

Strategic Environmental Analysis in the Automobile Industry: The Role of External Forces in Shaping Operations

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Abstract

The rapid global shift towards electric vehicles has altered the competitive and operational landscape of the automobile industry in profound ways. Firms now operate in an environment shaped by regulatory pressure, technological acceleration, geopolitical uncertainty, and shifting consumer expectations. This conceptual paper examines how external environmental forces influence business operations within the electric vehicle segment, with a particular focus on Tesla, Ford, and Volkswagen. Contingency theory provides the foundation for the analysis, supported by the integration of PESTEL analysis, Porter's Five Forces, and Key Success Factors. These frameworks allow for a detailed exploration of how political, economic, technological, social, environmental, and competitive conditions shape organisational choices.

The discussion highlights how external forces influence manufacturing systems, supply chain structures, human resource practices, financial performance, and technological strategies. Brexit, exchange rate volatility, regulatory changes, and the transition towards zero emission vehicles emerge as especially significant influences on operational decision making. Each firm demonstrates a distinct pattern of response shaped by its legacy systems, strategic priorities, and technological capabilities. Tesla's vertically integrated model, Ford's restructuring efforts, and Volkswagen's large-scale electrification strategy illustrate the varied ways in which organisations align internal capabilities with external demands.

The paper argues that effective organisational responses depend on the fit between environmental conditions and internal structures, reinforcing the relevance of contingency theory for understanding operational effectiveness in the evolving electric vehicle industry. The analysis contributes to ongoing debates on strategic alignment, technological transformation, and the future of mobility, offering insights for scholars and practitioners seeking to understand how firms navigate complex and fast changing environments.

Keywords: Electric vehicles; contingency theory; organisational adaptation; external environment; PESTEL; Porter's Five Forces; Tesla; Ford; Volkswagen; strategic alignment.

1. Introduction

The global automobile industry is undergoing a significant period of restructuring as firms respond to regulatory pressure, rapid technological development, and rising consumer expectations linked to

environmental sustainability. The shift from internal combustion engines to electric vehicles has altered product architecture and has also reshaped manufacturing systems, supply chain design, workforce capabilities, and competitive behaviour. Organisations now operate in an environment shaped by policy interventions, geopolitical

uncertainty, and accelerating innovation, all of which influence strategic and operational decision-making. The International Energy Agency reports that electric vehicle sales reached nearly fourteen million units in 2023, reflecting a thirty-five per cent increase from the previous year and signalling a decisive shift in global mobility patterns (International Energy Agency, 2024). This momentum has intensified the need for firms to adapt their operational structures to remain competitive.

This paper examines how the external environment shapes business operations within the electric vehicle segment, focusing on Tesla, Ford, and Volkswagen. These firms represent distinct strategic positions, ranging from fully electric production models to diversified portfolios that combine electric and conventional vehicles. The broader transition towards zero-emission mobility provides the context for this analysis, creating new expectations for firms while placing pressure on long-established operational systems. Recent assessments of the European electric vehicle landscape highlight increasing competition from Chinese manufacturers, tightening regulatory frameworks, and the need for substantial investment in battery technology and charging infrastructure (van Wieringen, 2024). These developments underscore the importance of understanding how firms align internal capabilities with external demands.

To explore these dynamics, the paper draws on contingency theory and integrates three established strategic frameworks: PESTEL analysis, Porter's Five Forces, and Key Success Factors. Contingency theory provides a useful foundation for examining how organisations adjust structures and processes in response to environmental conditions. PESTEL analysis supports an exploration of political, economic, social, technological, environmental, and legal influences, while Porter's Five Forces offers insight into competitive pressures, supplier relationships, and customer behaviour. Recent scholarship on electric vehicle markets emphasises the role of government policy, technological readiness, and supply chain resilience in shaping firm performance (Karthikeyan et al., 2024). These factors interact with firm-level capabilities, influencing decisions related to manufacturing, human resources, technology investment, and market positioning.

