

# **Distributed Leadership and Exploratory Innovation in Tunisian Industrial Firms: The Mediating Role of Knowledge Sharing and Cognitive Social Capital**

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## **Abstract**

This study investigates the effect of distributed leadership (DL) on exploratory innovation (EI) in Tunisian industrial firms, highlighting the mediating roles of knowledge sharing (KS) and cognitive social capital (CSC). Drawing on dynamic capabilities theory (DCT) and social capital theory (SCT), the study adopts a quantitative approach based on a survey of 220 industrial managers. The findings show that DL indirectly promotes EI through KS and CSC while directly enhancing it. Trust, cooperation, and collective learning are strengthened by these mechanisms, leading to a conducive environment for the emergence of novel and disruptive ideas. Theoretically, the study advances understanding of the organizational dynamics of innovation in emerging contexts. From a managerial perspective, it suggests implementing collaborative leadership practices, KS, and promoting cognitive diversity to boost innovation and improve the competitiveness of the Tunisian industrial sector.

**Keywords:** Distributed leadership; Exploratory innovation; Knowledge sharing; Cognitive social capital; Tunisian industrial firms

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## I. Introduction

Innovation is a key strategic lever for maintaining the competitiveness and sustainability of firms in an ever-evolving environment. It can be described as the capacity of a firm to develop and turn innovative ideas into value-added goods, services, or operations. This study focuses on EI, which involves discovering new domains and leveraging novel knowledge to address emerging needs, [1]. Its goal is to generate new possibilities, often through innovative products and services, enabling firms to differentiate themselves in the marketplace [2], [3].

Effective management of EI is thus essential. DL—a model emphasizing shared responsibilities and collaboration—aligns well with dynamic and uncertain contexts, facilitating co-creation and the free flow of ideas.

Two intra-organizational mechanisms are crucial to the success of EI: CSC and KS. CSC, defined as shared visions and frames of reference that foster cooperation, creates a trustful environment conducive to innovation [5]. KS integrates tacit and explicit knowledge, supporting collective learning and co-creation [6].

This research fills three gaps identified in the existing literature. First, while prior research has examined the link between DL and innovation, its direct impact on EI in the Tunisian industrial context has received little attention. Second, the interplay between CSC, KS, and DL in EI settings is insufficiently examined. Third, despite innovation being a national priority, Tunisia's manufacturing sector faces challenges related to transformation and competitiveness that DL may help mitigate.

To fill these gaps in the literature, this paper is guided by the following central research question : *What is the impact of DL on EI in Tunisian manufacturing firms, considering the mediating roles of KS and CSC?*

The study is grounded in dynamic capabilities theory (DCT) [7] and social capital theory (SCT) [5], adopting a knowledge-based perspective.

The paper follows a structure consisting of literature review and hypotheses, methodology, results and discussion, and concluding with theoretical and managerial insights.

## II. Literature review and hypotheses development

### A. Direct Effect of DL on EI

DL fosters collaboration and the emergence of innovative ideas by DL within teams [8]. It creates an environment conducive to open idea exchange, encourages exploration beyond rigid hierarchical constraints, and supports innovation outside conventional frameworks. DL stimulates creativity and employee engagement, maximizing talent utilization to generate novel solutions. It also facilitates balancing exploratory and exploitative innovation, as described by exploration-exploitation theory [9]. Indeed, DCT [7] underlines the necessity for firms to continuously integrate and renew internal resources to adapt to fast-changing markets. DL enhances this capacity through collaboration and decentralized decision-making, thereby enabling the effective mobilization of resources to pursue innovative opportunities. Based on these ideas, we can propose the following hypothesis.

: **H1:** DL has a direct positive effect on EI.

### B. Indirect Effect of DL on EI

#### 1). Mediating Role of KS :

DL fosters effective KS through task coordination and a positive social climate, which together facilitate idea circulation. Research identifies human, managerial, organizational, and technical factors influencing KS [10]. DL promotes a collective vision and spontaneous collaboration, strengthening social interaction and knowledge dissemination [4]. It encourages supportive behaviors and solidarity among employees, facilitating the flow of both tacit and explicit knowledge [11]. Cognitively, it fosters synergy and organizational learning through regular interactions [12]. Such exchanges are vital for knowledge collection, evaluation, and application [13], [4]. Consequently, the following hypothesis is proposed: **H2**: DL positively influences KS.

