sustainability

MDPI

Article

Enhancing Competitiveness through Strategic Knowledge Sharing as a Driver of Innovation Capability and Performance

Simon S. M. Yuen [1,*] and H. Y. Lam [2]

[1] College of Professional and Continuing Education, The Hong Kong Polytechnic University, Kowloon, Hong Kong
[2] Department of Supply Chain and Information Management, The Hang Seng University of Hong Kong, Shatin, Hong Kong
* Correspondence: simon.yuen@cpce-polyu.edu.hk

Abstract: In an era marked by global challenges, for example, the COVID-19 pandemic, the pharmaceutical sector stands at the forefront of innovation, tasked with delivering therapeutic breakthroughs at an unprecedented pace. This study ventures beyond the well-trodden path by probing the intricate dynamics of knowledge sharing as a strategic catalyst for bolstering innovation capability and performance (ICP) within pharmaceutical firms. We argue that knowledge sharing transcends conventional utility, acting as a pivotal lever that amplifies innovation within a highly regulated and competitive landscape. Through meticulous analysis, we unearth a nuanced synergy among six pivotal domains—organizational culture, managerial commitment, technological infrastructure, trust, reciprocal benefits, and knowledge dissemination. Our research model, anchored in a robust body of literature, reveals that while these elements individually support ICP, their collective orchestration through knowledge-sharing networks yields a magnified impact on innovation outcomes. We present novel insights illustrating that the interplay between these domains and knowledge-sharing practices engenders a fertile ecosystem for innovation, where diverse stakeholders contribute to richer, more robust ICP. Our findings underscore the strategic imperative for pharmaceutical firms to cultivate an integrated knowledge-sharing culture, not merely as good practice but as a cornerstone for sustained innovation and competitive superiority in a rapidly evolving industry.

Keywords: innovation capability; knowledge sharing; pharmaceutical supply chain

Citation: Yuen, S.S.M.; Lam, H.Y. Enhancing Competitiveness through Strategic Knowledge Sharing as a Driver of Innovation Capability and Performance. *Sustainability* **2024**, *16*, 2460. https://doi.org/10.3390/su16062460

Academic Editors: GuoJun Ji and Giada La Scalia

Received: 17 January 2024
Revised: 11 March 2024
Accepted: 12 March 2024
Published: 15 March 2024

1. Introduction

The pharmaceutical industry is pivotal in advancing healthcare by developing innovative drugs, medical technologies, and devices. With its crucial impact on society, the industry is subject to stringent regulations. In the face of evolving healthcare economics, pharmaceutical companies must innovate to meet new challenges effectively. The COVID-19 pandemic exemplified such challenges, catalyzing pharmaceutical firms to accelerate the development and deployment of therapeutic drugs and vaccines to combat the crisis [1].

To remain competitive and manage the rapid introduction of new medicines to the market, pharmaceutical organizations must leverage innovation as a strategic advantage [2,3]. However, the industry contends with intense competition and the complexity of drug development processes [2,4]. Patent protections afford only a limited window for profitability before generic competitors erode the market share [4]. Additionally, the R&D costs associated with drug development have surged, with the Tufts Center for the Study of Drug Development reporting a climb from approximately USD 800 million in 2000 to USD 2.6 billion in 2014, attributed largely to high failure rates and subsequent productivity challenges [5]. The extended duration of drug development, which can span up to 15 years, is exacerbated by the substantial time scientists spend sourcing knowledge, hindered by inadequate information sharing [6,7]. Thus, knowledge sharing (KS) emerges as a strategic

imperative to enhance innovation capabilities within this knowledge-intensive sector [2,8]. While trade secrets are integral to preserving competitive advantage and stimulating innovation [9], the securitization of these secrets should not impede the knowledge sharing within firms that is crucial for advancing innovation. The effective management of trade secrets should balance the need for confidentiality with the potential benefits of intra-firm knowledge sharing, which can significantly enhance innovation capabilities and performance in pharmaceutical firms. This becomes especially pertinent in response to global health emergencies, where the rapid sharing of knowledge and collaborative innovation are key to developing therapeutic solutions swiftly. This research aims to examine the critical factors influencing KS behaviors and to evaluate the significance of KS in boosting innovative capacity and performance (ICP) within the pharmaceutical firms. A research model is developed to demonstrate how KS is driven by key factors and its subsequent impact on ICP. Empirical evidence from interviews and surveys with industry professionals underpins the model's construction.

Furthermore, this study endeavors to offer strategic recommendations for optimizing KS, with the goal of augmenting ICP and overall organizational efficacy. The impetus for this research lies in the recognition of KS as an essential catalyst for innovation and growth in knowledge-driven sectors such as pharmaceuticals. By scrutinizing the determinants of KS and its interplay with ICP, this research aims to furnish industry stakeholders and policymakers with actionable insights to refine knowledge management practices and foster innovation.

The organization of the rest of this work is as follows. Section 2 summarizes the state-of-the-art literature about knowledge sharing and identifies the primary determinants. In Section 3, the research model and hypotheses are constructed for the empirical investigation. Section 4 depicts the research methods for investigating the research model, while the results are presented in Section 5. The discussion of the results is presented in Section 6, and the conclusion of this work is drawn in Section 7.

2. Literature Review

2.1. Defining Data, Information, Knowledge

Knowledge is a critical resource for maintaining and achieving competitiveness, especially in the healthcare industry. Distinguishing knowledge from information and data is crucial to address key issues concerning innovative capability. Data can be described as raw facts or a static collection of transactional elements, such as a series of numbers. Information is processed data that have been given meaning, such as financial data that are ready for use in analysis or decision-making. Knowledge, which encompasses a broader range of information, integrates experience, common sense, perception, training, and skills. Hicks, Dattero, and Galup [9] succinctly stated that "data is combined to create information, and information is combined to create knowledge".

