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Designing an Interpretive Structural Model of the Synergy Between Social Capital and Organizational Learning in the National Iranian Oil Company

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ABSTRACT

The purpose of this article is to design a model of the synergy between social capital and organizational learning in the National Iranian Oil Company based on Interpretive Structural Modeling (ISM). In today's world, organizations face numerous challenges, which become particularly salient in competitive and innovative arenas. One of the most critical factors for organizational success in such environments is the ability to learn and to apply the knowledge acquired. In terms of purpose, this study is exploratory, and in terms of approach, it is qualitative. In this research, data were collected through interviews with 15 experts. The snowball sampling method was employed for data collection, after which the data extracted from texts and interviews were categorized and analyzed using thematic analysis. In line with the research objectives, semi-structured interviews and document review based on a thematic analysis strategy were used to collect data. Ultimately, 73 basic codes were identified and organized into 10 basic themes, which were further grouped into 5 organizing themes and 1 overarching theme. Based on the Interpretive Structural Modeling method, the final model was then developed. It is also hoped that the findings of this study will assist policymakers and organizational managers in designing and implementing appropriate strategies to strengthen a culture of learning and collaboration within their organizations by providing a clearer understanding of the relationships between social capital and organizational learning.

Keywords: Synergy; Social Capital; Organizational Learning

Introduction

In contemporary organizational environments characterized by rapid technological change, increasing complexity, and intensified competition, the capacity of organizations to continuously learn, adapt, and innovate has become a critical determinant of long-term sustainability and performance. Among the various intangible resources that enable organizations to respond effectively to these pressures, organizational learning and social capital have emerged as two interdependent constructs that jointly shape organizational resilience, innovation capability, and strategic renewal. Recent management scholarship increasingly emphasizes that neither organizational learning

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nor social capital operates in isolation; rather, their interaction produces synergistic effects that amplify organizational outcomes beyond the sum of their individual contributions (1, 2).

Organizational learning refers to the processes through which organizations acquire, disseminate, interpret, and institutionalize knowledge in order to modify behavior and improve performance. It encompasses individual, group, and organizational-level learning mechanisms that collectively enable organizations to adapt to environmental changes and pursue continuous improvement (3, 4). Empirical evidence demonstrates that organizational learning plays a pivotal role in organizational transformation, innovation performance, and employee development, particularly in knowledge-intensive and dynamic sectors (5, 6). In industries such as oil and gas, where operational complexity, technological advancement, and safety considerations are paramount, organizational learning is especially critical for sustaining competitiveness and managing risk (7, 8).

Social capital, by contrast, represents the resources embedded in social relationships, networks, norms, and trust that facilitate coordinated action and knowledge exchange among organizational members and stakeholders. Social capital is commonly conceptualized through structural, relational, and cognitive dimensions, each contributing uniquely to information flow, collaboration, and collective problem-solving (2, 9). Prior research has shown that social capital enhances knowledge sharing, innovation, organizational resilience, and performance across diverse contexts, including SMEs, public organizations, supply chains, and educational institutions (10-12).

The growing body of literature suggests that the most substantial organizational benefits arise not merely from possessing high levels of social capital or strong learning capabilities, but from the synergistic interaction between these two constructs. Social capital provides the relational infrastructure that enables learning processes to occur effectively, while organizational learning transforms relational resources into actionable knowledge and innovation outcomes (1, 13). This synergy is particularly salient in environments that demand cross-functional collaboration, inter-unit coordination, and continuous knowledge renewal, such as large, complex organizations operating in strategic industries.

Recent studies highlight that social capital facilitates organizational learning by fostering trust-based interactions, open communication, and shared understanding, which reduce knowledge hoarding and encourage collective sense-making (14, 15). Conversely, organizational learning strengthens social capital by reinforcing shared values, enhancing professional development, and promoting collaborative norms that sustain long-term relationships within and beyond organizational boundaries (16, 17). This reciprocal relationship underscores the importance of adopting an integrative perspective when examining organizational capabilities.

Despite the acknowledged importance of this synergy, the existing literature reveals several limitations. First, much of the empirical research treats social capital and organizational learning as linear predictors of performance outcomes, without explicitly modeling their structural interrelationships or hierarchical dependencies (18, 19). Second, many studies rely on quantitative survey-based methods that capture associations but offer limited insight into the complex, multi-level mechanisms through which these constructs interact (20, 21). Third, there remains a notable gap in context-specific research within large public-sector and state-owned organizations, particularly in resource-based industries where institutional complexity and bureaucratic structures may shape learning and relational dynamics in unique ways (8, 22).

