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The Impact Of Transformational Leadership On Sustainable Digital Transformation: Exploring The Mediating Role Of Organizational Culture In Jordanian SMES

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Abstract: *This paper examines the mediating effect of organizational culture (OC) in the relationship between transformational leadership (TLS) and sustainable digital transformation (DT) in small and medium-sized enterprises (SMEs) in Jordan. It looks at the extent to which transformational leadership drives innovation and technology adoption through cultural change that encourages long-term resilience, adaptability and responsible business practice. The quantitative approach, through a 5-point Likert scale questionnaire was used as a self-administered to obtain of 368 SME"s Jordanian Managers from different sectors. We further included measures of TLS, OC, and DT while controlling for variables at the demographic level of analysis (i.e., gender, managerial experience, and industry type). Data were analyzed using with SMARTPLS4 by Structural Equation Modeling (SEM). CFA established reliability and validity of the constructs, and path analysis the proposed hypotheses. The findings indicate that TLS has a direct and indirect effect on DT mediated by OC. In fact, by creating a goal-directed and innovation-supportive environment, transformational leadership not only enables the introduction of digital technologies but also the inclusion of sustainability into organizations. OC plays a critical role in connecting leadership processes with sustainable digital results. The findings offer some useful implications for policy makers and organization policy designers who intend to support the SME's sustainable innovation and digital competitiveness. In addition, our research contributes to the more general literature on leadership, culture, and technology adoption, by placing digital transformation in the sustainability context and connecting it with the worldwide Sustainable Development Goals (SDGs).*

Keywords: *Transformational Leadership, Innovation and Technology, Organizational Culture. Jordan SMEs*

INTRODUCTION

The fast-paced trajectory of digital transformation (DT) has changed the way small to medium-sized enterprises (SMEs) engage in business, where innovation and embracing technology determines the day as well as sustainability and growth. Transformational leadership (TLS) is a leadership style focusing on vision, inspiration, and change, which is imperative to lead for organizations toward this transformation [1]. Leaders of TLS inspire the employees into commitment and loyalty through big changes which support the organization's strategy. TLS leaders seek to inspire followers through shared purpose and the creation of a climate of innovation. Further, TLS is a factor related to organizational development and strategic change, especially within dynamic and uncertain environments [2]. Transformational leadership leads innovation where organisational culture (OC) plays a crucial role as a mediator in the process. A positive and resilient culture may also serve to amplify the effectiveness of dynamic leadership, facilitate the adoption of technology and processes, and encourage transformation. As stated in [3], organizational culture defines common values and norms in order to affect employee behavior and organisational performance. In this sense, culture is fundamental in the effective use of digital technologies [4]. The purpose of the study considers the mediating effect of organisational culture on transformational leadership and digital strategic change on Jordanian SMEs, and questioning the role of leadership in fostering the technology adoption and innovation through cultural and organisational changes. The study provides insights into the factors shaping SMEs' digital innovation, utilizing a quantitative methodology based on structural equation modeling (SEM). But in recent years the increasingly evident a ssociation between sustainability and digital transformat ion, particularly to the SMEs. Transformational leadership is fundamental for the achievement of the environmental, social and economic objectives of enterprises and for steering the digital strategies whose purpose is sustainable. This has implications for concepts of leadership, culture and digital innovation, and subsequently for broader organisational sustainability.

A LITERATURE REVIEW

Transformational leadership (TLS)

Transformational leadership (TLS) promotes organizational growth and innovation by encouraging leaders to explore new ideas and views. Transformational leaders adjust the organization for future difficulties by fostering management and employee loyalty [1]. By linking individual interests with group aims, moral and spiritual leaders inspire followers. TLS increases group goal acceptance and organisational goal pursuit [2]. TLS boosts organisational performance in volatile settings, giving enterprises an edge in strategic rivalry and better results [5]. Leaders must detect environmental demands and facilitate changes for survival and growth. Transformational leaders promote fairness and satisfaction in the workplace, but discrimination lowers morale and productivity [6]. Managers at all levels must collaborate and take responsibility for results as organizational management becomes more important. Transformational leaders change followers' values and ambitions, improving culture. This leadership style helps employees to see opportunities and adopt change tactics [6].

Digital transformation (DT

Digital transformation (DT) involves organizations using digital technologies to create new business models and increase value [7]. DT differs from digitization, which converts analog data to digital, and digitalization, which changes corporate processes with digital technologies [8]. DT goes beyond technology adoption to rethink business model features and strategies [9]. DT relies on IoT, big data, and AI [10]. As [11] emphasized, all transformation entails change, but not all change is transformation. To promote innovation, DT demands new technology and organisational, team, and relational changes [4, 12]

Process, product and service, and business model digitalization are the three DT stages, according to [13]. They stressed dynamic capacities for each step. SMEs need digital capabilities to respond swiftly to market changes, where [14] examined their technological absorptive capacity and the role of CIOs in this transformation. According to [3], organizational culture is a framework of shared values that impact behavior across all levels of a company. [15] stressed that an organization's values effect people and efficiency, affecting profitability. Leading figures can create counter cultures that challenge the organisational culture [16]. Organizational culture fosters unity, cohesiveness, and creativity to boost profits. It strongly shapes employee behaviour based on norms [17]. Culture, an intangible force that shapes collaboration, is unique to each company.

