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# Transformational leadership and electric vehicle adoption: A systematic literature review

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## ABSTRACT

This systematic literature review examines how transformational leadership influences electric vehicle (EV) adoption across organizational and individual dimensions. Addressing critical gaps in understanding leadership influence propagation throughout the EV adoption ecosystem, the study explores temporal evolution, theoretical frameworks, leadership effectiveness, and stakeholder roles. Using PRISMA 2020 protocols with a dual-stream search approach, we analyzed peer-reviewed Scopus articles (2020-2025), yielding 94 initial articles refined to 53 methodologically relevant studies. Results reveal transformational leadership as critical in EV adoption pace, with publications peaking at 28 in 2023 a 155% annual increase. Geographically, Asia contributes 38% of studies, followed by Europe (30%), with significant gaps in Africa and South America. Methodologically, 56.4% employ quantitative approaches, potentially overlooking contextual complexities. Thematic analysis identifies eight primary research themes, dominated by sustainability-driven transformation and technological innovation. Comparative analysis demonstrates transformational leadership's superior effectiveness in addressing organizational readiness and individual adoption psychology versus other leadership styles. Synthesising diverse theoretical frameworks, we develop an Input-Process-Output model conceptualising how transformational leadership mediates between environmental conditions and adoption outcomes. This review contributes: (1) a comprehensive framework explaining leadership influence propagation through the EV adoption ecosystem, and (2) practical insights for accelerating electric mobility transitions through effective leadership approaches.

**Contribution/ Originality:** This study contributes to the existing literature by synthesizing evidence from 2020 to 2025 on how transformational leadership influences EV adoption. It employs a dual-stream PRISMA approach. The study is among the few that link organizational readiness and consumer psychology. The primary contribution of the paper is an IPO framework of these pathways.

## 1. INTRODUCTION

The global automotive industry is experiencing a transformative shift toward electric vehicles (EVs) as a strategic response to climate change concerns and sustainability imperatives [1, 2]. This transition represents more than a technological evolution; it embodies a complex socio-technical transformation requiring coordinated action across multiple stakeholders, including manufacturers, policymakers, and consumers [3, 4]. Despite growing policy support and increasing recognition of environmental benefits, EV adoption continues to face significant challenges, with the



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global market penetration remaining below projected targets in many regions [5, 6]. Recent data reveals that while EV sales have surged in some markets, reaching 15 million projected units in China by 2030, adoption remains disproportionately concentrated in developed economies, indicating persistent barriers to widespread implementation [1, 7].

Amid these challenges, leadership approaches have emerged as critical factors influencing the pace and trajectory of sustainable technology adoption. Research publications on leadership's role in EV adoption have increased dramatically, from isolated studies before 2017 to an unprecedented peak of 28 publications in 2023 representing a 155% increase from the previous year [8, 9]. This surge coincides with pivotal industry developments, including substantial EV incentive programs across numerous countries, significant expansion of charging infrastructure, and heightened urgency following climate assessment reports highlighting the critical window for action [10]. Among various leadership styles examined, transformational leadership has demonstrated particular promise for addressing the multifaceted challenges of EV transition, uniquely integrating organizational capabilities and individual adoption psychology while balancing idealism with pragmatism [11, 12].

Despite growing scholarly interest, significant gaps remain in understanding how transformational leadership influences EV adoption across different levels of analysis. Existing research has primarily employed quantitative methods (56.4% of studies), potentially overlooking the complex contextual factors and interpersonal dynamics that shape leadership effectiveness [13, 14]. Furthermore, geographical disparities in research distribution reveal critical blind spots, with the Global South contributing only 43% of studies despite representing major growth markets for the automotive industry [15, 16]. Most importantly, while studies have examined various aspects of EV adoption from technological barriers to consumer preferences few have systematically investigated the cascading effects of transformational leadership on organizational readiness and individual adoption decisions [17, 18].

In response to these research gaps, this systematic literature review aims to address these gaps by synthesising existing knowledge on how transformational leadership influences EV adoption through cascading effects across organisational and individual dimensions. By examining this relationship through a multi-level perspective, this review makes two significant contributions: (1) it provides a comprehensive framework for understanding the mechanisms through which leadership influences propagate throughout the EV adoption ecosystem, and (2) it offers practical insights for stakeholders seeking to accelerate electric mobility transitions through more effective leadership approaches. These contributions are particularly valuable given the urgency of transportation decarbonization efforts and the need for evidence-based strategies to overcome persistent adoption barriers [2, 19].

The review is guided by five research questions: (1) How has research on transformational leadership's influence on EV adoption evolved? (2) What theoretical frameworks explain the relationship between transformational leadership and readiness for EV adoption at organizational and individual levels? (3) How do different leadership styles compare in their effectiveness for facilitating EV implementation? (4) What is the role of various stakeholders in accelerating consumer EV adoption, and how does transformational leadership influence stakeholder contributions? By addressing these questions, this review not only maps the contours of current scholarship but also illuminates critical gaps in leadership-driven transitions. Ultimately, it offers a future-oriented perspective on how transformational leadership can serve as a strategic lever for advancing sustainable mobility—bridging the divide between technological promise and societal acceptance in the urgent race toward decarbonized transportation. To address these research questions systematically, this paper is structured as follows. The Literature Review covers key theories and recent studies on transformational leadership and EV adoption. The Methodology section details our systematic review approach following PRISMA protocols. The Results section presents findings organized around the four research questions. The Discussion section synthesizes these findings and proposes a comprehensive framework, followed by Conclusions and future research directions.



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## 2. LITERATURE REVIEW

The relationship between transformational leadership and technology adoption has been extensively studied across various industries, with the automotive sector receiving particular attention due to its significant environmental and economic implications. Technology adoption theories provide the foundational framework for understanding EV implementation processes. The Technology Acceptance Model (TAM) and its extension, UTAUT, have been widely applied to examine individual-level adoption decisions, with recent studies by Jaiswal, et al. [13] demonstrating how techno-psychological factors influence consumer intentions toward battery electric vehicles in developing markets.

At the organizational level, the TOE (Technology-Organization-Environment) Framework has proven effective in analyzing how external pressures, organizational capabilities, and technological factors collectively influence adoption decisions [1]. Furthermore, transformational leadership research in the EV context has evolved significantly, moving from general leadership effectiveness studies to sector-specific applications. Loder, et al. [9] examined German automakers' dynamic capabilities, revealing how leadership cognitive frames shape organizations' sensing abilities for low-carbon opportunities.

Similarly, Liu, et al. [12] explored cross-market innovation strategies among Chinese EV manufacturers, highlighting how transformational leadership facilitates technology catching-up through strategic international expansion. Recent studies have also emphasized the critical role of stakeholder collaboration, with research showing that successful EV transitions require leadership approaches that coordinate actions across manufacturers, policymakers, and consumers [20, 21]. However, significant gaps remain in understanding the cascading mechanisms through which transformational leadership influences both organizational readiness and consumer adoption outcomes across different cultural and economic contexts.

## 3. DATA AND METHODOLOGY

This study adopts a systematic literature review (SLR) methodology to examine the cascading effects of leadership on electric vehicle (EV) adoption, particularly focusing on the automotive sector. A systematic literature review is a rigorous methodology that systematically identifies, evaluates, and synthesizes existing research through transparent and replicable processes. Unlike traditional narrative reviews, SLR employs predefined search strategies and inclusion criteria to ensure objectivity.

