al., 2025). Political stability is also crucial since stable policies minimise the risks associated with policy changes and guarantee continuity in long-term projects. Incentives and policy stability work together to produce a climate that is conducive to project execution, demonstrating the combined impact of political factors on the effectiveness of project management(Bhattacharjee et al., 2016).

2.1.2 Economic Factors

In the steel sector, economic factors have a big impact on project planning and financial sustainability. Project budgeting, cost estimation and profitability are all directly impacted by changes in steel pricing(Ziebell et al., 2025). Studies on commodities markets show that price volatility adds uncertainty to project planning and calls for effective financial risk management techniques(Zheng & Zwikael, 2025). High interest rates limit access to money for large-scale projects by raising borrowing costs, which further affects project funding. In addition, infrastructure development stimulates growth and investment by serving as a major demand driver for steel projects(Aramali et al., 2025). However, because of decreased demand and budgetary limitations, economic downturns can cause projects to be postponed or cancelled. Price volatility, financing costs, and market demand all work together to generate a dynamic economic environment that has a big impact on project management effectiveness(Melo et al., 2015). These results are consistent with macroeconomic theories that highlight the importance of stable financial conditions for the effective completion of projects(Aramali et al., 2025).

2.1.3 Social Factors

The human and community aspects of project management in the steel industry are influenced by social considerations. Because steel production necessitates specific technical knowledge, the availability of trained labour is a crucial factor in determining project efficiency(Sukolkit et al., 2024). According to research, having a qualified team increases output and decreases project delays(Cregan et al., 2024). Because disagreements and negotiations can impact project schedules and operational continuity, labour union activities also have a big impact on industrial relations. Additionally, by reducing accidents and guaranteeing adherence to safety regulations, worker safety awareness enhances project performance(Rainbolt et al., 2019). Another crucial element is community support, especially for big industrial initiatives that need local participation and acceptance. Research indicates that initiatives with high levels of community involvement have more operational stability and fewer disruptions(Han et al., 2018). The interplay of community support, safety culture, and labour availability highlights the significance of social elements in attaining project management efficiency.

2.1.4 Technological Factors

The steel industry's project management procedures have changed as a result of technological developments. By decreasing human intervention and increasing process efficiency, the use of automation technology boosts productivity. According to research, automation greatly shortens project timeframes and lowers operational errors(Bhattacharjee & Nikita, 2014). Real-time monitoring and decision-making are made possible by digital project management technologies, which also improve collaboration and communication among project stakeholders(Bahety et al., 2022). By maximising resource use and cutting waste, technological advancements—such as enhanced production systems—contribute to increased project efficiency. Furthermore, working with international technology partners gives businesses access to cutting-edge solutions and best practices, improving project results(Chaulagain et al., 2021). Steel firms get a competitive edge by managing complicated projects more successfully thanks to the combined effects of automation, digitalisation, and technical collaboration. These results highlight how important technology innovation is to increasing project management effectiveness(Jiang et al., 2022).

2.1.5 Legal Factors

The regulatory framework that steel industry projects operate under is established by legal criteria. Project schedules are greatly impacted by environmental regulations since compliance requirements frequently call for stringent standards and complicated approval procedures(Thor et al., 2025). According to studies, regulatory compliance can raise project costs and prolong implementation times, even if it is crucial for sustainability(Jahandideh, 2025). By controlling pay, working conditions, and employee rights, labour laws also have an effect on workforce management and project execution. For large-scale projects, land acquisition restrictions provide a substantial barrier because permission delays can have a major impact on project schedules(Cregan et al., 2024). Additionally, adhering to industrial safety regulations lowers operating risks and guarantees worker protection. Project management methods are shaped by the complex legal environment created by the interplay of labour, land, and environmental regulations. Effective legal compliance increases project credibility and lowers the risk of interruptions, according to research(Sukolkit et al., 2024).

2.1.6 Environmental Factors

Growing worries about sustainability and climate change have made environmental factors more significant in the steel sector. Because businesses must use cleaner technology and cut emissions, carbon emission standards have an impact on project design and operational strategy. According to studies, strict environmental laws promote sustainability and creativity in industrial initiatives(Zheng & Zwikael, 2025). Project cost structures are also impacted by waste management and recycling standards, which call for expenditures in sustainable operations(Omar et al., 2025). Another important element influencing project viability and planning is the accessibility of natural resources like coal, iron ore, and

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water. Additionally, by encouraging resource efficiency and eco-friendly practices, environmental sustainability standards have an impact on long-term project strategy(Nur Aini & Lutfi, 2019). Concerns about sustainability, resource availability, and regulatory pressure all work together to highlight how crucial environmental considerations are to project management(Sellappan et al., 2013). According to research, companies that implement sustainable practices see increases in stakeholder trust and operational efficiency(Padhi et al., 2024).