Addressing these gaps requires methodological approaches capable of uncovering underlying structures, causal pathways, and interdependencies among organizational factors. Interpretive Structural Modeling (ISM) offers a robust framework for achieving this objective by enabling researchers to systematically identify, structure, and

hierarchically organize complex relationships among variables based on expert judgment (22, 23). ISM has been increasingly applied in management and organizational studies to model interrelated capabilities, strategic drivers, and systemic interactions, particularly in contexts characterized by uncertainty and complexity.

The application of ISM is especially relevant for examining the synergy between social capital and organizational learning, as this relationship involves multiple dimensions, feedback loops, and contextual dependencies. By integrating ISM with qualitative thematic analysis, researchers can move beyond surface-level associations to construct comprehensive models that reflect the lived experiences, expert insights, and organizational realities shaping learning and relational processes (4, 24). Such an approach aligns with calls for methodological pluralism in organizational research, emphasizing depth, interpretability, and contextual sensitivity.

In recent years, the digital transformation of organizations has further intensified the importance of learning–social capital synergy. Digital learning ecosystems, data-driven decision-making, and knowledge-sharing platforms have reshaped how organizations generate and disseminate knowledge, while simultaneously redefining the nature of social interaction and trust in organizational settings (16, 24). Studies indicate that digital infrastructures amplify the effects of social capital on learning by expanding network reach, accelerating information exchange, and enabling collaborative innovation across organizational boundaries (25, 26).

Moreover, organizational culture plays a critical mediating role in translating social capital and learning capabilities into sustainable performance. Cultures that emphasize participation, innovation, transparency, and continuous improvement create fertile ground for synergistic interactions between relational and cognitive resources (4, 27). Empirical findings from diverse sectors, including banking, tourism, education, and public administration, consistently show that cultures supportive of learning and collaboration enhance the impact of social capital on innovation and organizational outcomes (5, 15, 28).

In the context of large national organizations operating in strategic industries, such as the oil and gas sector, the stakes associated with effective learning and collaboration are particularly high. These organizations face persistent challenges related to technological complexity, safety, environmental sustainability, and global market volatility. Prior research in energy-sector organizations demonstrates that deficiencies in organizational learning environments and weak relational networks can hinder knowledge transfer, reduce adaptability, and compromise long-term performance (7, 8). Conversely, strong social capital combined with robust learning systems can support innovation, operational excellence, and strategic alignment.

Although international studies provide valuable insights into the learning–social capital nexus, contextual factors such as institutional structures, governance models, and cultural norms necessitate localized investigation. Public-sector and state-owned enterprises often exhibit hierarchical decision-making processes, formalized communication channels, and rigid bureaucratic routines that may constrain or reshape learning and relational dynamics (22, 29). Understanding how social capital and organizational learning interact within such settings requires qualitative, expert-driven approaches capable of capturing contextual nuance.

Furthermore, emerging perspectives in management research emphasize the concept of synergy as a systemic phenomenon, wherein the interaction among organizational elements generates emergent properties not attributable to individual components alone (21, 23). From this viewpoint, synergy between social capital and organizational learning represents a higher-order capability that enhances organizational adaptability, innovation, and resilience. Modeling this synergy necessitates analytical frameworks that can accommodate complexity, nonlinearity, and interdependence—features inherently embedded in ISM-based approaches.

Despite the theoretical relevance of synergy, empirical models explicitly depicting the structural relationships among learning, social capital, and their sub-dimensions remain scarce. Existing studies often stop short of identifying hierarchical levels, driving factors, and dependent variables within the learning–social capital system (19, 20). Consequently, managers and policymakers lack actionable models that clarify where to intervene strategically to strengthen organizational learning cultures and relational infrastructures.

In response to these gaps, recent scholarship has called for integrative, system-oriented models that combine qualitative insights with structured analytical techniques to map complex organizational phenomena (4, 24). Such models are particularly valuable in guiding strategic decision-making, capability development, and organizational change initiatives in large, complex organizations.

Accordingly, the present study adopts a qualitative, interpretive approach that integrates thematic analysis with Interpretive Structural Modeling to systematically identify, structure, and model the synergistic relationships between social capital and organizational learning within a large national oil organization. By grounding the model in expert knowledge and contextual realities, the study seeks to contribute both theoretically and practically to the literature on organizational capabilities, learning systems, and relational resources.

The aim of this study is to design and validate an interpretive structural model that explains the synergistic relationships between social capital and organizational learning in a national oil organization, based on expert insights and qualitative analysis.

