

Globalization and Innovation with the Role of Knowledge Transfer Across Borders

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Abstract

Globalization has complicated the MNC system, making cross-border knowledge transfer an important impetus of MNC innovation performance. Although theories generally agree that knowledge sharing has a positive influence on innovation performance, limited studies have explored the moderating effects of cultural, institutional, and technological factors on the knowledge transfer-innovation relationship. Therefore, this research aimed to investigate the influence of knowledge transfer mechanisms on the innovation performance in MNCs and the moderating roles of cultural distance and technological infrastructure in this relationship. This research was carried out using a quantitative research design, integrating survey data obtained from 180 subsidiaries in 12 countries with patent data and innovation indices. Key knowledge transfer mechanisms, innovation output, and moderating factors were operationalized, while regression and SEM were employed to identify the direct and moderated impacts. Besides, network analysis was utilized to investigate knowledge flow between subsidiaries. The results of the regression model indicate that knowledge transfer exerts a significant positive impact on innovation output ($\beta = 0.482$, $p < 0.001$). The SEM results reaffirm the direct effect, and the moderating effects of cultural distance and technological infrastructure were significant; cultural distance exerts a significant negative moderating impact on the knowledge transfer-innovation relationship ($\beta = -0.174$, $p < 0.001$), whereas technological infrastructure exerts a significant positive moderating effect ($\beta = 0.256$, $p < 0.001$). Comparing various subsidiaries, the innovative level of subsidiaries with effective knowledge-sharing practices and a technologically well-prepared system is higher. In conclusion, effective cross-border knowledge transfer exerts a positive effect on the innovation performance of MNCs; therefore, managers should adopt well-organized strategies to realize the knowledge-sharing system, overcoming the barriers of culture and technology. Future studies should also consider the impact of longitudinal design and industry-specific analysis for deeper insights into context impacts.

Keywords: Knowledge Transfer; Innovation Performance; Multinational Corporations; Cultural Distance; Technological Infrastructure; Structural Equation Modeling; Cross-Border Collaboration.

I. INTRODUCTION

Globalization has profoundly altered how businesses operate on an international stage, forcing organizations to expand their activities into several countries and manage complex, interdependent networks of operations. Within this environment, competition has increased,

technologies have become more advanced more quickly, and new sources of innovation have been created. Organizations that successfully integrate global knowledge resources while adjusting to local market conditions will be best able to gain a sustained competitive advantage (Malecki, 2010). Innovation has, consequently, become not merely an important strategic consideration, but a key determinant of organizational success in a globalized environment.

Cross-border knowledge transfer is defined as the systematic and strategic sharing of expertise, technological know-how, and managerial know-how across subsidiary/headquarters (HQ) of MNCs (Jandhyala & Phene, 2015). Knowledge flows through subsidiaries/HQ promote various R&D activities, hasten adoption of technology, and enhance learning capabilities of organizations (Nave & Franco, 2024). While the headquarters of an MNC draws on the subsidiary's knowledge, the latter takes advantage of the HQ's capabilities to innovate. Such integration leverages both localized knowledge and global capabilities of an MNC, enhances innovation and organizational learning, and improves business efficiency and performance (Duan et al., 2021). Specifically, in an environment characterized by rapid change of technology and high competitive pressures, effective knowledge transfer to various subsidiaries can improve innovation performance in an MNC (Liu & Uzunidis, 2021).

The theoretical contribution of knowledge transfer on innovation has been sufficiently demonstrated through the available literature; however, there is insufficient empirical evidence available to establish how cross-border knowledge mechanisms lead to measurable innovation performance (Makkonen et al., 2018; Weidenfeld, 2013). In the majority of the existing literature, only single-country cases were investigated, and the impact of differences in culture, institutions, and technology between countries was disregarded. This narrow perspective hinders an adequate understanding of how knowledge transfer can influence innovation performance in geographically distributed organizations and limits a manager's ability to devise strategies that would optimize the practice of sharing knowledge across countries (Malik et al., 2021; Lepik & Krigul, 2014).

