


## Article

# Toward Sustainable Global Product Development Performance: Exploring the Criticality of Organizational Factors and the Moderating Influence of Global Innovation Culture

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**Abstract:** In today's dynamic and global landscape, innovation and globalization are intricately linked drivers that propel modern businesses forward, serving as indispensable pillars upon which organizations heavily rely to maintain their competitive edge. Leveraging innovation within the context of global product development (GPD) practices is imperative for organizations seeking to survive and effectively compete in the rapidly evolving marketplace. While preceding studies have primarily focused on the importance of individual and organizational capabilities, policies, and cultural factors in driving product development (PD) performance, they often overlook their interconnectedness within a global context. To address this gap, this study delves into the relationship between organizational factors and global product development performance (GPDP) while examining the moderating influence of global innovation culture (GIC). These organizational factors encompass technological innovation capabilities (TICs), team creativity (TC), dynamic capabilities (DCA), and competitive advantage (CA). Our hypothesis suggests a positive impact of these factors on GPD performance. Employing a structural equation modeling (SEM) approach through SMART-PLS 3, we analyzed data collected from 480 questionnaire forms distributed among registered global product development (GPD) organizations operating in China. The empirical findings underscore the significant influence of organizational factors on GPD performance, highlighting the critical role of global innovation culture in shaping these relationships. These insights shed light on the importance of establishing a harmonious balance between organizational culture and various factors to enhance interaction among organizational elements and optimize global product development performance. Ultimately, these efforts can lead to improvements in the overall effectiveness and sustained global product development.

**Keywords:** global product development; technological innovation; dynamic capabilities; creativity; global innovation culture; innovation management; competitiveness; sustainable success



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## 1. Introduction

Global product development (GPD) has become an essential strategy for firms aiming to gain a competitive edge in the current interconnected marketplace, where the ability to generate and provide products tailored to the diverse demands of global consumers has become a crucial determinant of firms' success in international markets [1,2]. While previous studies focused on conventional product development (PD), recent attention has shifted towards GPD as an essential avenue for sustainable success [3,4]. Global product development is the systematic approach to creating, refining, and launching products that leverage insights from diverse markets, cultures, and regulatory environments, resulting in competitive advantages and sustained growth opportunities [3,5,6]. GPD entails complex product and process development across diverse geographical regions [7] and offers numerous benefits, including enhanced engineering efficiency, global access to technical

expertise, adapted product designs for diverse markets, and enhanced flexibility in product development resources [3,8].

On the other side, thriving in this evolving landscape requires GPD firms to navigate a multifaceted operational environment marked by intense global rivalry, fleeting time-to-market, shifting consumer preferences, and the imperative need to secure a competitive advantage in local pricing [9–11]. Scholars have examined the factors likely to influence successful GPD practices across organizational, technical, and operational dimensions, where the significance of specific elements has been underscored for sustainable success, such as organizational capabilities [12–15], organizational culture [12,16–18], sustainable innovation [17,19,20], and high performance [3,8,11,21].

However, a notable gap persists in the existing literature regarding a comprehensive understanding of the direct interplay among organizational elements, cultural dynamics, and performance in global product development practices. While prior studies have highlighted organizational culture's significant moderating role in shaping product development performance, including innovation, technology implementation, and organizational agility, integrating these factors within the global operational context remains largely unexplored [22–24].

Several key findings in the literature underline this problem. For instance, assumptions about firms' capabilities for global market operations without empirical testing highlight the need for further investigation into organizational factors and capabilities [25]. Scholars have also identified mismatches between organizational factors and product development processes, calling for research to mitigate misalignments [26]. The increasing complexity of global innovation processes underscores the importance of understanding how organizational factors interact across borders [27].

Additionally, suggestions for refining empirical research methodologies and exploring the impact of specific organizational characteristics, such as organizational culture and leadership influence on performance and goal achievement, emphasize the requirement for more empirical examination [28]. Likewise, recurring suggestions from Brentani and other scholars across various studies [29–32] underscore the imperative for a quantitative investigation to comprehensively analyze the nexus between organizational aspects, global innovation culture, and GPD performance. These findings collectively highlight the necessity for a quantitative study that comprehensively examines the relationship between organizational factors, organizational culture, and product development performance within global operations. Yet, empirical discussion on this specific linkage in the context of GPD remains limited.

This research gap necessitates exploration; hence, the current study seeks to bridge it by examining the complex interrelationships among these vital organizational aspects. Specifically, it explores technological innovation capabilities, team creativity, dynamic capabilities, competitive advantage, and their influence on global product development performance. Moreover, this study seeks to uncover the moderating role of global innovation culture and how cultivating it can significantly impact the linkages between these organizational elements and GPD performance.

This investigation is essential due to its significant contribution to determining the success and sustainability of organizations operating in a global dynamic landscape. Recognizing and understanding the complex interdependencies among various organizational aspects offers valuable insights for strategic decision making.

For this aim, this study focuses on the following two interconnected research inquiries:

1. "What pivotal roles do organizational factors related to innovation, technology, and competitiveness capabilities, along with their corresponding strategies, play in influencing the performance of multinational companies (MNCs), especially within the context of global product development practices"?
2. "How does the global innovation culture impact and moderate the correlation between organizational factors and global product development performance"?

To address these inquiries, this study outlines two primary research goals. Firstly, it examines the impact of technological innovation, team creativity, dynamic capabilities, and competitive advantage—recognized as key organizational factors—on GPD performance. Secondly, the study aims to closely examine the influence of global innovation culture as a moderator and its role in determining the relationships between organizational factors and GPD performance.

The structural equation modeling (SEM) process was applied to achieve the study's intended goals, utilizing partial least squares–structural equation modeling (PLS-SEM). PLS-SEM was chosen for its robust estimations in examining multifaceted relationships and statistical power in exploring direct and indirect effects and providing insights into complex interdependencies [33]. This methodology permits a deeper understanding of the intricate dynamics between organizational factors and GPD performance, empowering the exploration of GIC moderating influences, and thus, enhancing the comprehension of the interplay among the pivotal variables within the framework.

Consequently, this study contributes to the existing literature by providing a new cohesive framework that enhances the understanding of the interplay among diverse elements within organizational structures, capabilities, and strategies, including technological innovation competencies, team creativity, dynamic abilities, and competitive advantage, interrelated with GPD performance to guide success in global operations. Uncovering the nuanced moderating role of the global innovation culture contributes significantly to theoretical frameworks in innovation management, enriching the discourse on innovation culture and organizational performance in a GPD framework. The study's outcomes are anticipated to offer valuable insights for academia and practitioners navigating the complexities of the global business landscape.

The succeeding sections are organized as follows: Section 2 explores the literature review and hypothesis development, laying the foundation for the study; Section 3 details the research methodology, encompassing the study model, data collection, and variables measurement; the data analysis and results are presented in Section 4, which is discussed further in Section 5; Section 6 provides the study's conclusion, and lastly, Section 7 elaborates on the research implications and provides directions for future research.

## 2. Literature Review and Hypotheses

The evolution of global product development (GPD) companies, which involves relocating parts of their operations abroad and engaging in offshoring and outsourcing practices, presents many dynamic and complex scenarios [1]. This progress necessitates the continuous adaptation, innovation, and enhancement of strategies within the global landscape [3]. The literature highlights various internal and external aspects that impact the success of GPD practices. Certain studies concentrate on external factors, including governmental policies, localization considerations, and market dynamics [34,35]. Concurrently, other research focuses on internal and organizational factors within MNCs' firm level by exploring aspects such as the capabilities and strategies [17,20,29], where the presence of such organizational facets not only provides an avenue for experimentation and expansion but also facilitates the construction of innovative management approaches [15].

The pursuit of sustainable global product development performance encompasses a multifaceted endeavor, integrating efficient product creation, responsible resource management, and environmental impact mitigation [36]. According to prior research, achieving this goal necessitates strategically incorporating various dimensions such as technology, innovation, environmental considerations, and quality throughout the GPD processes and performance evaluation [3,36,37]. On the other hand, organizational aspects and resources such as technological and dynamic capabilities, creativity, and competitiveness are deemed pivotal for implementing sustainable solutions in various fields [4,38–41]. For instance, strengthening technological innovation capabilities enables companies to devise and execute innovative, sustainable solutions, enhancing adaptability and competitiveness in the global market [40,41]. Likewise, the effective utilization of organizational resources,

including human capital and capabilities, is indispensable for successful new product development and sustainable performance [29,42]. Moreover, fostering a global outlook and culture of innovation, incentivizing experimentation, cross-cultural collaboration, and risk-taking among employees is essential [19,30,43]. Organizational cultures emphasizing learning, openness, and sustainability catalyze innovation, furnishing a competitive edge for sustainable development [12,16,23].

