

Specificities and Lessons Learned from Operational Excellence in the Moroccan Automotive Context

Mohammed Hamoumi, Mariam Benhadou and Abdellah Haddout

Industrial Management and Plastics Forming Technology Team

Mechanics, Engineering and Innovation Laboratory

LM2I, National High School of Electricity and Mechanics

ENSEM- Hassan II University Casablanca, Morocco

hamoumi@gmail.com

Abstract

This study investigates the integration of Operational Excellence (OpEx) within Morocco's automotive sector. It addresses a critical void in the literature by presenting a comprehensive model that considers both leadership practices and critical success factors within the local sociocultural context. While Moroccan studies affirm OpEx's benefits like improved efficiency, they also identify persistent challenges such as resistance to change, skill deficiencies, and investment limitations. Through an exploratory research design, a validated questionnaire was administered to 265 managers across all Moroccan automotive companies, achieving a 93% response rate. This extensive examination significantly contributes to academic understanding, OpEx practitioners, and performance optimization researchers by thoroughly assessing OpEx adoption and integration in this specific environment. Key findings underscore the critical importance of strong management commitment, adequate training, effective communication, and a supportive organizational culture for successful OpEx initiatives. Crucially, the research reveals how Morocco's unique sociocultural context—marked by high power distance, strong collectivism, low uncertainty avoidance, and significant religious influence—profoundly shapes the adoption and maturity of these practices. Ultimately, achieving sustainable Operational Excellence in the Moroccan automotive industry requires a holistic approach, meticulously considering intertwined cultural, organizational, and individual dimensions. The paper synthesizes valuable lessons, offering essential insights for developing a tailored OpEx deployment model truly adapted to Morocco's distinct economic and cultural landscape.

Keywords

Operational Excellence, Moroccan Automotive Industry, Manufacturing Performance, Lean Six Sigma, Critical Success Factors (CSFs).

1. Introduction

Businesses today face a complex economic environment, where globalization, digitalization, environmental regulations, and heightened societal expectations all influence their strategic objectives. Evaluating performance is inherently complex due to its subjective nature and dependence on numerous variables. As (Issor, 2017) highlights, performance is a multidimensional concept, varying by organization and shaped by individual characteristics.

Operational Excellence (OpEx) has emerged as a highly successful approach to performance enhancement over the last two decades, particularly in the industrial sector since 2010. While definitions vary, a consistent theme is the relentless pursuit of perfection across all organizational facets. (Pathmalatha, et al., 2022) concisely define OpEx as "being excellent in everything you do." It's a holistic framework integrating best practices from Lean, Lean Six Sigma, and Agile (Found, et al., 2018), aiming to optimize processes, elevate quality, and enhance customer satisfaction through comprehensive employee involvement.

The Moroccan automotive sector, operating within this dynamic global economy, faces its own increasingly complex challenges. Intensified competition, market volatility, evolving regulations, climate change concerns, and technological disruptions demand continuous adaptation. Here, operational excellence becomes crucial for bolstering organizational performance and competitiveness (Hamoumi, et al., 2025a; Hamoumi, et al., 2024a; Hamoumi, et al., 2024b; Hamoumi, et al., 2024c; Hamoumi, et al., 2025b). The rapidly expanding Moroccan automotive industry offers a compelling setting for this investigation, especially as new manufacturing facilities are a significant national strategic imperative. Successful project realization hinges on an OpEx model tailored to Morocco's unique characteristics.

Despite existing studies on OpEx in the Moroccan automotive sector, there's a significant research gap regarding the influence of the country's specific socio-cultural context on the adoption and maturity of these practices.

This research aims to bridge this gap by proposing a methodological approach to adapt an operational excellence model to these specificities, through an in-depth analysis of current practices and identified company needs in the Moroccan automotive sector.