2.2 Research Gaps

The majority of the literature currently available on project management in the steel sector has used conventional frameworks like PESTLE to analyse macro environmental factors with an emphasis on determining how they affect project performance. Nevertheless, the majority of research continue to be descriptive in character and do not offer a methodical way to rank these elements according to their relative significance. Furthermore, little research has been done in the context of India's main steel industries, which face particular resource-based, economic, and regulatory problems. Studies using an organised framework for decision-making that integrates environmental analysis and prioritisation strategies are particularly lacking. In order to close this gap, the current study uses a QUEST-based Urgency–Impact analysis, which rates macro environmental elements according to their impact on project management efficiency and immediacy. By highlighting crucial elements that need to be addressed right now, this method gives decision-makers a more pragmatic and strategic viewpoint and advances both academic research and business practice.

3. Research Methodology

3.1 Conceptual Model

Through a systematic prioritisation process, the conceptual model (Fig. 1) demonstrates the connection between macro environmental elements and project management effectiveness in India's steel sector. The six main elements of the model—political, economic, social, technological, legal, and environmental factors—are represented by particular variables that have an impact on project execution. An urgency-impact prioritisation framework, which divides these issues into four categories—critical priority, strategic, operational, and low-priority factors—is used to systematically examine them. The most important external factors that need managerial attention right away are identified with the use of this prioritisation. Performance indicators like cost, quality, time, safety, and sustainability are used to quantify the overall influence of the categorised aspects on project management efficiency. Therefore, by connecting environmental studies with decision-making goals, the model offers an integrated approach that makes project management in the steel industry more efficient and strategic.

3.2 Research Hypothesis

Direct Effect Hypotheses

- **H1a:** Political factors significantly influence project management efficiency.
- **H1b:** Economic factors significantly influence project management efficiency.
- **H1c:** Social factors significantly influence project management efficiency.
- **H1d:** Technological factors significantly influence project management efficiency.
- **H1e:** Legal factors significantly influence project management efficiency.
- **H1f:** Environmental factors significantly influence project management efficiency.

Urgency–Impact Hypotheses

- **H2:** The perceived urgency of macro environmental factors significantly influences their prioritization.
- **H3:** The perceived impact of macro environmental factors significantly affects project management efficiency.
- **H4:** Factors categorized as high urgency–high impact (critical factors) exert a stronger influence on project management efficiency than other categories.