Methods and Materials

The present study is exploratory in nature (aimed at developing concepts, models, and frameworks). In terms of orientation, it is fundamental; from the perspective of research philosophy, it is interpretive; and its primary strategy is methodological pluralism, employing two strategies simultaneously. The study is grounded in a qualitative approach and is conducted through the integration of thematic analysis and Interpretive Structural Modeling (ISM). In the first phase, thematic analysis is used to extract the main themes related to the concept of synergy between social capital and organizational learning. In the subsequent phase, the extracted themes are leveled in accordance with the process recommended in the Interpretive Structural Modeling method, and the relational model among the main extracted themes is developed. The data required for a research design can be collected through both library-based methods and literature review, as well as field methods such as questionnaires, interviews, and similar techniques. In the present study, expert interviews were used to collect data for the thematic analysis section, and a researcher-developed questionnaire was employed for the Interpretive Structural Modeling section. Given the objective of the study, the questionnaire was designed in alignment with the research topic and distributed among experts and specialists; therefore, the statistical population of the present study consists of experts and specialists in the field of public management. In the thematic analysis phase of the study, interviews were conducted with experts using the snowball sampling method and continued until theoretical saturation was achieved, resulting in a total of 17 interviewees. Theoretical saturation refers to the point at which no new information is provided by interviewees and subsequent data become repetitive. Furthermore, for the implementation of the Interpretive Structural Modeling methodology, questionnaires were distributed among experts, and ultimately 15 completed questionnaires were returned and used as the basis for the study.

Qualitative researchers are required to employ at least two strategies to enhance the credibility of their research (Aghili et al., 2023). In the present study, the following measures were taken to achieve this objective:

Member checking: The opinions of two faculty members and two doctoral students in public management regarding the report of the research process and data were obtained, and the titles of several concepts were revised in accordance with their corrective feedback.

Prolonged engagement with the research topic: Due to the attractiveness of the topic and the researcher's in-depth exploration of the concepts under investigation, the literature review process extended over a relatively long period of time.

Methodological pluralism: In order to ensure diversity in the reviewed sources, efforts were made to analyze all types of textual data, including books, articles, projects, and analyses published in various databases.

In addition, according to Creswell (2003), two methods were employed to ensure the reliability of the study: (a) detailed and precise note-taking, and (b) anonymous coding conducted with the assistance of a coder who was not a member of the research team.

Data analysis in thematic analysis is based on the coding process. A theme represents a patterned meaning within the data that is related to the research questions. This method is a process for analyzing textual data (derived from interviews) that transforms dispersed and diverse data into rich and detailed information (Aghili et al., 2023). Based on a specified procedure, the thematic network systematizes themes through four stages: familiarization with the text, appropriate interpretation and understanding of apparently unrelated information, qualitative data analysis, and finally, the systematic observation of individuals, interactions, groups, organizational situations, or cultures. The following levels of themes are organized:

Basic themes (codes and key points identified in the interviews).

Organizing themes (categories derived from the integration and abstraction of basic themes).

Global themes (higher-order themes encompassing the governing principles of the text as a whole).

These themes are then depicted in the form of web-like thematic network maps, in which the key themes at each of the three aforementioned levels, along with the relationships among them, are illustrated. Thematic networks are not merely a procedure for preparing preliminary steps or presenting final analytical results; rather, they constitute a strategy for deconstructing the text and identifying salient and meaningful points within it.

Interpretive Structural Modeling is an interactive learning process in which a set of diverse and interrelated elements is structured within a comprehensive and systematic model. This method is situated at the intersection of mathematical sciences, graph theory, social sciences, group decision-making, and computer science. Interpretive Structural Modeling facilitates the organization of complex relationships among system elements and the identification of internal relationships among variables, and it serves as an appropriate technique for analyzing the influence of one variable on others. As an interpretive method, it seeks to present a group-based judgment regarding the relationships among variables. Interpretive Structural Modeling is interpretive in nature because it is the collective judgment of the group that determines which elements are related and how these relationships are configured. At the same time, it is structural in that, based on the identified relationships, an overall structure of a complex set of elements is extracted. Finally, the relationships among elements and the overall structure identified are visualized and presented in a graphical model.

Findings and Results

In the first step, in order to become familiar with the data, all interview-derived data regarding employees' perceptions of job security in the context of blockchain were reviewed. After repeated reviews, in the second step,

93 initial codes were extracted. In the subsequent step, basic themes emerged through the analysis and synthesis of the annotated statements. Thereafter, in the fourth step, based on the formation of 73 basic codes, 10 basic themes were identified within the framework of 5 organizing themes and 1 overarching theme. In the fifth step, considering the organizing themes as well as the researcher's evolving conceptual understanding throughout the study, seven overarching themes were ultimately identified. Themes and patterns within the data are identified using either an inductive (bottom-up) approach or a theoretical–deductive (top-down) approach. In the inductive approach, the identified themes are more closely related to the data themselves and emerge directly from the collected data, whereas in the theoretical–deductive approach, the data are derived from the researcher's theoretical interest in the topic and stem from prior research and professional background. Typically, when a topic has been insufficiently theorized, it is preferable to adopt an inductive approach. Accordingly, in the present study, an inductive approach was employed to extract basic, organizing, and overarching themes, which are presented in the table below.