This study examines how the efficiency of knowledge transfer and MNCs' innovation performance are linked, particularly by the moderating roles of cultural distance and technology infrastructure. Objectives are to determine how knowledge flows impact innovation outcomes at the subsidiary level and what contextual variables stimulate or impede these flows. The central premise of this paper states that improved performance in cross-border knowledge transfer is positively related to MNC innovation performance at the subsidiary level. Answering these questions will yield theoretical insights and practical applications for managers attempting to enhance innovation through effective global knowledge management.

The rest of the paper is organized as follows: Section II introduces a rich literature review about globalization, innovation, and cross-border knowledge transfer. In Section III, the research objectives, hypotheses, and framework of analysis are presented. Section IV deals with the methodology of research: data collection, description of the sample, measurement of variables, and methods of analysis. In Section V, the empirical results are illustrated by tables and figures. The discussion on these findings and implications for theory and practice, together with research limits, is dealt with in Section VI. Section VII is the conclusion where key results are synthesized, and directions for future research are provided.

II. LITERATURE REVIEW

Studies on international business knowledge transfer have been guided by concepts of organizational learning and resource-based theories (Wang, 2015). It views knowledge as a strategically important asset and sees knowledge transfer throughout subsidiaries in MNCs as beneficial to firms' innovation and performance (Gaur et al., 2019). Two types of knowledge-tacit and explicit-have been identified, the transfer of the former being more difficult owing to cultural differences and other contextual factors (Liu, 2019). Key theoretical perspectives have been presented, including that of absorptive capacity, where importance is attached to the capability of a subsidiary to identify, internalize, and exploit incoming knowledge; and that of the knowledge-based theory of the firm, that knowledge transfer offers a basis for sustained competitive advantage.

The diffusion of innovation model is concerned with the spread of new ideas, processes, and technologies within and between organizations in the global environment (Papadopoulos et al., 2025). Traditional theories such as the Diffusion of Innovations model by Rogers have been adapted to the multinational context, taking into account international linkages and complexity. The communication channels, social network linkages, and linkages between firms seem critical to foster the pace of diffusion. Certain subsidiary attributes, such as the absorptive capacity and managerial competences, play a crucial role in enabling the successful international spread of innovation diffusion across international markets.

The environment of culture, regulation, and technology influences the nature and extent of cross-border knowledge sharing (Edler et al., 2011). The knowledge transfer can be restricted by the distance in culture between HQ and subsidiary because of factors such as language, management styles, social culture, etc. Regulatory settings (e.g., Intellectual property law, data sharing regulations) can influence the security and access to knowledge transfer. The communication systems and collaborative tools available (e.g., Digital communication, network-based systems) influence the ease and speed with which knowledge can be transferred irrespective of location and time. The combination of these aspects determines the abilities of multinational companies to exploit their knowledge in the context of innovation (Zhang & Gallagher, 2016).

Empirical evidence from multinational corporations indicates that successful cross-border knowledge transfer is positively related to innovation performance. Specifically, subsidiaries that participate actively in knowledge-sharing networks and collaborative R&D projects tend to bring innovative products and processes to the market. Evidence, however, differs across industries and countries, suggesting that contextually-bound moderating variables, like the quality of the institutions, cultural compatibility, and technological preparedness, influence this relationship. Research in this field has grown exponentially, but there is a scarcity of integrative studies that assess the simultaneous influence of several variables impacting cross-border knowledge flow (Trippel, 2010).

While a solid theoretical basis exists in the literature regarding the association of knowledge transfer to innovation at the MNE level, empirical findings are still disparate, especially with regard to cultural, regulatory, and technological forces in interaction. Future research needs to

quantify the impact of knowledge transfer efficiency on innovation performance in various settings worldwide at both the subsidiary and the firm level.

III. RESEARCH OBJECTIVES AND HYPOTHESES

Research Objectives

1. To analyze how knowledge transfer across boundaries impacts the innovation performance in multinational corporations.
2. To identify the moderating effect of cultural and institutional differences on knowledge transfer performance.
3. To investigate how technological infrastructure enhances knowledge transfer and innovation performance.