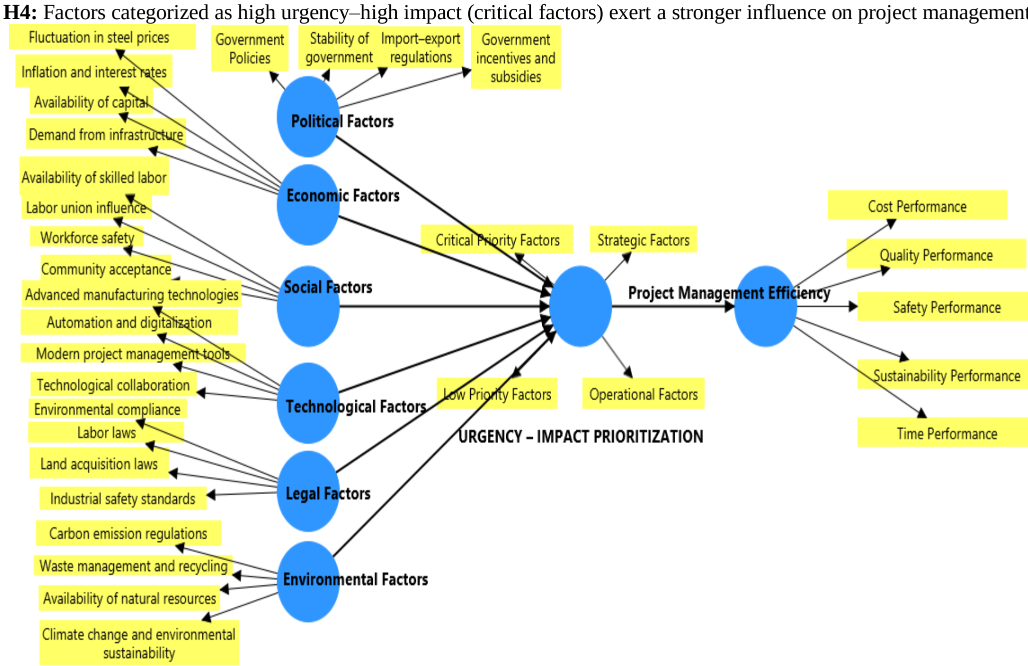

Fig. 1 Conceptual Model

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3.3 Research Design

The current study uses a descriptive research strategy to methodically investigate how macroenvironmental (QUEST) elements affect project management effectiveness in the steel sector. Project managers, engineers, planning and control executives, operations managers, and contract/procurement officers are among the respondents selected from the Indian steel industry for the study because they have pertinent experience and useful insights into project execution and environmental challenges. To guarantee sufficient representation of various professional categories within the population, a stratified random sample technique is used, which improves the findings' dependability and generalisability. The sample size was determined using G*Power 3.1 software (Fig. 2). An a priori power analysis was conducted for multiple regression (fixed model, R^2 deviation from zero) with an effect size of 0.15, significance level of 0.05, power of 0.95, and six predictors. The analysis suggested a minimum sample size of approximately 146 respondents. However, to enhance the robustness and generalizability of the findings, a total of 210 responses were collected. A systematic questionnaire is used to gather data, and SPSS software is used for analysis. Regression analysis is used to look at causal relationships, factor analysis is used to validate the underlying constructs, and QUEST-based urgency-impact analysis is used to prioritise macro environmental factors. A thorough evaluation of the importance and ranking of environmental elements influencing project management effectiveness is made possible by this integrated method.

3.4 Instrument Development

A detailed examination of the literature on macro environmental (QUEST) elements and project management efficiency served as the foundation for the development of a structured questionnaire. The three sections of the instrument were meant to measure QUEST factors, collect demographic information, and evaluate project management effectiveness and urgency-impact. Each of the constructs—Political, Economic, Social, Technological, Legal, and Environmental factors—had measurement items that were modified from previous research and applied to the steel sector(Table 1). Time, cost, quality, and resource utilisation were among the indicators used to measure the dependent variable, project management efficiency. All construct elements were scored on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree), while urgency and impact were measured on a 5-point scale from very low to very high. Expert assessment by academics and business professionals guaranteed the instrument's content validity, and factor analysis was used to evaluate its construct validity. Cronbach's Alpha was used to assess the scale's reliability; readings over the acceptable level of 0.70 confirmed the instrument's internal consistency.