Table 1. Results of Thematic Analysis Along with Code Frequencies

Organizing Themes	Basic Themes	Initial Codes
Communication Structure Network	Interpersonal and Group Interaction and Collaboration	Strong communication networks; organizational interactions; mutual trust; knowledge sharing; formation of joint teams; intra-organizational coordination; inter-unit information exchange; interdepartmental collaboration; formation of multidisciplinary teams
	Relationship Management	Strengthening inter-organizational relationships; use of informal communications; establishment of long-term relationships; development of strong internal and external organizational communications
Human Resource–Cultural Factors	Empowerment Enhancement	Continuous training programs; development of new skills; evaluation of training performance; improvement of technical and managerial skills; participation in decision-making; career advancement; enhancement of job autonomy; improvement of human resource management; identification and development of talents; individual development programs; learning and development opportunities; organizational talent management; enhancement of employee performance
	Culture of Participation and Innovation	Creation of a shared identity; strengthening organizational commitment; retention of employee loyalty; enhancement of job motivation; positive interactions with other employees; establishment of organizational trust; mutual respect; transparency in decision-making; trust in leadership; creation of an open space for idea exchange
Learning and Innovation Network	Learning and Innovation Ecosystem	Learning culture; learning from failures; knowledge sharing; organizational innovation; learning from new projects; creation of an innovative environment; acceptance of new ideas; improvement of work processes; application of new technologies; enhancement of quality and productivity
	Digital Learning Ecosystem	Use of digital learning tools; development of online learning platforms; data analysis to improve learning; use of new technologies in education and learning
Cognitive–Knowledge–Intelligence Factors	Organizational Knowledge	Knowledge documentation; storage of organizational experiences; creation of information databases; management of employee information; knowledge management systems; knowledge-based leadership styles; facilitation of knowledge flow; promotion of a learning culture; utilization of knowledge in decision-making
	Organizational Intelligence	Data collection and analysis; use of information in decision-making; application of best practices; updating knowledge in strategic decisions; utilization of expertise
Synergistic Learning Environment Factors	Collaborative Learning Environment	Creation of a participatory environment; promotion of a learning culture; trust-building culture; encouragement of innovative behaviors; support for innovation
	Learning Motivation	Financial and non-financial rewards; creation of growth opportunities; encouragement of participation in learning; individual and group development motivations