Research Hypotheses

H1: The knowledge transfer effectively contributes to the innovation output in multinational corporations.

H2: The knowledge transfer impact on innovation performance is moderated by cultural differences. Cultural difference is assumed to limit or enhance the knowledge transfer effect.

H3: The technological infrastructure helps to reinforce the knowledge transfer efficiency, thereby ensuring rapid dissemination and application of knowledge in worldwide subsidiaries.

IV. METHODOLOGY

Figure 1 shows the theoretical model showing the relationship between cross-border knowledge transfer and innovation performance in MNCs. The figure identifies knowledge transfer mechanisms (e.g., formal and informal means, staff migration, and networks) that have a direct impact on innovation performance (e.g., new product and process innovation, patents, speed to market). Additionally, it specifies the moderator factors: cultural and institutional distances may limit the knowledge transfer processes; technological infrastructure (IT infrastructure and network connections) could positively impact the effectiveness of knowledge transfer. This figure visually represents the proposed relationships to be examined in the study and provides a guide for the empirical investigation on how MNCs can best facilitate knowledge sharing for better innovation performance across subsidiaries.

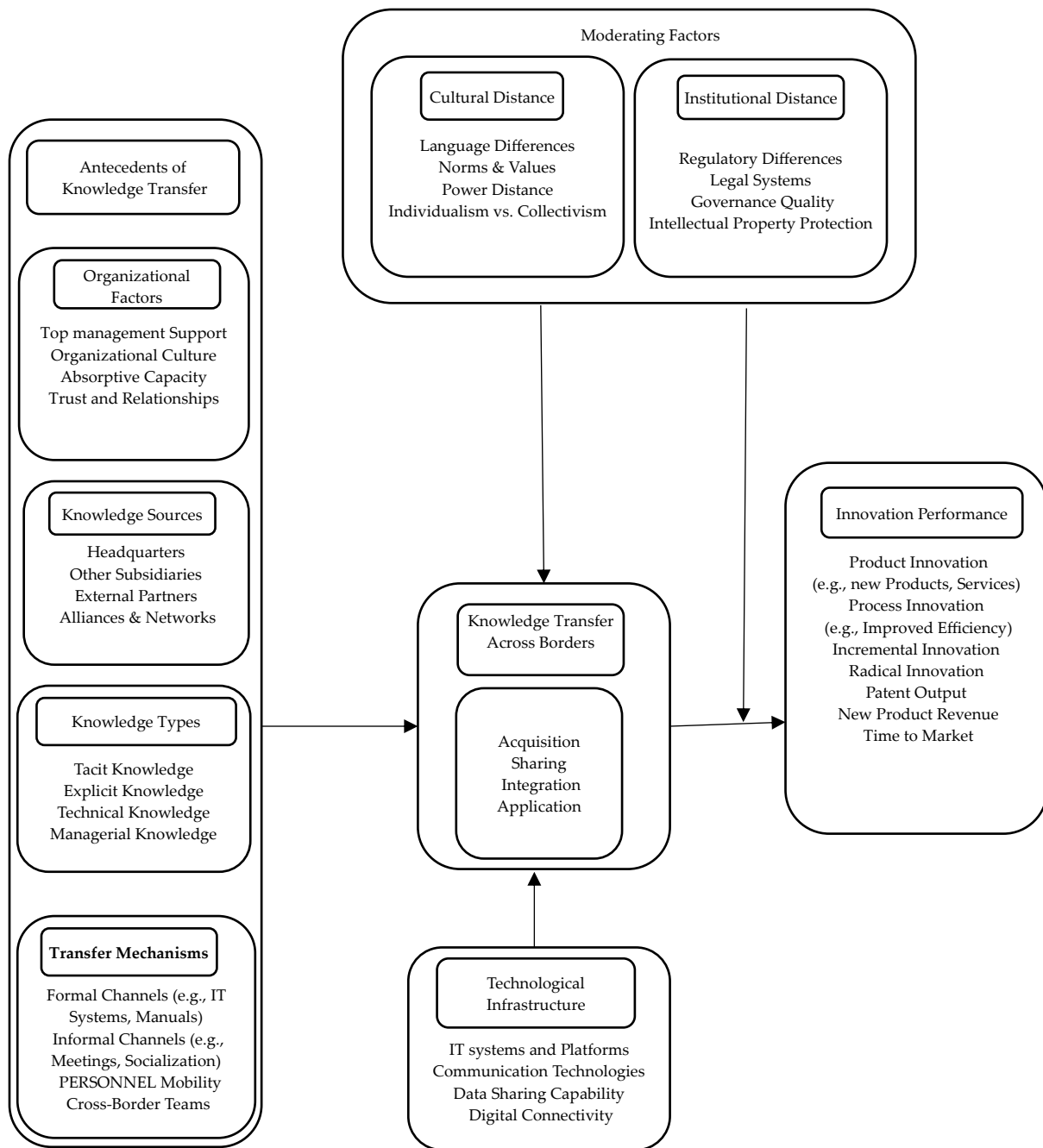


Figure 1: Conceptual Framework of Knowledge Transfer and Innovation Relationship

4.1 Research Design

This paper uses a quantitative design research approach to study the relationship between cross-border knowledge transfer and the MNC's innovation performance. The structure of the research framework is designed to evaluate both direct and moderating relationships of knowledge transfer, considering the contextual roles of cultural distance and technological infrastructure. Both primary and secondary data are obtained to enable a holistic analysis of cross-border knowledge flows and innovation performances in the international subsidiaries.

4.2 Data Collection

Primary data is gathered from managers and key informants within MNC subsidiaries by a structured survey instrument. The questions measure the extent of knowledge-sharing within and among subsidiaries, and the level of innovation activity conducted within the subsidiary. Secondary data from patent databases and indices on innovation are also used. Secondary data provides verifiable measures for the level of innovation activity within the subsidiary, such as counts of patents, product introductions, and process innovations. Combining primary and secondary data increases the reliability and validity of measures.