The analysis presented in this paper illustrates how external forces influence supply chain stability, workforce development, investment strategies, and sales performance across firms competing in the electric vehicle market. The discussion highlights the importance of strategic alignment between internal capabilities and external conditions, reinforcing the relevance of contingency theory for understanding operational effectiveness in a rapidly evolving industry.

2. Contingency Theory and Organisational Fit

Contingency theory provides an important foundation for understanding how organisations respond to changing environmental conditions. The central premise is that no single organisational structure or management approach is universally effective. Organisational performance depends on the degree of alignment between internal practices and the external environment. Early contributions to this field demonstrated that structures, decision-making systems, and coordination mechanisms must be adapted to contextual features such as technological complexity, market turbulence, and regulatory expectations (Donaldson, 2001). This perspective challenged the idea of a single best way to organise and instead positioned organisational design as a function of situational demands.

Recent scholarship continues to affirm the relevance of contingency theory in operations and strategic management. Studies examining supply chain resilience, sustainability pressures, and technological disruption show that performance outcomes are shaped by the interaction between organisational practices and external conditions (Alves et al., 2017). Firms that fail to adjust their internal processes in response to environmental change face increased risks of inefficiency, reduced competitiveness, and strategic misalignment. Research on performance measurement systems also highlights that organisational systems must evolve as environmental complexity increases, reinforcing the need for continuous alignment between internal capabilities and external demands (Nassou & Bennani, 2024).

The electric vehicle industry provides a compelling context for applying contingency theory. Firms in this sector operate under conditions of rapid technological development, shifting regulatory frameworks, and geopolitical uncertainty. The global transition towards zero-emission vehicles has intensified pressure on manufacturers to redesign production systems, invest in new technologies, and restructure supply chains. Regulatory initiatives in Europe, North America, and Asia have accelerated the shift towards electrification, creating both opportunities and constraints for automobile firms (International Energy Agency, 2024). At the same time, geopolitical events such as Brexit and disruptions to global logistics networks have altered the availability of critical components, increased cost volatility, and exposed vulnerabilities in traditional supply chain models.

Contingency theory helps explain why firms such as Tesla, Ford, and Volkswagen have adopted different approaches to managing these pressures. Tesla's vertically integrated model reflects a strategic response to supply chain uncertainty and the need for tight control over battery technology. Ford's restructuring efforts illustrate an attempt to balance legacy production systems with the demands of electrification. Volkswagen's large-scale investment in modular electric platforms

demonstrates a commitment to long-term strategic alignment with regulatory and technological trends. These varied responses highlight that organisational fit is shaped not only by external conditions but also by firm-specific capabilities, histories, and strategic priorities.

The analysis presented in this paper applies contingency theory to examine how firms align internal operations with external forces affecting the electric vehicle industry. Strategic fit is not a fixed state; it must be continually reassessed as environmental conditions evolve. Firms that maintain alignment between internal structures and external demands are better positioned to achieve operational effectiveness, sustain competitive advantage, and navigate the uncertainties of a rapidly changing industry.

3. Integrating Strategic Frameworks and Business Operations

The analytical framework used in this paper combines PESTEL analysis, Porter's Five Forces, and Key Success Factors to provide a structured assessment of how external forces shape business operations in the electric vehicle industry. Each framework captures a different dimension of the external environment, while contingency theory offers the overarching logic that links environmental conditions to organisational responses. This integrated approach supports a more comprehensive understanding of how firms interpret and respond to the pressures associated with electrification, regulatory change, and technological disruption.

PESTEL analysis provides a foundation for examining macro-environmental influences that affect firms operating in the electric vehicle sector. Political and legal developments, including emissions regulations, industrial policy, and trade agreements, continue to shape investment decisions and production strategies. Economic volatility, particularly fluctuations in energy prices and the cost of raw materials, influences manufacturing costs and supply chain resilience. Technological advancement remains a defining feature of the sector, with rapid progress in battery chemistry, charging infrastructure, and software systems driving competition and shaping long-term strategic planning. Environmental sustainability pressures also play a central role, as governments and consumers increasingly

prioritise low-carbon mobility solutions. Recent assessments of the global electric vehicle landscape highlight the importance of these macro-environmental factors in shaping firm behaviour and market development (Adamkasi, 2023; Fedotov, 2023).

