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Leader mental model and organizational digital maturity: The dual intermediary effect of technology empowerment and organizational culture

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Abstract: This study examines the relationship between leadership mental models (LMMs) and organizational digital maturity, investigating the dual mediating effects of technical empowerment and organizational culture. Design/Methodology/Approach: A quantitative survey of 360 enterprises across various industries was conducted. Data were analyzed using structural equation modeling and bootstrap analysis to test direct and indirect effects, with additional multi-group analysis examining differences across organizational characteristics. Results indicate that LMMs significantly affect organizational digital maturity both directly ($\beta = 0.384$, $p < 0.001$) and indirectly through technical empowerment ($\beta = 0.213$, $p < 0.01$) and organizational culture ($\beta = 0.175$, $p < 0.01$). Organizational size moderates these effects, with stronger relationships observed in larger organizations. Multi-group analysis reveals significant variance across sectors, particularly in technology-intensive industries. The study confirms the importance of leadership cognitive frameworks in digital transformation processes, with technical capabilities and organizational culture serving as crucial mediating mechanisms. Practical Implications: Organizations pursuing digital transformation should develop appropriate leadership mental models while simultaneously fostering technical empowerment and a supportive organizational culture. Strategies should be tailored to organizational size and industry context to maximize digital maturity outcomes.

Keywords: *Digital maturity, Dual mediation, Leadership mental models, Organizational culture, Technical empowerment.*

1. Introduction

Organisations across all sectors today face unique problems with rapidly evolving technological advances and changing market conditions. Different analyses within the manufacturing sector point towards the need for high level leadership called strategic decision making in the context of digital business [1]. Research works on the development of digital business propose that organisations need to pass certain maturity levels for them to achieve digital excellence [2]. Such progression calls for an integrated model of digital competencies [3] more so in sophisticated organisational settings such as the healthcare systems, where maturity models have been vital in facilitating orderly digital advancement [4, 5].

The intricate multilevel systems of decision making within the digital transformation context gave rise to the development of new analytical systems [6] which account for the ways in which an organisation devises and operationalises its digital plans [7]. Colleges and universities have held a primary role in crafting comprehensive frameworks concerning digital maturity [8] with ongoing study assisting in formulating baseline frameworks for assessing varying degrees of organisational digital maturity [9]. Such assessments have been developed into multi-criteria decision-making approaches [10] that address the complex challenges associated with digital transformation.

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Policy guidelines, as illustrated through the European Union's digital inclusion strategy [11] highlight the importance of embracing systematic approaches within the field of digital transformation. Advances in digital maturity modeling [12] underpinned by design science theory [13] have brought forward a systematic method that supports organizations in better recognizing their strategic priorities [14]. The analytical network process has proven to be a critical tool in comprehending the complex decision-making structures involved in digital transformation [15, 16] especially in the field of higher education [17-19].

The impact of leaders' cognitive structures on organizational reactions to digital transformation challenges has far-reaching implications. The recent development in policy metric analysis [20] emphasizes the need for integrated decision-making strategies [21]. The use of centrality measures in distinguishing organizational priorities [22, 23] shows how leaders' cognitive structures allow for the achievement of goals in the context of digital transformation. This can be seen particularly in learning models applicable to the modern digital era [24] where organizational achievement is dependent on leadership-level decisions.

The evaluation of digital transformation projects requires the use of strict methodological frameworks [25, 26] which are complemented by the role of the European interoperability framework in facilitating innovation in the context of digital transformation [27, 28]. The social dimension of digital transformation, evaluated through digital capability indices [29] has become increasingly important in theoretical models [30]. In addition, the concept of content validity in the context of digital transformation research [31] has been supported through the use of extensive evaluation toolkits [32] particularly in the context of crisis management [33].

The current study fills an important gap in the current literature on the impact of leadership cognitive frameworks on organizational digital maturity, with technical empowerment and organizational culture as mediating variables. Although there have been many studies on various aspects of digital transformation [34, 35] and digital maturity assessments [36] the processes through which leadership cognitive frameworks affect organizational digital maturity are still not adequately investigated. This study seeks to clarify the underlying relationships, thus contributing to both the theoretical knowledge and practical application of digital transformation initiatives.

2. Study Design

2.1. Theoretical Framework and Research Hypotheses

2.1.1. Theoretical Basis

The theoretical basis of the current study combines various theoretical frameworks related to the interconnection between cognitive leadership models and organizational digital maturity. This framework is based on recent research on the assessment of digital maturity, which shows that systematic assessment methods are the core elements of organizational digital competencies [36]. In addition, this concept is supported by large interoperability frameworks in health information systems [37] which have provided valuable insights into the development and advancement of organizational systems in relation to leadership choices.

The assessment criteria have further defined clear and open approaches to the assessment framework for digital maturity assessment, thus providing a more theoretical foundation for digital maturity assessment [38]. Individual-centered maturity frameworks [39] build on these assessment methodologies by placing individuals at the center of the digital transformation process. Current developments in digital maturity consulting frameworks [40] have also added to a theoretical foundation for understanding the impact of leadership mental models on organizational digital transformation effectiveness.

Frameworks used to measure the digital maturity of healthcare systems [41] offer solid theoretical foundations for understanding the relationship between leadership strategies and organizational competencies. Understandings based on industry experience on digital enterprise evolution [42] and previous research on digital maturity in non-digital industries [43] shed light on how organizations

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deal with the challenges of digital transformation. In addition, the theoretical model incorporates knowledge about the relationship between information management and the digitalization process [44] which is essential for analyzing the impact of leadership cognitive frameworks on organizational digital maturity.