KS is fundamental for stimulating EI by enabling the creation and integration of new knowledge. This process surpasses mere information exchange, involving dynamic interactions where tacit and explicit knowledge complement each other to generate new ideas [14]. By facilitating the emergence of novel concepts, KS supports the development of innovative products, services, and processes. EI, which involves developing new technologies and exploring untapped markets, relies heavily on the integration of fresh knowledge [15]. Employee willingness to share expertise is critical in fostering innovation, particularly in environments emphasizing continuous learning and adaptation. Knowledge management theory (KMT) positions knowledge diffusion as essential for EI, enabling collective knowledge building that fuels new ideas and innovation projects. Additionally, KS is key to organizational learning [16], allowing firms to adapt rapidly to market changes and pursue radical innovation paths, thereby reinforcing organizational agility. It can thus be hypothesized that: **H3**: KS positively affects EI.

Following the previous analysis, the literature review indicates that DL fosters the development of shared objectives and collective understandings. It generates mutual support, solidarity, and the dissemination of diverse perspectives, connecting members at various hierarchical levels and with different knowledge bases. DL thus stimulates organizational members to exchange knowledge [10], [4], which in turn can promote EI [17]. By amplifying collective intelligence, DL guarantees empowerment and self-development, encouraging individuals to leverage new knowledge for joint projects and innovative initiatives [18]. Accordingly, we propose: **H4**: The relationship between DL and EI is mediated by KS.

## 2). *Mediating Role of CSC :*

DL is recognized as essential in fostering commitment to innovation, facilitating the transfer and regulation of social capital throughout organizations. Yet, empirical research directly linking DL and social capital remains limited, with most studies focusing on related leadership styles such as relational or ethical leadership, which share characteristics with DL. For instance, [19] demonstrated that relational leadership fosters quality interpersonal relationships, enhancing employee vitality through collaborative behaviors and open communication that build trust and closeness—key components of social capital. Similarly, [20] showed ethical leadership promotes CSC by creating trustful climates conducive to commitment and cooperation. DL, by enabling collaboration across hierarchical boundaries, also facilitates an environment supportive of CSC. While research is still emerging, evidence from relational and ethical leadership studies suggests that collaboration and ethical behavior are fundamental to KS and collective decision-making—core elements of CSC. In sum, DL cultivates conditions favorable to CSC development. Thus: **H5**: DL has a positive effect on CSC.

CSC significantly contributes to EI by enabling the formation of novel associations and fostering innovative ideas [21]. It supports knowledge integration and collaboration, leading to radical solutions and legitimizing novel ideas [1][22]. Moreover, it helps organizations navigate the complexities and uncertainties inherent in EI, especially during experimentation and iteration phases, where rapid adaptation and information exchange are crucial [23]. In collaborative settings, trust among members reduces the need for tight supervision and lowers task conflicts, fostering creative idea generation and problem-solving [24]. This trust-based climate enhances members' commitment to common goals and adaptability, enabling radical idea emergence [23]. CSC thus diminishes ambiguity in EI, improving issue comprehension and facilitating innovation [25]. However, CSC's benefits have limits: excessive homogeneity may stifle the diversity of perspectives critical

for questioning established cognitive frameworks, thereby inhibiting EI [26],[27]. SCT [28],[29] helps explain this tension by framing social capital as resources accessed through relationships (trust, cohesion, shared knowledge) that both facilitate collaboration and, potentially, constrain cognitive diversity.

