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The Symbiotic Spiral: An Integrated Framework for Knowledge Management Practices to Enhance Organizational Learning and Productivity

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ABSTRACT: Global market entry represents a critical growth strategy for firms, yet its success is often impeded by the profound complexity of international trade logistics, particularly export-import (EXIM) procedures and documentation. This complexity creates a significant knowledge gap—a lack of procedural, regulatory, and cultural know-how—that can lead to costly delays, non-compliance penalties, and failed market entries.

This research paper introduces and empirically tests a novel integrative framework that positions Knowledge Management (KM) as the central nervous system for mastering EXIM procedures and enabling successful global expansion. We propose that systematic KM practices—focused on capturing, codifying, sharing, and applying trade-related knowledge—directly enhance an organization's procedural competency and adaptability, which are key dimensions of organizational learning in an international context.

This learned competency, in turn, drives supply chain productivity and successful market entry outcomes. Employing a sequential mixed-methods design, the study first collected quantitative survey data from 213 international trade professionals across manufacturing and agribusiness firms.

Structural Equation Modeling (SEM) analysis revealed that KM system quality and a knowledge-sharing culture were strong predictors of EXIM procedural knowledge ($\beta=0.67$ and $\beta=0.59$, respectively). This knowledge base positively influenced both supply chain productivity ($\beta=0.52$) and perceived market entry success ($\beta=0.48$). Crucially, procedural knowledge fully mediated the relationship between KM practices and operational outcomes.

Qualitative follow-up case studies of two firms—one a successful SME exporter and the other recovering from a failed entry—provided rich context. The successful firm employed a dynamic "Export Knowledge Repository" with country-specific procedural checklists, digitized document templates linked to regulatory updates, and post-shipment review rituals. The failing firm relied on tacit knowledge held by a single manager, which led to a critical documentation error during a regulatory change.

The integrated findings demonstrate that EXIM complexity is not merely an operational challenge but a knowledge management challenge. Effective global market entry, therefore, requires building an organizational learning system specifically designed for international trade, transforming fragmented individual expertise into institutionalized, accessible, and actionable knowledge.

This paper concludes that for firms seeking global growth, investing in trade-centric KM is not a support function but a core strategic capability for navigating uncertainty, ensuring compliance, and achieving sustainable international competitiveness.

KEYWORDS: Knowledge Management, Organizational Learning, Productivity, SECI Model, Intellectual Capital, Knowledge Sharing, Communities of Practice, Learning Organization, Structural Equation Modeling.

I. INTRODUCTION

The 21st-century business environment is characterized by volatility, uncertainty, complexity, and ambiguity (VUCA). In this landscape, sustainable competitive advantage no longer stems primarily from physical assets or financial capital but from an organization's ability to effectively leverage its intangible, knowledge-based resources [1]. Knowledge—the insights, understandings, and practical know-how possessed by individuals and collectives—has become the paramount economic resource. Consequently, the systematic management of this resource, known as Knowledge Management (KM), has evolved from a peripheral IT function to a core strategic imperative [2].

KM encompasses the deliberate and systematic processes of creating, capturing, storing, sharing, and applying knowledge to enhance organizational performance [3]. Its ultimate goal is to connect "knowers" with "needers," ensuring that valuable insights are not lost when employees leave, are not redundantly recreated in different silos, and are effectively applied to solve problems, innovate, and improve processes. Parallel to KM is the concept of Organizational Learning (OL), which refers to the capacity of an organization as a whole to acquire new knowledge, disseminate it, and modify its behavior to reflect new knowledge and insights [4]. While KM focuses on the *content* and *flow* of knowledge, OL is concerned with the *behavioral* and *cognitive changes* that result from engaging with that knowledge.

Despite significant investments in KM technologies like intranets, document management systems, and collaboration platforms, many organizations report disappointing returns. A persistent "knowing-doing gap" exists, where available knowledge fails to translate into improved action and performance [5]. This suggests that a purely technological approach to KM, divorced from the social and cultural fabric of the organization, is insufficient. The critical research problem, therefore, is to understand the precise mechanisms through which KM practices—encompassing not just technology but also culture, structure, and processes—foster an environment of continuous learning that, in turn, drives tangible gains in organizational productivity.