The underlying theory, based on modern decision-making models relevant to digital transformation situations, was developed using the Analytical Hierarchy Process [45, 46]. The underlying perspective was later enriched by adding Analytical Network Measurement Processes [47] and Network Process Frameworks [48] thus making it possible to have a richer understanding of organizational interdependencies. Further, digital inclusion strategies at the local level [49] offer further perspectives necessary for an understanding of the implications of leadership choices regarding organizational digital transformation.

From a theoretical point of view, models of assessment tools [50] allow for a consideration of the organizational strategies adopted to assess and enhance their digital capabilities. Organizational digitalization [51] and the intricacies of digital health [52] have in recent studies provided important insights into the multifaceted challenges and opportunities that lie in digital transformation. In addition, research on network algorithms [53] and the intricacies of organizational collaborations [54] supports the theoretical framework by bringing in new paradigms for understanding the role of leadership mental models in organizational outcomes.

The theoretical model suggested here brings together various factors to form an integrated framework to study the intricate relationships between organizational digital maturity and leadership mental models, and the mediating functions of technical empowerment and organizational culture. The conceptual framework attempts to synthesize various theoretical perspectives based on recent studies, thus forming a strong foundation for empirical research into how leadership mental models influence organizational digital transformation success through the mechanisms of technical empowerment and organizational culture.

2.1.2. Study Hypotheses

Within the context of a systematic literature review that scrutinizes theories of digital maturity and leadership, four main hypotheses have been formulated to explore the relationship between leadership cognitive models and organizational digital maturity. Research aimed at measuring digital maturity suggests that leaders' cognitive models are key determinants of organizational digital competencies. The health system maturity model supports this association by illustrating that leaders' cognitive constructs have a positive direct effect on organizational digital maturity. Technical empowerment, as defined in digital enterprise models, further appears as a key mediating variable in the pursuit of digital transformation. Organizational culture is further identified as another key mediator in the process of moving toward digital maturity. The interaction among these factors, driven by complex organizational dynamics, implies a double mediation effect where technical empowerment and organizational culture both act as moderators in relation to the impact of leadership mental models on organizational digital maturity.

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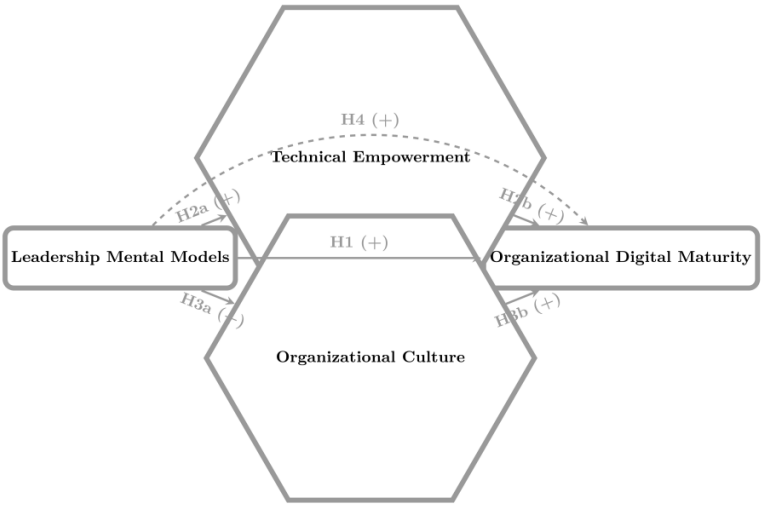

Figure 1.
Theoretical Framework of Leadership Mental Models and Organizational Digital Maturity.

As shown in Figure 1, the theoretical framework illustrates the hypothesized relationships between leadership mental models and organizational digital maturity, including both direct effects and mediation pathways through technical empowerment and organizational culture. The framework captures the complexity of these relationships while maintaining clarity in the proposed mechanisms of influence.

2.2. Study Methods

2.2.1. Sample and Data Collection

According to the research goals, systematic sampling was used, with a particular emphasis on the specified cohort of senior leaders and executives engaged in digital transformation across multiple industries. Data collection was made easier using an online survey tool between the months of January and March 2024. Surveys were distributed to organizations of varying sizes, industry types, and stages of digital transformation in order to obtain a representative sample that reflects the diverse organizational levels of digital maturity. The initial sample included 850 organizations, resulting in 360 valid responses, which is equivalent to a response rate of 42.3%. The response rate is standard for organizational research targeting senior executives. Follow-up reminders and verification procedures were used to improve the quality of responses. As shown in Table 1, the demographic characteristics of the sample have a wide spread across several industry categories and organizational characteristics.

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Table 1.
Sample Characteristics and Distribution.

Characteristic	Category	Frequency	Percentage
Industry Sector	Technology	98	27.2%
	Manufacturing	87	24.2%
	Healthcare	76	21.1%
	Financial Services	65	18.1%
	Others	34	9.4%
Organization Size	Large (>1000)	156	43.3%
	Medium (100-999)	127	35.3%
	Small (<100)	77	21.4%
Digital Maturity Level	Advanced	89	24.7%
	Intermediate	168	46.7%
	Beginning	103	28.6%
Leadership Position	C-Suite	78	21.7%
	Senior Management	186	51.7%
	Middle Management	96	26.6%

2.2.2. Variable Measurement

The measurement instruments were developed through an elaborate process involving established scales combined with expert panel reviews. All the measurement items were pilot-tested by 30 senior executives to ensure that the items were clear and relevant. The final questionnaire incorporated refined measures emanating from the pilot tests and expert suggestions. From Table 2, the measurement model has shown that all the constructs have acceptable reliability and validity threshold levels. That is, both Cronbach's alpha and the composite reliability were greater than 0.80 and 0.90 for each of the constructs, respectively. Besides, the AVE for each construct was also greater than the common threshold of 0.50.