Porter's Five Forces framework complements the PESTEL analysis by examining competitive dynamics within the industry. Rivalry has intensified as established manufacturers and new entrants invest heavily in electrification, digital technologies, and autonomous systems. Supplier power remains significant due to the concentration of battery production and the scarcity of critical minerals. Buyer power has increased as consumers gain access to a wider range of electric vehicle models and become more informed about performance, charging options, and lifecycle costs. The threat of substitution is shaped by developments in public transport, micro-mobility, and hydrogen technologies, while barriers to entry remain high due to capital requirements, regulatory compliance, and technological complexity. Peer-reviewed analyses of the electric vehicle sector confirm that these competitive forces are reshaping industry structure and influencing firm-level strategies (Fedotov, 2023; Sharanabasappa & Soumya, 2023).

Key Success Factors provide a third layer of analysis by identifying the capabilities firms must develop to achieve competitive advantage. Innovation capability, particularly in battery technology and software integration, remains central to differentiation. Financial strength is essential for sustaining long-term investment in research, production capacity, and charging infrastructure. Supply chain control has become increasingly important as firms seek to secure access to critical materials and reduce exposure to geopolitical risk. Strategic assessments of the electric vehicle industry consistently highlight these capabilities as essential for long-term competitiveness (Desklib, 2023).

The interaction between these frameworks (Figures 1 and 2) illustrates how external pressures translate into operational demands and strategic priorities. Firms that align internal capabilities with environmental conditions are better positioned to navigate uncertainty, maintain operational effectiveness, and compete in a rapidly evolving industry.