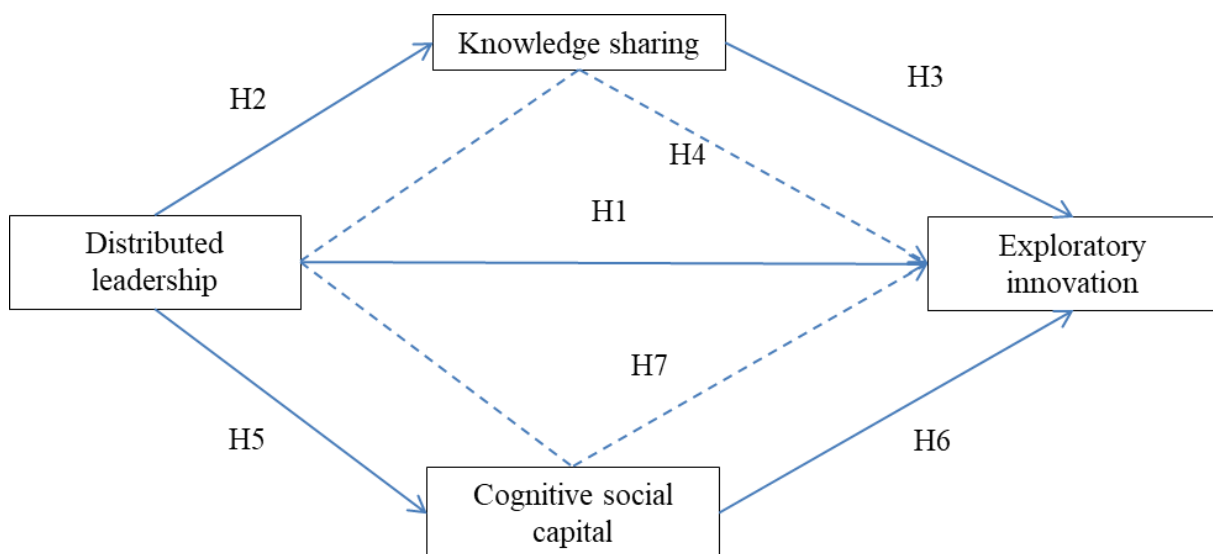
EI, focused on radical knowledge creation, contrasts with exploitative innovation, which enhances existing processes [30],[31]. CSC supports cooperative KS and uncertainty reduction, especially during critical exploratory phases such as prototyping and testing. Therefore, we propose : **H6**: CSC positively influences EI.

CSC mediates the link between DL and EI by fostering mutual trust and KS that facilitate cooperation and idea generation. Nevertheless, while heterogeneity in organizational relationships encourages experimentation with diverse solutions, it can also lead to cognitive consensus, which—although beneficial for cooperation—may hinder radical innovation by fostering “groupthink” [32] or institutional isomorphism [33], limiting the testing of unconventional ideas [26],[3],[34]. Excessive CSC may cause “collective blindness,” characterized by narrow problem understanding and rigidity in ideation, impeding EI [35]. While typically an asset for cooperation, CSC’s ambivalent effects highlight the need to balance trust and critical thinking.

SCT [28],[29] emphasizes that trust and collaboration enable the exchange of tacit and explicit knowledge essential for EI. Complementing this, collective intelligence theory asserts that collaboration and KS—facilitated by cognitive social capital—accelerate and diversify innovation. In essence, these theories show that cooperation, trust, and KS within teams enable radical solutions and new opportunity exploration. CSC thus serves as a strategic resource for EI. However, maximizing its impact depends on DL fostering an environment conducive to idea exchange and innovation. Consequently, we hypothesize : **H7**: The relationship between DL and EI is mediated by CSC.

The hypotheses developed above culminate in the framework presented in Figure 1, which delineates the direct and indirect pathways through which DL influences EI via KS and CSC.

**Fig.1.** Conceptual Model



### III. Methods

#### A. Selection of Sample and Data Collection Method

For this study, data were obtained through the administration of a questionnaire. 220 responses were collected from a total of 400 distributed questionnaires, yielding a response rate of 55%. Table 1 provides an overview of the sample's main characteristics.

**Table I**

Main Characteristics of the Sample

Gender	Frequency	(%)	Having obtained the Bac	%	Over the Bac	%	Age range		
			13	5.9	87	94.1	Less than 40	From 41 to 55	More than 55
Men	171	77.7					25%	63.2%	11.8%
Women	49	22.3							
Total	220	100							

#### B. Measuring Instruments

All variables in this study were measured through items evaluated on a five-point Likert scale, ranging from 1 ('Strongly disagree') to 5 ('Strongly agree').

DL was assessed using an eight-item scale adapted from [36]. EI was assessed using the scale developed by [37], which draws on [22]. *CSC was assessed using three items adapted from* [38]. KS was evaluated using a four-item scale from [39], measuring the extent of knowledge exchange among organizational members. The internal consistency of all scales was excellent, as indicated by Cronbach's alpha values over 0.8.

### IV. Results

#### A. Summary of Exploratory Factor Analysis

An Exploratory Factor Analysis (EFA) was performed in SPSS 25 to examine the dimensionality and appropriateness of the measurement items. The main results are presented below.