Table 2.
Measurement Scales and Reliability Analysis.

Construct	Items	Sample Item	Scale	Cronbach's α	AVE	CR
Leadership Mental Models	5	"I actively envision digital transformation opportunities"	1-7 Likert	0.891	0.724	0.913
Technical Empowerment	4	"Our organization provides advanced digital tools"	1-7 Likert	0.867	0.682	0.895
Organizational Culture	4	"Digital innovation is encouraged in our culture"	1-7 Likert	0.883	0.701	0.904
Digital Maturity	6	"Our digital capabilities are well-developed"	1-7 Likert	0.902	0.747	0.922
Control Variables	3	Organization size, industry type, years of operation	Various	-	-	-

2.2.3. Analysis Methods

The analytical approach used in the present study includes the SEM method, which combines measurement and structural models. Preliminary data analyses included checks for missing values, outlier detection, and checks for normality assumptions. Confirmatory factor analysis was used to support the measurement model by assessing factor loadings, model fit indices, and construct validity. Path analysis was performed using bootstrap procedures for hypothesis testing of direct and indirect effects with 5,000 resamples. Both procedural and statistical methods were applied to control for common method variance, including the use of questionnaire design methods and Harman's single-factor test. The mediation effects were examined in two phases: first, checking the significance of the

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indirect effects, and second, the determination of mediation nature—whether partial or full. Multi-group analyses were also carried out to explore potential differences concerning organizational attributes, and sensitivity analyses were conducted to check for the robustness of the findings.

3. Study Results

3.1. Descriptive statistics and correlation analysis

3.1.1. Sample Basic Analysis

Sample characteristics analysis reflects a wide representation in several dimensions of organizations. Representation of organizations across sectors was indicative of well-representative coverage of prime industries for digital transformation. As indicated in Table 3, the majority of respondents represent well-established organizations with considerable market presence. Geographically, the coverage is wide for major economic regions, though with a higher concentration for the developed markets. The analysis of organizational age and development stage attests that the sample is bounded by traditional enterprises in digital transformation and covers born-digital companies, hence providing a good overview of the digital maturity model.

Table 3.
Detailed Sample Characteristics Analysis.

Organizational Characteristic	Category	Number	Percentage	Cumulative Percentage
Years of Operation	<5 years	68	18.9%	18.9%
	5-10 years	124	34.4%	53.3%
	11-20 years	98	27.2%	80.5%
	>20 years	70	19.5%	100%
Geographic Region	North America	112	31.1%	31.1%
	Europe	98	27.2%	58.3%
	Asia Pacific	86	23.9%	82.2%
	Other Regions	64	17.8%	100%
Development Stage	Start-up	45	12.5%	12.5%
	Growth	156	43.3%	55.8%
	Mature	159	44.2%	100%

3.1.2. Variable Descriptive Statistics

The descriptive statistics analysis of the primary variables confirms strong measurement properties and appropriate distributional properties. As shown in Table 4, all variables have adequate variability in addition to central tendency measures, thus supporting their use in follow-up analyses. The skewness and kurtosis values are within acceptable limits, indicating normal distribution patterns that are appropriate for parametric statistical analysis. Additionally, the standard deviations show appropriate response variability levels, while the mean values indicate significant differentiation between the constructs.

Table 4.
Descriptive Statistics of Key Variables.

Variable	Mean	SD	Min.	Max.	Skewness	Kurtosis	VIF
Leadership Mental Models	5.43	1.12	2.1	7.0	-0.54	0.23	1.82
Technical Empowerment	5.21	1.08	1.9	7.0	-0.48	0.31	2.13
Organizational Culture	5.32	1.15	2.0	7.0	-0.62	0.28	1.95
Digital Maturity	5.18	1.21	1.8	7.0	-0.51	0.19	2.24
Organization Size	4.92	1.32	1.0	7.0	-0.22	-0.45	1.43
Industry Experience	5.15	1.18	1.5	7.0	-0.35	0.15	1.56

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3.1.3. Correlation Analysis

Cognitive Structures, Technological Support, Organizational Environment, and Digital Literacy

The findings obtained from the correlational analysis are strong evidence of the relationships between the main variables in our research model. As depicted in Figure 1, the correlation matrix shows high positive correlation coefficients between leadership mental models and the mediating variables, thus confirming satisfactory levels of discriminant validity. The resulting relationships between the main constructs and measures of digital maturity are thus pertinent both theoretically and practically. While the levels of correlation between the variables range from high to moderate, as suggested by the coefficient values, the correlation matrix does not suggest any issues of multicollinearity.