2. Literature Review

2.1. Evolution and Core Tenets of Operational Excellence

Operational Excellence (OpEx) serves as a vital catalyst for organizational achievement, synthesizing principles from various continuous improvement methodologies such as Lean, Six Sigma, and Agile to optimize processes across all organizational tiers (Found, et al., 2018). Historically, Lean management, particularly prominent within the automotive industry, has laid the groundwork for attaining OpEx, with numerous models reflecting the core tenets of the Toyota Production System. However, directly applying Western OpEx models in diverse settings like Morocco poses considerable challenges due to differing cultural and economic landscapes. This necessitates localized adaptations that take into account social relations, hierarchy, and long-term perspectives. Studies emphasize that effective OpEx extends beyond mere results, concentrating instead on enablers like corporate culture, robust methodologies, tools, and employee empowerment (Jaeger, et al., 2014). Recent meta-analyses further underscore the critical roles of employee involvement, comprehensive training, and strong management support in the success of OpEx within manufacturing contexts (Antony, et al., 2023).

2.2. Global and Regional Dynamics of Operational Excellence in Automotive

The global automotive sector has undergone profound transformations, with production nearly doubling in the past two decades. Asia, particularly China, has emerged as a leading manufacturing hub. Morocco has also significantly advanced in global automotive production rankings, highlighting its growing strategic importance in the industry (Hamoumi, et al., 2024a). Research into OpEx implementation across leading automotive producing countries reveals diverse approaches but converges on common success factors. These include unwavering leadership commitment, dedicated employee training, and a culture that fosters continuous improvement (Hamoumi, et al., 2025a; Tong, et al., 2019). Challenges such as resistance to change, skill deficiencies, and systemic complexities are frequently encountered (Rathi, et al., 2022). Furthermore, successful OpEx adoption demands careful adaptation to regional and cultural specificities, as evidenced by studies across China, the United States, Japan, and other nations. This confirms that while core principles are universal, their application must be culturally sensitive (Sayyadi, 2023; Lu Zhang, 2015). A comparative analysis of Operational Excellence (OpEx) practices within the automotive industry across various global leaders reveals diverse approaches and shared insights. Research in China highlights the criticality of leadership commitment, communication, and training for Lean's success, emphasizing local adaptation (El Safty, 2012). Further Chinese studies show Lean implementation often combines with Fordist-Taylorist practices (Lu Zhang, 2015) and that Lean Manufacturing and corporate culture positively impact sustainability in automotive companies (Tong, et al., 2019). In the USA, the experience of General Motors underscores the vital role of organizational culture for long-term Lean Manufacturing success (Vacanti Brondo, et al., 2010). Japanese automotive companies, through comparative analysis, emphasize the need for more flexible organizational and leadership models (Sayyadi, 2023), with the human aspect (soft TQM) being crucial for successful Total Quality Management (TQM) implementation in SMEs (Georgiev, et al., 2020).

Moving to other regions, India's automotive component manufacturing sector faces barriers to Lean Six Sigma (LSS) implementation, with studies identifying key obstacles and offering deployment recommendations (Rathi, et al., 2022). In Germany, Lean Manufacturing (LM) requires specific adaptations due to the country's institutional and cultural

context (Krzywdzinski, 2021). Mexican studies examine the impact of automation and digitalization on employment (Carrillo, et al., 2023), optimize assembly processes for enhanced productivity (Montesinos González, et al., 2023), and identify key success factors for the Kaizen method (García, et al., 2013). Research in Spain underscores the essential role of human resource development in successful Lean Manufacturing implementation (Ákos Uhrin, et al., 2017). Brazil's automotive sector is exploring the current state of LSS integration, emphasizing the need for a more structured adoption framework (Olga Maria, et al., 2019). Finally, studies from Thailand (Suriya, 2014) and South Africa (Rathilall, et al., 2018) both contribute to developing a unified theoretical model of Lean Six Sigma as a tool for organizational transformation.

2.3. Operational Excellence in the Moroccan Context: Enablers and Challenges

Within the Moroccan context, there's a burgeoning interest in Lean and Six Sigma, with numerous studies evaluating their practices and outcomes. These investigations confirm the potential for enhanced performance and competitiveness, yet they consistently identify country-specific obstacles. Key enablers for successful initiatives in Morocco include strong leadership, adequate training, effective communication, and a corporate culture geared towards continuous improvement (Mohib, et al., 2023; Hamoumi, et al., 2025a). Persistent challenges frequently observed include resistance to change, insufficient knowledge and skills, and inadequate investment (Benhrimida, et al., 2018). The unique Moroccan sociocultural context significantly shapes the adoption and maturity of these practices, underscoring the necessity for a holistic approach that moves beyond quick gains towards deep, lasting transformation (Hamoumi, et al., 2024b). In this vein, recent work has also explored specific methodologies pertinent to operational improvement, such as the "5 Dimensions of Problem-Solving using DINNA Diagram" (Hamoumi, et al., 2021a) and the "DINNA Diagram: Double Ishikawa and Naze Naze Analysis" (Hamoumi, et al., 2021b), which offer structured approaches for addressing complex operational issues.