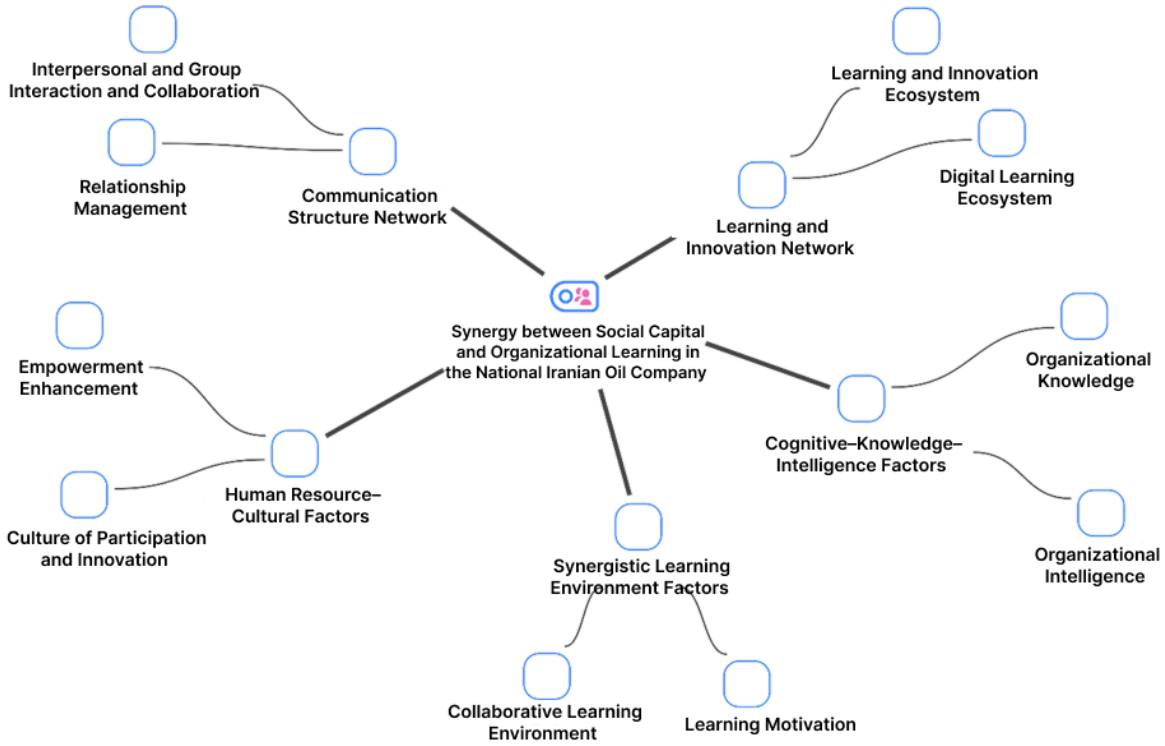

Figure 1. Qualitative research model

The Structural Self-Interaction Matrix (SSIM) is the first matrix used in Interpretive Structural Modeling (ISM). This matrix is employed to identify the internal relationships among indicators based on expert judgments. The matrix obtained at this stage shows which variables influence other variables and which variables are influenced by others. Conventionally, symbols such as those presented in Table 2 are used to identify the pattern of relationships among elements.

Table 2. Symbols and Conditions Used to Express Relationships Among Variables

Symbol	V	A	X	O
Relationship	Variable *i* influences *j*	Variable *j* influences *i*	Mutual relationship	No relationship

The Structural Self-Interaction Matrix is formed by comparing the dimensions and indicators of the study using the four types of conceptual relationships. The resulting information is synthesized based on the Interpretive Structural Modeling methodology, and the final Structural Self-Interaction Matrix is constructed (Aghili et al., 2023). According to the symbols presented in Table 2, the Structural Self-Interaction Matrix is shown in Table 3.

Table 3. Structural Self-Interaction Matrix (SSIM)

SSIM	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14
C01	–	V	V	V	X	O	V	V	V	X	V	V	X	O
C02		–	A	A	O	A	A	A	O	A	A	O	A	O
C03			–	A	O	X	V	O	V	A	O	O	A	A
C04				–	O	V	V	A	V	A	O	V	V	V
C05					–	A	O	O	V	A	A	O	A	O
C06						–	X	A	V	A	V	O	O	V
C07							–	A	V	A	O	O	A	O
C08								–	O	A	O	O	A	O
C09									–	O	A	A	A	A
C10										–	V	V	O	O

The reachability matrix is obtained by converting the Structural Self-Interaction Matrix into a binary (0–1) matrix. In the reachability matrix, the diagonal elements are assigned a value of one. In addition, transitivity among relationships must be verified. This means that if variable A leads to variable B, and variable B leads to variable C, then variable A should also lead to variable C. In other words, based on secondary relationships, indirect effects should be reflected as direct effects. If this condition is not met in practice, the matrix must be corrected to incorporate the secondary relationship. Accordingly, the reachability matrix of the model variables is presented in Table 4.

Table 4. Initial Reachability Matrix of Variables

RM	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14
C01	0	1	1	1	0	1	1	1	1	1	1	1	1	0
C02	0	0	0	0	0	0	0	0	1	0	0	0	0	0
C03	0	1	0	0	0	1	1	0	1	0	0	0	0	0
C04	1	1	1	0	0	1	1	0	1	0	0	1	1	1
C05	0	0	0	0	0	0	0	0	1	0	0	0	0	0
C06	0	1	1	0	1	0	1	0	1	0	1	0	1	1
C07	0	1	0	0	0	1	0	0	1	0	0	0	0	0
C08	0	1	1	1	1	1	1	0	0	0	0	0	0	0
C09	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C10	1	1	1	1	1	1	1	1	0	0	1	1	0	0

After obtaining the initial reachability matrix, the final reachability matrix is derived by incorporating transitivity into the relationships among variables. This is a square matrix in which each element equals one if there is accessibility between elements at any path length; otherwise, it equals zero. The reachability matrix is obtained using Euler's theory, whereby the adjacency matrix is added to the identity matrix. The resulting matrix is then raised to the power *n* until no further changes occur in the matrix elements. The following formula represents the method for determining reachability using the adjacency matrix.

Equation 1. Determination of the Final Reachability Matrix: $$M = (A + I)^n$$

In this formulation, matrix *A* represents the initial reachability matrix, *I* is the identity matrix, and *R* denotes the final reachability matrix. Matrix exponentiation is performed according to Boolean algebra rules.

Equation 2. Boolean Algebra Rules: 1 × 1 = 1; 1 + 1 = 1

Therefore, to ensure accuracy, secondary relationships must be verified. That is, if A leads to B and B leads to C, then A must also lead to C. If indirect effects implied by secondary relationships have not been reflected as direct effects in practice, the matrix must be revised accordingly. The final reachability matrix of the model variables is presented in Table 5.