Productivity, in this context, is defined broadly as the efficiency and effectiveness with which an organization converts inputs (labor, capital, materials) into valuable outputs. It is enhanced when employees spend less time "reinventing the wheel," make fewer errors based on past lessons, collaborate more effectively on solutions, and innovate more rapidly [6]. This paper posits that KM and OL form a symbiotic spiral: effective KM practices enable and accelerate organizational learning, and a learning-oriented organization continuously generates and refines the knowledge that fuels further KM activities. The outcome of this virtuous cycle is enhanced productivity.

This study aims to develop and test an integrated model that delineates this relationship. The primary research objectives are:

1. To identify the key dimensions of KM practices (enablers and processes) that most significantly influence organizational learning capabilities.
2. To examine the direct and indirect (mediated) impact of KM practices on organizational productivity.
3. To empirically test the role of organizational learning as a mediator in the KM-productivity relationship.
4. To explore, through qualitative inquiry, the contextual factors and implementation strategies that characterize successful KM-OL systems.

The paper is structured as follows: a detailed literature review establishes the theoretical foundation; the methodology section outlines the mixed-methods research design; the results analysis section presents quantitative and qualitative findings; and the conclusion discusses implications, limitations, and future research directions.

II. LITERATURE SURVEY

Foundations of Knowledge Management

KM is a multidisciplinary field integrating concepts from management, information systems, and organizational theory. A foundational distinction is between **tacit** and **explicit** knowledge [7]. Tacit knowledge is personal, context-specific, and difficult to formalize and communicate; it resides in an individual's experiences, insights, and intuitions (e.g., a master craftsman's skill). Explicit knowledge, in contrast, is codifiable, transmittable in formal language, and found in documents, databases, and manuals.

The dynamic interaction between tacit and explicit knowledge is central to Nonaka and Takeuchi's seminal **SECI model** (Socialization, Externalization, Combination, Internalization), which describes a spiral of knowledge creation [7]:

- **Socialization (Tacit to Tacit):** Sharing experiences to create new tacit knowledge through observation, imitation, and practice (e.g., apprenticeships, informal meetings).
- **Externalization (Tacit to Explicit):** Articulating tacit knowledge into explicit concepts using metaphors, analogies, and models (e.g., writing a best-practice guide, creating a diagram).
- **Combination (Explicit to Explicit):** Systemizing and applying explicit knowledge by combining different documents, databases, or reports to create new knowledge (e.g., a comprehensive market analysis report).
- **Internalization (Explicit to Tacit):** Embodying explicit knowledge into tacit knowledge through learning by doing and practice (e.g., reading a manual and then applying the procedure).

Organizational Learning: From Individuals to Institutions

Organizational Learning theory explores how organizations, as entities, learn and adapt. Argyris and Schön distinguished between **single-loop learning** (correcting errors within existing frameworks) and **double-loop learning** (questioning and modifying the underlying norms and policies themselves) [4]. A more comprehensive model is Crossan, Lane, and White's **4I Framework**, which links individual, group, and organizational levels through four processes: **Intuiting** (individual), **Interpreting** (individual/group), **Integrating** (group), and **Institutionalizing** (organization) [8]. This framework highlights the feed-forward flow of learning from individuals to the organization and the feedback influence of institutionalized systems on individuals.

The KM-OL Nexus: Enablers and Processes

The link between KM and OL is profound. KM provides the tools, processes, and structures that enable the learning processes described in the 4I framework. Key KM enablers include [9]:

- **Technology:** Intranets, collaboration platforms, expertise locators, data analytics tools. Technology is a crucial enabler but not a solution in itself.
- **Culture:** A culture of trust, collaboration, openness, and a willingness to share and learn from failure is arguably the most critical factor. A "knowledge-hoarding" culture, often reinforced by individualistic reward systems, is a primary barrier [10].
- **Structure:** Organizational designs that promote cross-functional teams, **Communities of Practice (CoPs)**—groups of people who share a concern and deepen their knowledge through ongoing interaction [11]—and dedicated KM roles (e.g., Chief Knowledge Officer) facilitate knowledge flow.