4.3 Sample

The sample consisted of subsidiaries of firms in a variety of industries, encompassing both developed and developing countries to represent the variety of organizational and environmental contexts. There are 180 subsidiaries of firms from 12 countries in the sample. The companies were chosen to reflect the nature of international presence and R&D activities and the accessibility of knowledge management data. Cross-national comparison was possible while eliminating the influence of industry on innovation activities.

4.4 Measures

Operationalization of key variables: the formal and informal mechanisms, the frequency of communication between subsidiaries, and the involvement in research and development projects measure the knowledge transfer mechanisms. Number of patents, number of new products or processes, and related indices constitute innovation performance. Cultural distance was assessed by Hofstede's dimensions of culture. The use and availability of digital tools for communication and collaboration represent the technological infrastructure. Firm size, industry, and region are included as control variables.

4.5 Data Analysis

The analysis of the data was done by performing multiple regression and structural equation modeling (SEM) in order to verify the direct and moderating impact of knowledge transfer on innovation performance. The strength and pattern of cross-subsidiary knowledge transfer were additionally analyzed using network analysis techniques. These methods are used to test all the hypotheses reliably, and both direct and moderating effects could be explained.

V. RESULTS

5.1 Regression Analysis

The results of the regression analysis on knowledge transfer and innovation performance in MNCs are discussed. As expected, knowledge transfer has a significant and positive impact on innovation output, so Hypothesis H1 is supported. The regression coefficients indicate that both formal and informal knowledge sharing processes and personnel mobility significantly enhance product and process innovation, patent output, and short time to market. The moderating effect was examined too, and results showed that cultural distance decreases the relation between knowledge transfer and innovation, whereas technological infrastructure enhances the relation. Hypotheses H2 and H3 were supported.