There are two primary types of knowledge: tacit and explicit [10,11]. Tacit knowledge is uncodified, deeply rooted in individual talent, experience, and specific contexts, making it challenging to articulate and share. It encompasses the "know-how", "know-why", and "care-why" aspects of skills, such as the surgical prowess of a surgeon. Explicit knowledge, conversely, includes content like images or audio recordings that can be easily documented and transferred. Despite explicit knowledge being the tangible product of tacit knowledge, it is estimated that up to 90% of the "know-how" is retained in the minds of employees, underscoring the importance of tacit knowledge.

Knowledge sharing (KS), a key component of knowledge management, involves the processes of discovering, acquiring, creating, storing, sharing, and applying knowledge [12], as shown in Figure 1. It is also described as the act of individuals disseminating their acquired knowledge within an organization.

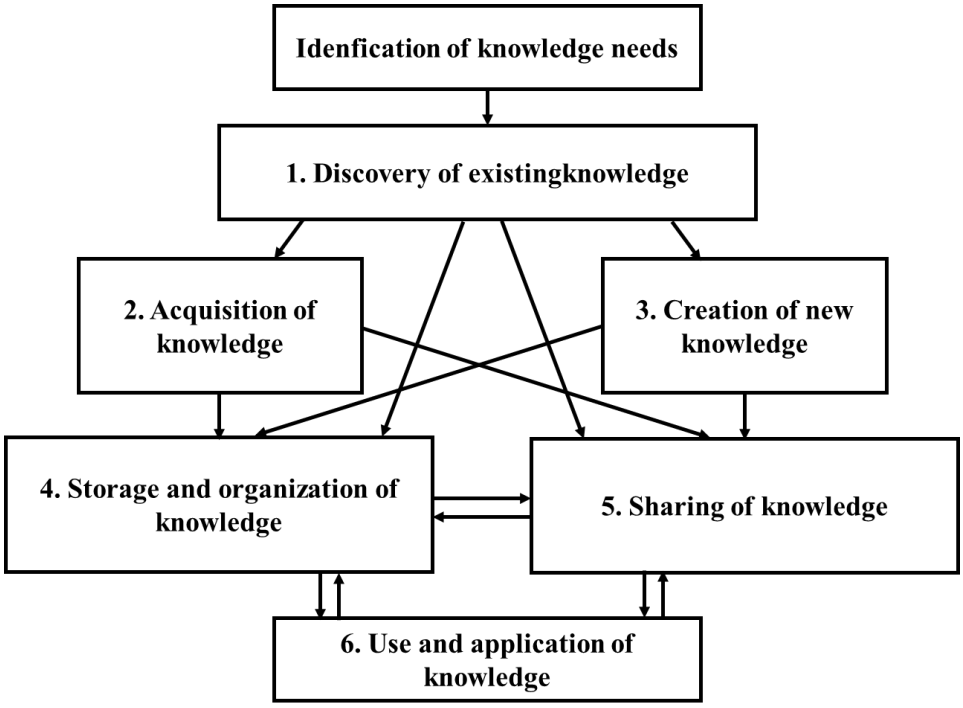

Figure 1. Knowledge-sharing process [13].

2.2. Innovative Capability and Performance and Knowledge Sharing

To sustain competitive advantages, pharmaceuticals must make quick progress in developing new drugs and keep track of scientific breakthroughs and innovation. Terziovski and Morgan [14] defined innovation as follows:

> *"a process of creating and developing new products or services through collaborative team processes and mechanisms, which utilise and empower the skills and knowledge of the people."*

Due to limited resources of related "know-how" and innovation capabilities, pharmaceutical firms need to collaborate with others in order to improve innovative capability and performance. Bouthillier and Shearer [13] echoed that the drug R&D sector could benefit from KS. In a clinical trial, a high failure rate was identified as the main barrier in the drug development process. It was suggested that by sharing clinical trial data, researchers were able to reach necessary data, which could shorten the time for development to reduce the cost and duplication of effort [15].

Past studies focused on a single facet of knowledge sharing (KS) and its determinants, together with innovative capability and performance (ICP). Examples include KS and innovation relationships and critical KS determinants. These components are described as a cycle or a sequential process [16–19].

However, due to various deterrents, it is not easy to implement a knowledge-sharing process. Lack of trust, intolerance for mistakes, culture barriers, lack of absorptive capacity in employees, etc., are deterrents hindering the implementation of the process [20]. Regarding the sensitiveness of patient privacy, together with factors like intellectual property rights and competitiveness during the drug development phase, the pharmaceutical industry would face challenges in these topics [15]. Within a firm, the exchange of knowledge facilitates the cross-pollination of ideas, blending diverse expertise and insights that can spark innovative solutions and drive the development of new products, services, or processes. Employees, empowered by shared understanding and skills, are better equipped to identify gaps, improve operational efficiencies, and propose novel approaches that align with the firm's strategic goals. Knowledge sharing breaks down silos, fostering a collaborative environment where information flows freely across departments and levels.

This environment nurtures a culture of continuous learning and adaptability, essential for rapidly responding to market changes and technological advancements. By leveraging the collective intelligence of its workforce, a firm can accelerate its innovation cycles, reduce redundancies, and enhance the quality of its outputs.

Moreover, intra-firm knowledge sharing is pivotal in maximizing the return on investment in R&D by reducing the duplication of efforts and enabling teams to build upon previous findings. It also plays a crucial role in employee engagement and retention, as individuals feel valued and integral to the firm's success when their knowledge contributes to innovative achievements. In summary, intra-firm knowledge sharing is not just a contributor but a requisite for fostering a dynamic and innovative organizational ecosystem.