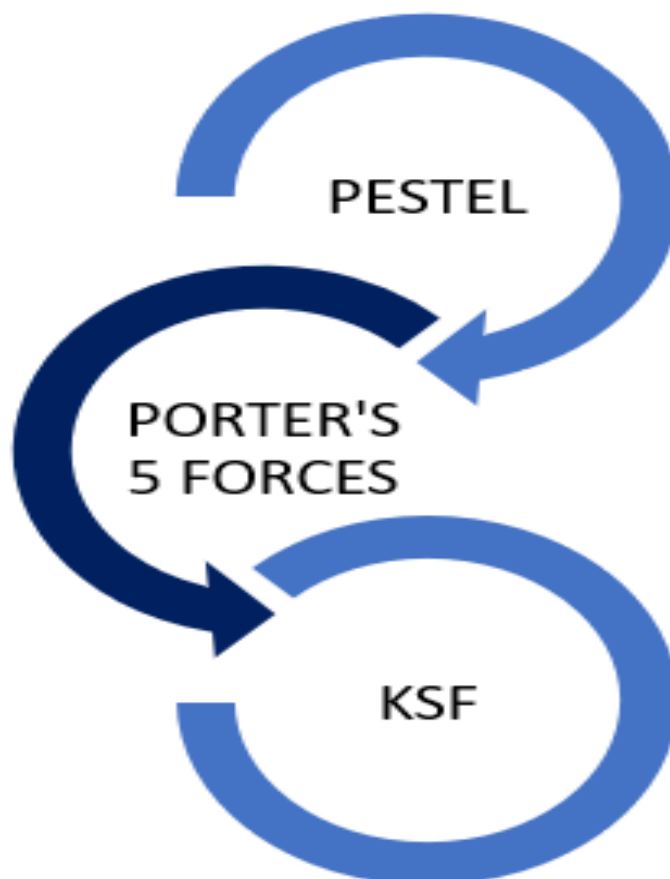


Figure 1: The interlinked frameworks

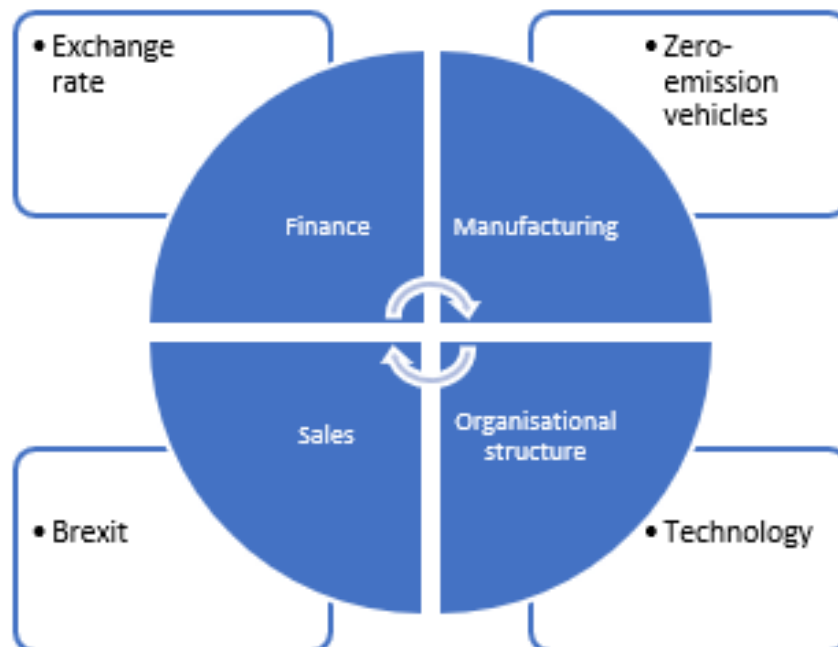


Figure 2: How the interaction between the frameworks affects business operations

4. PESTEL Analysis of the Electric Vehicle Industry

Political and legal developments continue to exert a strong influence on the electric vehicle industry. The United Kingdom's departure from the European Union has reshaped the operating environment for manufacturers through new trade barriers, regulatory

divergence, and constraints in labour mobility. These changes have affected supply chain continuity, investment decisions, and long-term strategic planning. Recent assessments show that rules of origin requirements under the UK–EU Trade and Cooperation Agreement have placed additional pressure on firms producing electric vehicles and batteries, prompting

several manufacturers to reconsider the location of future production facilities (Henry, 2024). Broader European analyses also indicate that political uncertainty and regulatory tightening across the region have contributed to shifts in manufacturing investment towards continental Europe (van Wieringen, 2024). These developments illustrate the importance of political alignment as a determinant of operational stability.

Economic conditions have also shaped the sector’s trajectory. Exchange rate volatility, rising interest rates, and fluctuations in the cost of critical minerals have increased production costs and affected financial planning. Evidence from recent trade studies shows that post-Brexit supply chain fragmentation has contributed to higher import costs and reduced efficiency in cross-border logistics (Du et al., 2024). These pressures have influenced pricing strategies, profitability, and employment patterns, with firms reporting uneven workload distribution and increased operational uncertainty. The economic dimension therefore reinforces the need for financial resilience within electric vehicle operations.

Technological and environmental factors remain central to the industry’s transformation. The global shift towards zero-emission vehicles has required extensive changes to manufacturing systems, organisational structures, and research and development priorities. Firms with established electric vehicle capabilities have been able to leverage technological expertise more effectively, while traditional manufacturers have faced the challenge of reconfiguring legacy systems. Recent analyses highlight the rapid pace of innovation in battery chemistry,

charging infrastructure, and digital systems, all of which demand sustained investment and organisational adaptability (Jagani et al., 2024). Environmental policy continues to reinforce these pressures, as governments intensify efforts to reduce emissions and accelerate the transition to clean mobility. These trends underscore the strategic importance of technological readiness and environmental compliance.

Socio-cultural factors have also contributed to rising demand for electric vehicles. Growing public concern about climate change, increased awareness of air quality issues, and shifting consumer preferences have strengthened the market for low-emission transport. Reports on the UK automotive sector note that consumer expectations for sustainability, transparency, and clean energy production are shaping purchasing behaviour and influencing firm-level strategy (CBI Economics & ECIU, 2024). At the same time, rapid technological evolution presents operational challenges, including the need for continuous software updates, cybersecurity measures, and higher production costs associated with advanced digital systems. These developments highlight the role of consumer expectations in shaping organisational priorities.