**Table II**

Overview of Variable Metric Properties

Variable	Cronbach's alpha	KMO index	Eigenvalue	Factor saturation	Variance explained (%)
DL	0.968	0.959	6.267	0.653 to 0.861	78.336%
EI	0.892	0.944	5.282	0.660 to 0.829	75.454%
KS	0.929	0.907	3.141	0.742 to 0.819	78.531%
CSC	0.919	0.838	2.306	0.739 to 0.785	78.855%

The analysis of the metric properties of the scales used in this study supports their strong psychometric quality.

### *B. Reliability and Validity Assessment*

The internal consistency and convergent validity of the measurement model were examined through the calculation of CR and AVE. Following the guidelines of [40], the acceptable thresholds were set at 0.7 for CR and 0.5 for AVE. All constructs exceeded these thresholds, confirming that the measurement scales are both reliable and valid.

**Table III**

Measurement model results - convergent validity

Variable	Retained items	Loading	AVE	CR
DL	LD1	0.895	0.783	0.967
	LD2	0.918		
	LD3	0.926		
	LD4	0.875		
	LD5	0.813		
	LD6	0.923		
	LD7	0.872		
	LD8	0.852		
KS	PC1	0.861	0.785	0.936
	PC2	0.877		
	PC3	0.899		
	PC4	0.906		
CSC	KSC1	0.877	0.766	0.908
	KSC2	0.862		
	KSC3	0.887		
EI	INER1	0.877	0.754	0.955
	INER2	0.820		
	INER3	0.915		
	INER4	0.884		
	INER5	0.866		
	INER6	0.848		
	INER7	0.864		

### *C. Discriminant Validity*

The discriminant validity assessment, summarized in Table 4, demonstrates that all constructs meet the [41] criterion. The square root of the AVE for each construct exceeds its strongest correlation with other constructs, indicating conceptual and statistical distinctiveness. These results confirm the discriminant validity of the measurement model.

**Table IV**

## Measurement model results - discriminant validity

	DL	KS	CSC	EI
DL	0.885			
KS	0.876	0.886		
CSC	0.705	0.618	0.875	
EI	0.849	0.865	0.656	0.868

Furthermore, the item saturation results summarized in Table 5 demonstrate that all retained items have factor loadings exceeding the threshold of 0.7, indicating strong associations between the items and their respective constructs. Less than 10% of the original items were removed during the analysis, and this pruning had no adverse effect on the validity or reliability of the measurement instrument.

**Table V**

## Cross-loading of the four variables

	DL	KS	CSCI	EI
LD1	<b>0.895</b>	0.799	0.593	0.766
LD2	<b>0.918</b>	0.822	0.650	0.777
LD3	<b>0.926</b>	0.786	0.623	0.756
LD4	<b>0.875</b>	0.714	0.610	0.723
LD5	<b>0.813</b>	0.770	0.596	0.742
LD6	<b>0.923</b>	0.816	0.686	0.786
LD7	<b>0.872</b>	0.732	0.589	0.710
LD8	<b>0.852</b>	0.751	0.635	0.747
PC1	0.801	<b>0.861</b>	0.516	0.697
PC2	0.730	<b>0.877</b>	0.536	0.743
PC3	0.781	<b>0.899</b>	0.600	0.813
PC4	0.790	<b>0.906</b>	0.537	0.809
KSC1	0.582	0.509	<b>0.877</b>	0.571
KSC2	0.517	0.404	<b>0.862</b>	0.464
KSC3	0.720	0.668	<b>0.887</b>	0.657
INER1	0.808	0.868	0.604	<b>0.877</b>
INER2	0.755	0.743	0.564	<b>0.820</b>
INER3	0.778	0.824	0.599	<b>0.915</b>
INER4	0.721	0.708	0.561	<b>0.884</b>
INER5	0.682	0.677	0.565	<b>0.866</b>
INER6	0.639	0.635	0.542	<b>0.848</b>
INER7	0.753	0.761	0.543	<b>0.864</b>

Evaluation of the Structural Model Based on the results presented in Tables 3, 4, and 5, we confirm that the measurement model demonstrates strong reliability and validity. The composite reliability (CR), average variance extracted (AVE), discriminant validity (Fornell-Larcker criterion), and item cross-loadings all meet or exceed the accepted thresholds. Therefore, the measurement instrument and collected data are well-suited for Structural Equation Modeling (SEM).