2.4. Literature Gaps

Despite extensive research on Operational Excellence (OpEx) within the Moroccan automotive sector, a significant void persists. This gap pertains to a comprehensive model that not only evaluates practices and outcomes but also integrates leadership approaches and critical success factors specifically for implementing OpEx within its unique sociocultural context. Existing studies, while valuable, often fall short of proposing such an integrated model. Furthermore, while the global landscape of OpEx success factors is explored, there's an acknowledged need for more comparative studies across various international settings to enrich the understanding of contextual influences and enable more robust cross-cultural analyses. This research aims to address these limitations by focusing on the impact of Morocco's specific socio-cultural dynamics on the adoption and maturity of OpEx practices, an area that has previously received limited attention.

2.5. Theoretical Foundation

The conceptual underpinning for understanding the contextual influences on OpEx implementation, particularly in Morocco, draws primarily from Geert Hofstede's cultural dimensions model (Hofstede, 1983). This framework is widely recognized and used in management sciences for analyzing national cultures, defining culture as a collective mental programming that shapes a group's thoughts, actions, and beliefs. Hofstede's model proposes a cultural typology built upon dimensions such as power distance, individualism vs. collectivism, uncertainty avoidance, masculinity vs. femininity, and long-term vs. short-term orientation.

Crucially, within the scope of this inquiry into Moroccan culture, "religiosity" is integrated as an additional and significant cultural determinant. While not explicitly part of Hofstede's original model, substantial research underscores its importance in understanding specific behaviors, attitudes, and social understandings prevalent in cultures where religion holds a commanding position, as is the case in Morocco. This expanded theoretical lens allows for a more nuanced examination of how Moroccan cultural specificities, characterized by a strong communal spirit, respect for hierarchical structures, low tolerance for ambiguity, a balance between assertive and nurturing values, a long-term outlook, and profound Islamic principles, can influence professional settings, team management, communication, and negotiation approaches, thereby impacting OpEx implementation.

2.6. Research Framework

This research establishes a framework for adapting an Operational Excellence (OpEx) model specifically for the Moroccan automotive sector. Our goal is to bridge the gap between existing, often Western-centric, OpEx models and Morocco's distinct socio-cultural and operational realities. This involves a multi-faceted analysis: first, assessing

current OpEx practices within Moroccan automotive companies; second, identifying their specific needs and challenges related to performance improvement; and third, integrating insights from Moroccan sociocultural specificities (drawing on Hofstede's model, including religiosity) into the model's design. This comprehensive approach aims to propose a tailored OpEx implementation model that is not only effective in boosting performance and competitiveness but also deeply aligned with the unique local context of the Moroccan automotive industry. This underscores the crucial shift from merely applying standardized models to embracing a transformation that is profoundly sensitive to context and centered on human and organizational dynamics.

3. Methodologies

3.1. Research Design and Data Characteristics

The study strictly adhered to a quantitative and empirical research approach, characterized by a systematic and structured investigation coupled with an in-depth analysis of quantifiable data. This methodological choice is visually substantiated by Figure 1. This illustrative diagram meticulously outlines each critical stage of the research, spanning from the initial identification of the target population to the final phases of data analysis. Such a detailed graphical representation emphasizes the study's unwavering commitment to a systematic and data-driven orientation, ensuring that all findings are grounded in measurable observations and statistical inference.