Organizational culture

Organizational culture is multifaceted. The internal process model emphasizes control and layers of authority; open systems model emphasizes flexibility, innovation, and responding to external forces; human relations model emphasizes internal teamwork and employee commitment; and rational goal emphasizes external control and performance.

Innovation

Organizational creativity Organizational creativity is described in [20] as: in the development of novel products, services and ideas through collaborative processes in complex social systems. There is of course innovation which means a company is trying out new approaches to products, services or processes. Innovation is about making and using new value-added products and services, originating markets and new ways of management, new concepts, and new business practices in [21-24] found that new ways of working improve firm performance and develop new products and services. When members interact regularly around solving problems and coping with challenges, organizational innovation emerges. [25] infer that experience, skills, and motivation drive innovation through transforming information into product or service. Organizational innovation is supported by formal practices such as flexible assignment of roles, project teams' transiency and self-organizing groups [26]. These trends promote employee involvement in innovation, learning, and design [27]. [23] argue that innovation that combines exploration and exploitation are individual and communal. [28]. stress that these processes should be aligned to each other for the sake of organizational control. [29] propose exploring individual and team adventure, exploitation, and knowledge deal." to "To understand the complete innovation practice in an organization, [29] recommend examining individual and team exploration, exploitation, and knowledge integration.

Technology adoption in SMEs

Adopting a technology in a small and medium-scale business is the process of obtaining and using a new technology [30]. Significantly in SMEs, organisational readiness – resources, capacities and willingness to innovate is alarm critical to this process [31]. [32] include strategic alignment, resources, knowledge, culture, and data as ai-ready variables. Customer wants, such as improved service, or new products drive the utilization of digital technology. Few partially deploy technology to masquerade as digital world [33]. Adoption of technology has been investigated at the individual, organizational and interorganizational levels. Adoption of individual is examined by model such as Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, Persuasive System Design and Theory of Planned Behavior. Organisational adoption is influenced by structure, communication, and internal resources [34]. According to the Diffusion of Innovation Theory, performance,effort, and social impact are the primary elements of individual and organizational measurement of adoption. Institutional perspective focuses on political and social conditions of the technological adoption [35]. Customers, competitors, and government normative institutional pressures affect the adoption of corporations' digital technology [36]. Therefore, internal capabilities and external pressures affect the SME's adoption of technology.

SMEs, Sustainability and Digital Transformation

"When the world moves towards sustainable development, the new question posed to the small & medium sized enterprises (SMEs) is how to reconcile economic progress with environmental protection and social responsibility. DT can be a means of sustainably operating with model of digital transformationLeadership, and Digital adaptive organization a vision. [37] Transformational leadership, innovation and organisational culture are also directly related to sustainability results [37]. Furthermore, green leadership in the digital era, researched by [38], exploring that integrating green consciousness in digital strategies shapes attitude aligned with sustainable development. Therefore, sustainability should not be seen as an exogenous add-in, but rather as an embedded feature of digital transformation, and this is even more relevant in SMEs that can be seen as sinuous and potentially culturally-based. Corporate culture is another important factor influencing the internalization of long-term environmenta[, and economic] values

Related studies

[37] examined the influence of robotization, transformational leadership, corporate culture and digital transformation on sustainability of Chinese manufacturing companies. Their research, based on a self-administered survey of 350 respondents and Smart PLS-SEM statistical analysis, revealed that corporate culture, transformational leadership and digital transformation have a significant effect on organizational sustainability. Therefore, innovation capabilities act as a mediator between transformational leadership, digital transformation, and sustainability, and environmental dynamism moderates the relationship between innovation and business performance. [38] examined the relationship among the GDT, the GDM and the GDTL, which the authors inferred from the structure of the research model for explaining the effects of the GDTL on green digital transformation (GDT) headed by the stimulus-organism-response (S-O-R theory) frameworks and the transformational leadership theory. Using data collected from 240 LinkedIn users, they provided evidence that leadership plays a key role in developing an ecological consciousness, which is important for Green Digital Transformation. Their research underscores that a high organizational green digital culture upholds the influence of leadership on forming a green digital mind- set.

[39] aimed to investigate the link between organizational culture, transformational leadership and the performance of Peruvian SMEs. Their observations revealed that organizational culture is the mediator between transformational leadership and organizational performance that is important for the survival of the SME's at long run, in particular in the creation of employment and economic growth in developing countries. saw the effectiveness of digital transformation leadership in formation of digital culture and employees' attitude in startups and other than startups firm. Their research indicates that organizations will need to become more digitally adept and attuned to a digital culture to enable technological innovation and growth. [41] outlined the problems of culture change in Ukrainian companies. Their professional survey also found challenges related to personnel, information, and funding. They also stressed the necessity of incorporating digital skills, business models and communication effectiveness in the transformation of the organizational culture.