Toward achieving sustainable GPD performance, this study examines the potential role of organizational factors in driving sustainable success in GPD practices. The study also aims to illuminate how organizational culture moderation can shape GPD performance. Further, the study broadens its focus beyond financial metrics to encompass natural resource consumption, environmental considerations, innovation, and quality for GPD performance evaluation toward offering sustainable solutions and valuable insights for navigating today's complex business landscape. Previous research and the identified gaps in the literature lay the foundation for subsequent hypotheses formulation.

### *2.1. Technological Innovation Capabilities (TICs) and GPD Performance*

The ability to innovate technologically is essential for gaining a competitive edge [13]. Technological innovation capabilities refer to a company's capacity to effectively utilize and leverage technology to create and implement innovative solutions, fostering adaptability and competitiveness [44], which involves adapting to unforeseen technological changes, generating novel products, and developing advanced technical processes to meet current and anticipated future requirements [20,40,44]. Technological innovation skills are multi-dimensional, and to fully represent TIC, large amounts of information about the company's organizational decisions, innovation management, and research and development abilities are required for successful technological innovation [45]. According to Ref. [44], TIC enables companies to generate innovations and restructure inter-organizational functions strategically in response to dynamic market forces. This distinctive asset of a firm empowers and facilitates technological innovation initiatives by providing essential support and streamlining its implementation processes.

TIC includes different capabilities, including product innovation capabilities encompassing interconnected phases for developing or enhancing new products. Process innovation capabilities are linked to the creation and enhancement of manufacturing technologies. These capabilities empower firms to strategically select and implement appropriate technologies to foster novel production systems, operations, and approaches [20,40]. Damanpour [46] suggests that both forms of TIC facilitate the efficient improvement of current products and industrial processes and the creation of novel goods and services.

Numerous prior studies have examined the capacity to innovate and its impact on company success [15,40,47]. These investigations show that TIC can improve product development performance via its strategic capabilities. Many academics, in particular, offer insight into the connection between TIC features and the success of companies' operations; for instance, the aptitude for acquiring external knowledge and advanced technologies in developing new products enables a company to distinguish its goods from the competition [48] and adjust its offerings to the marketplace [49]. As a result, consistent with their source-based perspective of innovation, product innovation skills may be critical for generating and maintaining a steadier competitive edge.

TIC is believed to favorably impact product development because of the inherent difficulties in evolving unique goods [50]. Meanwhile, process innovation alters how a company manufactures and distributes these goods [49]. Furthermore, on an international scale, improved technological innovation capabilities accelerate the product development lifecycle, reducing time-to-market for new products and providing companies with a competitive edge [51]. These enhanced capabilities have the potential to modernize processes, optimize resource allocation, and drive cost efficiencies, enabling companies to invest additional resources advantageously [52].

Additionally, organizations with superior innovation capabilities respond more adeptly to changing market trends and customer needs, leading to higher customer satisfaction and improved market adaptability [53]. Accordingly, technological innovation capabilities are critical for driving GPD performance by fostering product excellence, efficiency, adaptability, and long-term success in the global marketplace. The suggested hypothesis is as follows:

**H1.** *Technological innovation capabilities have a positive impact on global product development performance.*

### 2.2. Team Creativity (TC) and GPD Performance

The concept of team creativity, defined as the capability of a team to generate novel and valuable ideas, processes, products, or services, involves the development of creative outcomes relevant to the team's operating context [54]. Team creativity emerges as a pivotal driver of innovation [55] and has a vital role in achieving a competitive edge where creative thinking is imperative for crafting products that stand out in terms of competitiveness [56,57].

Previous research has looked at the critical role that team creativity plays in new product performance. Ref. [58] demonstrates that teams are a substantial source of fresh initiatives and business ideas, harnessing the collective power of collaboration to generate increased energy, uncover additional opportunities, and creatively address risk-related challenges. Conversely, other research indicates that cooperation may not always be beneficial and inhibit team creativity, where many factors such as social loafing, assessment anxiety, and the lack of required knowledge may restrain teams from invention [56,59]. High motivation levels and adequate information exchange are needed to develop creativity successfully [54,60].

Many academics have pointed out that to achieve success, companies must be creative [13,39]. The empirical evidence indicates a favorable association between creativity and new product performance [61]. In a global setting, team creativity necessitates additional effort to collaborate and communicate effectively among culturally diverse and globally distributed teams [55,59].

Gibson and Cohen (2003) investigated virtual teams' efficiency, consisting of groups of individuals working across geographic locations and often communicating primarily through digital tools. They examined the interplay of virtual teams' creativity and its implications for organizational performance. Their findings hold significance for companies engaged in distributed development projects to launch products, as they assert that promoting team creativity and embracing cultural diversity can enhance the performance of such companies [57]. By understanding and leveraging the creative potential within virtual teams, MNCs may navigate the challenges of global collaboration more effectively, ultimately leading to improved outcomes for GPD firms [62].

Overall, the literature suggests that team creativity is an essential factor that influences organizational performance. Specifically, team creativity can increase knowledge sharing and task coordination, leading to better GPD performance. Built on the above discussion, the presented below hypothesis is proposed:

**H2.** *Team creativity has a positive impact on global product development performance.*

### 2.3. Dynamic Capabilities (DCA) and GPD Performance

Dynamic capabilities have become essential to evolutionary economics, organizational strategy, and international business [4,63]. They refer to an organization's capacity to manage, construct, and adjust internal and external resources to meet quickly evolving environments [64]. This concept categorizes two types of capabilities, namely the identification and exploitation of opportunities. On the one hand, opportunity identification is an ongoing and iterative process that involves staying attuned to market trends, customer

needs, technological advancements, and other external factors that could potentially shape new and valuable opportunities for the organization [65,66]. Moreover, developing broad information networks between a company and the market could assist in exploring further business possibilities [65]. Once a new opportunity has been identified, successful exploitation necessitates integrating the newly acquired information with existing knowledge stocks, processes, products, or strategies. This integration phase is critical to dynamic capabilities, ensuring an organization can effectively leverage its internal resources to capitalize on the identified opportunity [65,66]. DCA plays a vital role in helping organizations respond to changes in the business environment. Ref. [67] argued that dynamic capabilities enable firms to adjust and invent in response to market shifts, technological advancements, and customer preferences.

Unlike domestic firms, which cultivate dynamic capabilities within a singular organizational system, multinational corporations inherently function as multi-level systems with centers and subsidiaries [68]. In Ref. [68], the authors underscore the contribution of dynamic capabilities in MNCs in adapting to changing environments, highlighting their managerial significance in ensuring organizational transformation and sustainability. Apart from promptly responding to changes and developments, DCA has substantial abilities to succeed in the global market [40].

Given that acclimating and innovating are crucial for organizations to maintain competitiveness and foster sustainable growth, researchers argue in Ref. [69] that dynamic capabilities facilitate overall performance enhancement for firms. Moreover, the agility to integrate information into product creation is positively associated with company success and long-term performance improvement [9]. This enables managers to leverage dynamic capabilities in transforming existing resources into new value-creating strategies, contributing to generating and developing competitive products to build and sustain competitive advantage [24].

Building upon this review, the present paper formulates the following hypothesis:

**H3.** *Dynamic capabilities have a positive impact on global product development performance.*

#### *2.4. Competitive Advantage (CA) and GPD Performance*

The escalating global competition in the marketplace strongly prompts decision-makers to internationalize specific aspects of product development abroad, even amidst highly challenging settings and inherent risks [5]. Competitive advantage denotes the firm's capability to outperform its competitors [48]. Earlier studies have brought together competitive advantage and product development performance to investigate the connection between these two dimensions. For instance, Barney [70] argued that CA enables companies to obtain a higher market edge over their rivals by providing superior products or services, reducing costs, or improving operational efficiency, which, in turn, leads to increased revenue and profits, which ultimately drives the firm growth. Research performed by Prakash [71] in the manufacturing industry context offers a comprehensive exploration of the positive link between service quality, competitive advantage, and overall organizational performance and effectiveness.

Furthermore, geographical location has been evaluated as a source of competitiveness in multinational enterprises (MNEs), providing valuable insights into the competitive advantage derived from their foreign operations and their influence on organizational performance [72]. Nguyen's study (2017) examined the correlation between multinationality and performance and highlighted the significance of firms' international networks as a source of competitive gain for multinational corporations (MNCs) and its implications on organizational performance [73]. As argued by Ref. [74], firms actively involved in external sources of innovation are strategically positioned to deliver distinctive new products that are challenging to substitute, thereby establishing a competitive edge. An investigation of the correlation between internationalization and firm performance revealed that compa-

nies demonstrating strong international competitiveness experience heightened financial performance [61].