2.3. Knowledge-Sharing Determinants

After conducting an exhaustive literature review, nine factors were selected for comparison. Five of the factors were identified as key factors. To conduct this review, more than forty articles were studied from journals like the *Research Journal of Pharmaceutical, Biological and Chemical Sciences* and the *Journal of Knowledge Management*. As illustrated in Table 1, five key factors were identified by scholars more than eight times regarding knowledge sharing. The most influential element is organizational culture, followed by management support and IT support. According to the SECI model (Nonaka–Takeuchi model) [21], four dimensions of knowledge are defined, namely, socialization, externalization, combination, and internalization. It is a promising model to facilitate understanding of how knowledge is transferred within an organization. Based on the KS determinants in Table 1, the (i) organizational culture, (v) trust, (vi) motivation, and (viii) leadership style are related to socialization, which involve sharing tacit knowledge through direct interaction and shared experiences. The determinants of (ii) management support, (iv) IT support, and (vii) reciprocal benefit are classified as externalization, which refers to the process of articulating tacit knowledge into explicit concepts. Furthermore, the determinants of (iv) IT support and (ix) organizational structure are relevant to the concept of combination, which involves combining different bodies of explicit knowledge to create new knowledge. Lastly, the determinants of (iii) satisfaction, (vi) motivation, and (vii) reciprocal benefits are also contributed to internalization, which is the act of absorbing explicit knowledge and turning it into tacit knowledge.

Table 1. Literature review of knowledge-sharing determinants.

	Knowledge Sharing Determinants								
Work	**(i)**	**(ii)**	**(iii)**	**(iv)**	**(v)**	**(vi)**	**(vii)**	**(viii)**	**(ix)**
[22]							✓		
[23]	✓						✓		
[17]									
[19]		✓						✓	
[24]	✓	✓		✓					
[25]	✓								
[26]									✓
[27]	✓	✓							
[28]			✓						
[29]									
[18]	✓						✓		
[30]		✓							
[31]									

Table 1. *Cont.*

	Knowledge Sharing Determinants								
Work	**(i)**	**(ii)**	**(iii)**	**(iv)**	**(v)**	**(vi)**	**(vii)**	**(viii)**	**(ix)**
[32]		✓							
[33]	✓				✓				
[34]		✓		✓		✓			
[35]	✓			✓			✓		
[36]							✓		
[37]	✓			✓					
[38]					✓		✓		✓
[39]				✓					
[40]				✓	✓	✓		✓	
[12]	✓			✓	✓	✓			
[41]		✓							
[16]				✓	✓				
[42]		✓							
[43]	✓								
[44]		✓		✓					
[45]					✓				
[46]					✓				
[47]				✓			✓		
[48]					✓				

Remark: (i) organizational culture, (ii) management support, (iii) satisfaction, (iv) IT support, (v) trust, (vi) motivation, (vii) reciprocal benefit, (viii) leadership style, and (ix) organizational structure.

3. Research Model and Hypotheses

Based on five key factors, the research model (see Figure 2) is constructed. These five key factors can directly foster knowledge sharing (KS) and subsequently contribute to innovative capability and performance (ICP) which would create a more solid and grounded foundation. The model tests the relationships among key factors, KS as well as ICP, in the context of pharmaceutical industry.

3.1. Organizational Culture (OC)

Organizational culture plays a critical role in fostering knowledge sharing, which is integral to fulfilling organizational missions, enhancing competitiveness, and effectively managing organizational change. A culture that prioritizes knowledge sharing is believed to significantly impact the success of knowledge-sharing practices, influencing behaviors and subsequently improving efficiency, competitive advantage, and the attainment of organizational objectives. The prior literature has delved into the interplay between organizational culture, knowledge sharing, and innovation capability. For instance, the study by [17] revealed that a pronounced organizational culture within the Taiwanese automotive industry significantly elevated the propensity for individuals to share knowledge, which in turn spurred organizational creativity. Similarly, the empirical research presented in [39] corroborated the existence of a positive and significant linkage between organizational culture and knowledge management. In light of this evidence and considering the unique context of the pharmaceutical industry, the following hypotheses are advanced:

H1a. *Organizational culture is positively associated with knowledge sharing.*

H1b. *Organizational culture is positively associated with innovative capability and performance.*

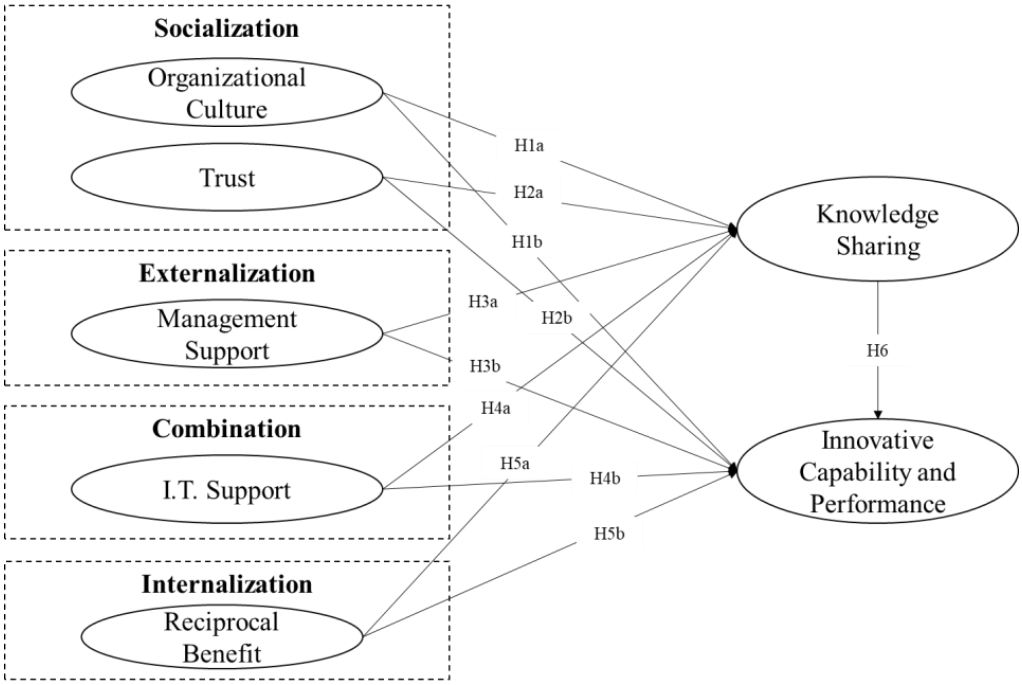

Figure 2. Research model of the innovation capability and performance.