Hypotheses Development

Hypotheses Hypotheses development is guided by the Theory of Planned Behavior and prior research; the important contribution has also been made through transformational leadership and organizational culture as well as transformational leadership and organizational culture interaction, in digital transformation process. The subsequent sections are showing how previous researches supported each of the hypotheses.

Transformational Leadership and Digital Transformation

The literature is replete with evidence in support of the link between transformational leadership and digital transformation. Transformational leaders motivate and encourage their followers to accept change, go beyond of barriers and experiment. [37] found that transformational leadership has a positive relationship with organizational success as mediated by technological adoption and innovation within Chinese manufacturing companies. Likewise, [38] stressed that the green digital mindset in the transformational leadership contributes to ecologically sentient culture, crucial for technological advancement. The implications emphasize the significance of transformational leadership as an important facilitator for digital transformation in different contexts, warranting hypothesizing its effects on Jordanian SMEs. Moreover, digital transformation activities led by transformational leaders can contribute to sustainability business model, through reduced resource use, better processes and social responsibility. Thus, transformational leadership in Jordanian SMEs is not only an enhancer of innovation, but also a driving force behind sustainable development.

Transformational Leadership and Organizational Culture

Transformational leadership also leads to the development of organizational culture. Peterson et al.[4] refer to previous research that finds transformational leaders foster environments that encourage collaboration, flexibility, and the alignment of activities with the goals of the organization. [39] reported that transformational leadership significantly influences organizational culture, which subsequently improves organizational performance among the SMEs in Peru. They argue that transformational leaders create cultures that are consistent with an organisation's strategic direction, and so are more likely to facilitate shared values and commitment. This is also consistent with the assumption that a transformational leadership style within Jordanian SMEs has a positive impact on their organizational culture, an important prerequisite for successful business developments.

Organizational Culture and Digital Transformation

Culture of organization is the backbone of digital transformation. A supportive environment supports digital skills as well as the successful introduction of technological innovations. [41] found that flexible organizational culture was an essential driver to break through the barriers of digital transformation and [42] pointed out the importance of a solid digital culture influencing the way in which the innovative process is determined and the utilization of technology is adopted. These results imply that strong organizational culture in Jordanian SME is a must in order to facilitate successful implementation DT activities.

Mediating Role of Organizational Culture

Additionally, the literature provides evidence of the mediating role of organizational culture in the relationship between transformational leadership and digital transformation. [39] reported that organizational culture as mediator between transformational leadership and organizational performance and stressed its vital role in achieving long run objectives. Likewise, [37] emphasized that organizational culture has a role in which mediating the effect of transformational leadership on digital transformation and sustainability. The findings of these studies indicate that the organisational culture in Jordanian SMEs mediates the relationship between the transformational leadership and digital transformation.

Hypotheses

Based on the insights from the literature, the following hypotheses are proposed:

- **H1:** Transformational leadership positively and significantly impacts digital transformation (driving innovation and technology adoption) in Jordanian SMEs.
- **H2:** Transformational leadership positively influences organizational culture in Jordanian SMEs.
- **H3:** Organizational culture positively influences digital transformation (driving innovation and technology adoption) in Jordanian SMEs.

- **H4:** Organizational culture mediates the relationship between transformational leadership and digital transformation (driving innovation and technology adoption) in Jordanian SMEs.

Theoretical framework

Fig (1) diagram depicts the relations between Transformational Leadership (TL), Organizational Culture (OC) and Digital Transformation(DT). Organizational Culture and Digital Transformation are directly influenced by Transformational Leadership. It had been discovered Organizational Culture also impacts directly Digital Transformation, and therefore it can partly mediated the effect of Transformational Leadership toward Digital Transformation. That is to say Transformational Leadership directly influence on Digital Transformation but also influence Organizational Culture which once again have positive association with effectiveness of Digital Transformation. Moreover, by promoting an innovative and adaptive culture, transformational leadership could support SMEs in integrating their digital tactics with sustainability aims. The incorporation of sustainability in the framework reflects the strategic implications of digitalisation going beyond technological advancement towards overall, long-term economic, and environmental performance. Figure (1) shows the relationships among TL、OC and DT.