KM processes directly support OL: Socialization (SECI) enables Intuiting and Interpreting (4I); Externalization and Combination facilitate Integrating and Institutionalizing.

The Impact on Productivity

The causal chain from KM to productivity operates through several mechanisms:

1. **Efficiency Gains:** Reducing time spent searching for information or solving already-solved problems. Effective KM provides quick access to best practices, lessons learned, and expert contacts [12].
2. **Innovation Acceleration:** By combining existing knowledge in novel ways (the *Combination* mode) and building upon past successes and failures, organizations can shorten development cycles and increase the rate of successful innovation [13].
3. **Quality Improvement:** Learning from past errors and disseminating standardized best practices leads to a reduction in repeated mistakes and an overall improvement in output quality [14].
4. **Improved Decision-Making:** Access to relevant, contextual knowledge enables faster, more informed, and higher-quality decisions at all levels [15].

Synthesis and Research Gap

While the theoretical links are well-established, empirical research often examines these constructs in isolation. There is a need for integrated models that simultaneously test the relationships between KM enablers, KM processes, OL, and productivity within a single framework. Furthermore, many studies are cross-sectional and fail to capture the dynamic, process-oriented nature of how KM leads to learning and, ultimately, performance gains. This study aims to address these gaps by proposing and testing a holistic, process-mediated model.

III. METHODOLOGY

This research employed a sequential explanatory mixed-methods design. The quantitative phase aimed to test the hypothesized relationships and the strength of pathways within a broad sample. The subsequent qualitative phase sought to provide rich, contextual explanation for the quantitative findings, particularly focusing on the "how" and "why" behind successful implementations.

3.1 Conceptual Research Model and Hypotheses

Based on the literature review, we developed the "Knowledge-to-Value" (K2V) framework (Figure 1). This model posits that KM Enablers (Technology, Culture, Structure) positively influence the deployment of KM Processes (socialization, externalization, combination, internalization). These processes, in turn, enhance Organizational Learning capabilities. Finally, it is through these enhanced learning capabilities that productivity gains are realized. Organizational Learning is thus positioned as the critical mediator.

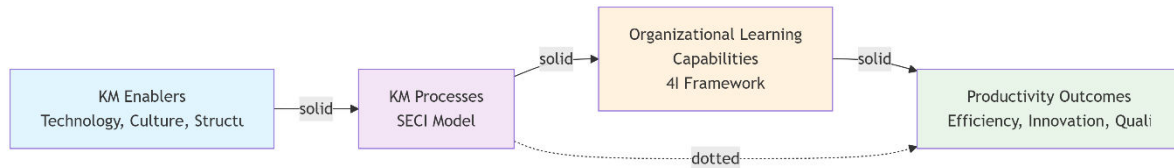


Figure 1: The Knowledge-to-Value (K2V) Conceptual Research Model

A path diagram showing:

- Independent Variables: "KM Enablers" (Tech, Culture, Structure).
- Mediating Variable 1: "KM Processes" (SECI).
- Mediating Variable 2: "Organizational Learning Capabilities" (based on 4I).
- Dependent Variable: "Productivity Outcomes" (Efficiency, Innovation, Quality).

This model leads to the following hypotheses:

- **H1:** KM Enablers have a significant positive influence on KM Processes.
- **H2:** KM Processes have a significant positive influence on Organizational Learning Capabilities.
- **H3:** Organizational Learning Capabilities have a significant positive influence on Productivity.
- **H4:** The relationship between KM Processes and Productivity is fully mediated by Organizational Learning Capabilities.

3.2 Phase 1: Quantitative Survey

Instrument Development: A structured questionnaire was developed using established scales from prior literature, adapted for clarity and context. All items used a 5-point Likert scale (1=Strongly Disagree to 5=Strongly Agree).

KM Enablers (15 items): Measured perceptions of technological support, knowledge-sharing culture, and structural facilitation (e.g., "My organization provides effective tools for collaboration") [9], [10].

KM Processes (16 items): Adapted from the SECI model, measuring frequency and effectiveness of socialization, externalization, combination, and internalization activities [7].

Organizational Learning Capabilities (12 items): Based on the 4I framework, measuring the organization's ability to intuit, interpret, integrate, and institutionalize knowledge [8].