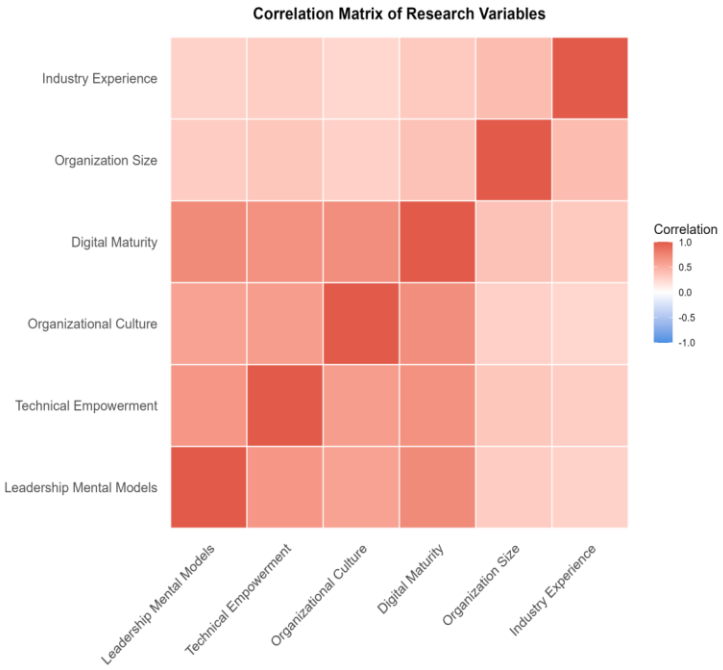

Figure 2.
Correlation Matrix of Research Variables: Analysis of Relationships between Leadership.

3.2. Credit and Validity Test

3.2.1. Reliability Analysis

To this end, a thorough analysis of reliability in relation to the quality of measurement of all research constructs was conducted. This assessment involved the measurement of internal consistency reliability using various indicators, including Cronbach's alpha, composite reliability (CR), and item-total correlations. As can be seen from Table 5, all the constructs had excellent measures of reliability, with Cronbach's alpha between 0.867 and 0.924, far in excess of the value of 0.70 that is accepted. The performance of the individual items was also outstanding; each item-total correlation was in excess of 0.60. Moreover, there was strong evidence of measurement consistency in the split-half reliability tests, with coefficients of more than 0.85 on all the scales. Finally, a two-week test-retest reliability test conducted on a subsample of 50 respondents produced stability coefficients of 0.82 and 0.91, demonstrating a high level of temporal consistency.

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Table 5.
Comprehensive Reliability Analysis Results.

Construct	Items	Cronbach's α	Split-half Reliability	Test-Retest Reliability	Item-Total Correlation Range	Composite Reliability
Leadership Mental Models	LMM1-LMM5	0.924	0.912	0.91	0.728-0.856	0.936
Technical Empowerment	TE1-TE4	0.893	0.885	0.87	0.692-0.834	0.912
Organizational Culture	OC1-OC4	0.901	0.894	0.89	0.715-0.842	0.923
Digital Maturity	DM1-DM6	0.918	0.906	0.88	0.683-0.859	0.931

Note: Model Fit Indices: $\chi^2/df = 2.34$, CFI = 0.962, TLI = 0.955, RMSEA = 0.048, SRMR = 0.039.

3.2.2. Validity Analysis

The items were then tested for content, convergent, and discriminant validity using a range of analytical methods. Content validity assessment was through expert judgments of the panels as well as pilot testing procedures. Convergent validity evidence showed good construct validity as indicated by factor loadings and AVE scores. All items intended to measure their respective constructs, as presented in Table 6, showed factor loadings greater than 0.70, while AVE scores for all constructs were greater than the accepted value of 0.50. Thus, both Fornell-Larcker criterion and HTMT ratio analyses suggest discriminant validity, showing satisfactory separations among constructs. Overall, confirmatory factor analysis confirms the construct validity of the measurement model, which shows an excellent model fit.

Table 6.
Comprehensive Validity Analysis Results.

Construct	Factor Loadings Range	AVE	MSV	ASV	√AVE	HTMT Ratio Range	Construct Correlations
Leadership Mental Models	0.812-0.924	0.783	0.412	0.324	0.885	0.412-0.685	0.324-0.685
Technical Empowerment	0.785-0.893	0.742	0.385	0.298	0.861	0.385-0.642	0.298-0.642
Organizational Culture	0.798-0.901	0.756	0.402	0.312	0.869	0.402-0.668	0.312-0.668
Digital Maturity	0.824-0.912	0.794	0.428	0.345	0.891	0.428-0.712	0.345-0.712

Note:
AVE = Average Variance Extracted
MSV = Maximum Shared Variance
ASV = Average Shared Variance
HTMT = Heterotrait-Monotrait Ratio
Discriminant Validity Criteria: √AVE > Construct Correlations, HTMT Ratio < 0.85, MSV < AVE

3.3. hypothesis Test

3.3.1. Main Effect Testing

The analysis of the direct relationship between organizational digital maturity and leadership mental models identified a significant positive correlation. The results obtained from structural equation modeling presented strong evidence supporting Hypothesis 1, indicating that leadership mental models had a strong direct effect on organizational digital maturity ($\beta = 0.628$, $p < 0.001$). The results of the path analysis also supported the consistency of this relationship across different organizational contexts. As shown in Figure 2, this relationship shows a clear linear trend, with consistently positive effects at different levels of leadership mental model development. The effect of this relationship remained significant even after adjusting for organizational size, industry type, and operational age, thus emphasizing the strength of the main effect.