Table 5. Final Reachability Matrix of Variables

RM	C01	C02	C03	C04	C05	C06	C07	C08	C09	C10	C11	C12	C13	C14
C01	0	1	1	1	0	1	1	1	1	1	1	1	1	0
C02	0	0	0	0	0	0	0	0	1	0	0	0	0	0
C03	0	1	0	0	0	1	1	0	1	0	0	0	0	0
C04	1	1	1	0	0	1	1	0	1	0	0	1	1	1
C05	0	0	0	0	0	0	0	0	1	0	0	0	0	0
C06	0	1	1	0	1	0	1	0	1	0	1	0	1	1
C07	0	1	0	0	0	1	0	0	1	0	0	0	0	0
C08	0	1	1	1	1	1	1	0	0	0	0	0	0	0
C09	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C10	1	1	1	1	1	1	1	1						

To determine the relationships and level partitioning of the criteria, the reachability set and the antecedent set for each criterion must be extracted from the reachability matrix.

• **Reachability set (row elements, outputs, or influences):** variables that can be reached through this variable.

• **Antecedent set (column elements, inputs, or dependencies):** variables through which this variable can be reached.

Table 6. Input and Output Sets for Level Determination

Variables	Symbol	Output: Influence (Rows)	Input: Dependence (Columns)	Intersection	Level
Learning Motivation	C01	C01, C02, C11, C12, C13	C01, C04	C01	1
Digital Learning Ecosystem	C02	C02, C05, C09	C01, C02, C03, C04, C13, C14	C02	1
Collaborative Learning Environment	C03	C02, C03, C06, C07	C06, C10, C11, C12	C06	1
Learning and Innovation Ecosystem	C04	C01, C02, C03, C04, C08	C04, C08, C10, C11	C04, C08	2
Culture of Participation and Innovation	C05	C03, C05, C09	C01, C02, C04, C05, C06, C07, C09, C10, C13	C05, C09	2
Organizational Knowledge	C06	C01, C02, C03, C05, C06, C07, C08	C04, C06, C07, C08, C10, C13	C06, C07, C08	3
Organizational Intelligence	C07	C02, C04, C05, C06, C07, C09, C11, C13	C01, C03, C04, C07, C08, C10, C13	C04, C07, C13	3
Empowerment Enhancement	C12	C03, C09, C12, C01, C11	C01, C09, C11, C12, C13	C09, C12, C01, C11	4
Relationship Management	C13	C01, C02, C03, C04, C06, C08, C09, C10, C11	C04, C06, C11, C13	C04, C06, C11, C13	4
Interpersonal and Group Interaction and Collaboration	C14	C02, C04, C06, C08, C11, C12, C14	C04, C06, C11, C13, C14	C04, C06, C11, C14	4

The output set includes the criterion itself and the criteria influenced by it. The input set includes the criterion itself and the criteria that influence it. Subsequently, the bidirectional relationship set of the criteria is identified. For a given variable, the reachability set (outputs or influences) includes the variables that can be reached through that variable, while the antecedent set (inputs or dependencies) includes the variables through which that variable can be reached. After determining the reachability and antecedent sets, the intersection of the two sets is calculated. The first variable for which the intersection set is equal to the reachability set (outputs) is assigned to Level 1. Accordingly, Level 1 elements exhibit the highest degree of dependence within the model. After determining a level, the criterion whose level has been identified is removed from all sets, and the input and output sets are reconstructed to determine the level of the next variable (Aghili et al., 2023). The final pattern of levels for the identified variables is presented in Figure 2. In this diagram, only the significant relationships of elements at each level with elements at the immediately lower level, as well as the significant internal relationships among elements within each row, are considered.

After determining the levels of the factors, and to facilitate a clearer understanding of the relationships among them, these relationships can be presented graphically in the form of a model (Figure 2).