3.2. Management Support (MS)

The influence of top management is a recurring theme in the literature, highlighting their pivotal role in shaping employee perceptions and willingness to engage in various tasks, particularly those associated with technological advancements. Their support is often seen as a cornerstone for the successful implementation and adoption of new technologies [36]. Within the pharmaceutical industry, it is posited that if senior management actively encourages knowledge sharing and innovation, this can significantly motivate employees to engage more deeply in the knowledge-sharing process and to pursue innovative paths in product development. In this vein, the following hypotheses are crafted:

H2a. *Management support is positively associated with knowledge sharing.*

H2b. *Management support is positively associated with innovative capability and performance.*

3.3. IT Support (IS)

The availability and reliability of IT support are crucial in enabling collaboration among employees. Robust IT infrastructure allows for seamless communication, easy access to knowledge bases, and platforms that foster collaboration and the exchange of ideas [11,16]. The quality, accessibility, and user-friendliness of IT support play a significant role in ensuring that workers can utilize these tools effectively. In an environment where IT services facilitate convenient communication tools and provide comprehensive knowledge management systems, employees are more likely to share ideas that could lead to innovative solutions and outcomes. Within this framework, the study proposes the following hypotheses:

H3a. *IT support is positively associated with knowledge sharing.*

H3b. *IT support is positively associated with innovative capability and performance.*

3.4. Trust (TR)

Trust is defined as an overarching belief that another party will act dependably and will not exploit the situation, and it is deemed essential for fostering a conducive environment for knowledge sharing, particularly among scientists. The literature suggests that the stronger the relationships within a network, the more likely trust will develop, thereby lowering the barriers to sharing knowledge and resources among members [49]. Trust facilitates open communication and reduces the perceived risks associated with exchanging sensitive or valuable information. Furthermore, studies have identified a positive correlation between the levels of trust and the atmosphere for innovation, indicating that trust can enhance a company's innovation capacity through the promotion of knowledge sharing [22]. Based on these insights, the study advances the following hypotheses:

H4a. *Trust is positively associated with knowledge sharing.*

H4b. *Trust is positively associated with innovative capability and performance.*

3.5. Reciprocal Benefit (RB)

Reciprocal benefit, which may encompass economic incentives such as financial compensation or advantages in career progression, as well as intangible rewards like enhanced reputation, is considered a compelling motivator for engaging in knowledge-sharing activities [23]. In the realm of knowledge management, the exclusivity and value of know-how make the concept of reciprocity particularly influential [25,26]. The exchange of tacit knowledge, which is often uncodified and deeply rooted in personal experience, hinges significantly on the expectation of mutual benefit [30]. In industries where knowledge is a critical asset, such as the pharmaceutical sector, fostering an environment that emphasizes reciprocal benefits can catalyze high-quality knowledge sharing. This is achieved by incentivizing individuals to engage in communicative exchanges that further collective understanding and innovation. Accordingly, the study posits the following hypotheses:

H5a. *Reciprocal benefit is positively associated with knowledge sharing.*

H5b. *Reciprocal benefit is positively associated with innovative capability and performance.*

3.6. Knowledge Sharing (KS)

Knowledge sharing represents a form of organizational innovation that can ignite fresh ideas and pave the way for novel business ventures. It involves the exchange of both explicit and tacit knowledge among individuals, fostering collaborative efforts to generate new knowledge. This collaborative dynamic is instrumental in aiding organizations to evolve and to introduce fresh offerings in the marketplace [30]. Previous research has identified a positive relationship between knowledge sharing and an organization's capacity for innovation [50]. Furthermore, empirical studies within the high-tech industry have reinforced the strong connection between effective knowledge management practices and the ability to innovate [39]. Drawing on these findings, the study formulates the following hypothesis:

H6. *Knowledge sharing is positively associated with innovative capability and performance.*

4. Research Methods

In this section, the research methods used in this study are outlined, while Figure 3 shows the primary steps in the structural equation modeling (SEM) analysis. In SEM analysis, model definition begins with the conceptualization of the theoretical framework, where observed and latent variables are identified, and their inter-relationships are hypothesized based on the existing literature and theory. Mathematically, the structural model with latent variables can be expressed as $\eta = B\eta + \Gamma\xi + \zeta$, where η represents endogenous latent

variables, B is the matrix of coefficients for the relationships between them, Γ is the matrix of coefficients for the effects of exogenous latent variables ξ on η, and ζ represents errors in the equations for endogenous variables. Data collection follows, which necessitates designing and executing a methodical approach, often through surveys or experiments, to gather empirical data that reflect the variables of interest. Data preparation is crucial, involving the management of missing values, ensuring normality, and validating the measurement scales. For instance, outlier detection, visual inspection and imputation for missing values are essential steps to organize the collected data. Model estimation then proceeds, utilizing specialized software to compute the path coefficients that illustrate the strength and direction of the hypothesized relationships. Maximum likelihood estimation (MLE) is a commonly used method to estimate the model, where the likelihood function $L(\theta)$ is maximized and $f(y;\theta)$ is the probability of the observed data given the parameters θ. Model testing is an iterative process, assessing model fit with statistical indices to evaluate if the conceptual model is supported by the data, leading to potential model re-specification for improved fit. For instance, the Chi-square test, comparative fit index, Tucker–Lewis index, and root mean square error of approximation are commonly considered. The final step, assessment and reporting, involves the careful interpretation of the estimated parameters, drawing conclusions about the hypotheses, discussing the model's implications, and presenting the results in a scholarly manner, complete with comprehensive documentation of the methodology, analysis, and findings.