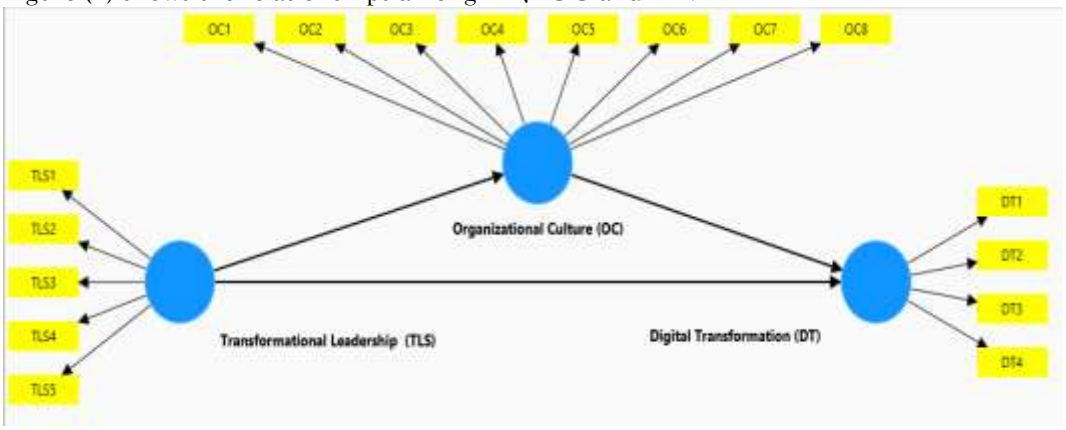

Figure 1: the relations between Transformational Leadership (TL), Organizational Culture (OC) and Digital Transformation(DT).

MATERIALS AND METHOD

This research is quantitative in nature, and it aims to investigate the influence of new conceptual variables (transformational leadership (TLS), digital transformation (DT), and organizational culture (OC)) in relation to the innovation and technology acceptance in SMEs in Jordan. Managerial staff of the SMEs were interviewed using self-administered questionnaire with 5-point Likert scale. The questions to quantify the outcomes of TLS, OC and DT were based on design. Jordanian SMEs managers from multiple sectors were conveniently reached, facilitating efficient data collection. Managers from manufacturing, technology, and services-based Jordanian SMEs were surveyed. The response rate was 92%, and 368 valid questionnaires were collected. Information was also gathered on age, gender, experience in management, and the type of sector in which the participants work, in order to clarify participants' perspectives on leadership, organizational culture, and digital transformation. Transformative leadership, organisational culture and digital transformation were measured using validated questions in the survey. Responses were elicited using a 5-point Likert scale, ranging from "1" ('Never') to "5" ('Always'). Demographics items were also asked to provide background to the findings. A survey was sent to SME managers for three months. The study and its instruments were approved by the institutional review board of the researchers' university, and follow-up e-mail contacts helped maximize response rates. The data were analysed in SMARTPLS4, a sophisticated technique for examining complex underlying latent variable relationships using SEM. There were two nodes in the analysis: (1) CFA (Confirmatory Factor Analysis): The factor loadings, the composite reliability, and the AVE (Average Variance Extracted) of the measures were applied to assure that the survey items suitably measured the components. Second, employing the structural model Path Analysis examined the TLS, OC and DT hypotheses.

RESULTS

Demographic Characteristics

The characteristics of study participants are shown in Table 1, and a mixed sample is evident. The majority of respondents were Bachelor's level (67.93%) following by other forms of higher education. The gender ratio easily favored male (55.71%), and experience of 5-10 years comprised 46.47% of the total participants, representing more than half of mid-career workers. Respondents Response have been recruited across multiple sectors with the top three being Retail (32.88%), Services (29.89%), and Manufacturing (21.47%). Most organisations employed 11-50 staff (51.36%) and were less than 5 years old (32.07%), in line with the SME emphasis. Types of ownership were Corporations (30.16%), Partnerships (26.36%) and Family-owned businesses (17.39%). Digital skills level was mixed, with 47.55% claiming to be at an Advanced level and majority (58.70%) stating they had had exposure to digital transformation initiatives, indicating the appropriateness of the sample used with respect to the research interest on leadership, culture and technology adoption.Table 1: Demographic Characteristics

Variables	Categories	Frequency	Percentage
Educational Level	High school	25	6.79%
	diploma	38	10.33%
	Bachelor's degree	250	67.93%
	Master's degree	48	13.04%
	Doctorate	7	1.90%
Gender	Male	205	55.71%
	Female	163	44.29%
Experience	<5 year	104	28.26%
	5-10 years	171	46.47%
	More than 11 years	93	25.27%
Industry Type	Manufacturing	79	21.47%
	Retail	121	32.88%
	Services	110	29.89%
	Technology	58	15.76%
Number of Employees	Less than 10	108	29.35%
	11-50	189	51.36%
	51-250	62	16.85%
	more than 250	9	2.45%
Age of the Organization	<5 years	118	32.07%
	5-10 years	109	29.62%
	11-20 years	95	25.82%
	More than 20 years	46	12.50%
Ownership Type	Family-owned	64	17.39%
	Partnership	97	26.36%
	Corporation	111	30.16%
	Other	96	26.09%
Digital Proficiency	Beginner	50	13.59%
	Intermediate	143	38.86%
	Advanced	175	47.55%
Exposure to Digital	Yes	216	58.70%
	No	152	41.30%

Variables	Categories	Frequency	Percentage
Transformation Initiatives			

The measurement model analysis

In structural equation modeling (SEM), the measurement model is a vital part for specifying & validating the relationships between indicators and underlying latent constructs. Its goal is to ensure that the indicators measure the theoretical construct of interest in a true and reliable manner. To validate a measurement model, it is necessary to evaluate the following: (a) the outer loadings that imply the strength of all indicators; (b) internal consistency or reliability of constructs; (c) discriminant validity which denotes whether each construct expresses a common theme and; and, (d) collinearity among indicators.