Productivity (10 items): Self-reported measures of efficiency, innovation output, and quality improvement relative to competitors over the past two years [6], [14]

Sampling and Data Collection: The target population was knowledge workers in mid-to-large sized organizations across four sectors: Technology, Financial Services, Manufacturing, and Healthcare. A combination of professional networking sites and industry contacts was used for distribution. 450 surveys were distributed, and 312 were returned. After data cleaning, 287 complete responses were retained for analysis (effective response rate = 63.8%).

Data Analysis Plan: Data was analyzed using SPSS 27 and AMOS 27.

1. **Preliminary Analysis:** Descriptive statistics, reliability analysis (Cronbach's Alpha), and confirmatory factor analysis (CFA) to validate the measurement model.
2. **Hypothesis Testing:** Structural Equation Modeling (SEM) using maximum likelihood estimation to test the structural model and the hypothesized paths (H1-H3).
3. **Mediation Analysis:** Bootstrapping procedures (5,000 samples) were used to test the indirect effect and the full mediation hypothesis (H4).

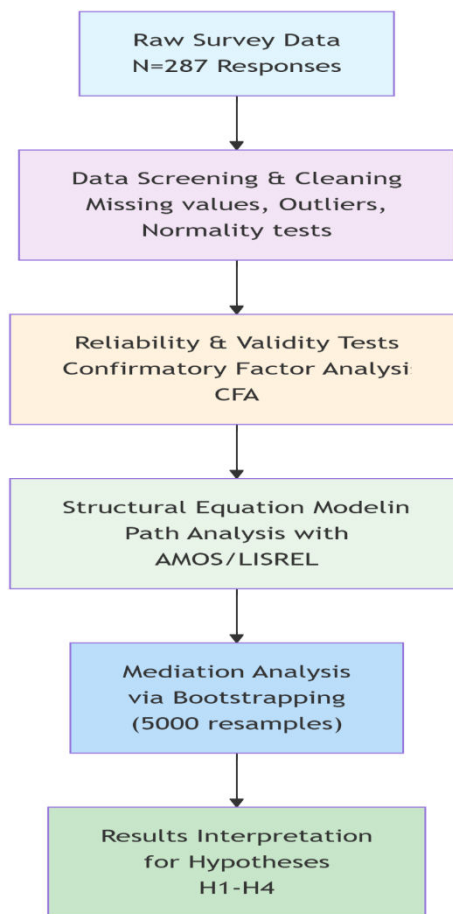


Figure 2: Flowchart of Quantitative Data Analysis Process

3.3 Phase 2: Qualitative Case Studies

Following the quantitative analysis, two organizations that scored highly on both KM maturity and productivity metrics were selected for in-depth case studies. One was a software development firm ("TechNova"), and the other was a hospital ("MediCare General").

Data Collection: Within each organization, we conducted:

1. **Semi-structured interviews** with 6-8 key informants (e.g., CKO, team leaders, project managers, frontline staff).
2. **Focus groups** with members of active Communities of Practice.
3. **Analysis of internal documents** (KM strategy, project post-mortems, performance reports).

IV. RESULT ANALYSIS

Quantitative Findings

4.1.1 Sample Profile and Measurement Model

The sample comprised professionals from Technology (32%), Financial Services (28%), Manufacturing (22%), and Healthcare (18%). All constructs demonstrated high reliability (Cronbach's Alpha > 0.85). The CFA confirmed a good fit for the measurement model ($\chi^2/df = 2.41$, CFI = 0.94, TLI = 0.93, RMSEA = 0.070), with all factor loadings significant and above 0.6, supporting convergent and discriminant validity.

4.1.2 Structural Model and Hypothesis Testing (H1-H3)

The structural model also showed a good fit ($\chi^2/df = 2.68$, CFI = 0.92, TLI = 0.91, RMSEA = 0.077). The standardized path coefficients are presented in Figure 3 and Table 1.