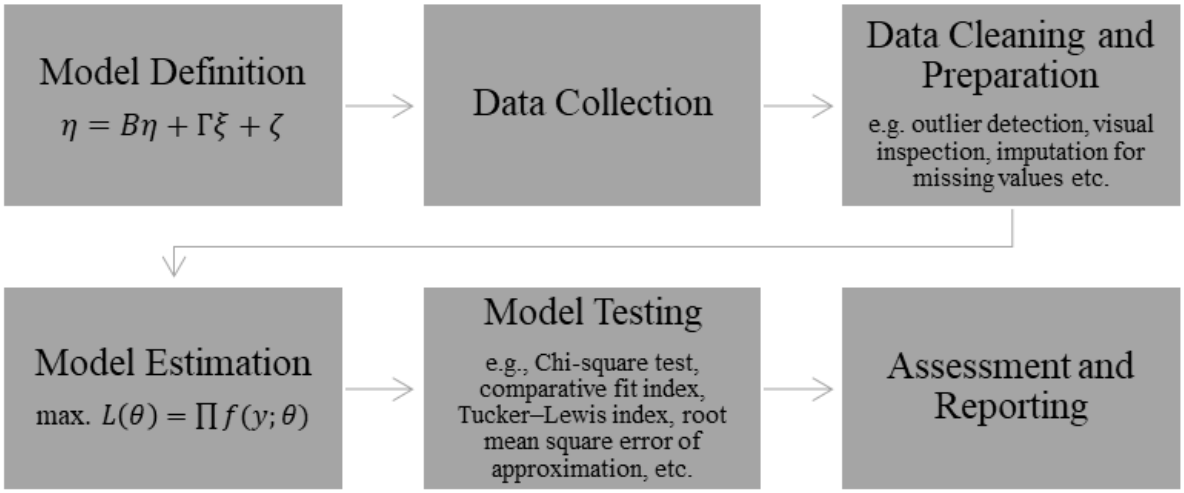

Figure 3. Primary steps in the structural equation modeling analysis.

4.1. Measures and Data Collection

To ensure content validity, all items were adapted from well-established instruments in the literature, as shown in Table 2. The different measures were assessed on a seven-point Likert scale (i.e., 1: strongly disagree; 7: strongly agree). In order to ensure the validity of the questionnaire, we modified the items of the questionnaire according to the background of the healthcare industry (for example, the relevant industry was changed to the pharmaceutical industry). We then interviewed 10 senior executives working in the healthcare industry. Based on their feedback, we further modified the items to make them concise and clear. Our target population was pharmaceutical firm practitioners. A pilot test using the Mturk platform with 40 employees working in the healthcare industry was conducted. The pilot test results show that Cronbach's alpha and the factor loading of each item were considered acceptable. Therefore, the final questionnaire was distributed through the Mturk platform from 14 September 2023 to 3 November 2023, and 379 valid questionnaires were finally collected for further analysis.

Table 2. Measures of constructs.

Variable	Items	Source
Organizational Culture (OC)	OC1. The organization is a personal place. It is like an extended family. People share a lot of themselves with others.	[51]
	OC2. The management style of my organization is characterized by teamwork, consensus and participation.	
	OC3. The glue the holds the organization together is loyalty and mutual trust. Commitment to the organization runs high.	
Management Support (MS)	MS1. Top managers think that encouraging knowledge sharing with colleagues is beneficial.	[52]
	MS2. Top managers always support and encourage employees to share their knowledge with colleagues.	
	MS3. Top managers provide most of the necessary help and resources to enable employees to share knowledge.	
IT Support (IS)	IS1. Employees make extensive use of electronic storage (such as online databases and data warehousing) to access knowledge.	[16]
	IS2. Employees use knowledge networks (such as groupware, intranet, virtual communities, etc.) to communicate with colleagues.	
	IS3. My company uses technology that allows employees to share knowledge with other persons outside the organization.	
Trust (TR)	TR1. My knowledge sharing would strengthen from reliability in the organization and myself.	[49]
	TR2. My knowledge sharing would strengthen from honesty in the organization and myself.	
	TR3. My knowledge sharing would strengthen from interpersonal trust between co-workers in the organization and myself.	
Reciprocal Benefit (RB)	RB1. My knowledge sharing would strengthen the ties between existing members in the organization and myself.	[30]
	RB2. My knowledge sharing would expand the scope of my association with other members in the organization.	
	RB3. My knowledge sharing would draw smooth cooperation from outstanding members in the future.	
Knowledge Sharing (KS)	KS1. Inside the company, same business goals, they were concerned with the project I developed.	[50]
	KS2. Sharing is a courtesy; I have always responded.	
	KS3. I usually try to be as collaborative as possible. To assist the team.	
	KS4. It makes me feel good and I would like to be respected for my knowledge with professional courtesy.	
Innovation Capability and Performance (ICP)	ICP1. The company have high service efficiency to customers/clients.	[13]
	ICP2. The company have increased net profit margin from related business.	
	ICP3. The company have increased growth rate of financial position in pharmaceutical industry from related business.	
	ICP4. The company can be innovative to the customer's/client's special requirement.	
	ICP5. The company have increased market share from related business.	
	ICP6. The company create a positive or favourable image in the customers' mind.	

4.2. Demographic Descriptions

In this study, 379 valid sample responses were collected. Senior management respondents accounted for 24.8% (94) of the sample. Middle management respondents accounted

for 58.0% (220) of the sample. In total, 11.1% (42) of respondents are front-line managers in a company. A total of 6.1% (23) of respondents are front-line staff in a company. Most of the respondents come from a limited company (44.8%) or a publicly listed company (34.6%). The majority of respondents work for companies that employ more than 50 people and have been in operation for more than two years. In total, 3.2% (12) of respondents work for companies that employ less than 50 people. A total of 4.2% (16) of respondents work for companies that have been in operation for less than two years. In terms of the value of physical assets of the surveyed enterprises, HKD 30 to HKD 49 in millions was the majority, accounting for 43.3% (164 companies). In addition, 36.2% (137) of respondents' companies had annual sales of HKD 20–HKD 49 (million), as shown in Table 3.