Drawing from the literature reviewed, it is apparent that a robust relationship exists between competitive advantage and GPD performance, as competitive advantage significantly influences the success of product development at a global level. Accordingly, the following hypothesis is formulated:

**H4.** *Competitive advantage has a positive impact on global product development performance.*

#### 2.5. Global Innovation Culture (GIC) and GPD Performance

Innovation culture serves as a cornerstone for fostering sustainable economic growth and prosperity, a crucial driver of competitiveness [16,18], and a leading strength for enhancing productivity, driving growth in sales volume, and solidifying a company's international competitive standing [3,45]. The innovation cultural guidelines that concentrate on domestic markets differ from those applied to the global innovation culture, which frequently involves a dedication to fostering collaboration among engineering teams distributed across diverse cultures and borders to facilitate the exchange of best practices and the integration of diverse perspectives and approaches to innovation [30].

Global innovation culture refers to the common values, attitudes, and practices that promote innovation on a worldwide scale within an organization, which encompasses the mindset, behaviors, and processes that encourage creativity, collaboration, and the development of novel ideas, products, or solutions across different geographical locations and diverse cultural contexts [31]. The firm's global innovation culture within the GPD practice encompasses two interconnected dimensions: entrepreneurialism and globalization [31]. Entrepreneurialism embodies a corporate attitude that embraces novelty, change, risk, and failure [32]. This culture instills the belief in the pivotal role of developing new products for the organization's endurance and success [24], fostering active involvement in new product development, out-of-the-box thinking, flexibility, and risk taking [29]. Such an entrepreneurial culture often propels a strategic orientation towards effective GPD performance, supporting high-risk investments involving revolutionary products and extensive market elaboration [19]. On the other hand, the globalization culture opens firms to global market opportunities, customer requirements, and the utilization of internationally dispersed skills, resources, and ideas [12], which are crucial in advancing global product innovation through collaborative initiatives across diverse cultural backgrounds. Additionally, it addresses the influence of cultural diversity and cross-cultural collaboration on knowledge sharing within MNCs [6].

Previous empirical research suggested that a robust global innovation culture prioritizes optimal strategic objectives and is more likely to enhance efficiency, effectiveness, and overall success. [62,63]. It is also positively associated with superior GPD performance [15,30]. Companies actively engaged in global product development typically embrace fierce strategies for expanding into international markets and apply innovative approaches that capitalize on globally distributed skills and ideas; this enables the creation of global products tailored to meet diverse customer needs worldwide [2,6].

A recent study examining the association between innovation culture and the success of new product launches investigated how innovation culture drives the performance of these launches [19]. It provided valuable guidance for organizations aiming to strengthen their innovation culture and improve outcomes in new product development. These findings underline the importance of fostering a global innovation culture that establishes an inclusive environment grounded in practicality for nurturing shared values such as cultural empathy, creativity, and collaboration, ultimately enhancing GPD performance effectively. In conclusion, the study posits the following hypothesis:

**H5.** *Global innovation culture has a positive impact on global product development performance.*

### 2.6. Moderating the Effects of Global Innovation Culture

Numerous research has extensively explored the impact of innovation culture as a moderating factor, examining its potential to significantly enhance overall performance and drive innovation forward [17,22,24,38]. Different organizational cultures have distinct levels of acceptance and resistance to change; however, those open to adaptation and experimentation are more likely to keep up technological advancements effectively, thereby enhancing firm performance [75]. Several investigations have emphasized the pivotal contribution of organizational culture to improving firms' capabilities, highlighting its profound impact on a firm's capacity to originate and adapt to technological advancements [12,18,22]. Schein [76] examined how employees interpret and respond to technological advancements and underscored that an innovation culture valuing novelty, openness to change, and learning is more likely to motivate employees to adopt and utilize new technologies effectively, which may positively influence GPD activities.

Global innovation culture can contribute to elevating the efficiency of globally dispersed teams engaged in product development by fostering collaboration within multinational organizations through cultivating diversity, cross-cultural understanding, and open communication. Empowering employees to generate new ideas, challenge norms, and explore innovative solutions creates an environment conducive to continuous performance improvement and adaptation. This, in turn, reduces the cultural gap between physically and culturally spread employees [38]. Ref. [43]'s findings underscore the importance of fostering team creativity through an innovative and supportive organizational culture, where an organizational culture that encourages creativity and values diverse concepts empowers employees to generate new ideas without fear of reprisal and fosters an environment conducive to creativity and innovation, which can positively influence multidisciplinary teams' performance and enhance innovative outputs. Besides that, cultivating a robust global innovation culture alongside developing dynamic capabilities can significantly contribute to GPD's success by fostering creativity, collaboration, and agility within multinational organizations [6]. Ref. [70] suggested that sustained competitive advantage contributes to a firm's performance, whereas a global innovation culture that fosters continuous innovation and improvement can contribute to creating and sustaining competitive advantage, positively impacting GPD performance.

Building on the literature and preceding research on organizational culture, innovation, and firm performance, we suggest the following hypotheses:

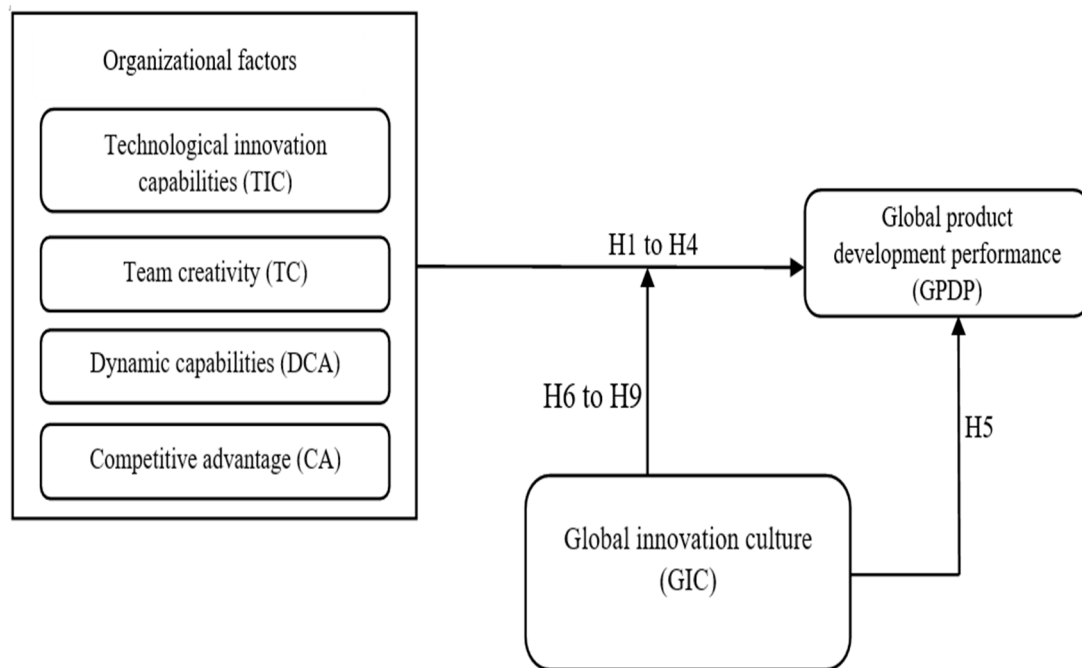
- H6.** *GIC positively moderates the relationship between TIC and GPDP;*
- H7.** *GIC positively moderates the relationship between TC and GPDP;*
- H8.** *GIC positively moderates the relationship between DCA and GPDP;*
- H9.** *GIC positively moderates the relationship between CA and GPDP.*

## 3. Method

### 3.1. Framework Development

Drawing from the extensive literature review in Section 2, this study introduces a comprehensive theoretical framework to illustrate the interrelationships among the variables outlined in nine research hypotheses, as depicted in Figure 1. The framework integrates four predictive organizational factors: technological innovation capabilities, team creativity, dynamic capabilities, and competitive advantage. Additionally, global product development performance serves as the dependent variable. The global innovation culture variable assumes the moderator role in this comprehensive model, contributing to its analytical framework.





**Figure 1.** Conceptual Framework.

### 3.2. Data Collection

This empirical research collected specific data from diverse sources to mitigate and resolve concerns regarding potential common-method and non-response biases across the investigated constructs [77]. This study's questionnaire was adapted from Ref. [13], maintaining a five-point Likert scale as the benchmark for assessing variables within the framework. Adjustments were implemented to ensure its international applicability and alignment with the formative nature of latent constructs. Following this, the moderator variable "global innovation culture (GIC)" was incorporated, sourced from earlier studies [29–31].

A diverse panel of experts piloted the survey to assess the clarity and comprehensibility of all measuring scales in preparation for the full-scale survey deployment. It included six academics in the field, nine managers in global business practices who were experienced in handling organizational culture and dispersed team dynamics, and three R&D experts focused on technology and innovation management. Participants were prompted to share observations on encountered ambiguities or challenges, and their valuable recommendations proved instrumental in refining the survey to ensure the clarity and understanding of all measuring scales.