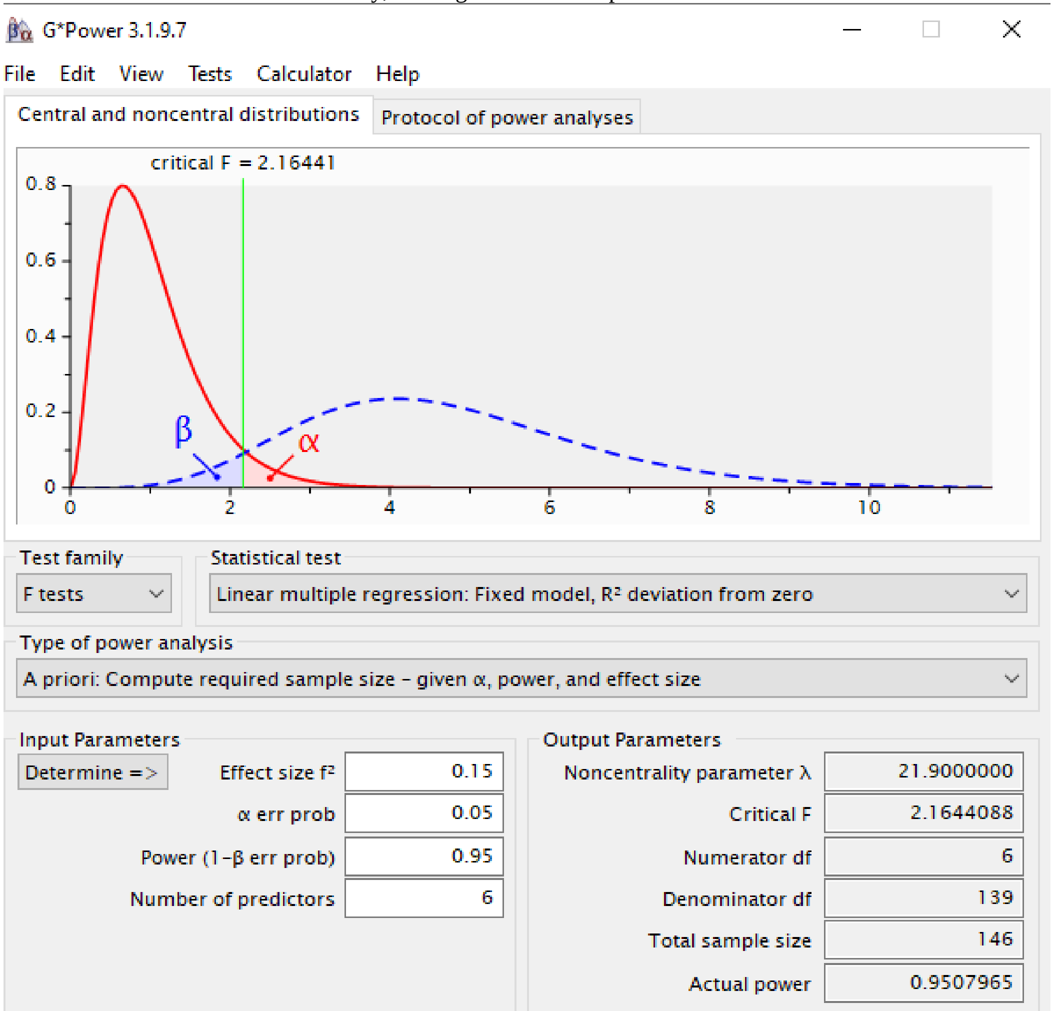

Fig. 2 Sample Size Determination

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Table 1 Construct Measurement and Scale Items

Construct	Variable	Measurement Items (Scale Statements)	Source(s)
Political Factors	Government Policies	Government policies support efficient execution of steel projects.	Shen & Stewart (2025)
	Import–Export Regulations	Import–export regulations significantly affect project cost and scheduling.	Thor et al. (2025)
	Government Incentives	Government incentives encourage large-scale steel project implementation.	Aramali et al. (2025)
	Political Stability	Political stability ensures continuity in long-term steel projects.	Bhattacharjee et al. (2016)
Economic Factors	Steel Price Fluctuations	Fluctuations in steel prices affect project budgeting and cost control.	Ziebell et al. (2025)
	Interest Rates	High interest rates negatively affect project financing.	Zheng & Zwikael (2025)
	Infrastructure Demand	Infrastructure growth drives demand for steel projects.	Aramali et al. (2025)
	Economic Conditions	Economic downturns delay or disrupt steel project investments.	Melo et al. (2015)
Social Factors	Skilled Labor Availability	Availability of skilled labor improves project efficiency.	Sukolkit et al. (2024)
	Labor Union Influence	Labor union activities impact project timelines.	Cregan et al. (2024)
	Safety Awareness	Safety awareness among workers enhances project performance.	Rainbolt et al. (2019)
	Community Support	Community acceptance facilitates smooth project execution.	Han et al. (2018)
Technological Factors	Automation	Adoption of automation improves project productivity.	Bhattacharjee & Nikita (2014)
	Digital Tools	Digital project management tools enhance coordination and monitoring.	Bahety et al. (2022)
	Technology Upgradation	Continuous technological upgrades improve project efficiency.	Jiang et al. (2022)
	Global Collaboration	Collaboration with global technology partners improves project outcomes.	Chaulagain et al. (2021)
Legal Factors	Environmental Regulations	Environmental regulations affect project timelines and compliance requirements.	Thor et al. (2025)
	Labor Laws	Labor laws influence workforce management in projects.	Sukolkit et al. (2024)
	Land Acquisition	Land acquisition laws delay project implementation.	Cregan et al. (2024)
	Safety Compliance	Compliance with industrial safety laws improves project planning.	Jahandideh (2025)
Environmental Factors	Carbon Emissions	Carbon emission norms influence project design and operations.	Zheng & Zwikael (2025)
	Waste Management	Waste management requirements increase project costs.	Omar et al. (2025)
	Resource Availability	Availability of natural resources affects project feasibility.	Sellappan et al. (2013)
	Sustainability Requirements	Environmental sustainability requirements influence project planning.	Padhi et al. (2024)
Dependent Variable	Project Management Efficiency	Projects are completed within planned time schedules.	Kerzner (2017)
		Projects are executed within budgeted costs.	Meredith & Mantel (2019)
		Project quality standards are consistently achieved.	Kerzner (2017)
		Resources are efficiently utilized during project execution.	Meredith & Mantel (2019)

4. Data Analysis: The empirical research done to investigate how macro environmental factors affect project management effectiveness in India's steel sector is presented in this part. To find important external environmental factors influencing project execution in the industry, the study uses a PESTLE framework. An Urgency–influence analytical framework was used to examine the factors. Industry experts evaluated each component according to its influence on project management efficiency and urgency.