Table 1: Summary of Regression Coefficients and Significance Levels

Variable	Coefficient	Std. Error	t-value	p-value
Knowledge Transfer Mechanisms	0.482	0.051	9.45	<0.001
Cultural Distance (Moderator)	-0.174	0.047	-3.70	<0.001
Technological Infrastructure	0.256	0.052	4.92	<0.001
Control Variables (Industry, Size)	–	–	–	–

Table 1 outlines the regression findings regarding how knowledge transfer mechanisms affect innovation performance within multinationals. The coefficient associated with knowledge transfer mechanisms is positive ($\beta = 0.482$, $p < 0.001$), demonstrating a significant positive relationship with innovation performance. Cultural distance serves as a negative moderator ($\beta = -0.174$, $p < 0.001$), demonstrating that increases in the amount of cultural difference between the countries decrease the knowledge transfer mechanisms' positive effect on innovation performance. Technological infrastructure positively moderates the relationship ($\beta = 0.256$, $p < 0.001$), indicating that IT and digital technology enhance the transmission of knowledge and subsequent innovative performance. Included in this model but not in the presented table are control variables that take into consideration the effects of industry and firm size. Overall, effective cross-border knowledge transfer has a positive and significant effect on innovation performance, with certain contextual elements further contributing positively or negatively to the relationship.

5.2 Comparative Analysis Across Regions

Regional differences in innovation performance depend on the effectiveness of knowledge transfer. Firms within regions with higher technological capability and lower cultural distance demonstrate a higher innovation performance. In contrast, subsidiaries in regions with high cultural and/or institutional distance exhibit lower innovation performance even under a proactive knowledge-sharing behavior. In summary, contextual features matter greatly in order to transform knowledge transfer into innovation performance.

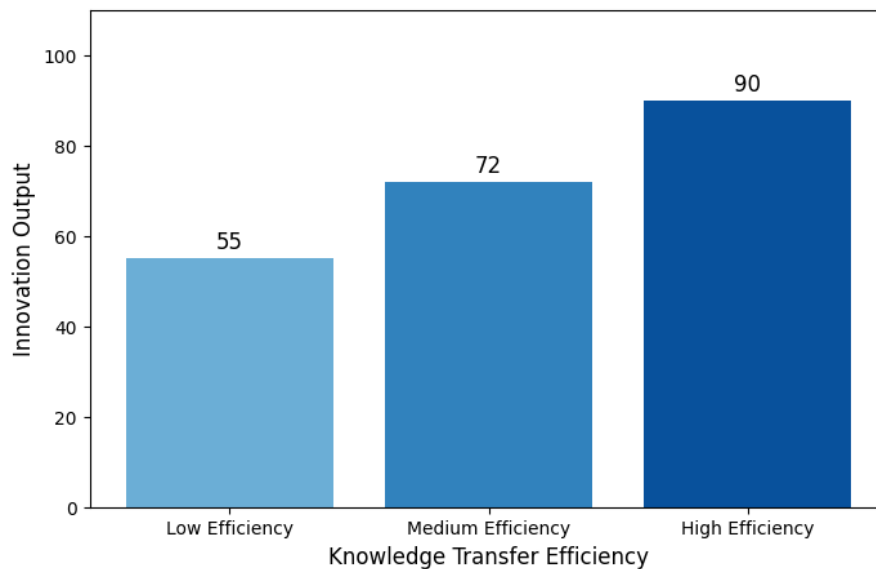


Figure 2: Innovation Output Across Different Levels of Knowledge Transfer Efficiency

Figure 2 illustrates the output of innovation in different subsidiaries under the effect of varying levels of knowledge transfer efficiency. It shows from the bar chart that those subsidiaries with a higher level of knowledge transfer efficiency result in higher levels of innovation output, with innovation output for the higher efficiency subsidiaries reaching as high as 90 units, that for the medium efficiency subsidiaries as high as 72 units, and for the lower efficiency subsidiaries as high as 55 units, providing convincing evidence on the correlation of efficient knowledge transfer and innovation output in internationalized firms.