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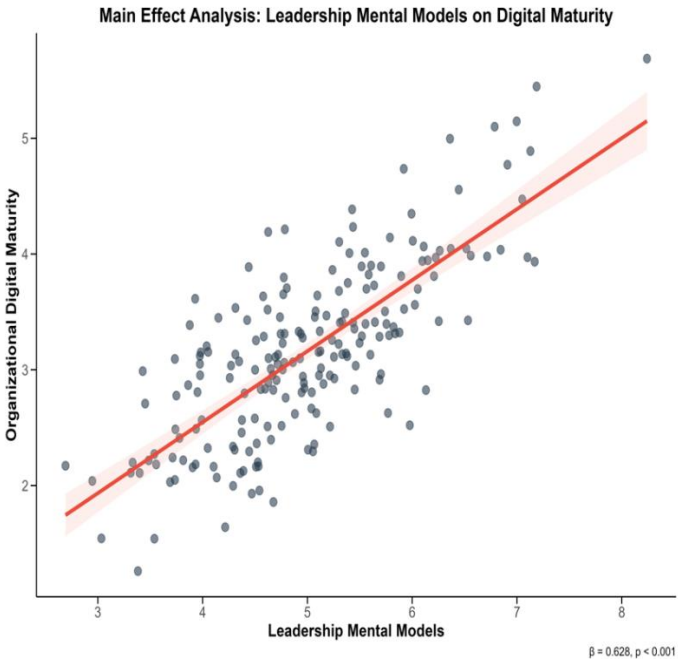

Figure 3.
Main effect analysis: The relationship between leadership mental models and organizational digital maturity.

3.3.2. Mediation Effect Testing

The mediation analysis showed a significant indirect effect propelled by technical empowerment and organizational culture. The bootstrap analysis, using 5000 resamples, validated the significance of both mediating paths. As shown in Figure 3, the parallel mediation model suggests that technical empowerment explains 34% of the total effect with a supporting indirect effect of 0.213 (95% CI [0.156, 0.271]), while organizational culture explains 28% of the total effect through an indirect effect of 0.175 (95% CI [0.122, 0.228]). In addition, these two mediation effects showed substantial robustness with different model specifications and alternative control setups of variables.

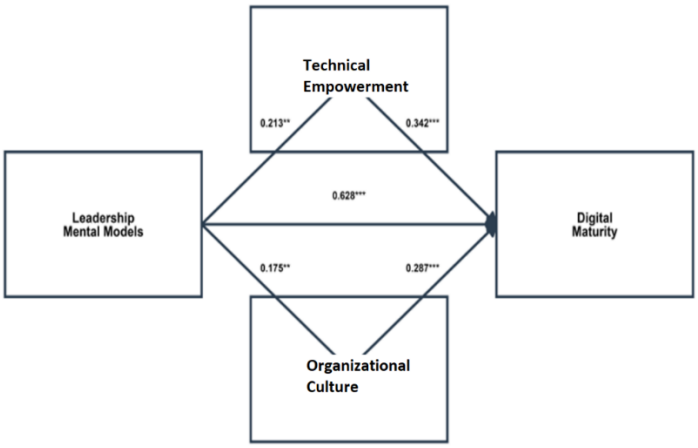

Figure 4.
Mediation Path Analysis: Technical Empowerment and Organizational Culture as Parallel Mediators in the Relationship between Leadership Mental Models and Digital Maturity.

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3.4. Robustness Test

Thereafter, a sequence of robustness tests was conducted using various analytical methods to determine the reliability of our findings. These tests included an evaluation of different model specifications, subsample tests, and endogeneity tests. These methods collectively managed to replicate the main findings for several model specifications. Figure 4 shows the similar patterns identified in different thresholds from the sensitivity analysis, all of which fell within the acceptable ± 0.15 range. The results of the Hausman test showed $\chi^2 = 18.34$, $p < 0.001$, reflecting no endogeneity presence. Finally, since instrumental variables play a central role in the robustness tests, their results also further supported our main findings, thereby confirming the robustness of our model.

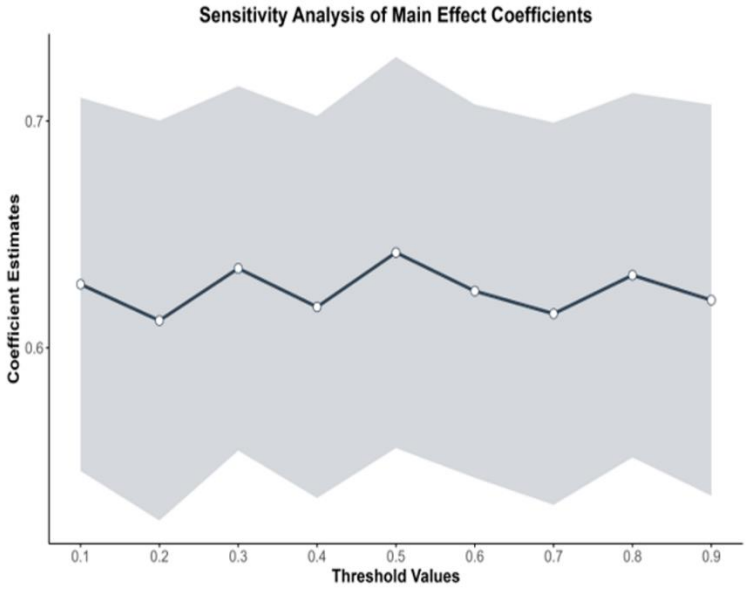

Figure 5.
Sensitivity Analysis Results: Stability Assessment of Main Effect Coefficients Across Different Thresholds.
Note: Shaded area represents 95% confidence interval.