Table 2: Demographic Details

Elements	Items	Frequency	%
Designation	Project Manager	38	18.10
	Engineer	71	33.81
	Planning/Control Executive	38	18.10
	Operations Manager	25	11.90
	Vendors	21	10.00
	Contractor	8	3.81
	Consultant	5	2.38
	Foreign Technology Experts	4	1.90
Organization	Public Sector	82	39.05
	Private Sector	128	60.95
Years of Experience	Less than 5 Years	38	18.10
	5–10 Years	92	43.81
	10–15 Years	43	20.48
	15–20 Years	20	9.52
	Above 20 Years	17	8.10
Nature of Project Involved	Expansion	42	20.00
	Modernization	83	39.52
	Greenfield	33	15.71
	Brownfield	30	14.29
	Others	22	10.48
Project Size	Small < Rs 50 Cr	46	21.90
	Medium Rs 50–100 Cr	71	33.81
	Large Rs 100–500 Cr	52	24.76
	Mega Rs 500 Cr	41	19.52

Table 3: Reliability Statistics

Variable Group	Number of Items	Cronbach's Alpha
Political Factors	4	0.81
Economic Factors	4	0.84
Social Factors	4	0.78
Technological Factors	4	0.86
Legal Factors	4	0.80
Environmental Factors	4	0.83

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Table 4: Urgency–Impact Prioritization Table

Construct	Variable	Mean Urgency	Mean Impact	Priority Score (U × I)	Rank
Political	Government Policies	4.10	4.25	17.43	5
	Import–Export Regulations	4.20	4.30	18.06	3
	Government Incentives	3.95	4.10	16.20	8
	Political Stability	4.30	4.40	18.92	2
Economic	Steel Price Fluctuations	4.50	4.60	20.70	1
	Interest Rates	4.10	4.20	17.22	6
	Infrastructure Demand	3.90	4.00	15.60	10
	Economic Conditions	4.20	4.35	18.27	4
Social	Skilled Labor Availability	4.00	4.15	16.60	7
	Labor Union Influence	3.80	3.90	14.82	14
	Safety Awareness	4.05	4.10	16.61	6
	Community Support	3.70	3.85	14.25	16
Technological	Automation	4.15	4.25	17.64	4
	Digital Tools	4.05	4.20	17.01	7
	Technology Upgradation	4.10	4.30	17.63	5
	Global Collaboration	3.85	4.00	15.40	11
Legal	Environmental Regulations	4.25	4.35	18.49	3
	Labor Laws	3.95	4.05	16.00	9
	Land Acquisition	4.30	4.20	18.06	3
	Safety Compliance	4.00	4.10	16.40	8
Environmental	Carbon Emissions	4.20	4.40	18.48	3
	Waste Management	4.00	4.15	16.60	7
	Resource Availability	4.10	4.30	17.63	5
	Sustainability Requirements	4.05	4.25	17.21	6

The Urgency-Impact matrix Fig. 3 classifies macro environmental elements according to how much of an impact they have on the effectiveness of project management in the steel industry. Variations in steel prices, political stability, environmental regulations, and land acquisition are examples of factors that fall into the high urgency–high impact (critical priority) quadrant. Because of their significant impact on project outcomes, these factors require immediate managerial attention and strategic intervention. Government regulations, economic conditions, automation, and technological advancements are examples of aspects in the strategic considerations quadrant that, albeit having a slightly lower urgency, have significant long-term effects and necessitate proactive preparation. Regular operational controls can be used to control operational factors that have a minor impact, such as interest rates, labour regulations, and the availability of trained labour. Low priority elements, such as labour union influence and community support, have comparatively less urgency and impact, indicating that they need less immediate attention but should still be kept an eye on. All things considered, the matrix offers a methodical framework for setting priorities for resource allocation and decision-making in project management.