Fig (2) shows the outer loadings for the indicators of each construct (DT, OC, and TLS) indicateing how well each item represents its respective construct. For Digital Transformation (DT), the loadings range from 0.83 to 0.90, which indicates a high correlation of these indicators with the DT construct, implying good reliability and validity. Similarly, the Organizational Culture (OC) items have loadings ranging from 0.80 to 0.89, suggesting that these items are well-representative of the OC construct. However, for Transformational Leadership (TLS), some indicators (TLS2 and TLS3) have lower loadings (0.68), indicating moderate representation of the construct. While these loadings are still acceptable, they suggest that the TLS construct could potentially benefit from slight modifications or the inclusion of additional indicators.

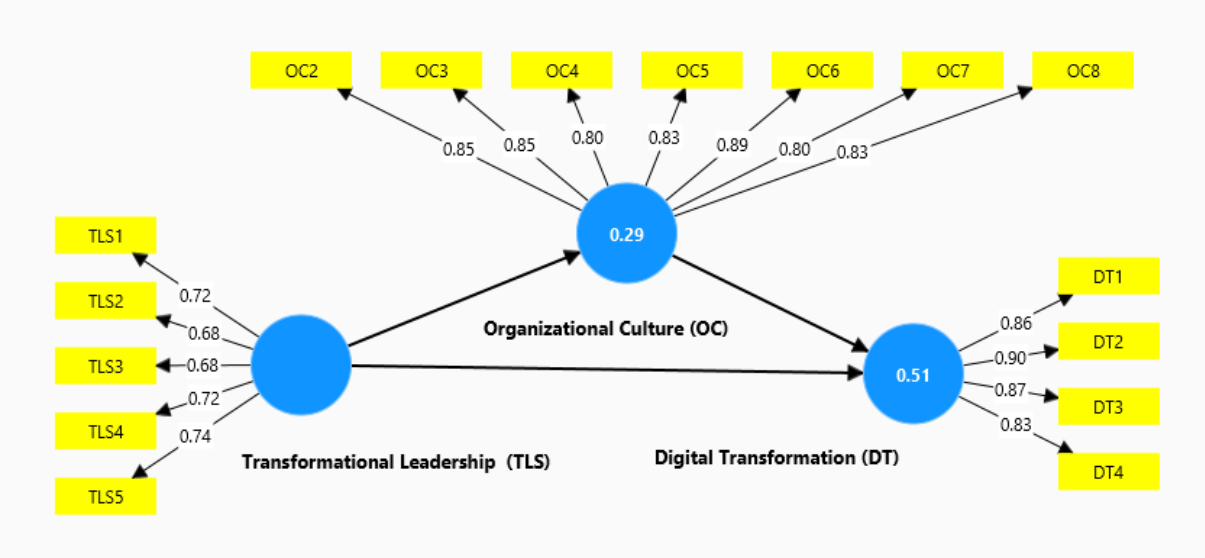

Figure 2: outer loadings for the indicators of each construct (DT, OC, and TLS)

Construct reliability and validity

Results in table (2) reveal that all constructs exhibit high reliability and validity. The internal consistency of DT (Cronbach's alpha = 0.89) and OC (Cronbach's alpha = 0.93) are both above the optimal level of >0.70, which suggests high internal consistency. TLS has a lower alpha of 0.76, which is acceptable in its own right. Composite reliability (rho_a and rho_c) values for all constructs were above 0.80, confirming good internal consistency. As shown in table 9 the AVE score for DT and OC was above by the value of 0.70, indicating a good convergent validity (i.e., positive correlations among items), & TLS had an AVE of 0.50 marks, which is just at the acceptance boundary suggesting acceptable convergent validity construct as well [43].

Table 2: Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DT	0.89	0.89	0.92	0.75
OC	0.93	0.93	0.94	0.70
TLS	0.76	0.76	0.84	0.50

Discriminant validity- Heterotrait-monotrait ratio (HTMT)

The HTMT values between the constructs in table (3) are below the threshold of 0.85 thereby confirming good discriminant validity between DT, OC and TLS (Table 3). It should be noted that correlation between each and every two configuration must be low (This is necessary because we cannot have overlaps in terms of the fact that all the configuration measures different aspect of the model.).

Table 3: **Discriminant** validity- **Heterotrait-monotrait ratio (HTMT)**

	DT	OC
OC	0.76	
TLS	0.62	0.63

Collinearity statistics (VIF)

All the VIF values of all the indicators in table (4) are less than 5 (far below the threshold), showing that there is no problematic multicollinearity in the model. So the range of 1.68 to 3.57 tells us that the predictors are not related, therefore providing stability and reliability in regression estimates (O'Brien).Table 5: Discriminant validity

Table 4: Collinearity statistics (VIF)

ITEMS	VIF	HGHGH	HGHGHH
DT1	2.32	OC6	3.57
DT2	3.21	OC7	2.16
DT3	2.65	OC8	2.48
DT4	1.95	TLS1	1.69
OC2	2.91	TLS2	1.68
OC3	2.81	TLS3	1.69
OC4	2.26	TLS4	2.45
OC5	2.67	TLS5	2.46

Model fit summary

The model fit statistics in table (5) indicate that the data and the observed data do not reject each other. This value of the SRMR = 0.08 meets the criteria for acceptable SRMR (close to 0), showing good model fit. Similarly, the remaining fit indices d_ULS, d_G and NFI (0.82) suggest that an adequate level of fit between the model and the data has been achieved but there is still room for a more satisfactory fitting.