Table 3. Demographic information for respondents (N = 379).

Category		Frequency	Percentage
Company Type	Limited Company	170	44.8%
	Publicly Listed Company	131	34.6%
	Partnership	39	10.3%
	Joint Venture	23	6.1%
	Sole Proprietorship	14	3.7%
	Others	2	0.5%
Number of Employees in the Company	Less than 50	12	3.2%
	50–99	48	12.7%
	100–199	115	30.3%
	200–499	123	32.4%
	500–999	56	14.8%
	1000 or more	25	6.6%
Operating Time of the Company	2 Years or Less	16	4.2%
	2–4 Years	140	36.9%
	5–7 Years	121	31.9%
	8–10 Years	48	12.7%
	Over 10 Years	54	14.3%
Physical Assets Value (HKD in Millions) of the Company	Less than 15	24	6.3%
	15–29	105	27.7%
	30–49	164	43.3%
	50–99	63	16.6%
	100 or more	23	6.1%
Annual sales (HKD in Millions) of the Company	Less than 5	19	5.0%
	5–9	42	11.1%
	10–19	118	31.1%
	20–49	137	36.2%
	50–99	42	11.1%
	100 or more	21	5.5%
Position in the Company	Senior Management	94	24.8%
	Middle Management	220	58.0%
	Front-Line Manager	42	11.1%
	Front-Line Staff	23	6.1%

5. Results and Analysis

Similar to some extant studies, structural equation modeling (SEM) and statistical product and service solutions (SPSS) were used to test our model. The cross-sectional data were analyzed using structural equation modeling (SEM) in IBM SPSS and AMOS.

5.1. Reliability and Validity of the Measurement Model

Previous researchers have indicated different threshold values for the fit indices: $X^2/df < 3.0$, $CFI \geq 0.92$, $RMSEA \leq 0.08$, and $TLI \geq 0.92$. In this study, we used Amos 28.0 and SPSS 22.0 to analyze the proposed research model. The measurement model proved to be a good fit, indicating suitability for further modeling: $X^2/df = 1.711$, $CFI = 0.953$, $RMSEA = 0.043$, and $TLI = 0.944$. The GFI and AGFI were noted to be 0.916 and 0.893, respectively.

In order to test the reliability and validity of the variables, the Cronbach's alpha, composite reliability (CR), and average variance extraction (AVE) of each variable were measured. Tables 1–4 present the measurement model results, including factor loading, CR, AVE, Cronbach's alphas, and correlations. As shown in Table 4, Cronbach's alphas were between 0.756 and 0.899 in our model, which indicates that the scales have high reliability. According to [53], CR should exceed 0.6, and AVE should exceed 0.5 under ideal conditions, while values of 0.36~0.5 are acceptable. In this study, the CR was greater than 0.70 (ranging from 0.760 to 0.901), and the AVE was greater than 0.36 (ranging from 0.487 to 0.753) in all cases, suggesting all items for convergent validity were met in this study.

This study used two approaches to evaluate discriminant validity. The first is the Fornell–Larcker criterion. As shown in Table 5, the diagonal values show that the values of the square root of AVE are higher than the coefficients of the correlations of all variables among each other, which indicates good discriminant validity [53]. The second is the cross-loading criterion. Table 6 shows that the item loadings of factors are greater than the cross-loading values of other latent factors, which indicates sufficient discriminant validity by fulfilling the cross-loading criterion.

Table 4. Convergent validity and reliability analysis.

Construct	Measurement Items	Factor Loading	CR	AVE	Cronbach's Alpha
Organization culture	OC1	0.845	0.797	0.572	0.787
	OC2	0.599			
	OC3	0.802			
Management support	MS1	0.762	0.780	0.542	0.776
	MS2	0.679			
	MS3	0.765			
Trust	TR1	0.926	0.901	0.753	0.899
	TR2	0.812			
	TR3	0.861			
Reciprocal benefit	RB1	0.893	0.836	0.633	0.831
	RB2	0.678			
	RB3	0.801			
IT support	IS1	0.704	0.760	0.514	0.756
	IS2	0.679			
	IS3	0.766			

Table 4. *Cont.*

Construct	Measurement Items	Factor Loading	CR	AVE	Cronbach's Alpha
Knowledge sharing	KS1	0.792	0.790	0.487	0.787
	KS2	0.680			
	KS3	0.716			
	KS4	0.588			
Innovative capability and performance	ICP1	0.734	0.853	0.491	0.852
	ICP2	0.678			
	ICP3	0.719			
	ICP4	0.655			
	ICP5	0.720			
	ICP6	0.697			

Table 5. Discriminant validity analysis.

Construct	KS	OC	MS	TR	RB	IS	ICP
KS	0.698						
OC	0.347	0.756					
MS	0.359	0.313	0.736				
TR	0.270	0.213	0.163	0.868			
RB	0.310	0.241	0.179	0.072	0.796		
IS	0.384	0.363	0.322	0.210	0.313	0.717	
ICP	0.456	0.387	0.332	0.275	0.219	0.287	0.701

Remark: Diagonal elements are the square root of AVE. These values should exceed the Inter-Construct Correlations for adequate discriminant validity. Note: KS = knowledge sharing; OC = organization culture; MS = management support; TR = trust; RB = reciprocal benefit; IS = IT support; ICP = innovative capability and performance.

Table 6. Constructs' cross-loadings.