Figure 3: Structural Equation Model (SEM) of Knowledge Transfer and Innovation

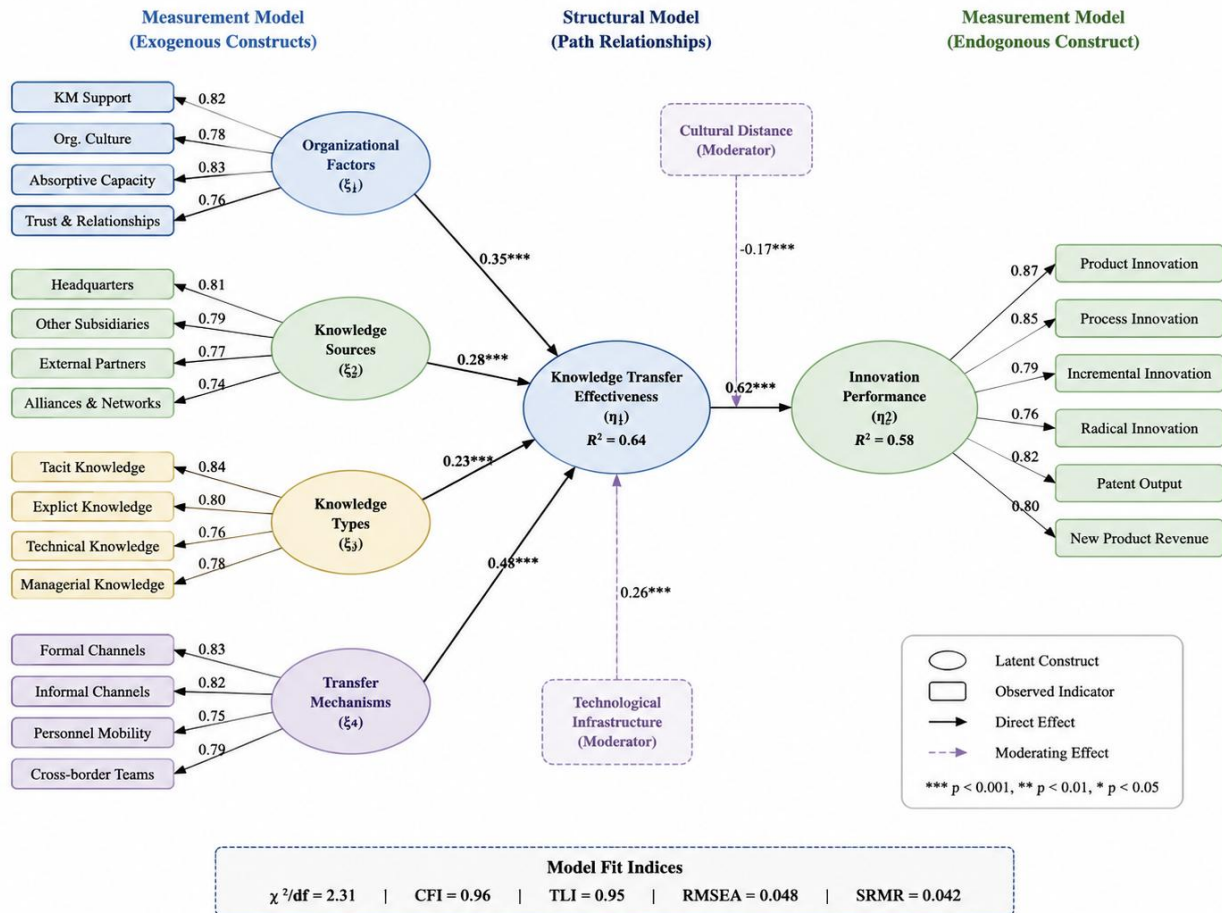


Figure 3: Structural Equation Model (SEM) of Knowledge Transfer and Innovation

Figure 3 displays the Structural Equation Model for the relations of knowledge transfer mechanisms, innovation performance, and moderators in MNCs. As seen in the SEM figure, latent factors of Organizational Factors, Knowledge Sources, Knowledge Types, and Transfer Mechanisms influence Knowledge Transfer Effectiveness, which influences Innovation Performance. The moderators, namely Cultural Distance and Technological Infrastructure, are displayed by the dotted lines and show how their effect on the primary relationship (path coefficient and its significance) operates and how they influence the relationship. Path coefficients along with levels of statistical significance are represented, and the model fit indices (CFI, TLI, RMSEA, and SRMR) are well within the acceptable range. This figure gives the graphical