MNCs have a towering presence in China, a prime destination for overseas product development initiatives, due to its attractive features such as cost-effectiveness, government incentives, a resilient supply chain and infrastructure, high manufacturing capabilities, and strategic access to domestic and international markets [6,78]. The synergy of these factors makes China appealing for economic development, foreign investments, and streamlined sourcing and manufacturing processes [79]. Data were collected from multinational companies, firms engaged in offshore product development, and international subsidiaries in China. This study specifically engaged managers with knowledge and expertise in navigating complex global, organizational, cultural, and operational dynamics. All organizational echelons, including top, middle, and lower managers, were targeted to ensure a diverse and comprehensive perspective across the various tiers. The questionnaire was disseminated through widely used communication channels such as Email, QQ, and WeChat, ensuring efficient outreach to respondents and convenient access. Respondents were instructed to provide feedback using a structured five-point Likert scale, with ratings ranging from 1, "strongly disagree", to 5, indicating "strongly agree". The choice of the five-point Likert

scale predominantly in research is due to its perceived accuracy, as scales with fewer than five or more than seven points are deemed less precise [80]. From the initially distributed 850 forms, a total of 500 forms were collected. Following the preliminary screening, 480 of these forms were considered suitable for further analysis, while the remaining 20 forms were excluded due to incomplete information.

### 3.3. Variables

This quantitative study addresses three primary variables and integrates their measures from validated scales in the existing literature.

The independent variable consists of measurements related to organizational factors, explicitly focusing on technological innovation capabilities, team creativity, dynamic capabilities, and competitive advantage.

Technological innovation capabilities (TICs) measurement involves the qualifications in production and supply, implementation of enhanced technology, innovations in the manufacturing procedure and domestic management system, technological ability, and the use of environmentally friendly and cost-reduction tools [13,20].

Team creativity (TC) assessment includes generating novel ideas from multiple sources, applying innovative techniques in daily activities, creatively addressing challenges, contributing to company performance, and serving as a positive role model for other departments [39,56,81].

Dynamic capabilities (DCA) valuation incorporates the capability to mobilize, allocate, and restructure organizational resources in response to various situations, the ability to learn and develop new knowledge and expertise, the capability to modernize and implement efficient organizational practices, and the capability to accommodate quick changes in the business climate [69,82].

Competitive advantage (CA) measurement encloses the originality of developed products, the superior characteristics of products and services over competitors, cost efficiency, and the adoption of a robust business plan [13,83].

The moderator variable, global innovation culture (GIC), is centered on developing an innovative and open corporate culture. The measurement includes acknowledging and rewarding entrepreneurial initiatives, actively promoting employees worldwide for generating and submitting new ideas, encouraging risk taking, prioritizing knowledge sharing, coordinating, and having a high degree of interdependence among geographically dispersed subunits [30,31].

The dependent variable, global product development performance (GPDP), was evaluated from multiple aspects that comprehensively examine the firm's strengths in cost management, international market growth, timely project execution, product quality improvement, and innovation contribution [3,8,10,34]. The assessment also encompasses environmental considerations in reducing carbon footprint, conscious energy consumption management, and adherence to environmental regulations during global product development [3,36,84,85].

## 4. Data Analysis and Results

SmartPLS software was used in this study to analyze the data, utilizing PLS algorithms with bootstrapping on 5000 substitute samples [80]. SmartPLS is a leading software due to its specialization in partial least squares–structural equation modeling (PLS-SEM) applications. The software has garnered widespread recognition for its efficiency in handling complex statistical analyses, making it a preferred choice for researchers and academics worldwide [86].

The data analysis process comprised two distinct stages. Initially, the assessment focused on verifying the model's reliability and validity. Subsequently, examining the research hypotheses involved an analysis of the structural model [33]. Confirmatory factor analysis and other tests were used to ensure the validity and reliability of the data.

Table 1 offers an in-depth breakdown of the sample's demographic composition. Senior managers, constituting 22% of the sample, encompass positions such as presidents, vice presidents, and similar roles. Middle management accounts for 51% of the sample, while lower-level managers account for 27%. Regarding gender distribution, 64% of respondents are male, and 36% are female. Moreover, educational attainment among respondents reveals that 84% hold bachelor's or master's degrees, 5% have educational levels below a bachelor's, and 19% possess education beyond a master's degree. Furthermore, approximately 15% of individuals possess over ten years of experience working for GPD companies. Meanwhile, 41% fall within the 6 to 10 years of experience range, 35% have 2 to 5 years in the field, and 9% possess experience of no more than two years. Further details regarding company size, industry sectors, and international experiences are depicted in Table 1.

**Table 1.** Demographic Analysis.

Demographics	Description	Frequency	%
Gender	Male	307	64%
	Female	173	36%
Education level	High school	23	5%
	Bachelor	170	35%
	Master	233	49%
	PhD	19	4%
	other	35	7%
Discipline	Natural Sciences	95	20%
	Social Sciences	139	29%
	Management Sciences	135	28%
	Physical Sciences	74	15%
	Other	37	8%
Position	Upper-Management	106	22%
	Middle-Management	242	51%
	Lower-Management	132	27%
Experience years	Less than 2	41	9%
	2–5	169	35%
	6–10	196	41%
	More than 10	74	15%
Size of the company (Number of employees)	Small (<50)	183	38%
	Medium (50–250)	211	44%
	Large (>250)	86	18%
Industry sector	Manufacturing and Production	174	36%
	Healthcare and Pharmaceuticals	35	7%
	Telecommunication services	74	16%
	Energy Industry	122	25%
	Information Technology	75	16%
International Experience (Number of Countries Worked In)	Local Experience	38	8%
	1–3	214	45%
	4–6	151	31%
	more than 6	77	16%

Table 2 displays the reliability and validity metrics for each construct in this study, including Cronbach's- $\alpha$ , rho\_A, composite reliability (CR), average variance extracted (AVE), and factor loadings (FLs). All values for these metrics exceed the standard benchmarks, indicating robust reliability and validity across the constructs examined.

**Table 2.** Constructs' Reliability and Validity.

Index	Variables	FL
Technological Innovation Capabilities (TICs) (Cronbach's- $\alpha$ = 0.869, rho_A = 0.874, CR = 0.874, AVE = 0.645)		
TIC1	The firm capability to develop high-quality products/services across different geographical subunits	0.832
TIC2	The firm capability to develop products/services globally by adopting new technologies.	0.929
TIC3	The firm capability to effectively manage time to respond to urgent local and foreign demands	0.900
TIC4	The firm's capability to attain external knowledge and advanced technologies.	0.818
TIC5	The firm has the innovative capability to improve global PD and control overseas management systems.	0.861
TIC6	The firm's technological capability warrants the effective development of offshored products/services.	0.735
TIC7	The firm uses technologies and strategies that are ecologically friendly and cost-cutting.	0.856
Team Creativity (TC) (Cronbach's- $\alpha$ = 0.868, rho_A = 0.872, CR = 0.867, AVE = 0.617)		
TC1	The teams generate new product ideas that originate from multiple sources worldwide.	0.841
TC2	The teams frequently incorporate new approaches and innovative concepts to enhance GPD tasks.	0.922
TC3	The distributed teams creatively tackle risks and uncertainties associated with overseas operations.	0.766
TC4	The creativity of globally spread teams affirmatively affects the firm overall performance.	0.903
TC5	The dispersed teams are praised as an excellent global role example for creativity.	0.852
Dynamic Capabilities (DCA) (Cronbach's- $\alpha$ = 0.870, rho_A = 0.885, CR = 0.869, AVE = 0.731)		
DCA1	The firm's ability to efficiently distribute product development activities.	0.750
DCA2	The firm capability to manage organizational assets to handle various conditions.	0.927
DCA3	The firm and its subsidiaries quickly acquire new expertise and skills to meet organizational needs.	0.844
DCA4	The firm actively implements efficient strategies within the GPD process to enhance performance.	0.724
DCA5	The firm capability to adapt to the quick shift in international business.	0.815
Competitive Advantage (CA) (Cronbach's- $\alpha$ = 0.895, rho_A = 0.878, CR = 0.902, AVE = 0.594)		
CA1	The firm delivers and exports distinctive products/services that are hard to substitute due to GPD.	0.771
CA2	The firm's products are more promising than those of its rivals due to global PD practice.	0.856
CA3	The firm can offer products at a more competitive price in the global market comparable to its rivals.	0.780
CA4	The firm's strategies outstrip that of its rivals through GPD practice.	0.879
Global Innovation Culture (GIC) (Cronbach's- $\alpha$ = 0.938, rho_A = 0.902, CR = 0.941, AVE = 0.657)		
	(1) The firm established an innovative and open corporate culture for our GPD program through:	
GIC1	The firm acknowledges and generously rewards entrepreneurship.	0.925
GIC2	The firm actively encourages worldwide global teams to propose innovative product concepts.	0.853
	(2) In order to establish a "truly global" innovation culture, our firm:	
GIC3	The firm highly promotes the recruitment of workforces from diverse nations and cultural backgrounds.	0.883
GIC4	The firm greatly stimulates knowledge exchange among all units dispersed abroad.	0.740
GIC5	The firm emphasizes responsiveness to differences in local markets.	0.819
GIC6	The firm reaches advanced interconnectedness levels across its global affiliates.	0.927
GIC7	The firm highly supports informal coordination among GPD teams and dispersed units.	0.729
Global Product Development Performance (GPDP) (Cronbach's- $\alpha$ = 0.857, rho_A = 0.843, CR = 0.860, AVE = 0.725)		
GPDP1	The firm effectively manages the costs associated with distributed product development	0.839
GPDP2	The firm optimizes labor costs due to global product development practices.	0.758
GPDP3	The firm derives significant growth in new product sales in overseas markets.	0.856
GPDP4	The firm's product development initiatives generate a satisfactory return on investment	0.929
GPDP5	The firm consistently meets project timelines and delivers products on schedule.	0.901
GPDP6	The firm improved the quality of its products generated through GPD processes.	0.847
GPDP7	The firm's GPD practice contributes to high levels of customer satisfaction.	0.859
GPDP8	The firm delivers a notable percentage of innovative ideas and new products.	0.903
GPDP9	The firm's global product development portfolio aligns effectively with its strategic goals.	0.741
GPDP10	The firm can efficiently bring products from the development stage to the market.	0.833
GPDP11	The firm demonstrates agility in developing new products in response to market demands.	0.919
GPDP12	The firm completes global product development projects within the intentional timeframe.	0.774
GPDP13	The firm actively assesses and reduces the carbon footprint of its product development activities.	0.842
GPDP14	The firm is conscious of managing energy consumption during the GPD processes.	0.878
GPDP15	The firm ensures compliance with local and overseas environmental regulations.	0.925