	OC	MS	TR	RB	IS	KS	1CP
OC1	0.839	0.109	0.068	0.053	0.071	0.148	0.135
OC2	0.730	0.115	0.031	0.022	0.145	−0.027	0.172
OC3	0.830	0.056	0.079	0.119	0.119	0.136	0.096
MS1	−0.018	0.834	0.042	−0.046	0.148	0.115	0.119
MS2	0.226	0.756	0.027	0.122	−0.010	0.138	0.065
MS3	0.089	0.825	0.057	0.058	0.104	0.057	0.073
TR1	0.088	0.051	0.911	0.010	0.070	0.120	0.096
TR2	0.050	0.059	0.874	0.003	0.046	0.077	0.134
TR3	0.042	0.021	0.895	0.013	0.066	0.089	0.133
RB1	0.109	0.088	0.006	0.865	0.127	0.068	0.069
RB2	0.076	−0.036	−0.032	0.800	0.134	0.106	0.076
RB3	0.004	0.082	0.052	0.861	0.038	0.147	0.047
IS1	0.133	0.182	0.062	0.089	0.746	0.150	0.043
IS2	0.104	0.006	0.055	0.129	0.780	0.108	0.087

Table 6. *Cont.*

	OC	MS	TR	RB	IS	KS	1CP
IS3	0.089	0.069	0.059	0.078	0.828	0.070	0.102
KS1	0.139	0.176	0.037	0.064	0.163	0.756	0.168
KS2	−0.030	0.107	0.106	0.122	0.112	0.714	0.195
KS3	0.131	0.063	0.042	0.104	−0.003	0.801	0.085
KS4	0.038	0.012	0.113	0.065	0.105	0.693	0.148
ICP1	0.122	0.094	0.006	0.007	0.124	0.150	0.740
ICP2	0.059	0.119	0.133	0.062	0.009	0.002	0.734
ICP3	0.035	0.036	0.062	−0.018	0.101	0.162	0.757
ICP4	0.149	−0.006	0.059	0.141	−0.031	0.162	0.678
ICP5	0.033	0.088	0.094	−0.071	0.061	0.085	0.764
ICP6	0.098	−0.010	0.075	0.140	0.047	0.109	0.731

5.2. Common Method Bias (CMB)

To measure the common method bias, we performed several statistical and non-statistical techniques to assess the presence of CMB. As a non-statistical measure, the clarity of the survey items and the confidentiality of the respondents were ensured to confirm the absence of common method variance. As a statistical measure, to assess the probability of CMB, Harman's one-factor test was performed. According to the analysis, one-factor items explained 23.89% of the variance, which is less than the suggested threshold value of 50%. In addition, we also used the unmeasured latent marker construct (ULMC) approach to test CMB [54]. The results were $\Delta GFI = 0.017$, $\Delta\ IFI = 0.017$, $\Delta NFI = 0.021$, and $\Delta RMSEA = 0.006$. The variation of each index was less than 0.03, indicating that the model was not significantly improved after the addition of the common method factor, and there was no obvious common method deviation in the measurement. This demonstrated that CMB was not a threat in this study.

5.3. Structural Model

This study used Amos24.0 to analyze the structural model. We first calculated the fitting index of the structural model. The results showed that $X^2/df = 1.711$, $CFI = 0.953$, $RMSEA = 0.043$, and $TLI = 0.944$. The GFI and AGFI were noted to be 0.916 and 0.893, respectively. This indicates that the research model and sample data have a good fit. This study utilized the different standardized regression coefficients (or beta values) and significant levels (p-value) estimated by the structural model to check the validity of the different hypotheses. The calculation results of the model are shown in Table 7 and Figure 4.

Organizational culture (β = 0.145, $p < 0.05$), management support (β = 0.199, $p < 0.05$), IT support (β = 0.181, $p < 0.05$), trust (β = 0.157, $p < 0.05$), and reciprocal benefit (β = 0.172, $p < 0.05$) shared a significant positive correlation with knowledge sharing. As expected, H1a, H2a, H3a, H4a, and H5a were supported. In addition, organizational culture (β = 0.202, $p < 0.05$), management support (β = 0.132, $p < 0.05$), and trust (β = 0.126, $p < 0.05$) also shared a significant positive correlation with innovative capability and performance, which implied that H1b, H2b, and H3b were supported. Moreover, there were significant positive relationships between knowledge sharing and innovation capability and performance (β = 0.282, $p < 0.001$), thus supporting H6. However, the results also indicated that H4b was not supported, as reciprocal benefit was positively associated with innovation capability and performance (β = 0.043, $p > 0.05$), but the result was not significant. In addition, the result also indicated that H5b was not supported, as IT support was positively associated with innovation capability and performance (β = 0.024, $p > 0.05$), but the result was also not significant.

Table 7. SEM standardized regression path analysis.

Hypothesis	Path	Standardized Estimate β	*p*-Value	Hypothesis Testing Result
H1a	OC → KS	0.145	0.028	Supported
H2a	MS → KS	0.199	0.003	Supported
H3a	TR → KS	0.157	0.005	Supported
H4a	RB → KS	0.172	0.005	Supported
H5a	IS → KS	0.181	0.011	Supported
H6	KS → ICP	0.282	***	Supported
H1b	OC → ICP	0.202	0.002	Supported
H2b	MS → ICP	0.132	0.041	Supported
H3b	TR → ICP	0.126	0.022	Supported
H4b	RB → ICP	0.043	0.465	Not Supported
H5b	IS → ICP	0.024	0.732	Not Supported

Remark: *** significant at the 0.001 level.

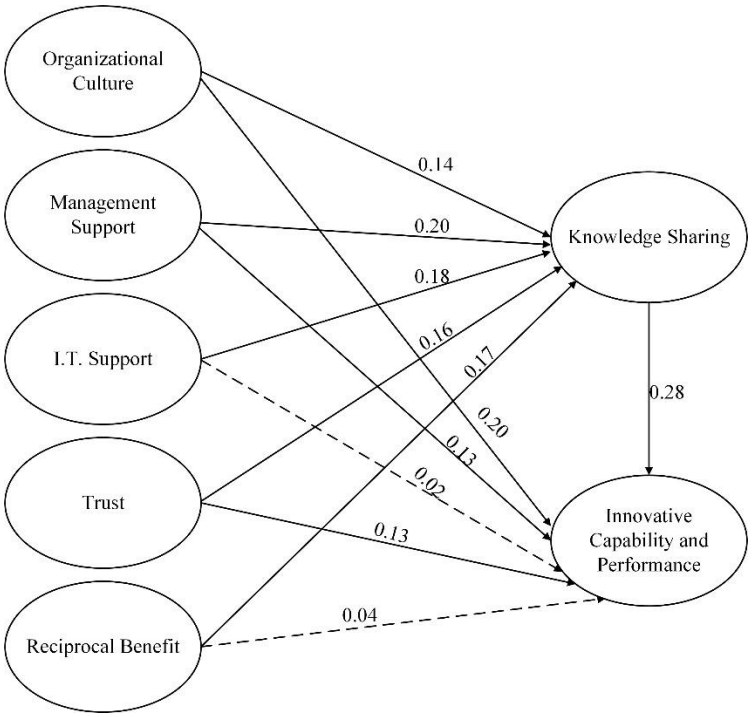

Figure 4. Results of the structural model.