Table 6 summarizes the results of the path analysis, including standardized coefficients ( $\beta$ ), t-values, and significance levels (p-values)

**Table VI**

Structural model – direct and indirect effects

Hypothesis	Relations	$\beta$	Mean	SD	T	P	Decision
H1	DL→EI	0.316	0.312	0.096	3.291	0.001 (*)	Supported
H2	DL→KS	0.876	0.875	0.019	46.080	0.000 (**)	Supported
H3	KS→EI	0.519	0.517	0.098	5.300	0.000 (**)	Supported
H4	DL→KS→EI	0.454	0.453	0.086	5.294	0.000 (**)	Supported
H5	DL→CSC	0.705	0.710	0.04	17.836	0.000 (**)	Supported
H6	CSC→EI	0.113	0.018	0.055	2.057	0.040 (*)	Supported
H7	DL→CSC→EI	0.079	0.084	0.041	1.957	0.040 (*)	Supported

(\*\*) Significant at  $P < 0.01$ ; (\*) Significant at  $P < 0.05$ .

#### D. Mediation Analysis

To examine the mediating effects of the two variables under investigation—KS and CSC—we applied the approach proposed by [42]. This method involves testing two key conditions:

1. Bootstrapping the indirect (or total) effect, which requires that the effect of DL on EI, through each mediator, be statistically significant. This condition was met for both KS and CSC, as reported in Table 6.
2. The bootstrapped confidence interval (i.e., lower and upper bounds) for the indirect effect must exclude zero, indicating the presence of a significant mediating effect. This second condition is confirmed in Table 7.

**Table VII**

Verification of mediation conditions

Hypo.	Path a	Path b	Indirect effect	SE	T	p	Bootstrapped confidence interval		
							95% Lower level	95% Upper level	Conclusion
H4	0.705	0.113	0.080	0.021	3.794	0.000	0.039	0.121	Presence of mediation
H7	0.807	0.519	0.419	0.021	19.959	0.000	0.378	0.460	Presence of mediation

#### Structural Model Assessment

To assess the quality of the structural model, the coefficient of determination ( $R^2$ ) was calculated, representing the proportion of variance in the dependent variable accounted for by the predictor variables [43]. The  $R^2$  value for EI is 0.496, which, according to [44], is considered high. This suggests that the model explains a substantial portion of the variance in EI.



- ✓ Regarding the predictor variables, the  $R^2$  values are 0.496 for cognitive social capital (a moderate level of explanatory power) and 0.791 for KS (a high level), again based on [44] thresholds.
- ✓ In addition, we examined the effect size ( $f^2$ ), which assesses the relative contribution of each exogenous latent variable to the endogenous latent variable, based on the change in  $R^2$  when the predictor is included or excluded from the model [44]. According to [45] guidelines, an  $f^2$  value between 0.15 and 0.35 is considered moderate, while values between 0.02 and 0.15 are considered small.
- ✓ Based on these criteria, KS exhibits a moderate effect size ( $f^2 \approx 0.30$ ), indicating a meaningful influence on exploratory innovation. In contrast, DL and CSC demonstrate small effect sizes, suggesting that while their effects are statistically significant, their relative explanatory contributions are more limited.

## V. Discussion

This study examined the impact of DL on EI, focusing on the mediating roles of KS and CSC, using data from Tunisian industrial firms. All hypotheses were confirmed. The findings reveal a positive and significant association between DL and EI, thus supporting H1. By delegating responsibilities and promoting shared decision-making, DL creates conditions that facilitate teamwork, stimulate employee involvement, and foster the development of innovative ideas [8], [9]. Grounded in DCT [7] and exploration-exploitation theory [9], this study shows that DL alleviates hierarchical constraints and enables teams to explore innovative paths. It supports the balance between exploration and exploitation, while enhancing organizational learning and continuous innovation. These findings are in line with previous work by [13], [4], [18], who highlighted the strategic value of DL in fostering ambidextrous innovation. In the Tunisian industrial context, this leadership style enhances diversity of thought, supports organizational agility, and reinforces adaptive capabilities. By decentralizing decision-making, it establishes a culture of trust and collaboration essential for sustainable innovation.