For instance, the composite reliability of all constructs ranged from 0.860 to 0.941, demonstrating strong internal consistency. Furthermore, each Cronbach's- $\alpha$  value exceeded 0.7, indicating high reliability across the constructs examined. Additionally, the average variance extracted (AVE) values ranged from 0.594 to 0.731, surpassing the recommended threshold of 0.500, further confirming the convergent validity of the investigated constructs [80].

Following this, confirmatory factor analysis was conducted, encompassing various metrics such as the root mean square error of approximation (RMSEA) [80], standardized root-mean-square residual (SRMR) [87], normed fit indexed (NFI), as well as other parameters like squared Euclidean distance (d\_ULS) and geodesic distance (d\_G). The results fell within the expected range, suggesting minimal common method variance (CMV) among the collected data. Subsequently, the structural model was evaluated for path analysis and overall model fit, with the demonstration data showing a satisfactory fit. The key fit indicators included Chi-square = 16,036.118, SRMR = 0.023, NFI = 0.722, d\_ULS = 0.562, d\_G = 11.818, and RMS theta = 0.153. The constructs and specific pathways explained a significant portion of the variance in the proposed endogenous constructs.

Table 3 illustrates the conventional metrics for assessing discriminant validity, as established by Fornell and Larcker [88]. This evaluation includes comparing the average variance extracted (AVE) to the squared inter-construct correlation for each construct in the model. The assessment of discriminant validity, based on the criteria outlined by Fornell and Larcker [88], suggests that the square root of AVE should exceed the correlations between constructs in both rows and columns. This approach ensures variables' differentiation from others for discriminant validity [89].

**Table 3.** Discriminant Validity (Fornell and Larcker Criteria).

	TIC	TC	DCA	CA	GIC	GPDP
TIC	0.928					
TC	0.825	0.897				
DCA	0.914	0.823	0.936			
CA	0.778	0.751	0.780	0.872		
GIC	0.787	0.865	0.805	0.786	0.918	
GPDP	0.819	0.742	0.731	0.807	0.826	0.832

Table 4 displays the Beta coefficients, Standard Deviations (SDs), T Statistics, and  $p$  values. These outcomes strongly indicate the significant positive influence of all hypotheses from H1 to H5. As per the results, the impact of "Technological Innovation Capabilities (TIC)" on "Global Product Development Performance (GPDP)" stands at ( $\beta = 0.306$ ,  $p = 0.000$ ), while "Team Creativity (TC)" on "GPDP" registers ( $\beta = 0.313$ ,  $p = 0.014$ ). Furthermore, "Dynamic Capabilities (DCA)" on "GPDP" are noted as ( $\beta = 0.128$ ,  $p = 0.000$ ), "Competitive Advantage (CA)" on "GPDP" stands at ( $\beta = 0.012$ ,  $p = 0.009$ ), and "Global Innovation Culture (GIC)" on "GPDP" presents ( $\beta = 0.245$ ,  $p = 0.000$ ). The adjusted R2 value of 0.79 indicates the model's predictiveness, suggesting it can describe 79 percent of the variance within the analyzed dataset.

**Table 4.** Direct relationship hypothesis testing.

		Std Beta ( $\beta$ )	SD	T-Statistics	$p$ -Values	Decision
H1	TIC -> GPDP	0.306	0.024	2.956	0.000	Supported
H2	TC -> GPDP	0.313	0.021	5.018	0.014	Supported
H3	DCA -> GPDP	0.128	0.019	6.766	0.000	Supported
H4	CA -> GPDP	0.012	0.003	4.544	0.009	Supported
H5	GIC -> GPDP	0.245	0.032	7.612	0.000	Supported

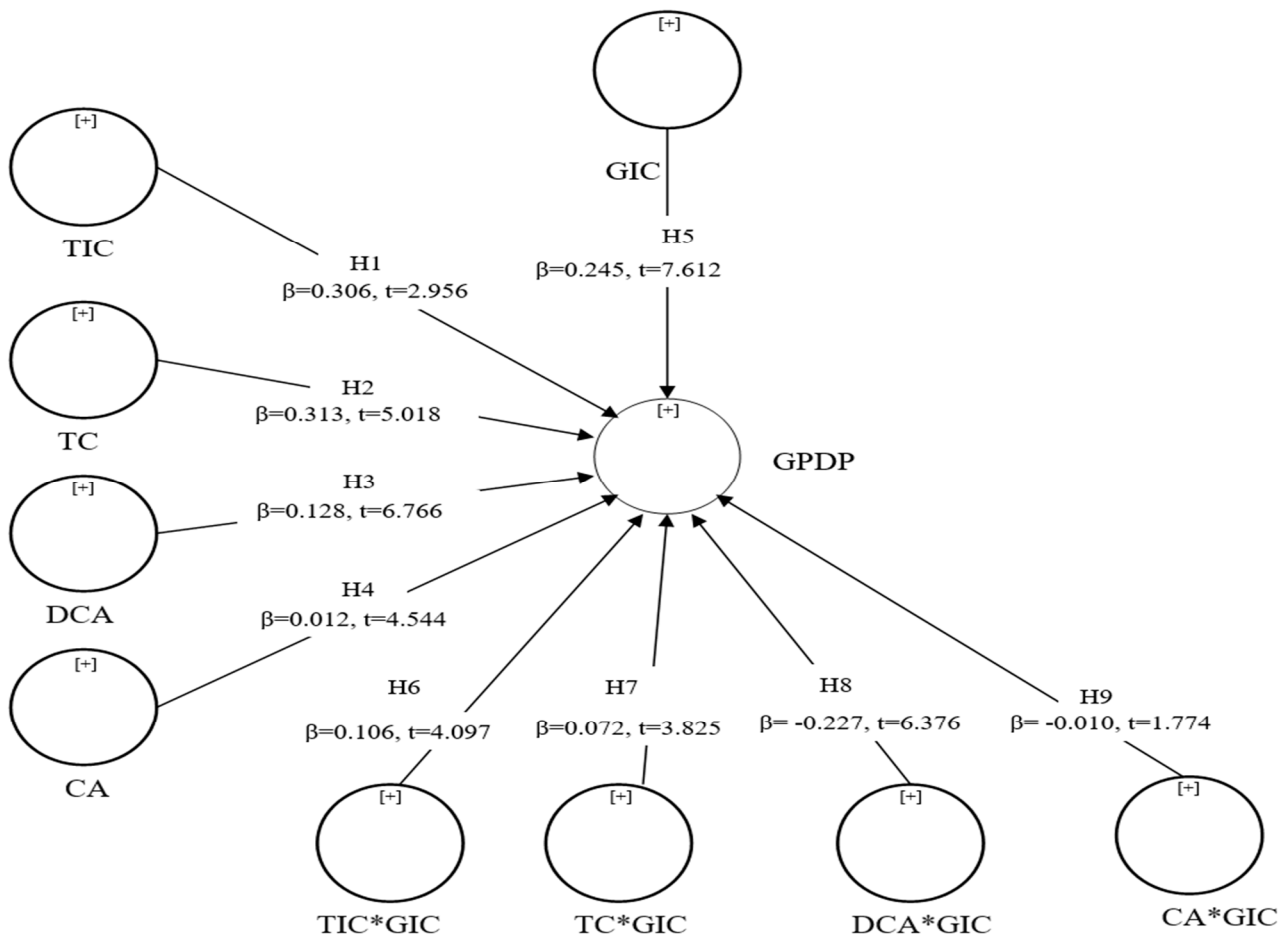
This research carried out a moderating analysis to evaluate the role of global innovation culture (GIC) in influencing the associations between organizational factors and GDP performance. Table 5 shows the moderating analysis values, illustrating the impact of GIC among predictor and predicted variables, as outlined in hypotheses H6 to H9.