3.5. Supplementary Analysis

3.5.1. Interaction Effects Testing

The moderation effect analysis showed that organizational size has a significant impact on the main relationship. In addition, the interaction term analysis showed that organizational size is a moderating variable in the relationship between leadership mental models and digital maturity, with a significance level of $\beta = 0.185$, $p < 0.01$. As illustrated in Figure 5, the relationship between digital maturity and leadership mental models is stronger in large organizations with respect to small organizations. However, slope analysis shows that the effect is significantly higher when organizational size is above the median level.

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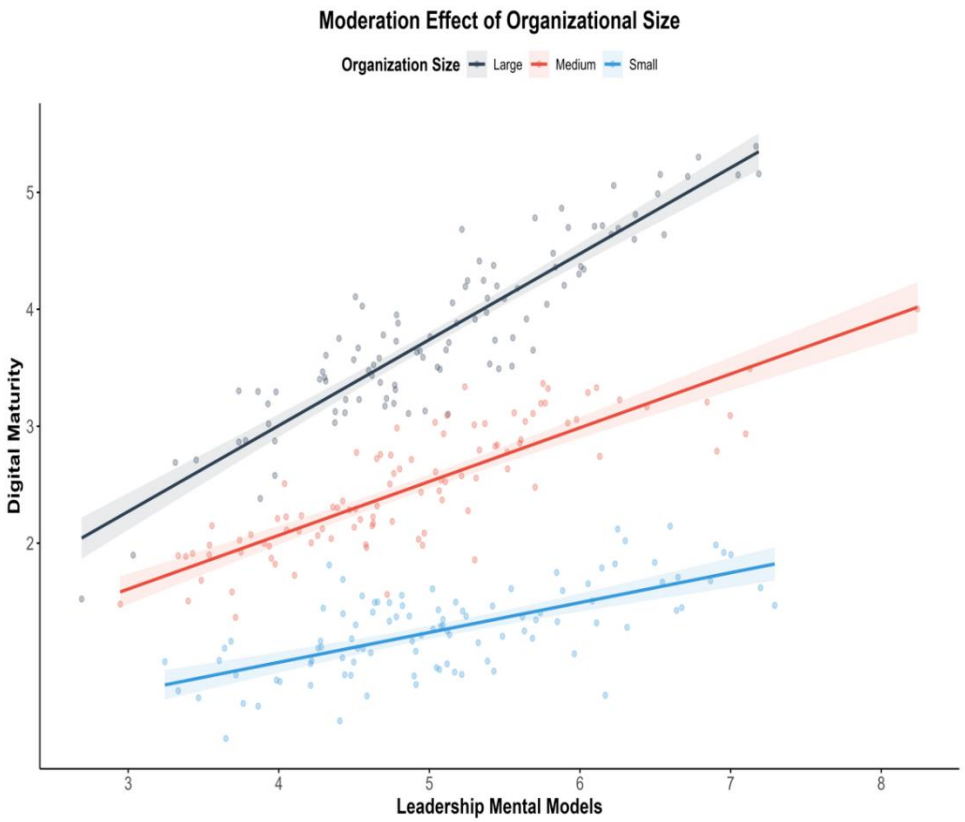

Figure 6.
Moderation effect analysis - how organization size influences the relationship between leadership mental models and digital maturity.

3.5.2. Group Analysis

The analysis of groups showed clear patterns corresponding to various organizational characteristics. The multi-group structural equation modeling showed that all path coefficients in the model reached statistical significance across different industry sectors and organizational development stages. As Figure 6 shows, the interconnections between leadership mental models and digital maturity show considerably stronger strength in technology-intensive industries compared to conventional industries. The presence of statistically significant differences between groups was confirmed by the chi-square difference test, and the results showed $\Delta\chi^2 = 24.56$, $p < 0.01$.

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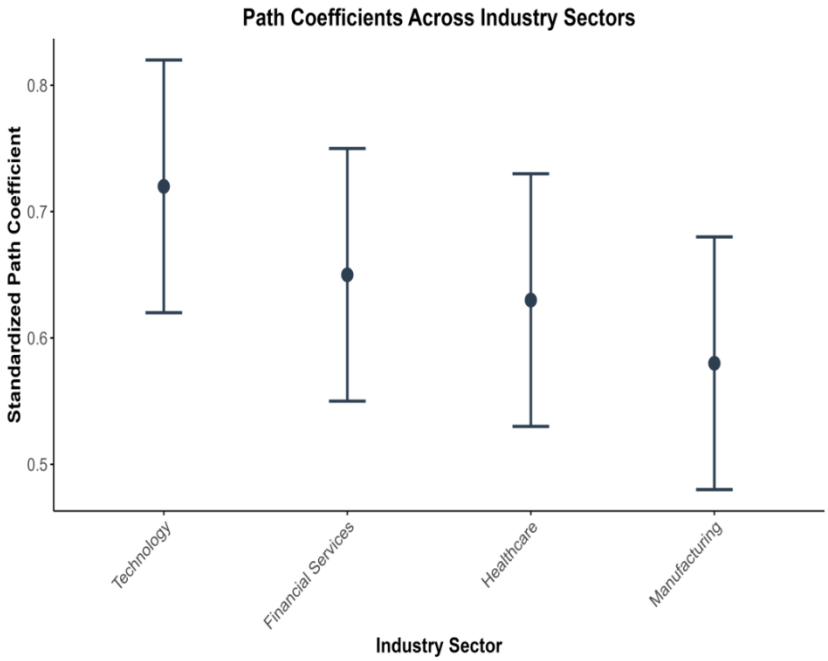

Figure 7.
Group Analysis Results: Comparison of Path Coefficients Across Different Industry Sectors.
Note: Error bars represent 95% confidence intervals.