Table 5: The model fit statistics

	Saturated model	Estimated model
SRMR	0.08	0.08
d_ULS	0.90	0.90
d_G	0.33	0.33
Chi-square	746.39	746.39
NFI	0.82	0.82

R-square

The R-square values in table (6) indicate how much variance of each endogenous variable the model explains. The R-square value for DT is 0.51 that means OC and TLS explains 51% of the variance in DT. This indicates a small to medium effect size. Hence that, R-square value for OC is 0.29 which means TLS explains 29% of the variance in OC — a much weaker but also still significant effect.

Table 6: R-square values

	R-square	R-square adjusted
DT	0.51	0.51
OC	0.29	0.29

Structural model- Path coefficients

The structural model in fig (3) investigates the relationships between the latent variables which are quantified by path coefficients, specific indirect effect and total effect determined via bootstrapping to demonstrate the statistical significance of related estimates. Bootstrapping is a resampling approach that derives many subsamples from the original data for standard error and confidence intervals, lending robustness to the results. Path coefficients measure the direct effect of one construct on another, indicating the significant relation and present nearer insight to the direct and indirect influence among constructs. Because this technique systematically relates everything to everything — thereby controlling for all covariates and making sure you distinguish between individual ideas — any effects that emerge are both significant in value, as well as stable across samples.

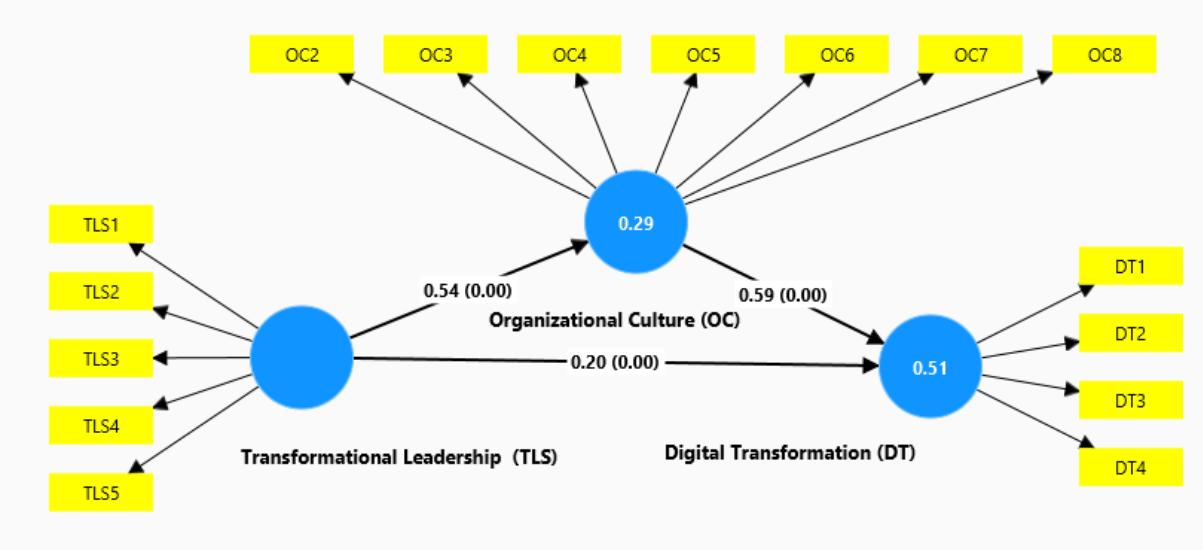

Figure 3: Structural model- Path coefficients

Direct effect path coefficients

The path coefficients in table (7) indicate that the constructs are significantly related. The path coefficient of 0.59 from OC to DT, T-statistic of 13.64 and p-value 0.00 indicates a strong positive relationship between these variables (see Table 5). Supporting H3b, TLS has a positive effect with path coefficient of 0.54 and is statistically significant (T-statistic of 12.99; p-value = 0.00) on OC [36]. TLS has direct effect on DT where path coeffecient from TLS to DT is 0.20 and T-statistic is 4.28 and P-value is 0.00 which implies that impact of TLS on DT is moderate.

Table 7: Path coefficients

	Original sample (O) path coefficients	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
OC -> DT	0.59	0.04	13.64	0.00
TLS -> DT	0.20	0.05	4.28	0.00
TLS -> OC	0.54	0.04	12.99	0.00

Indirect Effects

The specific indirect effect of TLS on DT through OC in table (8) is 0.32, with a T-statistic of 9.80 and a p-value of 0.00. This indicates a significant mediating effect of OC in the relationship between TLS and DT.