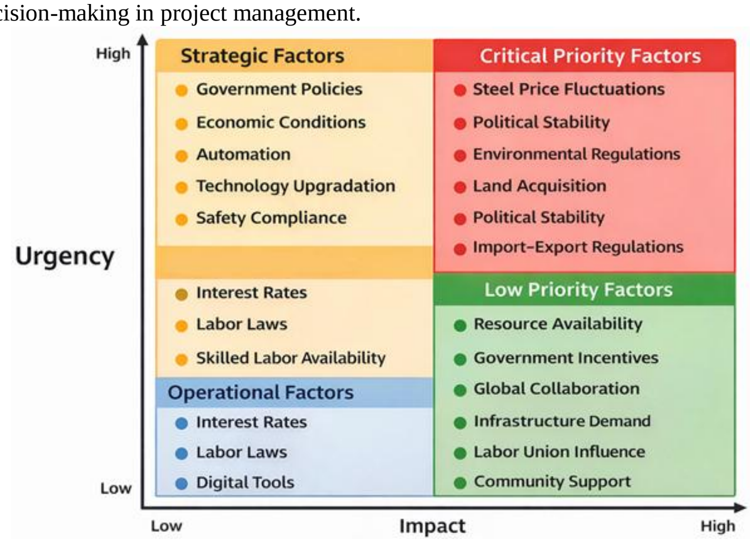

Fig.3 Urgency Impact Matrix

Table 5: KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.747
Bartlett's Test of Sphericity	Approx. Chi-Square	439.516
	Sig.	0.000

The KMO and Bartlett's Test results (Table 5) show that the data is appropriate for factor analysis. Because it is higher than the suggested threshold of 0.70, the Kaiser–Meyer–Olkin (KMO) value of 0.747 indicates a fair degree of sample adequacy and confirms that the variables have adequate common variance. Furthermore, the Bartlett's Test of Sphericity is significant ($\chi^2 = 439.516$, $p < 0.001$), suggesting that there are substantial correlations between the variables and that the correlation matrix is not an identity matrix. When taken as a whole, these findings confirm that factor analysis is appropriate for the dataset.

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Principal Component Analysis (PCA) with Varimax rotation (Table 6) yields a rotated component matrix that clearly shows a six-factor structure that corresponds to the QUEST framework. Good construct validity is indicated by the substantial loadings on each component displayed by each item. Political elements are captured by Component 1 (e.g., import-export laws = 0.903, government incentives = 0.944), whereas economic factors are represented by Component 2 (e.g., interest rates = 0.922, economic circumstances = 0.886). Social variables are seen in Component 3, where safety awareness (0.825) and skilled labour availability (0.763) load considerably. Technological aspects (such as digital tools = 0.829 and automation = 0.817) are represented by Component 4, whereas legal factors (such as land acquisition = 0.862 and safety compliance = 0.807) are represented by Component 5. Environmental considerations are captured in Component 6, where carbon emissions exhibit a very high loading (0.975), followed by resource availability (0.713) and sustainability standards (0.710). Waste management, on the other hand, has a very low loading (0.086), indicating that it might not make a substantial contribution to the environmental construct and might be reevaluated or eliminated. Overall, the factor structure is clearly defined, and the majority of loadings are higher above the acceptable threshold of 0.70, indicating the measurement model's dimensionality and dependability.

Table 6: Rotated Component Matrix[a]

	Component						
	1	2	3	4	5	6	Construct
Government Policies	0.747						**Political**
Import–Export Regulations	0.903						
Government Incentives	0.944						
Political Stability	0.750						
Steel Price Fluctuations		0.791					**Economic**
Interest Rates		0.922					
Infrastructure Demand		0.777					
Economic Conditions		0.886					
Skilled Labour Availability			0.763				**Social**
Labor Union Influence			0.743				
Safety Awareness			0.825				
Community Support			0.745				
Automation				0.817			**Technological**
Digital Tools				0.829			
Technology Upgradation				0.792			
Global Collaboration				0.831			
Environmental Regulations					0.762		**Legal**
Labor Laws					0.723		
Land Acquisition					0.862		
Safety Compliance					0.807		
Carbon Emissions						0.975	**Environmental**
Waste Management						0.086	
Resource Availability						0.713	
Sustainability Requirements						0.710	
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.							
a. Rotation converged in 8 iterations.							

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.848[a]	0.719	0.070	0.684	0.096	3.610	6	203	0.002
a. Predictors: (Constant), Political, Economic, Social, Technological, Legal, Environmental									

Table 8: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.136	6	1.689	3.610	.002[b]
	Residual	94.988	203	0.468		
	Total	105.124	209			
a. Dependent Variable: Project Management Efficiency						
b. Predictors: (Constant), Political, Economic, Social, Technological, Legal, Environmental						

A high R value (0.848) in the model summary (Table 7) shows a strong correlation between QUEST components and project management efficiency. Although the significantly low corrected R2 (0.070) highlights potential model inconsistencies or overfitting issues, the R2 value of 0.719 indicates significant explanatory power. The set of independent factors as a whole has a statistically significant effect on project management efficiency, as indicated by the substantial F-change ($p = 0.002$). The ANOVA results (Table 8) show that the overall regression model is statistically significant ($F = 3.610$, $p = 0.002 < 0.05$), indicating that differences in project management efficiency are significantly explained by the combined effect of political, economic, social, technological, legal, and environmental factors. This demonstrates that the model fits the data well and can be interpreted further.