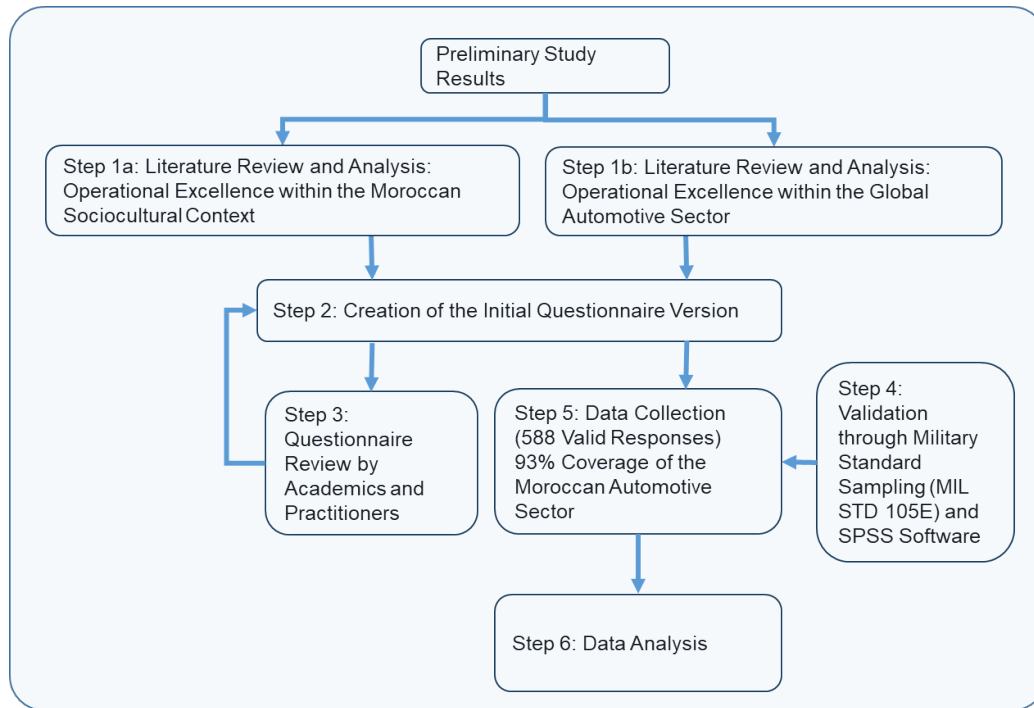


Figure 1: Research Methodology of the Experimental Study

Complementing this rigorous approach, the nature of this research is predominantly applied and explanatory. It extends beyond mere description by seeking to understand and clarify the underlying relationships between various factors and organizational performance. The ultimate goal is to offer actionable insights and propose a practical model of operational excellence specifically tailored to the unique economic and socio-cultural intricacies of the Moroccan context.

To fulfill these objectives, the investigation exclusively relied on primary data, which was meticulously collected directly from the source – the companies operating within the Moroccan automotive sector. This direct collection was crucial, as it ensures the relevance and specificity of the information gathered to the study's precise aims and the unique characteristics of the industry under examination.

3.2. Data Collection and Sampling Strategy

The primary method for data acquisition was an extensive questionnaire-based survey. This widely recognized approach facilitated the efficient gathering of standardized information across a broad spectrum of companies. The structured nature of the questionnaire ensured consistency in data collection, providing a rich and comparable dataset for subsequent statistical analyses.

Following the selection of this robust data collection method, the sampling process was rigorously executed in accordance with the principles outlined in the Military Standard Sampling (MIL STD 105E). This industry-recognized standard is renowned for its precision in determining optimal sample sizes and for validating the representativeness of a collected sample against a larger population. Its meticulous application in this study provided a robust framework for selecting participants, thereby significantly enhancing the statistical validity and the generalizability of the results to the broader Moroccan automotive industry.

As a direct outcome of this stringent sampling technique, the sample size achieved was highly significant. The survey initially targeted a total of 268 identified automotive enterprises operating across Morocco. A remarkably high response rate of 93% was achieved, with 246 companies actively participating and contributing a substantial total of 588 valid questionnaires. This impressive level of participation not only underscores the industry's engagement with the research topic but also vastly exceeds the minimum statistically required sample size. In comparison, when adhering to the MIL STD 105E standard for a population estimated at 220,000 individuals (representing the total workforce in the Moroccan automotive sector) and setting an Acceptable Quality Level (AQL) of 0.25%, the minimum statistically required sample size was calculated to be 315. The study's achievement of collecting 588 questionnaires significantly surpasses this required threshold, thereby lending substantial statistical power and robustness to the conclusions derived from this extensive sample.