**Table 5.** Moderation relationships hypothesis testing.

Hypotheses	Std Beta ( $\beta$ )	SD	T-Statistics	p-Values	Decision
H6 TICxGIC -> GPDP	0.106	0.026	4.097	0.028	Supported
H7 TCxGIC -> GPDP	0.072	0.019	3.825	0.001	Supported
H8 DCAxGIC -> GPDP	-0.227	0.036	6.376	0.000	Supported
H9 CAxGIC -> GPDP	-0.010	0.006	1.774	0.076	Not supported

The findings for H6 ( $\beta = 0.106, p = 0.028$ ) reveal a positive moderating effect of GIC between TIC and GPDP. Similarly, the results for H7 ( $\beta = 0.072, p = 0.001$ ) indicate a positive moderating influence of GIC between TC and GPDP. Conversely, the outcomes for H8 ( $\beta = -0.227, p = 0.000$ ) suggest a negative moderating impact of GIC between DCA and GPDP. Furthermore, the results for H9 ( $\beta = -0.010, p = 0.076$ ) pertaining to CA and GPDP exhibit an insignificant relationship.

Figure 2 illustrates hypothesis testing, bootstrapping, and moderation results across all hypotheses from H1 to H9, encompassing direct and moderating relationships.



**Figure 2.** Hypothesis testing, bootstrapping, moderating effect results.

Figures 3–5 illustrate the slopes denoting the significant moderating interactions within the model. The results exhibited in Figures 3 and 4 suggest a positive moderation effect; as “global innovation culture” increases, there is a corresponding increase in the influence of “technological innovation capabilities” and “team creativity” on “global product development performance”. Conversely, in Figure 5, the observed negative moderation effect implies that as “global innovation culture” increases, there is a decreasing impact of “dynamic capability” on “global product development performance”.

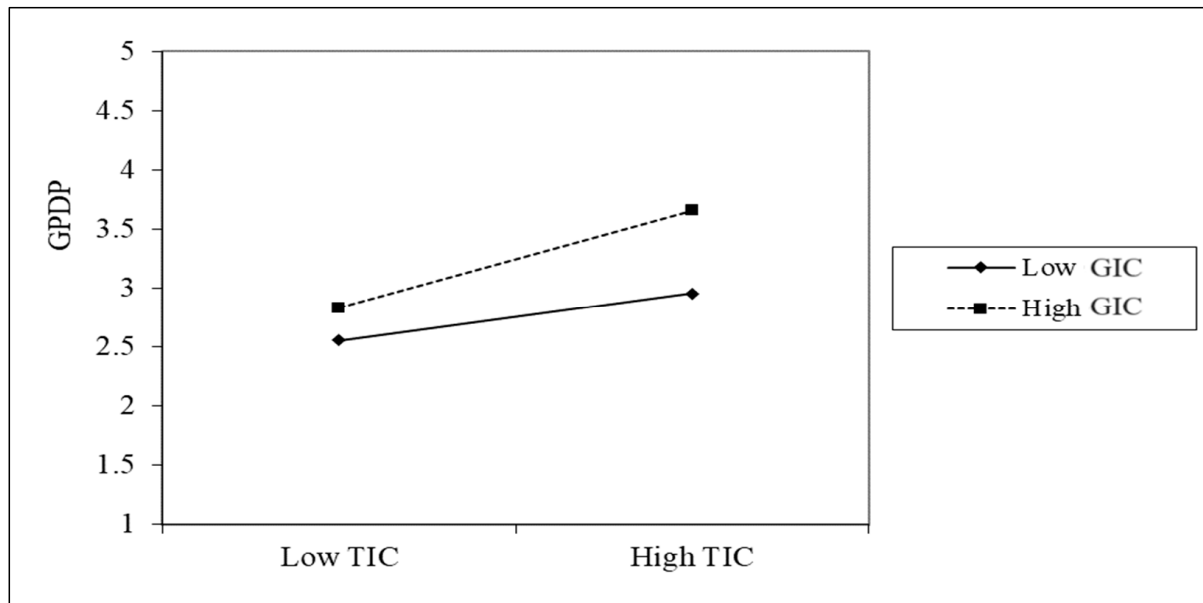


Figure 3. GIC as a moderator in the link between TIC and GPDP.

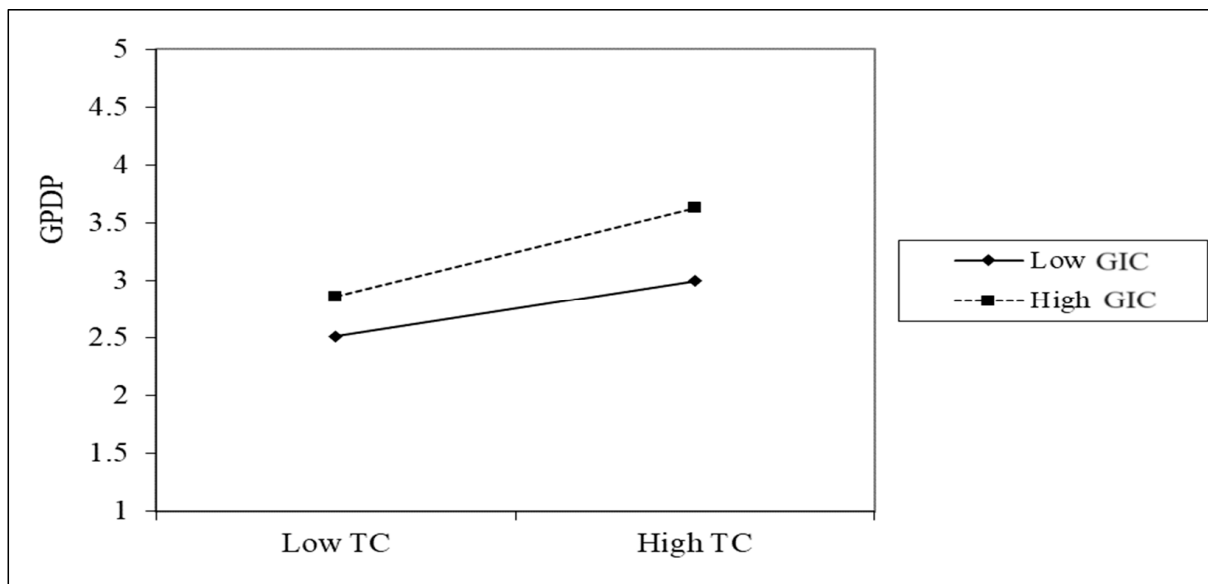
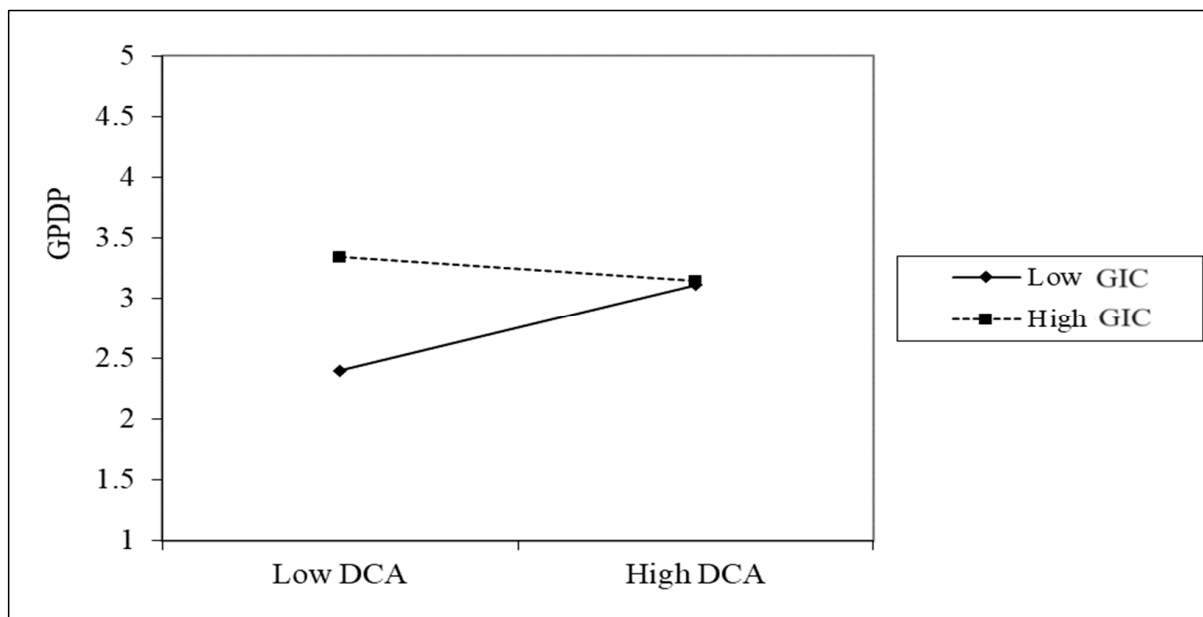