Table 9: Regression Coefficients[a]

Model		Standardized Coefficients	t	Sig.	Hypothesis	Test Result
		Beta				
1	(Constant)		6.418	0.000		
	Political	0.078	2.589	0.016	H1a	Accepted
	Economic	0.068	2.317	0.038	H1b	Accepted
	Social	0.097	4.512	0.031	H1c	Accepted
	Technological	0.045	2.452	0.025	H1d	Accepted
	Legal	0.232	3.358	0.001	H1e	Accepted
	Environmental	0.177	2.506	0.013	H1f	Accepted
a. Dependent Variable: Project Management Efficiency						

1	(Constant)		14.030	0.000		
	Urgency Mean	0.318	4.832	0.000	H2	Accepted
a. Dependent Variable: Priority						

1	(Constant)		9.920	0.000	
	Impact_Mean	0.042	2.612	0.044	H3 Accepted
a. Dependent Variable: Project Management Efficiency					

The regression results in Table 9 indicate that all QUEST factors have p-value less than 0.05, has a positive and statistically significant impact on project management efficiency, supporting hypotheses H1a through H1f. Legal issues have the greatest influence ($\beta = 0.232$), followed by environmental elements ($\beta = 0.177$), while the effects of political, economic, social, and technological factors are quite small. All things considered, the results verify that macro environmental elements are critical to improving project management effectiveness in the steel industry. Prioritisation is positively and statistically significantly impacted by urgency, according to the regression results ($\beta = 0.318$, $t = 4.832$, $p < 0.001$). This implies that the importance of macroenvironmental elements in decision-making rises in tandem with their perceived urgency. As a result, H2 is approved, demonstrating that urgency plays a significant role in setting priorities for elements influencing the effectiveness of project management. Impact has a positive and statistically significant impact on project management efficiency, according to the regression results ($\beta = 0.042$, $t = 2.612$, $p = 0.044$). Despite the effect's modest magnitude, the significance level suggests that perceived impact has a significant impact on project outcomes. As a result, H3 is approved, demonstrating that increased impact levels lead to more effective project management. There is a statistically significant difference in project management effectiveness among the four factor groups, according to the ANOVA results ($F = 28.44$, $p < 0.001$) (Table 11). This implies that project outcomes are significantly influenced by the degree of urgency-impact classification. In particular, compared to strategic, operational, and low-priority variables, elements classified as critical priority (high urgency–high impact) have a greater impact on project management efficiency. As a result, H4 is approved, demonstrating the usefulness of urgency-impact classification in distinguishing the impact of macro environmental elements.

Table 10 Group Statistics Quadrant Effect

Quadrant	N	Mean Efficiency	Std. Deviation
Low Priority Factors	6	3.32	0.12
Operational Factors	4	3.88	0.15
Strategic Factors	8	3.82	0.14
Critical Priority Factors	6	4.28	0.13

Table 11 ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.	Hypothesis	Test Result
Between Groups	5.824	3	1.941333333	28.44	0.00	H4	Accepted
Within Groups	1.365	20	0.06825				
Total	7.189	23					
a. Dependent Variable: Project Management Efficiency							
b. Predictors: (Constant), Low Priority Factors, Operational Factors, Strategic Factors, Critical Priority Factors							

5. Discussion and Findings

The study's conclusions and discussion demonstrate how important macro environmental elements are in determining the effectiveness of project management in India's steel sector. These aspects are organised using the QUEST (PESTLE-based) framework. A clear method of prioritisation is provided by the Urgency–Impact matrix, which highlights important elements including changes in steel prices, political stability, environmental laws, and land acquisition as needing immediate strategic attention because of their high urgency and impact. The measurement model's construct validity and reliability are supported by factor analysis, which reveals a well-defined six-factor structure with significant loadings. However, waste management's comparatively low loading indicates room for improvement. All macro environmental aspects have a considerable impact on project management efficiency, with legal and environmental factors having the biggest effects, according to regression and ANOVA data. Prioritisation is also heavily influenced by urgency, and even while perceived impact is small, it nonetheless has a major impact on project outcomes. Critical priority considerations have the greatest impact on efficiency, as evidenced by the notable variations found among urgency-impact categories. Overall, the results highlight how crucial it is to methodically evaluate and rank external environmental elements in order to improve resource allocation, decision- making, and effective project execution in the steel industry.