3.3. Data Analysis Tools and Statistical Methods

All statistical computations and data analyses were meticulously performed using IBM SPSS Statistics 28 software. This industry-standard, powerful analytical tool is widely acclaimed for its advanced capabilities in processing and interpreting quantitative data across various scientific and management disciplines, ensuring precision and reliability in the analytical phase of the research.

Leveraging the capabilities of this software, a suite of advanced statistical tests was systematically implemented to rigorously analyze the collected data and validate the research hypotheses. These included:

- Cronbach's Alpha Coefficient: Utilized to assess the internal consistency and overall reliability of the measurement scales within the questionnaire, ensuring that the constructs were measured dependably.
- Exploratory Factor Analysis (EFA): Employed to uncover and confirm the underlying latent structures within the collected data, identifying key dimensions or factors that explain the observed variables.
- Kaiser-Meyer-Olkin (KMO) Measure and Bartlett's Test of Sphericity: These tests were conducted prior to EFA to assess the sampling adequacy and confirm that the data were suitable for factor analysis. A high KMO value and a significant Bartlett's test indicate that the data are well-suited for such an analysis.
- Multiple Regression Analyses: Applied to examine the predictive relationships between various independent variables (including identified control variables) and the dependent variable, which is operational excellence, allowing for the quantification of their respective impacts.

3.4. Reliability and Validity Testing

The reliability of the research instrument was robustly confirmed through the calculation of Cronbach's alpha coefficient. An impressive overall Cronbach's alpha of 0.727 was obtained, with all individual measurement instruments consistently exhibiting alpha values greater than the widely accepted threshold of 0.7. This strong result emphatically attests to the high internal consistency and dependable nature of the collected data. The validity of the instrument was subsequently established through a rigorous Exploratory Factor Analysis (EFA). The EFA results further solidified the instrument's validity, yielding a KMO index of 0.723 and a highly significant Bartlett's test of sphericity ($p < 0.000$). These statistical indicators confirm the excellent sampling adequacy and the presence of significant relationships among variables, validating the underlying factorial structure of the data. Furthermore, the EFA process successfully identified five crucial performance factors that underpin the concept of operational excellence within this study's context: Operational Performance, Customer Orientation, Financial Performance, Strategy, and Human Resources. These factors are integral to a nuanced understanding of OpEx in the Moroccan automotive sector.

4. Data Analysis and Results

4.1. Sectoral Context and Industrial Dynamics

The study began with an exhaustive mapping of the Moroccan automotive sector, revealing the presence of 268 active companies. This industrial landscape is distinguished by its complexity and marked diversity, characterized by a predominance of international players (68%) coexisting with Moroccan-owned entities (32%). Foreign firms, notably French (33%), American (15%), and Japanese (12%), prove to be essential drivers of innovation and sectoral development. In parallel, local companies enrich the industry with their specific expertise and actively contribute to its diversification. Crucial dynamism emanates from joint ventures, facilitating not only technology transfers but also the adoption of international standards. These strategic alliances grant Moroccan companies increased capacity to produce high-quality goods and services, thereby consolidating their competitive advantage in the global market.

4.2. Visual Representation of Key Findings

The significant discoveries of this research are materialized and illustrated by fundamental visual models. Figure 2 offers a schematic representation of the complex interrelationships and dependencies between the various components of operational excellence, as statistically corroborated. More specifically, Figure 3 embodies the major contribution and innovation of this study. This innovative model has been specifically developed to harmonize with Morocco's cultural and economic particularities, identifying the most relevant levers of action and essential impact factors for successful operational excellence implementation at the local level.