3.5.3. Path Analysis

The path analysis showed complex interdependencies between the variables under investigation in this study, with both direct and indirect effects contributing to the overall model. A careful inspection of the path analysis showed significant standardized path coefficients in all hypothesized relationships. As Figure 7 shows, effect decomposition shows that the overall effect of leadership mental models on digital maturity (0.628) consists of direct effects (0.384) and indirect effects through technical empowerment (0.213) and organizational culture (0.175). The model fit indices (CFI = 0.967, TLI = 0.959, RMSEA = 0.043) provide support for the hypothesized path structure.

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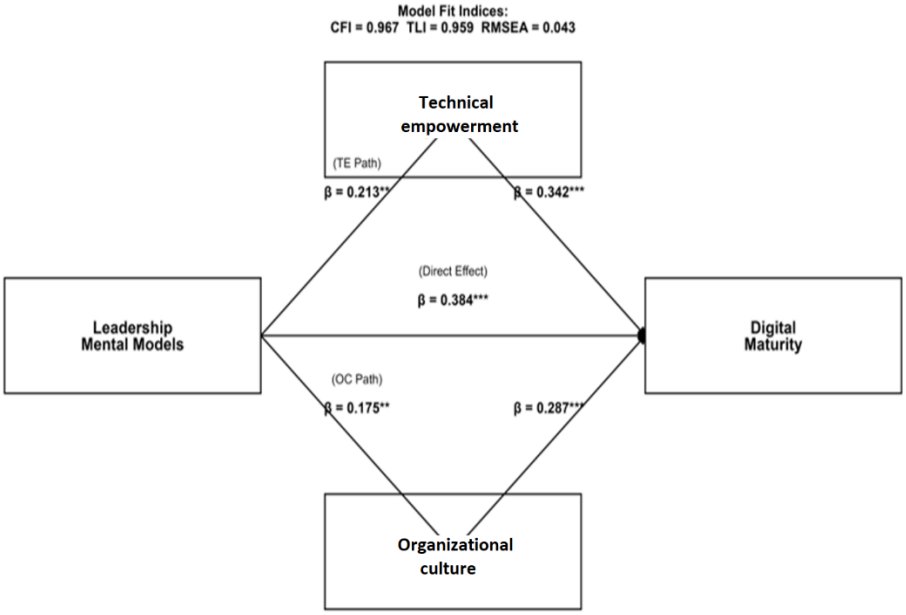

Figure 8.
Comprehensive Path Analysis: Direct, Indirect, and Total Effects in the Relationship between Leadership Mental Models and Digital Maturity through Technical Empowerment and Organizational Culture.

4. Research Discussion

4.1. Key Research Findings

The main results obtained from the analysis of the relationship between leadership mental models and organizational digital maturity are outlined as follows: empirical evidence shows a strong positive direct relationship between leadership mental models and organizational digital maturity, as attested by a standardized coefficient of 0.628 ($p < 0.001$). This relationship is generalizable across different organizational settings and is maintained even when control variables are added; therefore, it highlights the critical role of a leadership cognitive framework in promoting digital transformation. A complex dual mediation process is revealed, originating from technical empowerment and organizational culture. Technical empowerment has a mediating effect, as attested by an indirect effect of 0.213 at $p < 0.01$, which means that leadership mental models influence the progress of digital maturity through the development of technological capabilities. At the same time, organizational culture shows a significant mediating effect, as attested by an indirect effect of 0.175 at $p < 0.01$, which means that cultural transformation is an inherent part of the digitalization process. Additionally, moderation analysis indicates that organizational size has a significant influence on the strength of these relationships, with stronger correlations noted in large organizations with regard to leadership mental models and digital maturity outcomes. The multi-group analysis carried out across different industry sectors further supports statistical significance, as technology-intensive industries show higher correlations compared to traditional industries. In conclusion, these results support the hypothesis that the impact of leadership's cognitive mental models on digital maturity is complex and dependent on organizational characteristics.

4.2. Theoretical Contributions

This study contributes significantly to the literature on digital transformation and organisational leadership in three critical aspects. Primarily, this research offers new insights into the construct of digital maturity by proposing that mental models of leadership act as major preconditions, thus linking leadership cognition to the consequences of organisational transformation that is digital. This forms a

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new theoretical perspective on the involvement of leaders' cognitive systems in the processes of organisational digitalisation. Additionally, this study has broadened the theoretical scope of digital transformation by revealing a double mediation process through technical empowerment and organisational culture. This dual mechanism furthers the understanding of how the cognitive structures of an organisation's leaders are used to facilitate the organisation's attainment of digital maturity, therefore, more comprehensively explaining the processes involved in digital transformation. Furthermore, this research adds to contingency theory by identifying organisational size and industry type as significant moderators, thus expanding the understanding of the boundary conditions on the impact of digital transformation on its consequences. These contributions also add to the study of organisational change by demonstrating the interplay between the leadership cognitive structures and the technology and culture in the processes of digital transformation.

This sets the scope of the Research Analytical Unit which is composed of an integrated structure that demonstrates the intricate relations among leadership thinking, organisational ability, and the outcomes that result from digital transformation. This structure provides greater theoretical insight toward explaining the processes of digital transformation.