The PESTEL analysis demonstrates that political, economic, technological, environmental, and socio-cultural forces interact to shape the strategic and operational landscape of the electric vehicle industry (Figure 3). Firms must therefore maintain close alignment between external conditions and internal capabilities to sustain competitiveness in a rapidly evolving sector.

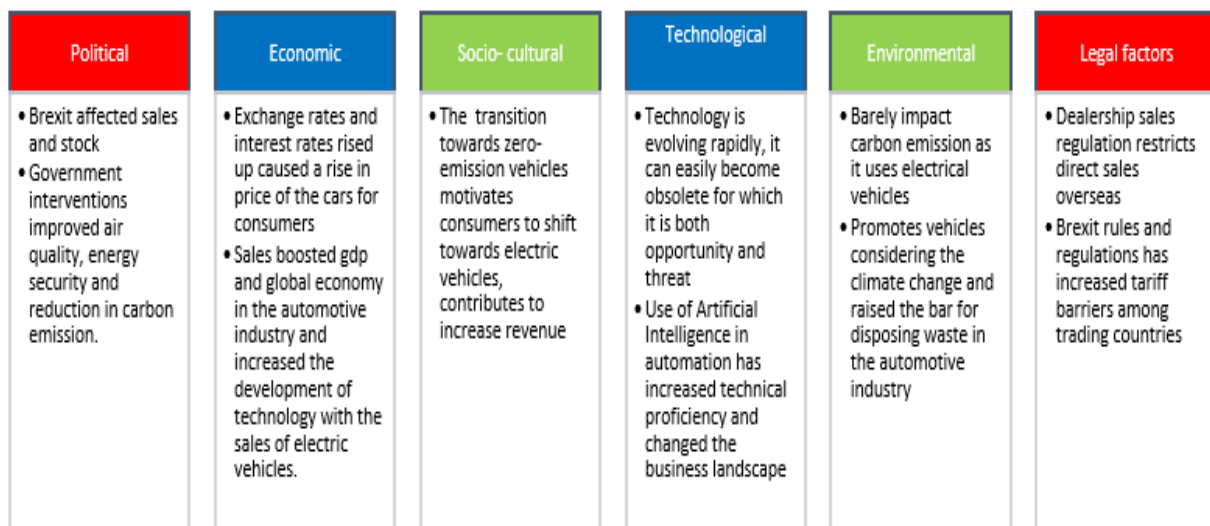


Figure 3: PESTEL Analysis of the Electric Vehicle Industry

5. Porter’s Five Forces and Competitive Dynamics

Competitive rivalry within the electric vehicle industry has intensified as firms expand investment in electrification, digital systems, and

performance-enhancing technologies. Porter’s (1980) original work on industry structure remains a useful foundation for understanding this competitive landscape, as rivalry is shaped by the number of firms, the pace of innovation, and the degree of product differentiation. In

the electric vehicle sector, differentiation increasingly depends on battery performance, software capability, charging speed, and the integration of digital services. Firms with strong technological capabilities are better positioned to compete, while those with limited access to advanced components or software expertise face significant constraints. Research on technological competition supports this view, noting that firms operating in fast-moving environments must innovate continuously to sustain advantage (Teece, 1986).

The threat of new entrants remains moderate. High capital requirements, the need for specialised manufacturing facilities, and the complexity of integrating hardware and software systems create substantial barriers to entry. Porter’s (1980) analysis of entry barriers remains relevant, as economies of scale, brand reputation, and access to distribution networks continue to protect established firms. Although new entrants such as technology companies and emerging manufacturers have gained visibility, the scale advantages held by incumbent firms limit widespread entry. Operations research also highlights that industries with complex supply chains and high asset specificity tend to deter new entrants due to the difficulty of replicating established production systems (Fine, 1998).