Figure 4. GIC as a moderator in the link between TC and GPDP.



**Figure 5.** GIC as a moderator in the link between DCA and GPDP.

## 5. Discussion

This study advanced a sophisticated model to investigate the intricate interplay among organizational factors, innovation culture, and product development performance on a global scale. In this regard, the study also examined how global innovation culture moderates the relationships between TIC, TC, DCA, CA, and GPD performance. Drawing on feedback from managers at multinational and GPD companies, we employed SEM-PLS analyses to evaluate the hypotheses.

Firstly, the analysis of direct relationship findings reveals significant positive impacts across all hypotheses, spanning from H1 to H5. Accordingly, hypothesis H1 exhibited a substantial positive effect of technological innovation capabilities on global product development performance, indicating that TIC improvements significantly contribute to enhanced GPDP. This finding aligns with Azubuike's study [20], which underlined the implication of technological innovation capability in driving firm performance and influencing new product development outcomes, highlighting that TIC is a critical determinant of a firm's performance in new product development. Likewise, according to Ref. [90], technological innovation advancements enable companies to produce higher-quality products with innovative features that meet market demands. Ultimately, these capabilities help companies develop globally competitive products that cater to diverse customer segments, facilitating global market penetration [47]. The findings imply that investing in and improving technological innovation capabilities can be a strategic approach for firms aiming to enhance their performance. The implications of these results in the field of study are significant. Accordingly, companies are advised to utilize developing digital technologies and strengthen their digital capabilities to become leaders in innovation and improve their overall performance [91]. Furthermore, numerous studies have emphasized the significant impact of TIC on the performance of firms. This highlights the importance of investing in innovation practices and new technology acquisition to drive the development of the GPD process and operations [3]. Moreover, the mediating function of firm innovation capability between shared leadership, market-oriented culture, and firm performance highlights the significance of fostering innovation capabilities within companies to improve overall performance [47].

The findings of the second hypothesis, H2, confirm the valuable influence of team creativity on GPD performance. These align with previous research that disclosed the positive impact of fostering a creative team environment in driving success in product



development [13,17]. Furthermore, this finding is in line with research on team creativity in multinational companies, which emphasizes how nurturing creative teamwork enhances product development processes across diverse global markets and leads to improved performance outcomes by providing evidence of the positive impact of team creativity on firm performance [55]. Similarly, a study on team intuition and imagination in new product development projects emphasized the critical role of creativity in driving performance and highlighted its favorable impact on outcomes [92]. These findings could have a substantial effect on the field. Initially, organizations are directed towards nurturing creativity within their teams by confirming the valuable influence of team creativity on GPD performance. This could increase investment in initiatives like training programs and innovation hubs [3,17]. Then, these findings inform strategic decision making within organizations, emphasizing the importance of creativity in driving success in international PD practice, where prioritizing a creative team environment could enhance innovation and global competitiveness.

Furthermore, hypothesis H3, which demonstrates a significant positive impact of dynamic capabilities on GPD performance, is supported. These findings indicate that an organization's adaptability and capacity to innovate dynamically can substantially enhance GPD performance. These findings are compatible with prior studies that exhibited the critical influence of dynamic capabilities in driving strategic change, enhancing advantage in the internationalization process, and promoting the development and performance of multinational enterprises [63,93]. The findings imply that dynamic capabilities are crucial for firms seeking to excel in global product development. These capabilities encapsulate an organization's ability to sense, seize, and transform internal and external resources to effectively navigate changing environments [21,94], which is essential for firms to identify opportunities, mitigate threats, and adapt to dynamic market conditions. Moreover, the cognitive diversity among top executives can lead to variations in dynamic managerial capabilities, influencing organizational performance during periods of change [67,95]. Integrating dynamic capabilities with strategic direction can enhance enterprise performance by providing a competitive advantage and improving overall effectiveness [41,96].

The results of hypothesis H4 affirm that competitive advantage positively impacts firm performance on a global scale. Consistent with prior empirical evidence, these findings conclude that competitive advantage is decisive in amplifying firms' success across diverse markets. DC enables differentiation, innovation, and agile responses to market demands. By leveraging their unique strengths, companies can establish a solid competitive position, expand their global presence, and drive sustained growth [5,21,35]. The findings suggest that building and maintaining competitive advantage is essential for firms aiming to succeed in international markets and can profoundly benefit their global position. Firstly, they underscore the critical importance of developing and nurturing competitive advantage as a strategic priority for firms navigating the international business environment, where companies that invest in building and sustaining their competitive advantage are more likely to outperform competitors and achieve sustained success. By enhancing their ability to sense and seize opportunities in the market, firms can excel beyond their rivals and respond effectively to evolving customer needs and preferences. Moreover, the correlation between competitive advantage and firm performance on a global scale suggests that companies with a robust competitive position are better positioned to expand their operations internationally, leading to increased market share, access to new customer segments, and enhanced profitability.

The H5 hypothesis results suggest a significant positive impact of global innovation culture on GPD performance, indicating that cultivating an innovative culture in GPD practice can significantly enhance product development performance. These findings align with previous studies affirming the importance of global innovation culture as a driving force in today's global business environment [16], also with research on success in global new product development that explored the positive relationship between global innovation culture and the firm's global presence strategy, which further underlines the

significance of innovation culture in a global context [29,31]. Other consistent research explored the necessity of a global innovation culture in boosting firms' operations by facilitating organizational change, encouraging collaboration within multicultural teams, and driving success in international markets [19,97]. The findings are substantial and imply that creating a global innovation-driven culture is essential for firms seeking to excel in global product development. Accordingly, organizations that emphasize and encourage a culture of global innovation are likely to have improved performance in GPD and overall success in their business. Organizations can enhance their product development processes, boost competitiveness in the global market, and react more effectively to changing business conditions by establishing an innovative environment.

Moreover, the emphasis on fostering an innovation culture highlights the importance of organizational values, norms, and practices in influencing the direction of a company's innovation efforts. The findings suggest that PD organizations can achieve long-term gains by investing in developing and maintaining a robust global innovation culture, mainly when operating worldwide. Organizations can establish themselves as industry leaders, foster continuous development, and attain sustainable growth in today's dynamic and competitive business environment by cultivating a culture that prioritizes creativity, experimentation, and collaboration.

Second, this study helps reduce ambiguity regarding the moderation mechanism of organizational culture by clarifying how global innovation culture might affect the relationship between organizational factors and GPD performance. The findings highlight that GIC is a central moderating mechanism between organizational factors (especially TIC and TC) and performance. However, it reveals distinct moderating effects of other organizational factors. Results related to hypothesis H6 show that global innovation culture positively moderates the connection between technological innovation capabilities and GPD performance. These findings are uniform with the preceding results that illustrate the importance of a supportive innovation culture in magnifying the association between technological competencies, product innovation, and firm performance [24], and suggest that an innovation-oriented culture facilitates the effective utilization of technological capabilities, thereby positively influencing product development outcomes and performance [18]. Likewise, according to Ref. [12], innovative organizational culture plays a vital function in disseminating beneficial technological capabilities, particularly at the top management level of born global firms, and the factors that influence their performance in the international market. These results underscore the importance of nurturing an innovation-oriented culture within organizations to leverage technological capabilities effectively. They highlight that a supportive global innovation culture can facilitate the utilization of technological resources, ultimately positively impacting product development outcomes and firm performance. By promoting a knowledge-sharing culture and innovative organizational practices, firms can enhance their innovation capabilities and competitiveness in the market. Moreover, the findings suggest that organizational innovation culture plays a crucial role in driving new product performance, especially in global markets, and that institutional environments and organizational cohesion can moderate this relationship.