This study differs from past studies in several key aspects. First, we employed a dual-stream search approach that captures both general leadership insights (Stream 1) and EV-specific applications (Stream 2), providing broader contextual understanding. Second, our review examines explicitly cascading effects of transformational leadership across both organizational and individual levels simultaneously. Third, we focus on the automotive sector during the critical 2020-2025 period when EV adoption accelerated globally, utilizing PRISMA 2020 protocols for enhanced methodological rigour.

Guided by the PRISMA 2020 protocol [22], the review was structured around two distinct but complementary search streams, as shown in Figure 1. Stream 1 focused on leadership, innovation, and support within the broader context of the automotive industry, identifying research that might not explicitly center on EVs but is critical for understanding leadership dynamics and organizational transformation. Meanwhile, Stream 2 targeted more specialized literature addressing transformational leadership and change management in relation to EV adoption, sustainability, and integration. Both streams sourced peer-reviewed articles from Scopus, published between 2020 and 2025, written in English, and categorized under the article type format.



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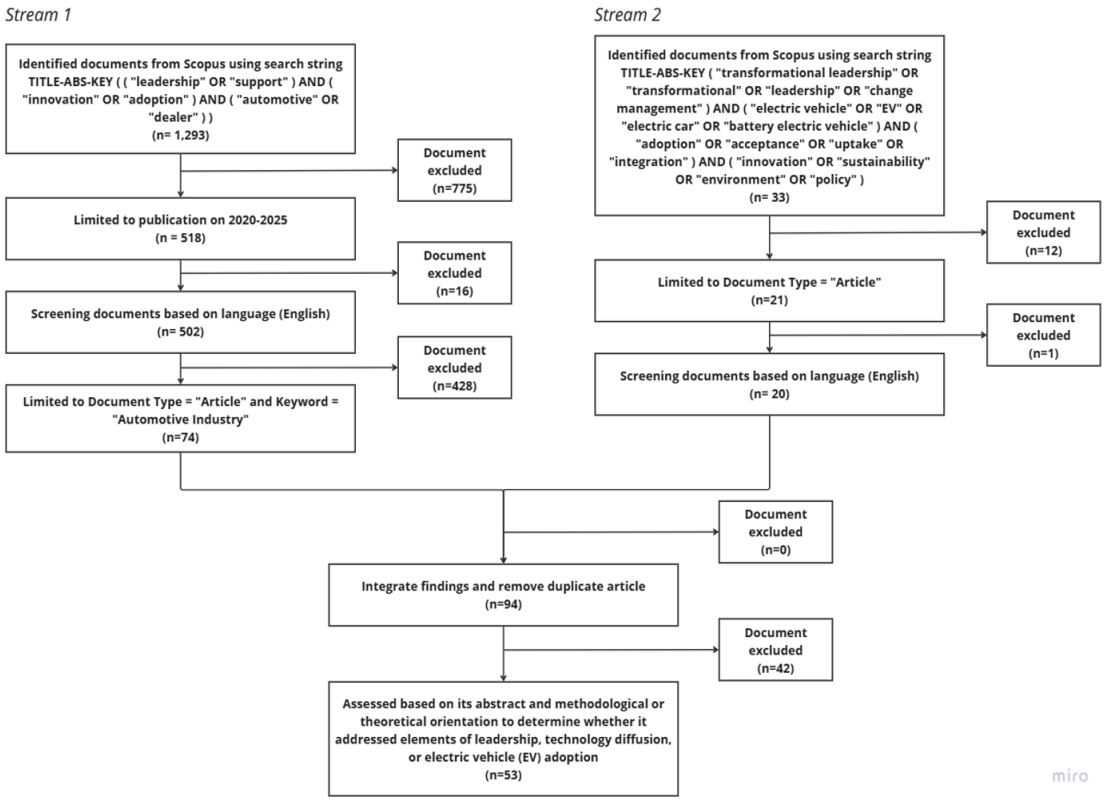


**Figure 1.** PRISMA framework.

After duplicate removal and exclusion of irrelevant documents, 94 articles remained and were further screened based on abstract content and theoretical orientation. Only studies that addressed core elements such as leadership types (e.g., transformational, distributed), technology diffusion mechanisms, or factors influencing EV adoption were included in the final synthesis. This yielded 53 articles deemed methodologically and conceptually relevant. The dual-stream approach allowed for both a broad contextual capture and a focused investigation, ensuring the review encompasses both general leadership insights and specific applications to EV adoption pathways. Such design strengthens the review's analytical depth and supports the development of a conceptual framework that links leadership with innovation ecosystems and sustainability transitions.

## 4. FINDINGS

RQ1: How has research on transformational leadership's influence on EV adoption evolved over time?

### *4.1. Research Trend Over Time*

The evolution of research on transformational leadership's influence on electric vehicle (EV) adoption reveals a fascinating progression over the past 16 years, as illustrated in Figure 2. From 2008 through 2017, scholarly interest remained notably modest, with only one publication per year, reflecting the early developmental stage of both EV technology and research connecting leadership to sustainable transportation initiatives. This period coincided with the early commercial introduction of modern EVs like the Tesla Roadster (2008) and Nissan Leaf (2010), though academic focus remained primarily on technical challenges rather than leadership dimensions [23, 24]. Research during these early years primarily explored fundamental conceptual frameworks, examining basic connections between leadership styles and sustainable transportation alternatives.

Interest in this area began to show signs of growth in 2020, with a notable increase to 8 publications, marking the first significant upward trend. This initial rise aligned with increasing global climate action awareness following the 2015 Paris Climate Agreement implementation and growing corporate sustainability commitments [2, 10]. The



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trajectory then accelerated dramatically in 2020 and 2021, with 14 and 16 publications, respectively, reflecting a substantial shift in focus from theoretical leadership frameworks toward practical implementation strategies. This surge corresponded with several pivotal developments: major automotive manufacturers announcing ambitious EV transition plans [11, 25]; government carbon neutrality pledges, and, surprisingly, the COVID-19 pandemic's influence on green recovery initiatives that emphasized sustainable transportation [18, 26].