Buyer power varies across market segments. In mass-market segments, price sensitivity remains high, with consumers weighing cost, range, and charging availability. In premium segments, performance, technological sophistication, and brand reputation exert greater influence. Porter’s (1980) framework emphasises that buyer power increases when customers have access to information and alternatives, both of which have expanded in the electric vehicle market. Studies of consumer behaviour in technology-intensive industries

show that buyers increasingly evaluate products based on digital features, reliability, and long-term value (Kotler & Keller, 2016). These expectations place pressure on firms to balance affordability with innovation.

Supplier power remains significant due to the concentration of battery production and the limited availability of critical minerals such as lithium, cobalt, and nickel. Dyer and Singh’s (1998) relational view highlights that firms dependent on specialised suppliers face heightened vulnerability unless they develop collaborative partnerships or invest in vertical integration. The electric vehicle industry reflects this pattern, as firms seek long-term contracts, joint ventures, and internal battery production to reduce exposure to supply chain risk. Operations scholars have long noted that supply chains built around scarce or high-value components tend to amplify supplier influence and increase the strategic importance of procurement decisions (Christopher, 2016).

The threat of substitution has declined as policy commitments to phase out internal combustion engines strengthen and consumer interest in sustainable mobility grows. Although alternative technologies such as hydrogen fuel cells remain relevant, the scale of investment in battery-electric vehicles has reduced the attractiveness of conventional substitutes.

Porter’s Five Forces (Figure 4) illustrate an industry characterised by strong rivalry, high entry barriers, shifting buyer expectations, concentrated supplier power, and declining substitution threats. These dynamics shape the strategic priorities of firms competing in the electric vehicle market and reinforce the importance of aligning technological, financial, and operational capabilities with evolving competitive pressures.

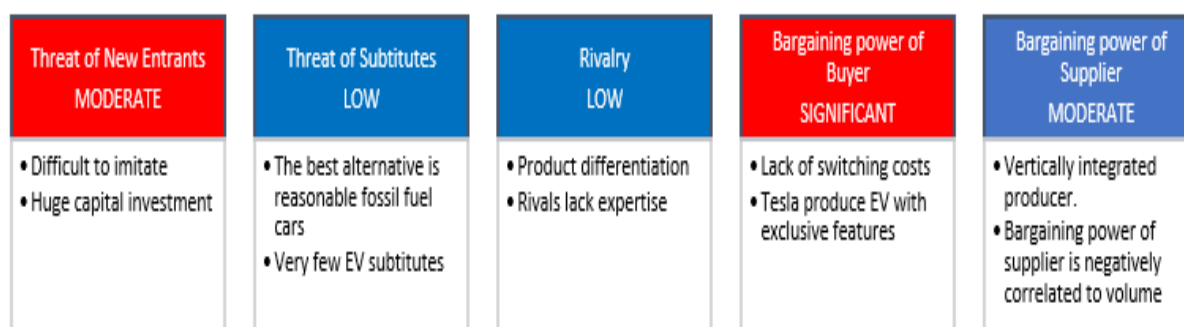


Figure 4: Porter’s Five Forces and Competitive Dynamics

6. Key Success Factors in the Electric Vehicle Industry

Key Success Factors within the electric vehicle industry revolve around technological leadership, innovation capability, financial resilience, and effective supply chain management (Figure 5). Firms that demonstrate strong research and development capacity are better positioned

to introduce advanced features, enhance vehicle performance, and sustain competitive advantage. Classic strategy research emphasises that firms operating in technology-intensive environments must continually invest in innovation to maintain differentiation and protect their market position (Teece, Pisano, & Shuen, 1997). In the electric vehicle sector, this includes advances in battery chemistry, software integration, and

energy-efficient design, all of which require sustained commitment to research and development.