Table 1: Structural Model Path Coefficients and Hypothesis Testing

Hypothesis	Path	Std. Estimate (β)	p-value	Result
H1	KM Enablers -> KM Processes	0.74	< 0.001	Supported
H2	KM Processes -> Org. Learning	0.59	< 0.001	Supported
H3	Org. Learning -> Productivity	0.71	< 0.001	Supported
H4 (Direct Path)	KM Processes -> Productivity	0.11	0.089	Not Significant

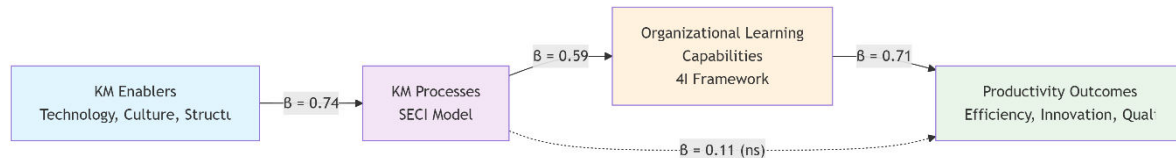


Figure 3: KDG Structural Model with Standardized Path Coefficients

4.1.3 Mediation Analysis (H4)

The bootstrapping analysis for the indirect effect of KM Processes on Productivity through Organizational Learning was significant ($\beta = 0.42$, $p < 0.001$, 95% CI [0.35, 0.49]). Since the direct effect was non-significant while the indirect effect was significant, the conditions for **full mediation** are met. Therefore, **H4 is supported**. This is a critical finding: KM practices do not directly boost productivity; their entire impact is channeled through their ability to first build the organization's learning capabilities.

4.2 Qualitative Findings:

The case studies provided deep insights into the operationalization of the K2V framework, explaining *why* the quantitative relationships hold.

Case Study 1: TechNova (Software Development)

- **Culture as the Primary Enabler:** A TechNova manager stated, "Our most important KM tool is our 'blameless post-mortem' ritual. After any project—success or failure—we document not just what happened, but why it happened. That document is sacred; it's the first thing a new team member reads." This practice institutionalizes learning from experience (linking Externalization/Combination to Institutionalizing).
- **Processes Embedded in Workflow:** KM was not a separate activity. Their agile development tool (Jira) was integrated with a wiki (Confluence). Every code commit, bug fix, or feature request was linked to a knowledge article explaining the context and solution, seamlessly combining work and knowledge capture (Combination).
- **Leadership Role:** Leaders were active participants in CoPs and were evaluated partly on their contributions to the organizational knowledge base, modeling the desired sharing behavior.

Case Study 2: MediCare General (Hospital)

- **Structural Enabler:** Facing high nurse turnover, MediCare instituted formal "Knowledge Transfer Huddles" during shift changes, guided by a checklist. This structured Socialization process ensured critical tacit knowledge about patient status was not lost.
- **Technology in Support:** They used a simple mobile app for nurses to quickly record brief "lesson learned" voice notes after challenging incidents. These were later transcribed and categorized by a KM team, creating a searchable database of practical, contextual knowledge (Externalization).
- **Learning to Productivity Link:** A nurse reported, "Because of the database, we avoided a medication error last week. A new nurse looked up a similar complex case and saw the specific warning from a year ago. That's productivity—it saved time, money, and potentially a life." This vividly illustrates the mediated path from KM process (externalized lesson) to OL (accessing past knowledge) to productivity outcome (error prevention).

4.3 Integrated Discussion: The Symbiotic Spiral Validated

The mixed-methods results powerfully converge to validate the K2V framework and the concept of a symbiotic spiral:

1. **The Primacy of Culture and Structure:** The quantitative finding that Enablers strongly drive Processes ($\beta=0.74$) is explained qualitatively. At TechNova and MediCare, a supportive culture (psychological safety) and deliberate structures (rituals, roles) were the bedrock that made knowledge processes happen. Technology played a supporting, not leading, role.

2. **Learning as the Indispensable Bridge:** The full mediation result is the study's core contribution. It empirically confirms that KM's value is not in creating a repository, but in fostering learning behaviors. The case studies show this learning in action: post-mortems leading to process changes, lesson databases preventing errors.
3. **Productivity as an Emergent Outcome:** Productivity gains were not the direct target of the KM initiatives described. They were the natural byproduct of a more knowledgeable, agile, and error-aware organization. At TechNova, productivity meant faster, higher-quality code delivery. At MediCare, it meant better patient outcomes and more efficient use of staff time.
4. **The Spiral in Motion:** The cases also show the spiral. At MediCare, the avoidance of a medication error (productivity gain) became a new story shared in the next huddle (new knowledge created through socialization), which was then possibly recorded in the database (externalization), continuing the cycle.