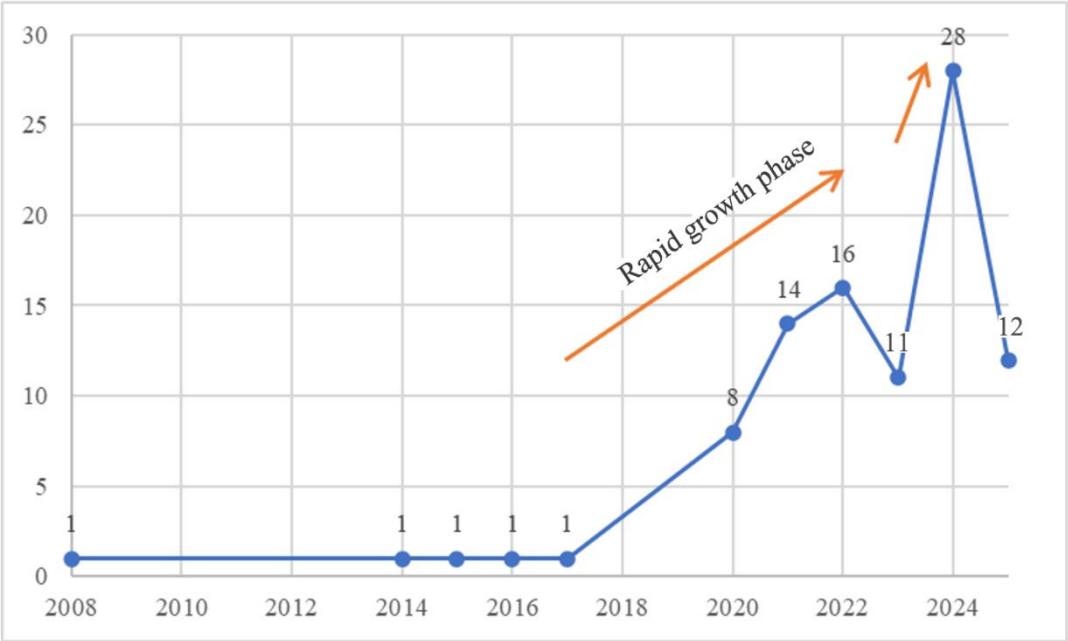


**Figure 2.** Research trends on transformational leadership and EV adoption.

The most remarkable feature in the publication trend occurs in 2023, with an unprecedented spike to 28 publications, representing a 155% increase from the previous year. This exceptional peak coincided with multiple catalytic events that intensified interest in the leadership dimensions of EV adoption: implementation of substantial EV incentive programs across numerous countries [1, 7]; significant expansion of charging infrastructure [27]; and heightened urgency following the IPCC's (Intergovernmental Panel on Climate Change) Sixth Assessment Report highlighting the critical window for climate action [10]. The research focus during this peak year expanded substantially, examining leadership's multifaceted role across policy implementation, consumer behavior change, industrial transformation, and community-based EV initiatives [13, 28].

Following this remarkable peak, 2024 shows a moderate decrease to 12 publications, suggesting a recalibration period where the field appears to be consolidating knowledge rather than continuing its explosive growth [8, 29]. This pattern aligns with typical research maturation cycles, where rapid expansion is followed by periods of integration and refinement. Throughout this entire trajectory, the research focus has evolved significantly beginning with exploratory studies examining potential connections between transformational leadership and EV adoption intentions [30, 31], then progressing to implementation strategies and organizational change processes [32], and most recently expanding to comprehensive analyses of leadership's cascading effects across entire ecosystems of stakeholders [33, 34]. This evolution reflects broader societal recognition that successful EV transition demands transformational leadership at multiple levels to overcome entrenched systems and behaviors [12, 15]. The research trajectory demonstrates not just changing publication volumes but a fundamental shift in how scholars conceptualize the leadership dimensions of sustainable transportation transformation moving from isolated leadership-adoption relationships to integrated frameworks that recognize the complex interplay between leadership, policy, technology, infrastructure, and social factors in facilitating the global transition to electrified mobility systems [14, 19]. Despite



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the recent moderation in publication numbers, the sustained level of scholarly output suggests continuing recognition of leadership's critical role in navigating the challenges of widespread EV adoption [35, 36].

### *4.2. Geographical Distribution*

The geographical distribution of research on transformational leadership and electric vehicle adoption reveals significant patterns that merit careful analysis. Based on a careful review of the literature provided, Figure 3 presents the distribution of studies across different regions globally.

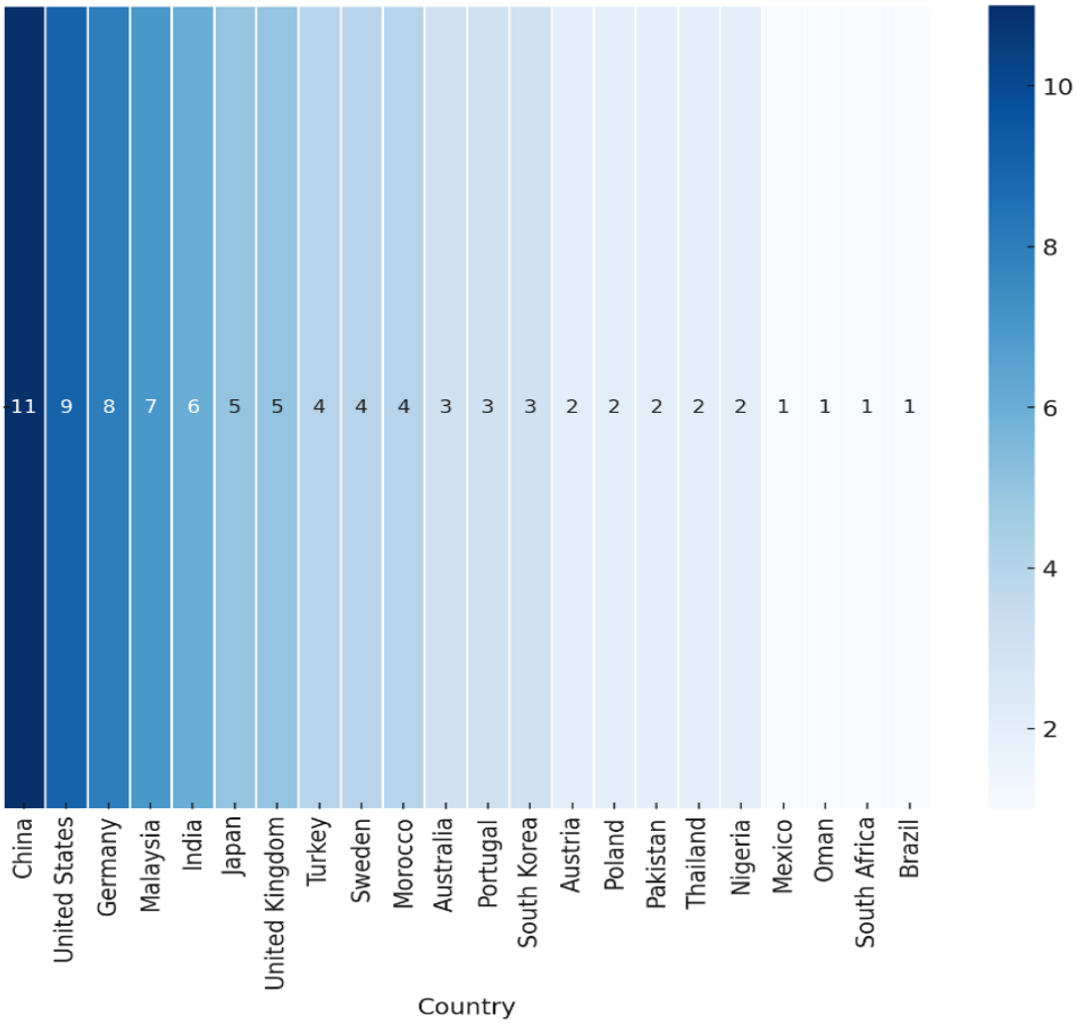


**Figure 3.** Geographical distribution of research.

The geographical landscape of research on transformational leadership's influence on electric vehicle adoption demonstrates a distinctive pattern that challenges traditional assumptions about research concentration. Asia emerges as the dominant region with 36 publications, accounting for approximately 38% of the total research output. China leads within this region with 11 publications [1, 37], reflecting its position as the world's largest electric vehicle market and its aggressive policy initiatives toward transportation electrification [38, 39]. Malaysia's strong representation with 7 publications [28, 40] is particularly noteworthy for a developing economy, suggesting significant interest in leadership dimensions of sustainable transportation within Southeast Asia.

Europe follows with 28 publications (approximately 30%), with Germany contributing the largest share (8), consistent with its automotive manufacturing prominence and early adoption of transformational approaches to transportation electrification [4, 9]. The geographic distribution within Europe spans both Western and Eastern



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regions, with Morocco's substantial contribution (4) highlighting increased research interest in North African contexts [34, 41]. North America's contribution is primarily from the United States (9 publications), reflecting its significant but not dominant position in this research domain [19, 25].