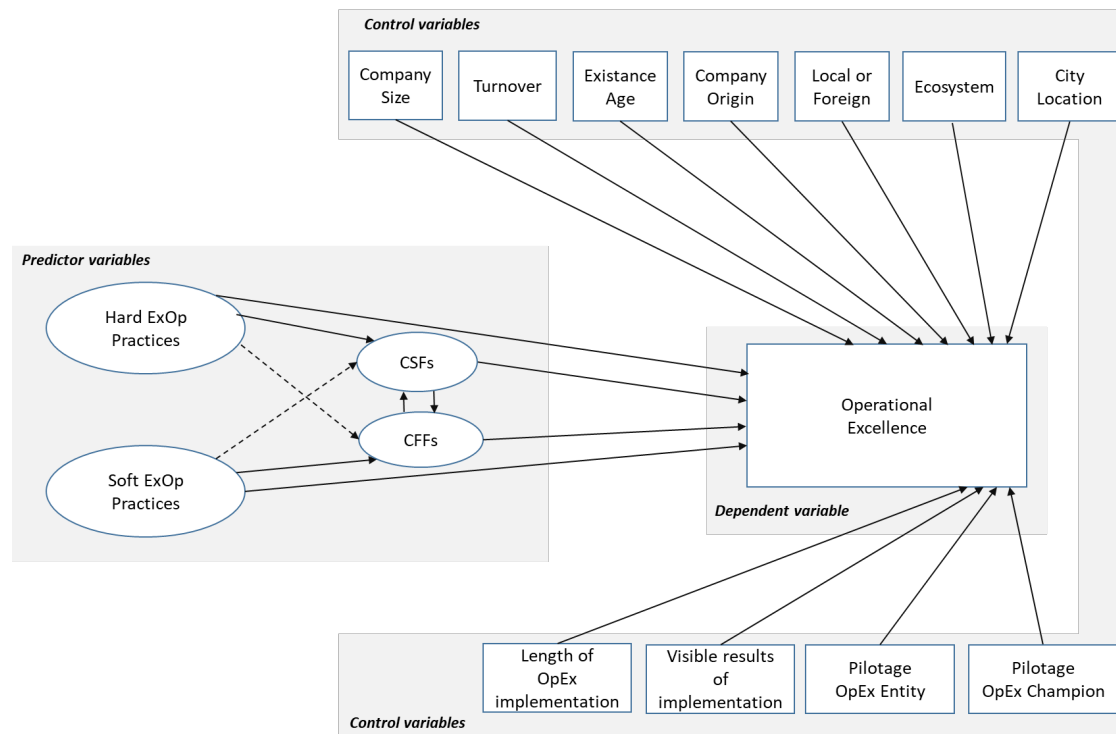


Figure 2: Validated Final Model of Operational Excellence

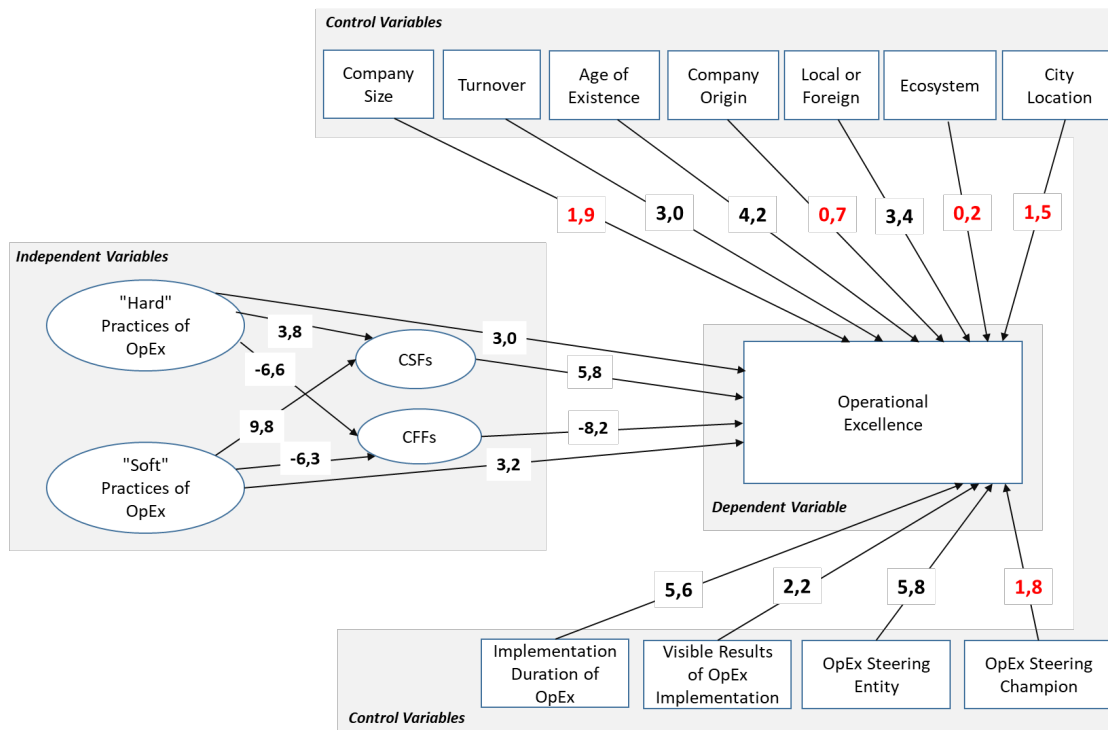


Figure 3: Operational Excellence Model Tailored to the Moroccan Sociocultural Context

4.3. Statistical Analysis and Hypothesis Validation

Data analysis was conducted using rigorous statistical tests, including multiple regressions, to evaluate the influence of various variables on company performance. Regarding the control variables, the results highlighted that turnover, company age, and its status (multinational versus local) exert a significant influence on achieving operational excellence. Notably, factors such as company size, origin, or ecosystem affiliation did not reveal a statistically significant correlation with the success of Operational Excellence in the studied sample.

Furthermore, the examination of the main hypotheses clearly underscored the importance of several factors for effective Operational Excellence implementation. It was confirmed that the application of "hard" practices (methods, tools) and "soft" practices (human relations, culture) of operational excellence, significantly influence critical success and failure factors.

4.4. Principal Findings and Modeling Implications

The fundamental discoveries of this research unfold along two complementary axes:

- A precise and in-depth identification of the preponderant factors that modulate performance and operational efficiency within Moroccan automotive companies.
- The development and validation of an Operational Excellence model specifically designed to integrate harmoniously with Morocco's sociocultural and economic fabric. This model, whose key impact factors are synthetically illustrated in Figure 3, is conceptualized as a strategic guide for companies wishing to optimize their competitive advantage and improve their overall performance.