representation of the theoretical framework being tested and provides the empirical evidence for testing cross-border knowledge transfer and innovation performance.

VI. DISCUSSION

The results of this study are in agreement with past studies emphasizing that knowledge transfer is very important for multinational corporations to improve innovation performance. The result indicates that cross-border knowledge transfer can have a positive effect on product innovation, process innovation, patent count, and time-to-market performance, which are consistent with the resource-based view and absorptive capacity theory. The results for the moderating role of cultural distance and technology infrastructure are also in agreement with past studies, where cultural and institutional differences can pose a threat to knowledge flows, and a sufficient digital infrastructure can increase the effective transfer of knowledge in multinational firms.

In management practice, these results lead to the conclusion that MNCs need to set up formal knowledge sharing systems and mechanisms. IT systems, standardized procedures, and a structured knowledge sharing process as a formal mechanism, as well as personnel movement, inter-subsidiary cooperation, and team building as informal mechanisms, will facilitate innovation performance. Managers should take into account the conditions and context of knowledge transfer, such as culture similarity, technological readiness level, and other variables in the local environment, in order to achieve effective knowledge transfer. Custom-tailored training programs and inter-subsidiary teams could effectively facilitate the capability of innovation.

In theoretical implications, the study adds value to the existing literature by combining several knowledge transfer antecedents and moderating variables within one Structural Equation Model and demonstrates empirical evidence of the mechanisms (direct and indirect) through which knowledge transfer impacts innovation performance, building on previous studies that mostly examined individual mechanisms or only within a specific country. Limitations in the study, however, involve dependence on survey-based data with possible self-reporting bias and lack of generalisability for industries other than those covered in the sample. Constraints to implementation at a practical level include varying regulations in each locality, resistance to changes, and varying technological capacity between subsidiaries. Regardless of the limitations in the study, the findings give useful and actionable insights to managers and deepen the comprehension of the contexts under which cross-border knowledge transfer can be best utilized for innovation performance in global organizations.

VII. CONCLUSION

This empirical study proves that cross-border knowledge transfer contributes positively to the innovation performance of MNEs. Using regression analysis, we found a significant positive effect of the knowledge transfer mechanism on innovation output ($\beta = 0.482$, $p < 0.001$). That means those MNEs effectively transfer knowledge among their subsidiaries, develop more products and process innovations, gain higher patent output, and have shorter time-to-market. The Structural Equation Model shows that the knowledge transfer mechanism contributes to innovation

performance, and its influence is moderated by cultural distance ($\beta = -0.174$, $p < 0.001$) and technological infrastructure ($\beta = 0.256$, $p < 0.001$). It is evidenced that there are certain impediments posed by cultural distance and institutions; however, an advanced technological system can reinforce the effectiveness of knowledge transfer. Based on our findings, MNCs should build proper formal knowledge transfer mechanisms (such as IT infrastructure, R&D networks, personnel exchange), take steps to remove negative influences of cultural distance (such as cultural training, team integration, and local responsiveness strategies), and governments should foster better digital infrastructure, intellectual property systems, and cross-border collaboration mechanisms to help firms in innovation. Future studies could extend our findings by using longitudinal data to verify the dynamic influence of the knowledge transfer mechanism on innovation performance, industry-level data to explain how industry structure affects the relationship, or interviews with subsidiary managers to gain a deeper understanding of this knowledge transfer process. This research provides insights to MNEs on managing cross-border knowledge transfer to achieve the maximum effect in innovation performance and gain a sustainable competitive advantage.

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