This distribution reveals a more balanced research landscape than typically observed in many technological and leadership domains, with the Global South contributing substantially to the literature. The combined contributions from Asia (excluding Japan and South Korea), Africa, the Middle East, and South America account for approximately 43% of the geographically identified studies. This relatively equitable distribution suggests growing recognition of the importance of context-specific understanding of transformational leadership in EV adoption across diverse economic and cultural settings [15, 16]. Nevertheless, important geographical gaps remain. Africa, despite its population size and increasingly urgent climate adaptation needs, contributes only 3 publications [10, 30]. South America is particularly underrepresented, with just a single study from Brazil, despite the region's significant automotive manufacturing base and growing environmental concerns [42]. These gaps highlight the need for greater research attention to regions facing unique challenges in EV adoption, including infrastructure limitations, economic constraints, and distinctive leadership environments [13, 43].

The relatively small number of studies with undefined geographical contexts (8) suggests a predominantly context-aware approach in this research domain, with most studies explicitly situating their analysis within specific national or regional frameworks. This contextual grounding enhances the applicability of findings while potentially limiting inappropriate generalization across dissimilar settings [11, 32]. The evolving geographical distribution of research in this domain indicates a growing recognition that transformational leadership for EV adoption must be understood within specific socioeconomic, cultural, and infrastructural contexts rather than applying universal models [12, 14]. Future research would benefit from more explicit comparative analyses across diverse regions, particularly examining how leadership approaches must adapt to varying stages of economic development, policy environments, and cultural dimensions that influence effective EV adoption strategies [8, 29].

## 5. METHODOLOGY

Table 1 presents the distribution of methodological approaches across 94 studies on transformational leadership and EV adoption. Of the studies reviewed, 56.4% employed quantitative methods, such as surveys, statistical modeling, and hypothesis testing, focusing on measurable relationships between leadership and adoption metrics [5, 6]. While this quantitative dominance aligns with traditional positivist paradigms, it often overlooks the complex contextual factors and interpersonal dynamics that shape leadership effectiveness [37, 44].

**Table 1.** Methodological approaches in transformational leadership and EV adoption research.

| Methodological approach | Number of studies | Percentage |
|---|---|---|
| Quantitative | 53 | 56.4% |
| Qualitative | 22 | 23.4% |
| Mixed methods | 15 | 16.0% |
| Conceptual/Theoretical | 4 | 4.2% |

Qualitative approaches, comprising 23.4% of the studies, offer valuable insights into the nuanced mechanisms through which leadership influences EV adoption. These methods, including case studies and interviews, capture the underlying processes, such as how leaders navigate resistance and foster organizational cultures conducive to change [11, 16]. However, the limited number of qualitative studies suggests a need for greater emphasis on understanding the cultural and organizational contexts in which transformational leadership operates [9, 19]. Meanwhile, mixed methods research accounts for 16.0% of the studies, combining quantitative surveys with qualitative interviews or case studies. This integration allows for both broad statistical analysis and deeper exploration of leadership practices, providing a more comprehensive understanding of the processes behind EV adoption [23, 33]. Despite its growing



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presence, mixed methods research remains underutilized, and there is a clear opportunity for future studies to explore leadership through both rigorous measurement and in-depth qualitative analysis [30, 45].

Finally, conceptual or theoretical approaches (4.2%) have contributed to the development of frameworks that establish the theoretical foundations between transformational leadership and EV adoption [2, 24]. While these studies are foundational, they lack empirical data, highlighting a gap in applied research that could further validate or refine theoretical models [8, 32]. In summary, the predominance of quantitative approaches, while offering robust statistical evidence, risks neglecting the complex, context-dependent dynamics that are crucial for understanding leadership's role in EV adoption [13, 14]. Greater methodological diversity, especially in qualitative and mixed methods studies, is essential to uncover the mechanisms behind leadership practices and to explore the interplay between leadership and organizational cultures [29, 36]. Longitudinal studies, which are currently underrepresented, would also provide deeper insights into how leadership influences evolve during the adoption process [31, 34].

### *5.1. Key Research Themes*

Based on the analysis of the literature, several significant themes emerge regarding transformational leadership's influence on electric vehicle adoption. These themes represent the primary focal areas within the current body of research and highlight the multifaceted nature of leadership's role in facilitating EV transitions. Table 2 presents the main thematic categories identified in the systematic review.

**Table 2.** Predominant research themes in transformational leadership and EV adoption studies.

| Thematic category | Description | Number of studies | Representative references |
|---|---|---|---|
| Sustainability-driven transformation | Research focusing on how transformational leadership articulates and implements sustainability values to drive organizational change toward EV adoption. | 18 | Loder, et al. [9]; Wu, et al. [46]; Lodhia, et al. [10] and Wurster [4] |
| Technological innovation and capabilities | Studies examining how transformational leaders foster technological innovation, R&D investments, and develop organizational capabilities necessary for EV transition. | 15 | Ziegler and Abdelkafi [47]; Taalbi and Nielsen [36]; Feng, et al. [39] and Liu, et al. [37] |
| Policy implementation and government influence | Research investigating the interplay between transformational leadership and policy frameworks, including how leaders navigate regulatory environments and leverage government incentives. | 14 | Wang, et al. [1]; Meckling and Biber [23]; Richards [19] and Liu, et al. [7] |
| Stakeholder collaboration and ecosystem development | Studies focused on how transformational leadership facilitates collaboration across multiple stakeholders and builds supportive ecosystems for EV adoption. | 12 | Tagliazucchi, et al. [3]; Guzik, et al. [33]; Roumboutsos, et al. [45] and Gianiodis, et al. [48] |
| Consumer behavior and market readiness | Research examining how transformational leadership influences consumer perceptions, addresses adoption barriers, and creates market readiness for EVs. | 10 | Jaiswal, et al. [13]; Potoglou, et al. [5]; Jansson, et al. [31] and Seebauer [30] |
| Organizational change management | Studies analyzing how transformational leadership manages resistance to change, cultural transformation, and organizational restructuring during EV transitions. | 9 | Kumar and Sahay [11]; Liu, et al. [12]; Baumgartinger-Seiringer [49] and Lin, et al. [18] |
| Cross-cultural and geographic variations | Research investigating how transformational leadership approaches and effectiveness vary across different cultural contexts and geographic regions. | 8 | Oni and Longe [15]; Dolanay [16]; Sarker, et al. [28] and Ojubanire, et al. [34] |
| Infrastructure Development and System Integration | Studies focused on how transformational leadership addresses infrastructure challenges and system integration issues in EV implementation. | 8 | Hirata [35]; Mohamad and Songthaveephol [27]; Zhang, et al. [50] and Nascimento, et al. [51] |

The thematic analysis reveals that sustainability-driven transformation constitutes the most significant research focus, highlighting the centrality of environmental values and sustainability narratives in practical leadership



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approaches to EV adoption [4, 9]. This predominance reflects the increasingly recognized role of transformational leaders in articulating compelling visions of sustainable mobility that can mobilize organizational resources and stakeholder commitment. However, the relatively balanced distribution across multiple themes indicates the multidimensional nature of leadership challenges in EV transition, suggesting that successful transformational leadership must simultaneously address technological, organizational, market, and ecosystem dimensions rather than focusing narrowly on environmental messaging alone [2, 11].

Notably, the thematic distribution also illuminates significant gaps in current research. While sustainability narratives and technological innovation receive substantial attention, fewer studies address the critical aspects of organizational change management and cross-cultural variations in leadership effectiveness [28, 49]. This imbalance suggests that researchers have emphasized the "what" of transformation (sustainability goals and technological solutions) over the "how" (managing organizational change processes and cultural factors). Additionally, the limited research on infrastructure development and system integration indicates a potential disconnect between leadership studies and the practical implementation challenges that often determine EV adoption success in real-world contexts [35, 50]. These gaps highlight opportunities for future research to develop a more holistic understanding of how transformational leadership can effectively address the full spectrum of barriers to widespread EV adoption [1, 12].