4.5. Methodological Rigor and Objectivity of Conclusions

The objectivity of the analyses and results presented in this chapter is solidly underpinned by the rigor of the research methodology adopted. The use of a large, representative sample, the application of recognized and validated statistical tests (notably Cronbach's alpha coefficient for measurement reliability, Exploratory Factor Analysis, as well as KMO and Bartlett's tests for construct validity) and full transparency in the presentation of hypothesis test results, collectively contribute to ensuring the reliability, validity, and impartiality of this study's conclusions.

5. Discussion and Interpretation of Results

The study revealing that both "hard" (tools, methods) and "soft" (culture, human relations) OE practices are crucial. Notably, motivation significantly impacts "soft" practices, suggesting human engagement primarily influences cultural and relational OE dimensions, while its direct link to "hard" practices was not statistically established. These empirical findings align with existing literature emphasizing strong leadership (Hamoumi, et al., 2025a), the importance of both "hard" and "soft" practices (Found, et al., 2018), the role of human capital (Mohib, et al., 2023), and the need for contextual adaptation in OpEx models (Krzywdzinski, 2021; Lu Zhang, 2015).

The study's robust methodology, based on 588 valid questionnaires from 268 Moroccan automotive companies (93% response rate) with validated representativeness (MIL STD 105E) and high data quality (Cronbach's Alpha > 0.7, KMO > 0.7, significant Bartlett's Test), ensures credible conclusions. The final OpEx model was validated through multiple regression analyses, with most hypotheses showing strong statistical significance (p-values < 0.05).