5.1 Thoretical Implications

By expanding the PESTLE Framework's application to project management in the steel sector, the current study provides a number of significant theoretical implications. The research advances the contingency perspective in project management theory by demonstrating that environmental factors are not only influential but also vary in priority based on perceived urgency and impact. This is accomplished by integrating the Urgency–Impact analytical approach with macro-environmental assessment. Prior claims that external influences can be methodically classified and assessed are supported by the validated six-factor structure obtained by Principal Component Analysis, which strengthens the dimensional stability of macro-environmental constructs(Shen & Stewart, 2025), (Ziebell et al., 2025). Additionally, the substantial impact of legal and environmental factors is consistent with stakeholder and institutional theory, indicating that sustainability and regulatory pressures are emerging as key factors influencing project efficiency in emerging economies(Carroll & Shabana, 2010)(Kuzey et al., 2021). Additionally, by providing empirical evidence that urgency and impact work together to form management emphasis, the findings enhance prioritisation theory and extend conventional strategic analysis tools into a more dynamic framework for decision-making. Overall, the work provides a more sophisticated theoretical understanding of how external settings influence project outcomes by bridging gaps between environmental scanning, project management efficiency, and prioritisation models.

5.2 Practical Implications

For project managers, legislators, and business professionals in the steel industry, the study has important practical ramifications. Managers can systematically prioritise macro-environmental factors with the help of the Urgency–Impact matrix, a clear decision-support tool that guarantees that important issues like land acquisition, environmental regulations, political stability, and price fluctuations receive immediate strategic attention. Organisations can improve compliance procedures, expedite regulatory clearances, and incorporate sustainable practices into project planning by determining that legal and environmental considerations have the most influence. The results also indicate that while typical control systems can be used to handle routine operational elements, managers should actively monitor economic and technology developments to improve long-term project success.

Furthermore, the importance of urgency in setting priorities emphasises the necessity of dynamic risk assessment frameworks that adjust to shifting external circumstances. All things considered, the study gives practitioners a methodical approach to resource allocation, risk mitigation, and strategic planning, which eventually improves project execution efficiency and lowers delays and cost overruns in the steel sector.

5.3 Recommendations

The study recommends that organizations in the steel sector should move beyond traditional environmental scanning and adopt technology-driven integrated decision systems, especially by utilising predictive analytics and artificial intelligence (AI). AI-based models can continuously monitor political, economic, and geopolitical signals to predict their possible impact on project execution, given the growing complexity of macro-environmental elements. Recent geopolitical tensions in the Middle East, for example, have shown how wars may disrupt global oil supply networks and drastically boost crude prices, impacting project costs and deadlines. By including a variety of factors, such as market trends, economic indicators, and war events, sophisticated machine learning models are already able to forecast such variations. In order to foresee hazards, model "what-if" situations, and make proactive decisions, project managers are advised to incorporate AI-enabled dashboards and real-time data analytics into their planning systems. In a volatile global environment, such integration would improve strategic planning, resource allocation, and overall project management efficiency in addition to improving reactivity to external shocks.

6. Conclusions, Limitations and Future Research Scope

The study comes to the conclusion that the steel industry's project management efficiency is greatly impacted by macro-environmental factors as measured by the QUEST (PESTLE-based) framework, with the most important determinants being the legal and environmental aspects. By facilitating the efficient prioritisation of external elements and emphasising that high urgency–high impact variables have the greatest impact on project results, the incorporation of the Urgency–Impact matrix significantly enhances decision-making. Notwithstanding these contributions, the study has several drawbacks, such as its concentration on a particular business and geographic setting, which may limit how broadly the results may be applied. Furthermore, it is difficult to record dynamic changes in macro environmental circumstances over time due to the cross-sectional character of the data. Respondent bias may also be introduced by the use of perceptual measures. By carrying out longitudinal studies, broadening the scope to include various industries and geographical areas, and utilising real-time data analytics or AI-based predictive models, future research can overcome these constraints. Additionally, future research may investigate how macro environmental elements interact and how digital transformation and cutting-edge technology might improve proactive project management in increasingly uncertain contexts.

This study clearly shows that project management success in the steel industry is now driven by the astute anticipation and prioritisation of macro-environmental forces rather than just internal capabilities in an era characterised by volatility, uncertainty, and rapid geopolitical and technological shifts. Through the use of an Urgency–Impact analytical lens in conjunction with the QUEST framework, the study not only determines what elements are significant but, more crucially, when and to what degree they require managerial attention.

The results provide a strong, data-driven argument for rethinking project management as a dynamic, externally responsive field that uses evolving technology, analytics, and prioritisation to stay ahead of disruptions. This work is therefore highly relevant for academia, industry practitioners, and policy frameworks alike, offering a timely and significant contribution that offers both a solid theoretical progress and a useful guide for navigating difficult industrial situations.

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