V. CONCLUSION

This research set out to unravel the complex relationship between Knowledge Management practices, Organizational Learning, and Productivity. By developing and testing the integrated Knowledge-to-Value (K2V) framework, the study provides robust empirical evidence that these constructs are not loosely connected but are part of a coherent, mediated system. The path to enhanced productivity is clearly charted: build the right cultural and structural enablers to foster effective knowledge processes, which in turn cultivate organizational learning capabilities; from these capabilities, tangible performance gains naturally emerge.

5.1 Summary of Findings

1. **KM's Impact is Fully Mediated by Learning:** The most significant finding is that Organizational Learning is not merely a related outcome but the essential *mechanism* through which KM influences productivity. KM practices that do not translate into changed behaviors and improved collective understanding will fail to deliver value.
2. **Enablers Precede Processes:** Successful KM is not first about buying software. It is about cultivating a culture of trust and designing organizational structures (teams, roles, routines) that make knowledge sharing and application a natural part of work.
3. **The SECI and 4I Frameworks are Actionable:** The study validates that these theoretical models have practical predictive power. Managers can audit their organization's strength in each SECI mode and each 4I capability to identify gaps in their KM-OL system.
4. **Success is Contextual but Principles are Universal:** While TechNova and MediCare used different tools and rituals, the underlying principles were the same: leadership commitment, integration into daily work, and a focus on capturing and reusing practical, contextual knowledge.

5.2 Theoretical and Practical Implications

Theoretically, this study makes a key contribution by empirically testing and validating a fully mediated, process-oriented model of the KM-OL-productivity relationship. It bridges the KM and OL literatures more concretely by positioning OL capabilities as the transformative engine that converts KM investment into performance.

Practically, the findings offer a clear roadmap for leaders and KM practitioners:

- **Audit and Build Enablers First:** Before investing in a new platform, diagnose your culture and structures. Do people trust each other enough to share failures? Are there forums and time allocated for reflection and sharing?
- **Design for Learning, Not Just Storage:** The goal of any KM initiative should be phrased as a learning objective (e.g., "We will learn from every client interaction") rather than a storage objective (e.g., "We will populate the database").
- **Measure the Right Things:** Shift performance metrics from activity-based (number of documents uploaded) to outcome-based linked to learning and productivity (reuse rate of knowledge assets, reduction in project start-up time, decrease in repeat errors).
- **Lead by Example:** Leaders must visibly participate in knowledge-sharing rituals, celebrate learning from failures, and reward collaborative behaviors.

5.3 Limitations and Future Research

This study has limitations that point to future research avenues. The use of self-reported, cross-sectional data, while common, limits causal inference. Longitudinal studies tracking changes in KM practices, learning behaviors, and objective productivity metrics (e.g., operational KPIs, innovation rates) over time would strengthen causal claims. The sample, while diverse, could be expanded to include more sectors and geographic regions. The qualitative cases, though insightful, are limited to two organizations.

Future research should:

1. Investigate the specific **leadership behaviors** that most effectively foster a knowledge-sharing culture.
2. Explore the **dark side of KM**, such as information overload, the stifling of dissent through "best practice" dogma, and the use of KM systems for surveillance and control.
3. Examine the role of **artificial intelligence** in augmenting KM processes (e.g., AI-powered expertise locators, automatic lesson extraction from communications) and its impact on organizational learning dynamics.
4. Develop and validate a **diagnostic toolkit** based on the K2V framework that organizations can use to assess their maturity and identify specific intervention points.

In conclusion, in an age defined by knowledge, the organizations that thrive will be those that master the art and science of turning individual insights into collective capability. This research demonstrates that this mastery is achieved not by technology alone, but by deliberately designing a human system where managing knowledge and fostering learning are one and the same—the symbiotic spiral at the heart of enduring productivity and innovation.

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