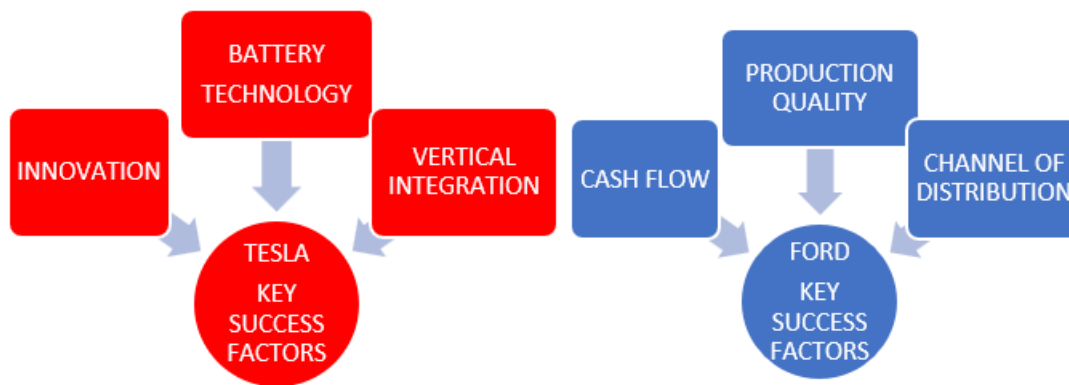


Figure 5: Key Success Factors in the Electric Vehicle Industry

Vertical integration and in-house production capabilities have become increasingly important. Firms that internalise key stages of production, such as battery manufacturing or software development, gain greater control over quality, cost structures, and supply chain reliability. This aligns with longstanding operations research showing that vertical integration can reduce transaction costs, strengthen coordination, and improve responsiveness in complex manufacturing environments (Williamson, 1985). Although vertical integration requires significant upfront investment, it supports long-term stability by reducing dependence on external suppliers and mitigating exposure to supply chain disruptions.

Financial strength is another critical success factor. Firms with robust financial resources are better equipped to absorb external shocks, manage operational risks, and invest in sustainable manufacturing technologies. The resource-based view highlights that financial capital enables firms to acquire and deploy strategic assets that support long-term competitiveness (Barney, 1991). In the electric vehicle industry, this includes investment in production capacity, charging infrastructure, and advanced digital systems. Financial resilience also allows firms to navigate periods of market volatility, regulatory change, or supply shortages without compromising strategic priorities.

The ability to align organisational structures with evolving external conditions remains essential. Contingency theory suggests that organisational effectiveness depends on the fit between internal systems and environmental demands (Lawrence & Lorsch, 1967). Firms that adapt their strategies, production systems, and workforce capabilities in response to regulatory shifts, technological developments, and competitive pressures are more likely to sustain performance. This includes redesigning manufacturing processes for electric drivetrains, developing new skills within the workforce, and restructuring supply chains to support electrification. Research on organisational adaptation reinforces that

firms operating in dynamic environments must remain flexible, responsive, and willing to reconfigure internal processes to maintain alignment with external conditions (Burns & Stalker, 1961).

These factors highlight that success in the electric vehicle industry depends on the integration of technological capability, financial strength, supply chain control, and organisational adaptability. Firms that combine these capabilities are better positioned to navigate uncertainty, respond to competitive pressures, and sustain long-term performance in a rapidly evolving industry.

7. Implications for Tesla, Ford, and Volkswagen

The analysis of external forces and competitive dynamics has direct implications for how Tesla, Ford, and Volkswagen configure their operations and strategic priorities within the electric vehicle industry. Each firm occupies a distinct position shaped by its history, resource base, and organisational capabilities. Contingency theory provides a useful foundation for understanding these differences, as it highlights the need for alignment between internal structures and environmental conditions (Lawrence & Lorsch, 1967).

Tesla's approach reflects a strong emphasis on technological leadership and vertical integration. Its investment in proprietary battery technology, software development, and in-house manufacturing supports tight coordination across the value chain. This aligns with the dynamic capabilities perspective, which argues that firms competing in fast-moving environments must continually reconfigure their resources to sustain advantage (Teece, Pisano, & Shuen, 1997). Tesla's strategy reduces dependence on external suppliers and strengthens its ability to respond to technological and regulatory change. However, this model requires substantial financial commitment and exposes the firm to risks associated with rapid scaling and capital intensity.