RQ2: What theoretical frameworks explain the relationship between transformational leadership and readiness for EV adoption at organizational and individual levels?

The concept of readiness for technology adoption represents a critical dimension in understanding the implementation of transformational technologies such as EVs. Based on a synthesis of the literature, Table 3 presents the dual streams of readiness that influence EV adoption at both organizational and individual levels.

**Table 3.** Dual streams of readiness for electric vehicle adoption.

| Dimension | Organizational readiness | Individual Readiness |
|---|---|---|
| Core focus | *What conditions enable organizations to effectively adopt and build capabilities to exploit EV technology?* | *How to increase EV acceptance levels high enough for effective dissemination across stakeholder groups?* |
| Unit of analysis | Organizational systems and structures [52]. | Individual actors (though often contextualized within organizational settings) [53, 54]. |
| Theoretical frameworks | TOE framework; resource-based theory; critical success factor frameworks; management of technology models [55, 56]. | Technology Acceptance Model (TAM); Unified Theory of Acceptance and Use of Technology (UTAUT); Social Cognitive Theory [30, 57]. |
| Key readiness factors | Organizational factors (leadership, culture); technology infrastructure; environmental factors; external policy support [1, 58]. | Environmental constraints; norms; self-efficacy; emotions; management interventions; technology accessibility [31, 37]. |
| Role of readiness factors | Direct influence on adoption capability [17]. | Indirect influence through mediating psychological states [5, 13]. |
| Implementation focus | Strategic integration of EVs into operations and business models [35, 47] | Facilitating individual adoption decisions and usage behaviors [6, 14] |
| Leadership influence | Strategic direction, resource allocation, organizational structure design [11, 18] | Vision articulation, role modeling, cultural influence [12, 32] |
| Barriers to readiness | Financial constraints, infrastructure limitations, organizational inertia [16, 26] | Range anxiety, habit persistence, knowledge gaps, charging inconvenience [15, 33] |
| Measurement approaches | Organizational capability assessments, resource audits, strategic alignment evaluations [4, 28] | Technology Readiness Index (TRI), behavioral intention scales, acceptance modeling [8, 10] |

The concept of readiness for EV adoption encompasses the preparedness of both organizations and individuals to embrace and effectively implement electric vehicle technology [17, 59]. This dual-level readiness framework is



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particularly relevant to understanding the complex dynamics of EV adoption, where success depends on coordinated readiness across multiple dimensions, ranging from infrastructure preparedness to individual acceptance of new mobility paradigms [2, 26]. At the organizational level, readiness involves developing the internal capabilities required to integrate EV technology into operational systems, as seen in the transformation of automotive production lines, the conversion of company fleets, and the development of charging infrastructure [28, 47, 58]. Key factors include top management support, technological infrastructure readiness, and alignment with external policy frameworks [19]. Research shows that transformational leadership plays a central role in shaping this organizational readiness by setting strategic vision, allocating resources, and cultivating a supportive culture for change [11, 18].

On the other hand, individual readiness focuses on the psychological, behavioral, and contextual factors that influence a person's decision to adopt EVs. This dimension is critical in consumer markets, where collective purchasing decisions determine the pace of market transformation [5, 37]. Its mechanisms of influence tend to be indirect, shaped by social norms, personal values, and perceptions of technology [60, 61]. Key components include the Technology Readiness Index (TRI), perceived control over EV use and maintenance, and emotional responses such as range anxiety and environmental values [6, 14]. Additionally, exposure to transformational leadership can influence psychological readiness mainly when leaders communicate a compelling vision of sustainable mobility [10, 31].

The interaction between organizational and individual readiness further highlights the critical role of transformational leadership as the bridge between the two. Leaders not only drive institutional preparedness through strategy and investment but also shape individual readiness through role modeling and narratives of change [53, 62]. This is evident in workplace EV adoption programs, where organizational initiatives directly affect employee perceptions and adoption behaviors [15, 32]. Studies show that a lack of alignment between the two, such as strong organizational readiness without addressing individual concerns like charging convenience, often results in limited adoption success [16, 45]. Conversely, psychologically ready individuals may be constrained by inadequate organizational support [33]. Therefore, this dual-stream readiness framework offers a more holistic approach to analyzing EV adoption processes. Future research should explore how transformational leadership simultaneously enhances both organizational capabilities and individual psychological readiness across various social and economic contexts [8, 29].



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**Table 4.** Leadership styles for EV adoption.

| Leadership style | Key authors | Pros | Cons | Suitability for EV adoption | Relative effectiveness |
|---|---|---|---|---|---|
| Sustainability-focused leadership | Wurster [4]; Potoglou, et al. [5]; Loder, et al. [9]; Lodhia, et al. [10]; Seebauer [30]; Jansson, et al. [31] and Kayikci, et al. [63] | • Aligns with environmental values | • May be perceived as "greenwashing" | Most suitable for organizations with a strong environmental identity and stakeholders who prioritize sustainability. | Medium-High |
| | | • Appeals to eco-conscious stakeholders | • Limited appeal to economically motivated stakeholders | | |
| | | • Enhances organizational reputation | • Can overlook practical implementation challenges | | |
| Technology-oriented leadership | Kim, et al. [6]; Jaiswal, et al. [13]; Taalbi and Nielsen [36]; Liu, et al. [37]; Feng, et al. [39]; Ziegler and Abdelkafi [47] and Mousaei, et al. [64] | • Strong focus on technical capabilities | • Neglects emotional adoption factors | Best suited for contexts where technical barriers are the primary adoption challenges and for technically sophisticated stakeholders. | Medium-High |
| | | • Addresses infrastructure challenges | • Creates knowledge gaps in organizations | | |
| | | • Appeals to early adopters | • Often lacks inspirational elements | | |
| Collaborative/Networked leadership | Tagliazucchi, et al. [3]; Liu, et al. [7]; Richards [19]; Guzik, et al. [33]; Roumboutsos, et al. [45] and Gianiodis, et al. [48] | • Leverages ecosystem resources | • High coordination complexity | Particularly effective for addressing infrastructure challenges and policy barriers that require multi-stakeholder cooperation. | High |
| | | • Creates systemic solutions | • Slow decision-making | | |
| | | • Distributes implementation costs | • Potential dilution of organizational focus | | |
| Consumer-centric leadership | Potoglou, et al. [5]; Jaiswal, et al. [13]; Jansson, et al. [31]; Banerjee and Patre [32]; Liu, et al. [37] and Munshi, et al. [65] | • Directly addresses adoption barriers | • Resource-intensive customer support | Most effective in consumer markets with significant adoption barriers and for organizations with direct customer interaction. | Medium-High |
| | | • Builds trust and transparency | • Extends adoption timelines | | |
| | | • Enhances market intelligence | • Requires substantial staff retraining | | |
| Transformational leadership | Wang, et al. [1]; Romero-Lankao, et al. [2]; Kumar and Sahay [11]; Liu, et al. [12] and | • Integrates multiple dimensions of change | • Requires exceptional leadership qualities | Highly suitable for the comprehensive nature of the EV transition, addressing both technical and cultural dimensions | High |
| | | • Addresses both organizational and individual readiness | • Demands sustained effort | | |



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| Leadership style | Key authors | Pros | Cons | Suitability for EV adoption | Relative effectiveness |
|---|---|---|---|---|---|
| | Baumgartinger-Seiringer [49] | • Creates compelling vision for change | • May face entrenched resistance | while facilitating paradigm-shifting change. | |
| | | • Balances idealism with pragmatism | • Success depends on the leader's skills | | |
| | | • Develops new capabilities | | | |
| Dynamic capabilities leadership | Loder, et al. [9]; Sarwar, et al. [43]; Zhang, et al. [50]; Yan, et al. [66] and Chvatalova, et al. [67] | • Creates organizational flexibility | • May create organizational instability | Particularly effective in rapidly evolving EV markets characterized by high competition and technological change. | High |
| | | • Builds a culture of innovation | • Requires significant investment | | |
| | | • Enables rapid reconfiguration | • Disrupts established patterns | | |
| Traditional transactional leadership | Kim, et al. [6]; Digges [68]; Zhu, et al. [69] and Pan, et al. [70] | • Provides clear metrics | • Inadequate for paradigm-shifting technology | Best suited for the implementation of clearly defined, incremental aspects of EV adoption rather than transformative change. | Low-Medium |
| | | • Familiar approach | • Focuses on compliance, not commitment. | | |
| | | • Maintains operational stability | • Limited effectiveness for innovation | | |



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RQ3: How has leadership been conceptualized and studied in relation to sustainable technology adoption in the automotive sector?