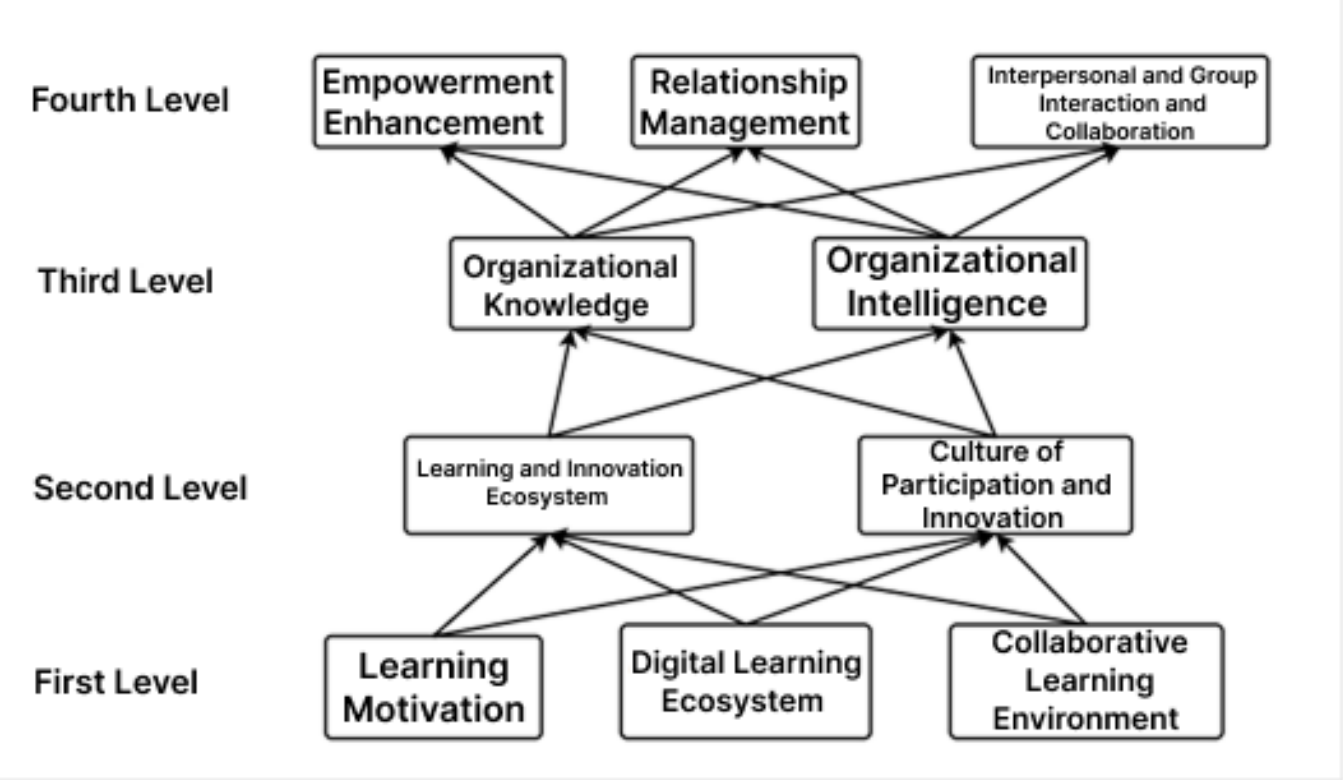

Figure 2. Model design based on dimensions and components

Level 1: Learning motivation; Digital learning ecosystem; Collaborative learning environment

Level 2: Learning and innovation ecosystem; Culture of participation and innovation

Level 3: Organizational knowledge; Organizational intelligence

Level 4: Empowerment enhancement; Relationship management; Interpersonal and group interaction and collaboration

Discussion and Conclusion

The present study sought to explain the synergistic relationships between social capital and organizational learning through an interpretive structural modeling (ISM) approach grounded in expert judgment. The findings reveal a multi-level, hierarchical structure in which learning-related and relational constructs are not independent but are systematically interconnected in a way that produces cumulative and reinforcing effects. At the most dependent level of the model, learning motivation, the digital learning ecosystem, and the collaborative learning environment emerged as outcome-oriented variables, indicating that these elements are strongly influenced by deeper structural and managerial factors within the organization. This result underscores the idea that individual and collective learning behaviors are not spontaneously generated but are shaped by upstream organizational conditions and relational infrastructures, a finding that aligns with prior research emphasizing the contextual embeddedness of organizational learning processes (3, 4).

At the second level, the learning and innovation ecosystem and the culture of participation and innovation were identified as key mediating constructs. These findings suggest that organizational learning becomes sustainable and innovation-oriented only when supported by a participatory culture that legitimizes experimentation, dialogue, and shared problem-solving. This result is consistent with studies demonstrating that innovative organizational

cultures act as a catalyst that transforms learning inputs into innovative outputs, particularly when learning is ambidextrous and integrates both exploratory and exploitative dimensions (6, 20, 27). The positioning of these constructs at an intermediate level also confirms that culture and ecosystem factors function as transmission mechanisms through which deeper capabilities influence observable learning outcomes.

The third level of the model highlights organizational knowledge and organizational intelligence as foundational cognitive capabilities. These constructs occupy a pivotal position in the hierarchy, indicating that they serve as bridges between structural-managerial factors and learning-related outcomes. Organizational knowledge, encompassing documentation, storage, and application of experience, provides the substantive content upon which learning processes operate. Organizational intelligence, in turn, reflects the organization's capacity to interpret information, integrate expertise, and make informed strategic decisions. This finding strongly aligns with prior empirical work showing that knowledge-based resources mediate the relationship between social capital and learning effectiveness, as well as between learning and performance (9, 16, 19). The results further corroborate arguments that learning without structured knowledge systems remains fragmented and that intelligence without relational support lacks collective coherence.