The table below summarizes the key hypothesis testing results for independent variables:

Table 1: Research Hypothesis Testing for "Independent Variables"

<i>Hypothesis</i>	<i>Research Hypothesis Test</i>	<i>Statistical Result t/f</i>	<i>p-value</i>	<i>Result</i>
H1	"Hard" Practices of OpEx -> OpEx	3.01	0.003	Supported
H2	Critical Success Factors (CSFs) -> OpEx	5.79	0.000	Supported
H3	Critical Failure Factors (CFFs) -> OpEx	-8.24	0.000	Supported
H4	"Soft" Practices of OpEx -> OpEx	3.06	0.002	Supported
H5	"Hard" Practices of OpEx -> Critical Success Factors (CSFs)	3.84	0.000	Supported
H6	"Hard" Practices of OpEx -> Critical Failure Factors (CFFs)	-6.63	0.000	Supported
H7	"Soft" Practices of OpEx -> Critical Success Factors (CSFs)	9.76	0.000	Supported
H8	"Soft" Practices of OpEx -> Critical Failure Factors (CFFs)	-6.32	0.000	Supported

The research offers significant theoretical and managerial implications. Theoretically, it enriches literature by providing an OpEx model tailored to the Moroccan sociocultural context, highlighting the interplay between "hard" and "soft" practices. Managerially, it provides a validated strategic guide for Moroccan automotive companies to optimize OpEx by investing in both technical aspects and leadership development, employee motivation, and a continuous improvement culture. Recognizing critical success/failure factors and adapting to local specificities are vital for sustainable OpEx, enhancing competitiveness and overall performance.

6. Conclusion

This research delved into Operational Excellence (OpEx) in the Moroccan automotive sector, analyzing its perception, management, and deployment to propose a tailored model for Morocco's unique sociocultural context. Grounded in literature linking culture and leadership to OpEx outcomes, our study explored OpEx perception, practice deployment, maturity, and key influencing factors.

An extensive empirical study, using a validated questionnaire, gathered data from over 268 Moroccan automotive companies with a 93% response rate, creating a highly representative database.

Key findings align with existing theories: OpEx understanding is suboptimal, technical practices are more adopted than managerial ones, communication and skill development are weak, leadership significantly influences employee behavior and OpEx culture, and core success factors include training, change management, awareness, and clear vision.

This study significantly contributes by providing unique data on OpEx integration in the Moroccan automotive sector, mapping company integration levels, assessing leadership's impact on OpEx maturity, and identifying context-specific success factors. It directly addresses questions on OpEx deployment and model adaptation. Both "hard" and "soft" practices, critical success factor management are crucial for OpEx project success.

Limitations include its automotive sector focus (limiting generalizability), reliance on perception-based questionnaire data, and snapshot nature (no long-term evolution). Future research could include longitudinal studies, cross-cultural comparisons, impact of new technologies, and qualitative studies on resistance to change and leadership.

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Biographies

Mohammed Hamoumi is the founder and president of the HiQuality Management association, enabling him to organize and conduct 68 seminars in faculties and higher education schools in Morocco as a speaker. Furthermore, visiting most automotive equipment manufacturers' factories in Morocco as a trainer or auditor has allowed him to consolidate his knowledge and build a network in the Moroccan automotive industry. He is a graduate of Polytech Lille, the leading public engineering school of the University of Lille in France and holds an MBA from EHTP/ENPC - School of International Management Paris. With 17 years of experience in the automotive sector in Morocco, he has held various management positions at ST Microelectronics, LEONI, and PSA, where he managed the startup of the KENITRA plant as Director of Quality and Engineering. He has had the opportunity to visit major PSA factories worldwide (France: Poissy, Velizy, Mulhouse, Sochaux, Valenciennes; Spain: Vigo, Madrid; Portugal: Mangualde; China: Shaingdu, Wuhan 1, 2, and 3). Having gained extensive and sufficient experience with a desire to continue his studies, Mohammed HAMOUMI started his doctoral project in October 2018 in industrial engineering at the LM2I Laboratory with the Industrial Management Team and Technology of Plastics and Composites at ENSEM Casablanca. Mohammed HAMOUMI is certified in IRCA ISO 9001, ISO 14001, ISO 45001, ISO 50001, IATF 16949 V2016, APSAD standard, NEBOSH, BBLSS, and other certifications.

Dr. Mariam Benhadou is a Professor at Industrial Management and Technology of Plastics and Composites Team, Mechanical Laboratory, Engineering and Innovation, ENSEM, Casablanca, Morocco.

Dr. Abdellah Haddout is a Professor and Director at Industrial Management and Technology of Plastics and Composites Team, Mechanical Laboratory, Engineering and Innovation, ENSEM, Casablanca, Morocco.