This review examines leadership primarily within organizational contexts, focusing on the roles of manufacturers, suppliers, policy bodies, and infrastructure providers, all of which play critical roles in either facilitating or hindering EV adoption [11, 49]. Organizations serve as the primary implementers of technological, infrastructural, and market changes necessary for EV transitions [2]. The focus is on how organizational leadership creates readiness conditions that subsequently enable consumer adoption, reflecting the cascading influence from leadership decisions to market outcomes [1, 12].

The automotive sector's transition toward electric vehicles (EVs) represents one of the most significant technological shifts in transportation history, demanding leadership capable of addressing the complex organizational, technological, and market challenges involved. The literature reveals diverse conceptualizations of leadership in relation to sustainable technology adoption, each with distinct strengths and limitations for facilitating EV implementation, as shown in Table 3. The literature analysis indicates significant variation in how leadership has been conceptualized concerning EV adoption. Early research applied traditional models without substantial adaptation [68, 69], whereas more recent approaches have developed specialized leadership frameworks reflecting the unique demands of sustainable technology implementation [4, 50]. Each style offers distinct advantages and limitations.

Sustainability-focused leadership effectively aligns with environmental values but may struggle with practical implementation barriers [10, 30]. Technology-oriented leadership excels at addressing technical challenges while often overlooking psychological dimensions of adoption [6, 39]. Collaborative approaches effectively address ecosystem challenges but increase coordination complexity [3, 45] while consumer-centric leadership directly addresses adoption barriers but requires substantial resources [13, 65]. Among these diverse approaches, transformational leadership emerges as particularly well-suited for EV adoption due to several distinctive strengths. It uniquely integrates multiple dimensions of technological change, addressing both organizational capabilities and individual adoption psychology [1, 11]. This integration enables transformational leaders to simultaneously build necessary infrastructure while creating the compelling vision and motivation needed for stakeholder engagement. Transformational leadership also effectively balances the needs of diverse stakeholders affected by EV adoption [2] while demonstrating adaptability across organizational settings and cultural contexts [7, 49].

After reviewing the leadership styles in Table 4, several critical questions arise regarding their effectiveness in driving EV adoption. Is sustainability-focused leadership effective if it aligns with environmental values but struggles with practical implementation [10, 30]? While it enhances reputation, its limited appeal to economically motivated stakeholders hinders broader EV transitions. Does technology-oriented leadership suffice when it addresses technical challenges but overlooks emotional adoption factors [3, 39]? Although it excels at infrastructure development, its lack of inspirational elements limits broader stakeholder engagement. Can collaborative or networked leadership overcome its coordination challenges [3, 45]? While it leverages ecosystem resources, its slow decision-making process can delay EV progress. How does consumer-centric leadership justify its resource-intensive approach despite addressing adoption barriers [13, 65]? The need for extensive support and retraining raises questions about its scalability. Can dynamic capabilities leadership maintain stability while driving innovation [43, 66]? Its potential to destabilize organizations limits its applicability. Lastly, is traditional transactional leadership sufficient for the transformative nature of EV adoption [68, 69]? While it provides stability, its focus on compliance rather than transformation makes it inadequate for driving change.

Given these challenges, transformational leadership (TL) stands out as the most suitable approach for EV adoption. TL uniquely addresses these concerns by integrating technical, organizational, and psychological dimensions of change, ensuring both infrastructure development and stakeholder engagement. It balances idealism with pragmatism, fostering a compelling vision for change while developing new organizational capabilities [1, 11].



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Additionally, TL has proven particularly effective in navigating regulatory complexities and building consumer confidence, crucial for the successful adoption of EVs [2, 49]. Therefore, TL is the optimal choice for leading the comprehensive transformation required in the automotive sector's shift to electric mobility.

The critical advantage of transformational leadership in the context of EV adoption lies in its ability to address both organizational and individual readiness two key dimensions that are crucial for the successful implementation of EVs. Transformational leadership stands out as the most effective approach for EV adoption due to its ability to address both organizational and individual readiness, which are essential for a successful transition. By focusing on vision articulation, motivation, intellectual stimulation, and individualized consideration, transformational leadership creates a comprehensive framework that drives change across all levels of an organization [11, 12]. This holistic approach ensures that both the structural changes and the human factors involved in EV adoption are effectively managed, engaging stakeholders on an emotional and intellectual level. Unlike collaborative/networked or dynamic capabilities leadership, which excel in specific areas like external partnerships or rapid adaptation, transformational leadership balances organizational stability with flexibility, making it ideal for navigating the complex nature of the EV transition [9, 45].

While other leadership styles may offer strengths in particular aspects of EV adoption, transformational leadership's ability to integrate vision, motivation, and practical adaptation is key. It addresses the multifaceted challenges of EV adoption, ensuring that both external collaboration and internal cultural change are aligned. Importantly, it also engages the hearts and minds of stakeholders, overcoming resistance and ensuring long-term commitment to the transition [1, 12]. This makes transformational leadership not only the most suitable but the most comprehensive approach for guiding organizations through the paradigm shift of EV adoption, while still allowing for adaptations from other leadership styles where necessary [9, 43].

RQ4: The Role of Stakeholders in Accelerating Consumer EV Adoption

Electric vehicle adoption represents far more than an isolated corporate initiative or individual consumer decision; it embodies a complex ecosystem process requiring coordinated action across multiple stakeholders. This transition fundamentally depends on the interactions between diverse actors, each contributing essential elements to the adoption pathway [2, 3]. Understanding the systematic role of stakeholders in accelerating EV adoption is critical for developing effective strategies that address both organizational readiness and consumer adoption factors. Our analysis reveals that stakeholder influence varies significantly across the EV adoption ecosystem, with each group contributing unique and complementary capabilities to the transition process. Table 5 presents a comprehensive overview of key stakeholders, their relative influence, representation in the literature, and specific contributions to EV adoption.