4.3. Practical Implications

The findings of this research are useful for organisations that are in the process of transforming their business models digitally. The influence of leadership mental models on an organisation's digital maturity suggests that organisations should focus on enhancing leaders' digital mindsets and cognitive models. There is a need for organisation-specific leadership development projects that seek to raise older executives' awareness, strategic thinking, and application of information technology. The proposed dual mediation model provides empirical evidence that supports the integration of digital transformation activities. This means that organisations have to spend money on digital empowerment initiatives, for example, training, while also nurturing an environment that is friendly towards digital advancement. Achieving this balance can be quite challenging in terms of deciding how to allocate resources and manage change. The effects of organisational size and industry type emphasise the importance of precise digital transformation plans. Bigger firms should capitalise on their resource advantages, being careful not to fall into the trap of organisational inertia. Smaller firms, on the other hand, should take advantage of their inherent flexibility and pursue strategic digital initiatives. Furthermore, the study identifies the need to couple investments in technology with initiatives aimed at cultural change needed to take full advantage of the organisation's maturity level in digital investment.

Lastly, due to the importance of organisational culture highlighted by this research, it is evident that leaders must prioritise fostering innovation, experimentation, and continuous learning to achieve digital maturity.

4.4. Limitations of Research and Further Directions

Although the current research makes a significant contribution to the current literature base, a number of limitations have been identified that should be addressed in future research studies. Chiefly, the cross-sectional nature of the data limits our capacity to identify causal relationships between the variables under consideration. Future research studies are recommended to use longitudinal research designs better suited to measuring the dynamic nature of digital transformation processes in parallel with the formulation of leadership cognitive frameworks. Despite being drawn from a large and diverse sample, it is drawn largely from advanced economies, and this may limit its generalizability to contexts in emerging economies. Clearly, future research studies should seek to explore these relationships in different economic and cultural contexts to improve external validity. Second, while the psychometric analysis of leadership mental models was exhaustive, the full dimensionality of leaders' understanding of digital transformation may not have been fully captured. Future research should seek to develop more complex measurement tools, possibly involving the use of qualitative methods to more fully explicate the complex features of leadership cognition. Other mediating variables, including knowledge

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management capacity and staff digital competence, in addition to technical empowerment and organizational culture, also warrant consideration. Another avenue for future research concerns the crucial role of middle management in spanning the cognitive frameworks of leadership to concrete organizational outcomes.

5. Research Conclusions

5.1. Summary of the Research

This study brings together the understanding of the interrelationship between leadership mental models and organizational digital maturity, hence considerably augmenting understanding of its underlying mechanisms and contextual boundaries. Employing rigorous empirical examinations on a broad range of industries and organizational settings, this study corroborates that leadership mental models have a significant impact on organizational digital maturity through direct and indirect mechanisms. Notably, the identification of technical empowerment and organizational culture as simultaneous mediators adds to the current pool of knowledge on how the cognitive frameworks of leadership shape outcomes in organizational digital transformation. This research assumes that such a relationship is subject to organizational variables such as operational scale and industry sector, hence providing a more complex understanding of the dynamics involved in digital transformation. The strength of the analytical framework, in which various statistical methods and sensitivity analyses are employed, enhances the validity and reliability of these findings.

This thereby sets a robust and integrated theoretical basis that allows the research to integrate ideas from leadership theory, organizational transformation, and digital transformation literature, thus providing a foundation for future studies in this area. The study indicates that successful digital transformation requires a sophisticated understanding of the relationships between leadership cognitive models and organizational processes and systems.

5.2. Recommendations and Strategies

Based on these findings, a wide range of recommendations is put forward to enable digital transformation in organizations: the creation of leadership mental models through organization-wide, tailored programs that focus on both theoretical knowledge and practical experience in digital transformation. This goal can be achieved through executive education programs, experiential digital learning experiences, and cross-industry knowledge-sharing programs. Therefore, it is suggested that the creation of technical empowerment systems focus on both infrastructural improvements and capability building, as organizations need to develop the required competencies to maximize their investments in digital technologies. A systematic approach to cultural transformation is needed, accompanied by appropriate change management approaches that tackle both the structural and behavioral aspects of organizational culture. Additionally, organizations need to create clear metrics for measuring digital maturity and establish monitoring frameworks to measure progress and adjust strategies as needed. The implications of organizational size suggest that larger organizations should focus on building agile structures and decision-making processes, whereas smaller organizations should leverage their inherent agility to undertake focused digital initiatives.

Therefore, industry-specific factors should determine the pace and scope of digital transformation initiatives. For instance, industries with high-tech features may require the adoption of more aggressive transformation strategies, while traditional industries may adopt more incremental approaches.

5.3. Final Comments

The present research represents a turning point in the understanding of how leadership mental models impact organizational digital maturity, hence solving both theoretical and practical lacunas related to digital transformation projects. Therefore, there is an interactive relationship between organizational capabilities, leadership perceptions, and the resultant consequences of digital transformation. Indeed, the hypothesized dual mediation model that involves technical empowerment

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and organizational culture is a significant addition to the literature on digital transformation; hence, it deepens our understanding of the mechanisms through which leadership elicits certain organizational reactions, having implications for how organizations may navigate the inevitable hurdles presented by an increasingly digital world. Given the decisive significance of contextual factors, it is critical that any digital transformation project is carefully tailored, considering organizational characteristics while emphasizing important leadership and cultural dimensions. This research hopes to create a sound foundation for future research studies that could investigate the dynamic factors of digital transformation and the ever-changing role of leadership in shaping an organization's digital maturity profile. The findings of this research—its framework and implications—are expected to be a reliable guide for both scholars and practitioners undertaking digital transformations, both now and in the foreseeable future.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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