The analysis also confirms H2: DL significantly facilitates KS. By cultivating a climate of trust, openness, and cooperation, this leadership style ensures a fluid exchange of both tacit and explicit knowledge. It fosters a participatory governance system that encourages communication and interaction [4], [14]. Such an environment encourages the strengthening of organizational learning capacities and the integration of individual knowledge, which in turn enhances organizational effectiveness [12], [11].

The findings support H3 by demonstrating that KS is a key driver of EI. This process goes beyond the mere exchange of information—it involves dynamic interactions where tacit and explicit knowledge are combined to generate radical ideas [14]. KS encourages interdisciplinary collaboration, experimentation, and risk-taking—critical components of breakthrough innovation. These results are consistent with the work of [15], emphasizing the strategic role of knowledge exchange in dynamic environments. The mediating role of KS is confirmed. DL exerts an indirect influence on EI through the promotion of knowledge exchange. This suggests that leadership alone is not sufficient—its impact is realized through the creation of learning dynamics and collaborative behaviors [4],[10]. Through informal networks, collective activities, and the recognition of individual expertise, DL translates into innovation capabilities. These findings align with the literature on collective intelligence and employee empowerment, where decentralized decision-making and cross-level dialogue fuel the emergence of novel ideas [17],[18].

The study also demonstrates that DL significantly enhances CSC, thereby validating hypothesis H5. This leadership style fosters shared norms, trust, and mutual understanding, which are key components of cognitive cohesion [5]. By promoting horizontal communication and mutual comprehension, DL improves the cognitive foundations of collaboration. These findings support earlier research by [20], and [19], who emphasized the role of interpersonal relationships in facilitating knowledge flows and innovation.

The results support H6, indicating that CSC positively and significantly influences EI by enhancing trust, facilitating knowledge integration, and encouraging creativity in uncertain and dynamic environments [23].

However, the study also highlights a critical limitation: excessive cognitive homogeneity can inhibit EI. Overly uniform thinking can limit critical reflection and reduce the organization's ability to challenge existing cognitive frames [26],[27]. Hence, a balance between social cohesion and cognitive diversity is essential.

Finally, the mediating role of CSC is confirmed. DL fosters shared cognitive frameworks, mutual trust, and cooperative behaviors, which in turn stimulate EI. This mechanism illustrates how leadership is translated into innovation through social and cognitive enablers [32], [33].

However, as with KS, excessive consensus can be counterproductive. Groupthink and isomorphism may inhibit creativity and reduce the organization's ability to challenge the status quo. CSC, when properly balanced, acts as a catalyst for collective intelligence, enabling the integration of diverse knowledge and the development of radical solutions.

This research contributes to the understanding of the cognitive and social mechanisms through which DL drives EI. By integrating DCT, exploration-exploitation theory, and SCT, the study offers an original conceptual framework. The dual mediation of KS and CSC provides a clearer explanation of how decentralized leadership transforms organizational structures into innovation dynamics, especially in emerging industrial contexts.

From a managerial perspective, the findings encourage the adoption of collaborative leadership practices based on trust, transparency, and accountability. Leaders are advised to invest in mechanisms that promote KS (e.g., knowledge platforms, cross-functional teams) and to cultivate environments that value diverse perspectives. Furthermore, managers should support the development of CSC through shared rituals, dialogue forums, and cultural initiatives that reinforce common visions while preserving the cognitive diversity needed for radical innovation.

## VI. Conclusion

This study provides new insights into how DL fosters EI in industrial organizations. The results reveal that DL, by promoting KS and strengthening CSC, serves as a powerful strategic lever for generating novel and disruptive ideas.

Despite its contributions, this research has several limitations. The sample is confined to one sector and country, which may restrict the generalizability of the findings. In addition, the cross-sectional design does not allow for examining temporal dynamics. Future studies could therefore explore other leadership styles or dimensions of social capital (e.g., relational, structural) to further enrich the proposed model.

Future studies could address these limitations by including diverse cultural and industrial contexts and adopting longitudinal approaches to track the evolution of leadership effects. Examining the synergistic effects of multiple leadership styles, along with contextual variables such as organizational culture and knowledge management technologies, would provide a more comprehensive understanding of the phenomenon.

Additionally, a deeper investigation into the interplay between dimensions of social capital could provide greater insight into the conditions that enable true EI.

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