Global innovation culture acts as a positive moderator between team creativity and GPD performance, as confirmed by hypothesis H7 results, which asserts that an organizational culture that values and supports creativity and collaboration from diverse teams across borders strengthens the link between team creativity and successful global product development. These findings are in line with various studies in the field that accentuate the significance of promoting an organizational culture in enhancing creativity and innovation among diverse teams to maximize the impact of team creativity on successful global product development efforts [17,38], where a global innovation culture encourages and supports creative teamwork, and provides the opportunity to create a shared space with an inclusive environment, as well as discuss and collaborative spaces [97,98], leading to superior product development outcomes [55]. By emphasizing the role of organizational culture in supporting creativity and innovation, these findings underscore the significance

of creating a conducive environment that fosters creativity within dispersed teams working on global PD projects. This implies that organizations aiming for successful GPD should prioritize the establishment of a culture that values and supports creativity, as it can catalyze enhancing team motivation and inspiration and, consequently, improving GPD performance. Moreover, the results suggest that organizations should build a global innovation culture that encourages globally distributed teams to collaborate across borders, leveraging their diversity to innovate and drive successful product development initiatives.

Nevertheless, two more results deserve more discussion. Initially, dynamic capabilities significantly influence GPD performance; however, as per the findings of hypothesis H8, global innovation culture negatively moderates this connection. This outcome suggests that an excessive emphasis on cultivating a global innovation culture might impede or weaken the typical positive impact of dynamic capabilities on product development performance worldwide. The underlying reason for this may be that a greater focus on fostering a global culture of innovation may divert resources and attention away from enhancing dynamic capabilities for developing differentiated products; this shift in resource allocation may mitigate the dynamic capabilities of firms [99]. In addition, such a dispersal could impact the prioritization of activities related to dynamic capabilities for product development, thus weakening their influence on performance [11]. Although strong dynamic capabilities could enhance practical open innovation globally [100], an increased emphasis on a global innovation culture might introduce complexities within the organizational structure, processes, or strategies, and this could constrain the ability of dynamic capabilities to align with changing market demands or emerging technologies in a rapidly changing global landscape, thus weakening their impact on product development performance [14]. In line with our study and prior research results, although a robust global innovation culture is essential, an excessive emphasis on it might compromise the connection between dynamic capability and global product development performance. These findings are crucial to the GPD field, urging the necessity to diligently consider the balance between fostering a global innovation culture and investing in dynamic capabilities for product development. Consequently, organizations may need to carefully prioritize resource allocation to balance nurturing a global innovation culture and strengthening dynamic capabilities to meet evolving market demands and technological changes effectively. It is crucial not to overshadow dynamic capabilities with an excessive focus on a global innovation culture, as this could compromise the connection between dynamic capabilities and global product development performance [101].

Moreover, as shown in hypothesis H9, there is no significant moderating effect of global innovation culture between competitive advantage and GPD performance, which could be attributed to several potential reasons. First, competitive advantage is derived from various sources, such as proprietary technologies, brand reputation, and operational efficiencies. Prior research highlighted that an organization's innovation culture might not exclusively determine competitive advantage [70], and although GIC fosters innovation and creativity, the link between competitive advantage and performance may involve multiple components beyond the scope of organizational culture [67]. Additionally, this link may depend on market dynamics, industry-specific factors, and the competitive landscape. For instance, the significance of competitive advantage in GPD performance may vary across industries, speed, and flexibility in the context of trade liberalization [35]. The impact of competitive advantage can be contingent upon market demands, customer preferences, and technological disruptions within an industry [35].

In summary, certain competitive advantages are already embedded or established within an organization, operating independently of the innovation culture. Organizations might possess inherent competitive strengths that are not necessarily influenced by the prevailing innovation culture. This finding could have several implications. It suggests that competitive advantage, derived from various sources, may not solely rely on the presence of a global innovation culture within GPD firms, which challenges the notion that innovation culture is the sole determinant of competitive advantage and agrees with previous research,

which indicated that competitive advantage is multifaceted and can be influenced by a variety of factors beyond just innovation culture. Moreover, the lack of a significant moderating effect of global innovation culture implies that the relationship between competitive advantage and international product development (GPD) performance is complex and may be influenced by external factors such as market dynamics, industry-specific conditions, and the competitive landscape. This highlights the importance of considering industry context and market conditions when analyzing the impact of competitive advantage on GPD performance. Furthermore, the findings suggest that the significance of competitive advantage in driving GPD performance may vary across industries and can be contingent upon factors like market demands, customer preferences, and technological disruptions. This underscores the need for organizations to adapt their competitive strategies based on the specific characteristics of their industry and the evolving market conditions.

## 6. Conclusions

In the present interconnected global landscape, GPD is progressively emerging as a vital practice for businesses seeking to broaden their market presence, seize opportunities in emerging markets, and maintain competitiveness amidst constant change. This research introduces an innovative theoretical model within the context of global product development that integrates and assesses multiple critical factors in a unified framework to present new insights and perspectives. It concludes that organizational factors significantly influence global product development performance, and specifically underscores the importance of leveraging technological innovation capabilities, team creativity, dynamic capabilities, competitive advantage, and global innovation culture to enhance GPD performance in today's dynamic market landscape.

Additionally, the research highlights the critical influence of global innovation culture on shaping the interactions among organizational factors and GPD performance, along with the potential complexities it may introduce. Specifically, an overemphasis on promoting a global innovation culture could weaken dynamic capabilities' positive influence on product development performance. Additionally, the study reveals no significant moderation effect of global innovation culture between competitive advantage and GPD, suggesting that certain competitive advantages may operate independently of the prevailing innovation culture.

The findings underscore the significance of striking a balance between diverse organizational factors while fostering an innovation-centric culture and nurturing technological, creative, and dynamic capabilities in global settings. This approach significantly improves product development performance, facilitates organizational change, endorses collaboration within multicultural teams, and ultimately leads to sustainable GPD performance and improvements in overall effectiveness.

Overall, this research holds significance for local and international businesses aiming to enhance their global practices by delving into the impact of their global innovation culture and strategies for better organizational factors. It offers valuable insights, enabling businesses to refine their approaches and advance their strategies internationally.

## 7. Implications and Future Research Directions

The current study offers significant implications for both academics and practitioners. The managerial contributions and practical insights derived from this study encompass the following:

1. Enriching theoretical frameworks related to innovation management and organizational effectiveness; this study extends the theoretical boundaries of understanding the multifaceted dynamics at play within organizations operating in a global context by examining the connection between organizational factors and international product development performance and by elucidating how a global innovation culture can moderate the effects of technological capabilities, creativity, and dynamic capabilities on GPD performance;

2. Encouraging organizations to invest in cultivating a global innovation culture; this is essential, as it fosters an environment where creativity thrives across borders, promoting open communication and idea sharing among spread teams, facilitating knowledge transfer, fostering collaboration, valuing risk taking, and implementing effective recognition and reward systems to incentivize innovative ideas; these strategic approaches ignite team creativity, nurture cross-cultural understanding, and embrace diversity, thus fostering advanced innovation and strategic advantage in the global landscape; such investments can amplify the organization's ability to generate pioneering products and drive GPD's sustainable growth and competitive advantage;
3. Balancing organizational strengths and global innovation culture; the findings, which provide actionable intuitions for organizations to strategically boost their global product development strategies by leveraging organizational strengths while fostering an innovative culture, underscore the need for GPD managers to invest more time and effort in striking a balance between adopting a robust global innovation culture and maintaining a focus on nurturing organizational factors for global product development success; such a balance allows managers to leverage a mix of structured processes, diverse talent, and a creative atmosphere to improve the overall performance of global product development initiatives.

Nevertheless, this study acknowledges certain limitations that open avenues for future research. Firstly, the complexities of adapting capabilities within diverse organizational contexts may vary significantly based on specific industry nuances and organizational structures. Further empirical research or in-depth case studies are warranted to address these limitations and enhance understanding. Further research could emphasize developing the comprehensive model proposed in this study by incorporating additional variables or exploring more nuanced relationships among existing factors. For instance, this could be achieved by examining how other organizational factors, such as leadership styles or organizational structure, interact with global innovation culture and its moderating effects on GPD performance. Secondly, more investigation into the moderating effect of global innovation culture on the relationship between dynamic capabilities and GPD performance is essential for understanding how organizations can balance the promotion of innovation culture with the maintenance of dynamic capabilities, which is crucial for effective strategic management in a global context. Lastly, exploring the influence of external factors such as market dynamics, government regulations, or technological disruptions is needed. Understanding how these external factors interact with internal organizational factors can provide a more holistic understanding of GPD performance determinants and inform adaptive management strategies.

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