This finding suggests that TLS positively influences DT not only directly but also indirectly by shaping the organizational culture, which further enhances digital transformation efforts.

Table 8: Specific indirect effects

	Original sample (O) path coefficients	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
TLS -> OC -> DT	0.32	0.03	9.80	0.00

Total Effects

The total effects in table 9 represent the combined direct and indirect effects of the constructs. The sum value of OC on DT is 0.59, further suggesting that OC is an important driver of DT. The total indirect effect of TLS on DT is 0.52, which means that TLS had a direct and an indirect effect on DT through OC. The overall impact of TLS on OC is still at a strong level at 0.54, indicating the importance of transformational leadership in influencing the organisational culture.

Table 9: Total effects

	Original sample (O) path coefficients	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
OC -> DT	0.59	0.04	13.64	0.00
TLS -> DT	0.52	0.05	11.08	0.00
TLS -> OC	0.54	0.04	12.99	0.00

DISCUSSION

This research provides important knowledge about the links between transformational Leadership (TLS), digital Transformation(DT) and organizational culture (OC) in the Jordanian small and medium-sized business enterprise environment. The results demonstrate that TLS significantly enhances the success of DT initiatives both directly (i.e., through enhancement of innovation and technology adoption) and indirectly, by molding organizational culture conducive to change, learning, and adaptation. Transformational leadership in these SMEs also communicates an inspiring direction to the advancement of technology and serves to incubate a common culture, which provides a sustainable basis for digital transformation. Finally, this form of organisational culture contributes to digital readiness, work sustainability and work mechanisms, it mitigates resistance to change, work agility and, of course, ecologically responsible operations.

This study contributes to and extends the literature, especially the works of [37], which highlighted the importance of TLS and DT in facilitating sustainability in Chinese manufacturing industry. Likewise, [39] found that OC mediates the link between TLS and organizational performance in Peruvian SMEs. By directing attention to the SMEs in Jordan—a largely overlooked setting— this research provides new lenses into the global discussions on leadership, culture, and innovation, particularly in the context of developing countries which are faced with resource limitations and need to implement creative and sustainable leadership models.

In theory, the study contributes to knowledge about transformational leadership in the context of sustainable digital transformation. The TLS is painted as a facilitator not simply of innovation but of deeply organisational development in tune with wider societal needs. This is in line with international goals (such as the United Nations SDGs, in particular SDG8 [Decent Work and Economic Growth] and SDG 9 [Industry, Innovation and Infrastructure]). Ethical leaders who motivate ethical conduct and long-termism and also promote environmental protection facilitate the integration of sustainability within the heart of SMEs and contribute to inclusive and sustainable economic growth.

The organisational culture discussed in this research results as a dynamic capability under the RBV perspective of the firm. It is critical in facilitating the take up and application of technological innovations, as well as surfacing values for example sustainability, innovation, cooperative working, and resilience. The indirect effect of OC is not just statistically significant but also practically transformative in that it converts

leadership vision into concrete performance, promoting the sort of mind-sets and behavioral norms necessary for sustained competitiveness in a rapidly changing digital economy.

Practically, the results are useful for SME managers, policy makers and development organizations working in Jordan and comparable contexts. In situations where money and resources are obstacles to the swift embracement of technology, TLS is a force of change. Brought about by creating a culture of openness, learning and innovation, such transformational leaders can combine available human and organisational resources to promote both digital progress and sustainability. Leadership development programs for SMEs should address digital fluency, sustainability measures and cultural change management, to create leaders as champions for the technological shift as well as to catalyse change in society.

Furthermore, these findings create possibilities for policy makers that may contribute to national strategies in fostering the resilience and sustainability of SMEs. For example, public programs that phase in the development of digital skills by combining public action aimed at digital cultural transformation, including gender (women-led or youth-led SMEs) can support SMEs to adopt sustainable digital innovation. These initiatives could equally feature incentivized green innovation, digital upskilling and leadership training specific to the SME sector, and are directed toward a national level of development and sustainability.

If the organization's culture is consistent with sustainability values, responsible innovation, resource efficiency and ethical decision making can be embedded in the daily operations of the organization. This cultural match fosters employee ownership, innovation and the adoption of technologies that are environmentally or socially footprint-friendly. In the end, TLS-embedded OC can help SME not only open networks to a more holistic view of success (including profit and performance) but also to creating social and ecological value.

Limitations and Suggestions for Future Research

Limitations of this study Although helpful, this study faces some limitations. Firstly, the reliance on convenience sampling, although unavoidable in the context of SME managers, restricts the generalisability of the results. The sample of the study may be not representative to the larger population of Jordanian SMEs, in particular that for SMEs operating in more rural and informal sectors. It will be better that the sample for future research could be probabilistically or stratified randomly selected to further the external validity.