Ford's position is shaped by its legacy systems and the

need to balance conventional vehicle production with electrification. The firm has undertaken significant restructuring to modernise manufacturing facilities, develop electric platforms, and build partnerships in battery production. Research on organisational adaptation suggests that firms with established routines face greater challenges when responding to disruptive technologies, as they must unlearn existing processes while developing new capabilities (Hannan & Freeman, 1984). Ford's strategy reflects an incremental approach that seeks to preserve core competencies while investing in new technologies. This dual focus requires careful coordination to avoid misalignment between legacy operations and emerging electric vehicle priorities.

Volkswagen has adopted a large-scale transformation strategy centred on modular electric platforms, extensive investment in battery production, and long-term commitments to electrification. Its approach reflects an effort to build scale advantages and reduce production costs through standardisation. Operations research highlights that modular architectures can enhance flexibility, reduce complexity, and support efficient product variation (Ulrich, 1995). Volkswagen's strategy positions the firm to compete across multiple market segments while maintaining control over key components. The scale of its investment also reflects the importance of financial strength in supporting long-term transformation.

Across all three firms, the ability to align organisational structures with evolving external conditions remains essential. Regulatory change, technological advancement, and competitive pressure require firms to adapt their production systems, supply chains, and workforce capabilities. Classic organisational theory emphasises that firms operating in dynamic environments must remain flexible and responsive to maintain performance (Burns & Stalker, 1961). Tesla, Ford, and Volkswagen illustrate different pathways to achieving this alignment, shaped by their strategic priorities and resource configurations.

The implications of this analysis reinforce the importance of technological capability, financial resilience, supply chain control, and organisational adaptability as foundations for sustained competitiveness in the electric vehicle industry.

8. Conclusion

This paper has explored how external environmental forces influence business operations within the electric vehicle segment of the automobile industry. Drawing on contingency theory and integrating PESTEL analysis, Porter's Five Forces, and Key Success Factors, the discussion has shown that political uncertainty, economic fluctuations, technological development, and competitive intensity exert a strong influence on how firms organise

production, manage supply chains, develop their workforce, and make strategic choices. These external forces shape the conditions under which firms operate and determine the types of capabilities required to remain competitive.

The analysis reinforces the central argument of contingency theory that organisational effectiveness depends on the degree of fit between internal practices and external conditions. Electric vehicle production takes place within an environment characterised by rapid technological change, evolving regulatory frameworks, and shifting consumer expectations. Firms must therefore adjust their structures, processes, and resource configurations to maintain alignment with these conditions. This includes rethinking manufacturing systems, strengthening supply chain resilience, investing in technological capability, and developing new organisational competencies.

The evidence presented across the strategic frameworks highlights that firms capable of integrating strategic analysis with operational flexibility are better positioned to navigate uncertainty. The ability to interpret environmental signals, anticipate regulatory developments, and respond to technological shifts supports more informed decision-making and reduces exposure to risk. Firms that cultivate these capabilities are more likely to sustain competitive advantage as the automobile industry continues its transition towards electrification.

The conclusion underscores that the electric vehicle industry is shaped by a complex interplay of external forces and internal responses. Organisational success depends on the capacity to adapt, innovate, and align strategic intent with operational reality. As the industry evolves, firms that maintain this alignment will be better equipped to manage disruption, capture emerging opportunities, and contribute to the broader transformation of global mobility.

Author Contribution

All authors contributed meaningfully to the development of this study and the preparation of the manuscript. The study was conceptualised and designed by S.F.S. and S.M.S. The development of the theoretical framework was carried out by C.L.K., I.F.N. and K.O.O., who also contributed to the primary drafting of the manuscript. Co-authors contributed to the interpretation of findings, provided critical revisions and strengthened the clarity and coherence of the final text. All authors collaborated in drafting, revising, and approving the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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