**Table 5.** Stakeholder roles and influence in EV adoption.

| Stakeholder | Influence | Representation in literature | Count | How they shape EV adoption | Key citations |
|---|---|---|---|---|---|
| Government | High | High | 14 | • Establish regulatory frameworks and emissions standards<br>• Provide financial incentives and subsidies<br>• Invest in public charging infrastructure<br>• Create policy direction and implementation frameworks<br>• Fund R&D initiatives | Wang, et al. [1]; Meckling and Biber [23]; Richards [19] and Lodhia, et al. [10] |
| Automotive industry | High | High | 15 | • Develop and manufacture EV products<br>• Build charging infrastructure networks<br>• Adapt business models for electrification | Ziegler and Abdelkafi [47]; Kumar and Sahay [11]; Sarker, et al. [28] and Hirata [35] |



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| Stakeholder | Influence | Representation in literature | Count | How they shape EV adoption | Key citations |
|---|---|---|---|---|---|
| | | | | • Establish technical standards<br>• Train workforce on new technologies | |
| Energy providers | High | Medium | 8 | • Develop charging network infrastructure<br>• Manage grid integration challenges<br>• Implement renewable energy solutions<br>• Create pricing models for EV charging<br>• Adapt business models for electrification | Zhang, et al. [50]; Hirata [35]; Roumboutsos, et al. [45] and Mohamad and Songthaveephol [27] |
| Financial institutions | Medium | Low | 6 | • Provide financing for EV purchases<br>• Fund charging infrastructure development<br>• Create leasing and insurance products<br>• Develop new valuation models for EVs<br>• Support business model innovation | Lin, et al. [18]; Broadbent, et al. [20] and Jaspers and Proff [71] |
| Consumers | High | High | 10 | • Make EV purchase decisions<br>• Determine adoption timelines<br>• Shape market direction through preferences<br>• Contribute user feedback for improvement<br>• Drive social norm development | Jaiswal, et al. [13]; Potoglou, et al. [5]; Kim, et al. [6]; Wan, et al. [14] and Jansson, et al. [31] |
| Local communities | Medium | Low | 7 | • Support or resist charging infrastructure siting<br>• Create local incentives for adoption<br>• Implement public charging facilities<br>• Shape local transportation integration<br>• Influence social acceptability | Guzik, et al. [33]; Wurster [4]; Oni and Longe [15] and Templeton, et al. [21] |
| Research & academia | Medium | Medium | 9 | • Develop new battery technologies<br>• Research consumer adoption patterns<br>• Create new materials and manufacturing processes<br>• Evaluate environmental impacts<br>• Train future workforce | Taalbi and Nielsen [36]; Mousaei, et al. [64]; Loder, et al. [9] and Sarwar, et al. [43] |
| NGOs & advocacy groups | Medium | Low | 4 | • Advocate for supportive policies<br>• Build public awareness of EV benefits<br>• Monitor environmental compliance<br>• Provide independent evaluation of progress<br>• Connect diverse stakeholders | Lodhia, et al. [10]; Romero-Lankao, et al. [2]; Melton, et al. [25] and Seebauer [30] |

The stakeholder analysis reveals several important patterns. First, government and automotive industry stakeholders exert the highest influence on EV adoption pathways and receive the most attention in the literature, reflecting their critical role in establishing policy frameworks and developing vehicle technologies, respectively [1, 11]. While consumers also receive substantial research attention, other crucial stakeholders particularly financial institutions, local communities, and advocacy groups remain significantly underrepresented despite their important



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roles in enabling adoption [18, 33]. A notable observation is the interconnected nature of stakeholder influences. Government policies directly shape automotive industry investments, which in turn affect consumer options. At the same time, energy providers must coordinate with both sectors to ensure charging infrastructure aligns with vehicle technology and user needs [2, 50]. This complex web of interdependencies highlights why EV adoption cannot be effectively accelerated through isolated interventions targeting single stakeholder groups.

The EV adoption process can be conceptualized through an Input-Process-Output framework that highlights how various stakeholder groups contribute to specific aspects of the adoption journey. This framework demonstrates that successful adoption depends not only on the presence of supportive environmental conditions (inputs) but also on the effective processing of these conditions through organizational systems and transformational leadership to create adoption readiness (outputs). Figure 4 illustrates how different stakeholder groups contribute to specific aspects of the EV adoption journey, underpinned by established theoretical frameworks.

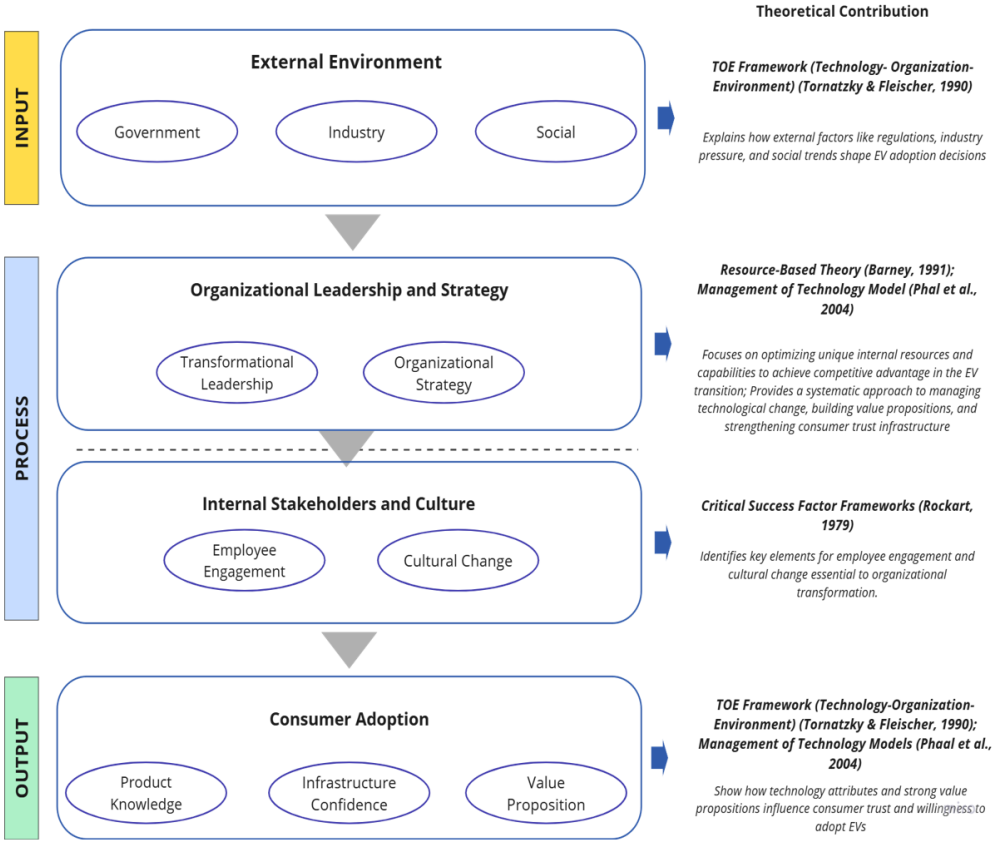


**Figure 4.** Leadership framework for EV adoption.

**Source:** Tornatzky and Fleischer [72]; Barney [73]; Phaal, et al. [74] and Rockart [75].

Figure 4 illustrates how the EV adoption journey is structured as a cascading process with theoretical underpinnings at each stage. The external environment layer, informed by the TOE Framework [72], represents the foundational inputs from government, industry, and social stakeholders that create the enabling conditions for EV adoption. These external factors establish the regulatory frameworks, market context, and social norms that shape the broader adoption environment. The process layer demonstrates how organizational leadership and strategy, supported by Resource-Based Theory [73] and Management of Technology Models [74], transform these external inputs through transformational leadership approaches and strategic resource allocation. This leadership process then influences internal stakeholders and organizational culture, where Critical Success Factor Frameworks [75] help identify key elements for employee engagement and cultural change essential for adoption readiness.