Second, the cross-sectional nature of the study precludes any causal inferences. Although the regression-based approach finds statistically significant effects, it does not provide evidence of the temporal/causal relationships. Studies with follow-up over time are required to evaluate the change of TLS, OC, and DT relationships, in particular in relation to organization's growth, crisis, or regulation change.

Third, this investigation is based on self-reported data, which could produce common method bias or social desirability effects, especially when examining perceptions of leadership and culture. Using mixed-methods designs that integrate survey data collection with interviews or observational data collection could potentially lead to richer and more nuanced understandings about how leadership and culture are enacted in practice.

Fourth, the current work does not directly assess a number of sustainability performance indicators (e.g., energy savings, employee happiness, environmental health), although it does so conceptually when associating TLS and DT with sustainable outcomes. Future work will need to incorporate quantitative measures, or some concept of sustainability (e.g. ESG indicators, triple bottom line), to empirically test the sustainability implications of leadership and cultural practices.

Moreover, digital leadership is for the purpose of the study limited to transformational leadership type, but different leadership styles (like servant leadership, ethical leadership and digital leadership) could also influence digital transformation and sustainability in diverse ways. Comparative research on how various leadership styles are more effective or complementing each other in relation to sustainable digital innovation may prove useful in making theoretical advances.

Contextual variables also deserve further exploration. For instance, government regulations, credit, digital connectivity, and market turbulence might moderate the TLS–OC–DT–sustainability nexus. Exploring how these external forces interact with internal organizational factors can inform leadership and transformation models for SMEs in developed and emerging economies.

Finally, the sectoral discrepancy was not well investigated in this research. Future research should investigate whether such the visible relationships differ by industry —representing, for example, manufacturing, retail,

technology, or services—given that market sectors may be more digitally mature or sustainability-sensitive than others.

CONCLUSION

By investigating the mediation effect of organisational culture on transformational leadership and the digital transformation of Jordanian SMEs, our study stressed the strategic role of leadership and culture in sustaining NGOCs. The results provide evidence to support the dual-play role of TLS by facilitating technological innovation directly, and by fostering digital transformation indirectly through creating a responsive and value-based culture.

By conceptualizing DT against the backdrop of sustainability, the approach of this paper contractually links itself to the aspirations of SDG 8 and SDG 9 and confirms the relevance of SMEs as significant stakeholders in sustainable development. This transformational leadership, as it is embedded in a culture which values innovation, partnership and ethical responsibility enables SMEs to be increasingly responsive to changing challenges of digital and environmental perspectives.

The findings are of practical relevance and provide guidance to policy makers and leaders into an embedded approach to sustainability in the digital strategies of SMEs. These local leaders' transformational potential in SME-level leadership development, cultural alignment, and capacity-building allows SMEs to drive transformative sustainability and growth in ways that could never be fully understood or actualized by third-party stakeholders.

Finally, the present study provides a solid base for a further investigation of the interrelationship of leadership, culture, technology and sustainability. It also encourages a more holistic pro-entriched approach advancing the thinking beyond the efficiency/growth and profit dimension and incorporates a wider social and environmental impact side of digital transformation of SMEs.

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Survey questionnaire

Demographic Information

Check the appropriate answer with (x) in the right column		
Educational Level	High school	
	diploma	
	Bachelor's degree	
	Master's degree	
	Doctorate	
Gender	Male	
	Female	
Experience	<5 year	
	5-10 years	
	More than 11 years	
Industry Type	Manufacturing	
	Retail	
	Services	
	Technology	
Number of Employees	Less than 10	
	11-50	
	51-250	
	more than 250	
Age of the Organization	<5 years	
	5-10 years	

	11-20 years	
	More than 20 years	
Ownership Type	Family-owned	
	Partnership	
	Corporation	
	Other	
Digital Proficiency	Beginner	
	Intermediate	
	Advanced	
Exposure to Digital Transformation Initiatives	Yes	
	No	

Section 1: Transformational Leadership (5 Items)

1. Our leaders inspire employees with a clear vision of the future.
2. Leaders in our organization encourage employees to explore new ways of doing things.
3. Our leaders prioritize the development of employees' potential.
4. Leaders in our organization motivate employees to achieve organizational goals collectively.
5. Our leaders demonstrate a strong sense of purpose and commitment to the organization.

Section 2: Digital Transformation (4 Items)

1. Our organization actively adopts new digital technologies to improve business processes.
2. Innovation is a central part of our business strategy.
3. Employees in our organization are encouraged to contribute innovative ideas for digital improvements.
4. Technology adoption in our organization enhances the overall efficiency and competitiveness.

Section 3: Organizational Culture (8 Items)

1. Our organization promotes a culture of openness and collaboration.
2. There is a clear set of values that guide employee behavior in our organization.
3. The management encourages a culture that supports innovative thinking and risk-taking.
4. Employees are rewarded for coming up with innovative solutions to business challenges.
5. There is a strong sense of unity and teamwork within the organization.
6. The organization adapts quickly to changes in the external environment.
7. Our organizational culture fosters trust and transparency among employees and management.
8. Employees in our organization feel empowered to take initiatives.