At the most influential level of the model, empowerment enhancement, relationship management, and interpersonal and group interaction and collaboration emerged as the primary driving forces. These factors exert the strongest influence on all other elements in the system, indicating that the synergy between social capital and organizational learning is fundamentally rooted in managerial and relational practices. Empowerment enhancement reflects investments in human capital development, autonomy, and participation in decision-making, which prior studies have repeatedly linked to stronger learning behaviors and innovative performance (5, 10). Relationship management and interpersonal collaboration, meanwhile, represent the structural and relational dimensions of social capital that enable trust, coordination, and knowledge flow across organizational boundaries. This finding is highly consistent with the social capital literature, which emphasizes that trust-based relationships and dense interaction networks are prerequisites for effective learning and knowledge sharing (2, 14, 15).

The hierarchical ordering identified through ISM offers important theoretical insights. Specifically, it demonstrates that social capital-related constructs function primarily as driving variables, while learning-related constructs tend to appear as dependent or mediating variables. This supports the integrated perspective proposed by Birasnav et al., which argues that social capital provides the relational infrastructure that enables organizational learning to unfold effectively (1). The present findings extend this perspective by clarifying how different dimensions of social capital—such as relationship management and interpersonal collaboration—operate at distinct structural levels to shape learning motivation, learning environments, and digital learning systems.

The strong influence of digital learning ecosystems observed in the results also reflects the growing importance of technology-enabled learning in contemporary organizations. Experts emphasized that digital platforms, data-driven learning tools, and online knowledge-sharing systems amplify the effects of social capital by expanding access to information and facilitating cross-unit collaboration. This finding aligns with recent research highlighting the mediating role of digital infrastructures in strengthening the relationship between organizational learning and performance (16, 24). Moreover, it resonates with studies showing that digital learning environments are most effective when embedded within trust-based networks and participatory cultures (25, 26).

From a contextual perspective, the findings are particularly relevant for large, complex organizations operating in strategic and resource-intensive industries. Prior studies in oil, gas, and public-sector organizations have reported

challenges related to siloed knowledge, rigid hierarchies, and weak learning environments (7, 8). The present model suggests that addressing these challenges requires a systemic approach that prioritizes empowerment, relationship management, and collaborative interaction as levers for strengthening organizational knowledge and intelligence, which in turn foster sustainable learning outcomes. This systems-oriented interpretation is consistent with synergetic and complexity-based approaches to public administration and organizational management (22, 23).

In addition, the results contribute to the broader literature on synergy in management by empirically demonstrating that the interaction between social capital and organizational learning produces emergent properties that cannot be explained through linear models alone. The ISM-based hierarchy illustrates how lower-level relational practices cascade upward to influence cultural, cognitive, and behavioral outcomes. This supports recent calls for moving beyond variable-centered analyses toward structural and system-based models in organizational research (4, 21). By explicitly modeling interdependencies, the study provides a more nuanced understanding of how learning and social capital co-evolve within organizational systems.

Overall, the discussion of results indicates strong convergence between the present findings and prior empirical and theoretical studies, while also extending the literature by offering a structured, hierarchical model tailored to a large national organization context. The integration of thematic analysis with ISM enabled the identification of deep structural drivers that may not be readily observable through conventional quantitative approaches, thereby enhancing the explanatory power of the findings.

Despite its contributions, the present study has several limitations that should be acknowledged. First, the findings are based on expert judgments within a specific organizational and sectoral context, which may limit the generalizability of the model to other industries or institutional settings. Second, the qualitative and interpretive nature of ISM relies on subjective assessments, which, although systematically aggregated, may reflect contextual biases or dominant perspectives among experts. Third, the study does not empirically test the proposed relationships using quantitative data, and therefore causal inferences should be made with caution.

Future research could extend this study by empirically validating the proposed model using structural equation modeling or other quantitative techniques across different organizational contexts. Comparative studies between public-sector and private-sector organizations, or between resource-based and knowledge-based industries, could further illuminate contextual differences in the learning–social capital synergy. Additionally, longitudinal research designs could explore how these relationships evolve over time, particularly in response to digital transformation and organizational change initiatives.

From a practical standpoint, managers should focus on strengthening empowerment mechanisms, relationship management practices, and collaborative interaction structures as foundational levers for enhancing organizational learning. Investments in digital learning infrastructures should be accompanied by efforts to build trust, participation, and open communication. Finally, policymakers and organizational leaders should adopt a systemic perspective, recognizing that sustainable learning outcomes emerge from the coordinated development of relational, cultural, cognitive, and technological capabilities rather than from isolated interventions.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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