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The framework's output layer illustrates how organizational processes ultimately influence consumer adoption through three key dimensions: product knowledge, infrastructure confidence, and value proposition—guided by the TOE Framework and Management of Technology Models. This integrated theoretical approach demonstrates how transformational leadership acts as a crucial mediating mechanism, transforming external environmental conditions into internal organizational readiness and, ultimately, into consumer adoption outcomes. The framework emphasizes the importance of both technological factors (such as infrastructure and product specifications) and psychological factors (including cultural change and value perceptions) in the electric vehicle (EV) adoption process. It explains why approaches that focus solely on technical aspects or behavioral factors often fall short of expectations [1, 12]. Successful EV transitions require leadership strategies that address multiple dimensions of the adoption ecosystem, coordinating actions across stakeholder groups and stages of adoption.

## 6. DISCUSSION

This systematic literature review provides a comprehensive analysis of the cascading effects of transformational leadership on electric vehicle adoption, revealing important insights into the complex interplay between leadership approaches, organizational readiness, and consumer adoption outcomes. Our findings highlight the multidimensional nature of EV adoption processes and the critical role of transformational leadership in facilitating successful transitions across multiple stakeholder groups and adoption stages.

A significant contribution of this research is the development of the Leadership Framework for EV Adoption (Figure 4), which conceptualizes the adoption process through an Input-Process-Output model with theoretical foundations at each stage. This framework demonstrates how transformational leadership functions as the critical mediating mechanism that translates external environmental conditions into organizational readiness and ultimately into consumer adoption. By integrating established theoretical perspectives, including the TOE Framework [72], Resource-Based Theory [73], Critical Success Factor Frameworks [75], and Management of Technology Models [74], the model provides a robust foundation for understanding the cascading influence of leadership decisions on EV adoption outcomes.

Despite the growing body of literature on various aspects of EV adoption, research specifically examining consumer adoption through the lens of transformational leadership remains relatively scarce. Our thematic analysis (Table 2) reveals that while sustainability-driven transformation and technological innovation have received substantial attention, consumer behavior and market readiness represent a smaller proportion of the research focus (10 studies), indicating an important gap in the literature. This gap is particularly significant given the critical role of consumers in determining ultimate adoption outcomes, as highlighted in our stakeholder analysis (Table 5). While consumers are identified as having high influence on adoption pathways, the mechanisms through which transformational leadership shapes consumer decisions remain underexplored [5, 13].

Table 6 presents the principal research gaps connecting transformational leadership to consumer EV adoption, including barrier-specific leadership tactics, cascading mechanisms from organizations to markets, contextual adaptations, impact metrics, longitudinal evidence, and integration of technical and psychological dimensions.

Furthermore, our methodological analysis highlights that the predominance of quantitative approaches (56.4% of studies) may be limiting our understanding of the nuanced psychological and cultural factors that influence consumer adoption decisions. The complex, context-dependent dynamics of leadership's influence on consumer behavior may be better captured through increased use of qualitative and mixed-methods approaches [13, 14]. Additionally, the geographical analysis reveals significant gaps in research from regions facing unique adoption challenges, particularly in Africa and South America, indicating a need for more diverse contextual perspectives on consumer adoption patterns [28, 42].



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**Table 6.** Research gaps in transformational leadership and consumer EV adoption.

| Research gap | Description | Relevant citations |
|---|---|---|
| Consumer barrier-specific leadership approaches | Limited understanding of which leadership approaches most effectively address specific consumer barriers (Range anxiety, charging concerns, cost perceptions). | Wan, et al. [14]; Kim, et al. [6]; Guzik, et al. [33] and Oni and Longe [15] |
| Cascading mechanisms from organizations to markets | Underdeveloped knowledge of how leadership practices cascade from organizational contexts to consumer markets and what factors mediate this transition. | Liu, et al. [12]; Banerjee and Patre [32]; Kumar and Sahay [11] and Wang, et al. [1] |
| Contextual adaptations of leadership | Insufficient research on how transformational leadership needs to be tailored to different consumer segments and cultural contexts across diverse markets. | Oni and Longe [15]; Dolanay [16]; Sarker, et al. [28] and Ojubanire, et al. [34] |
| Effectiveness metrics and evaluation frameworks | Lack of established metrics and frameworks for evaluating the impact of transformational leadership interventions on consumer adoption outcomes | Lodhia, et al. [10]; Thompson and Lee [8]; Wurster [4] and Jaiswal, et al. [13] |
| Longitudinal studies on leadership effects | Scarcity of longitudinal research examining how leadership influences adoption over time through various market stages. | Jansson, et al. [31]; Banerjee and Patre [32]; Seebauer [30] and Richards [19] |
| Integration of technical and psychological dimensions | Limited investigation of how leadership can simultaneously address both technical implementation aspects and psychological adoption factors. | Feng, et al. [39]; Kim, et al. [6]; Liu, et al. [37] and Munshi, et al. [65] |

The Leadership Framework for EV Adoption proposed in this study offers a promising foundation for addressing these research gaps by providing a holistic model that explicitly connects leadership practices to consumer adoption outcomes through organizational readiness mechanisms. By identifying the specific pathways through which transformational leadership influences the adoption process, this framework can guide future research and practice in developing more effective strategies for accelerating EV adoption among consumers. In particular, the framework highlights the importance of addressing both technological factors (product knowledge, infrastructure confidence) and value-based considerations in consumer adoption decisions, suggesting that leadership approaches must balance technical implementation with compelling value propositions to achieve widespread adoption [1, 12].

## 7. CONCLUSION

This systematic literature review examined the cascading effects of transformational leadership on electric vehicle adoption across organizational and individual dimensions. Analyzing 94 peer-reviewed articles from 2020 to 2025, we identified transformational leadership as a critical mediating mechanism that translates external environmental conditions into organizational readiness and ultimately consumer adoption outcomes. The study revealed significant growth in research publications, peaking at 28 studies in 2023, with Asia contributing 38% of research output. Our analysis demonstrates that transformational leadership uniquely integrates multiple dimensions of technological change, addressing both organizational capabilities and individual adoption psychology more effectively than other leadership styles.

### *7.1. Theoretical and Practical Implications*

This study contributes to leadership and technology adoption theory by developing an integrated Input-Process-Output framework that connects transformational leadership practices to EV adoption outcomes. The framework synthesizes the TOE Framework, the Resource-Based Theory, and the Technology Acceptance Models, providing a comprehensive theoretical foundation for understanding leadership's cascading influence across organizational and consumer levels.



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### *7.2. Practical Implications*

For practitioners, our findings suggest that organizations adopt transformational leadership approaches that simultaneously address technological infrastructure development and stakeholder engagement. The framework guides the development of leadership strategies that balance sustainability narratives with practical implementation, coordinate multi-stakeholder ecosystems, and address both organizational readiness and consumer adoption barriers.

### *7.3. Limitations*

This study has several limitations that should be acknowledged. First, the predominance of quantitative methodologies (56.4%) may limit understanding of complex contextual factors influencing leadership effectiveness. Second, geographical representation remains uneven, with significant gaps in research from Africa and South America. Third, the review focuses primarily on peer-reviewed articles from Scopus, potentially excluding valuable insights from other databases and grey literature. Finally, the 2020-2025 timeframe, while capturing recent developments, may not reflect longer-term trends in leadership effectiveness.

### *7.4. Future Research Directions*

Future research should address several critical gaps identified in this review. First, longitudinal studies examining how leadership influences evolve through various market stages are needed. Second, qualitative and mixed-methods approaches should be emphasized to capture nuanced psychological and cultural factors influencing consumer adoption. Third, comparative analyses across diverse regions and cultural contexts would enhance understanding of leadership adaptations required for different markets. Fourth, research specifically examining consumer barrier-specific leadership approaches and cascading mechanisms from organizations to markets represents important opportunities for theoretical and practical advancement.

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