6. Discussion

6.1. Discussion of Research Findings

The present study provides a granular examination of the interplay between knowledge sharing (KS) determinants, KS practices, and innovation capability and performance (ICP) in the pharmaceutical sector. By delving into the multifaceted relationships that underpin KS, our research contributes to the literature by elucidating the nuanced mechanisms that facilitate innovation in this highly specialized and competitive industry. Our empirical analysis substantiates the hypothesis that organizational culture, executive support, IT infrastructure, trust, and reciprocal benefits significantly enhance KS practices (H1a, H2a, H3a, H4a, and H5a were supported). These determinants are instrumental in

cultivating a conducive environment for the exchange of knowledge, which is vital for fostering innovation in the tightly regulated pharmaceutical arena.

Notably, our findings indicate that while IT support and reciprocal benefits are crucial for KS, they do not have a direct, significant effect on ICP (H4b and H5b were not supported). This suggests that the provision of IT resources and the expectation of mutual benefit alone may not be adequate to drive innovation outcomes. Rather, it is the strategic application of these IT resources within KS processes and the development of a culture that values reciprocity that likely underpin the indirect enhancement of ICP.

The absence of a direct impact of IT support on ICP implies that the value of IT investments may lie in their integration into effective knowledge management strategies, rather than their mere availability. This insight calls for a re-evaluation of IT investment paradigms in the pharmaceutical industry, with an emphasis on aligning IT capabilities with the core innovation needs of firms.

Furthermore, the unexpected finding regarding reciprocal benefits raises questions about the direct translation of this exchange into innovation results. It is plausible that the complexity of innovation in the pharmaceutical context, influenced by stringent regulatory requirements, clinical trial processes, and market demands, may diminish the direct influence of reciprocal exchanges on ICP.

In summary, our study affirms the mediating role of KS in linking organizational factors to innovation outcomes. While the direct effects of certain determinants on ICP are modest, their significance in promoting a knowledge-sharing milieu is indisputable. Pharmaceutical firms aiming to navigate the innovation landscape successfully should, therefore, prioritize the enhancement of KS practices as a strategic imperative to unlock the latent potential for innovation within their organizations.

6.2. Implications

The contributions of this study are multifaceted, extending the frontier of knowledge in the domain of pharmaceutical innovation and knowledge management. Our research marks a significant foray into the empirical investigation of knowledge-sharing (KS) determinants within the pharmaceutical industry, establishing a critical link to innovation capability and performance (ICP). This novel exploration fills a conspicuous void in the extant literature that has hitherto treated KS and ICP as largely disparate entities.

The introduction of our comprehensive research framework represents a paradigm shift in the analysis of ICP determinants within this sector. It brings to the fore the pivotal influence of often-overlooked factors such as organizational culture and trust, thereby enriching the theoretical tapestry of innovation studies. By delineating the mediating role of KS between these foundational elements and ICP, the study adds a new dimension to the ongoing dialogue on pharmaceutical innovation.

From a practical standpoint, our findings offer a strategic blueprint for industry stakeholders intent on amplifying their innovation quotient. The study emphasizes the criticality of KS as an enabler of innovation, guiding firms toward cultivating a conducive environment for knowledge exchange. It advocates for the strategic development of an organizational culture steeped in collaboration and open exchange, as well as the deployment of technological and structural platforms that facilitate knowledge dissemination. Additionally, it calls for reward mechanisms that recognize and incentivize knowledge-sharing behaviors. To operationalize these insights, we suggest the following three actionable strategies for pharmaceutical firms:

- Cultivation of a Knowledge-Sharing Culture: Pharmaceutical firms are encouraged to foster an environment where knowledge sharing is deeply embedded in the company ethos. This involves establishing organizational policies that reward the open exchange of ideas and collaboration throughout all levels of the hierarchy. Such a culture is cultivated by not only recognizing contributions through formal reward systems but also by promoting informal exchanges via team-building exercises and cross-functional

projects. This environment enables employees to feel valued for their input and safe to share their insights, driving the collective intelligence of the organization forward.

- Enhancement of Management Support: The role of management is pivotal in championing a knowledge-sharing culture. Leaders within pharmaceutical firms should be trained to understand the importance of knowledge sharing and to act as role models in this domain. By incorporating knowledge sharing into the core performance metrics for managers, the organization ensures that it is seen as a priority at all levels. Leaders must be provided with the necessary tools to facilitate such practices within their teams, making knowledge sharing a key aspect of the daily work routine.
- Investment in IT Infrastructure: A decisive move for pharmaceutical companies is to invest in IT infrastructure that supports and enhances knowledge sharing across the organization. This investment must prioritize user-friendly, accessible tools that encourage collaboration and information exchange. To stay relevant and effective, these systems require regular updates and a strategic alignment with the evolving needs of the workforce. Such infrastructure becomes the backbone of a knowledge-centric organization, enabling seamless communication and the storage of valuable insights.

By highlighting the indirect yet impactful role of IT infrastructure and reciprocal benefits in innovation, this study prompts a reassessment of resource allocation and the management of innovation processes. It encourages pharmaceutical firms to align their IT investments with strategic knowledge management objectives and to foster a reciprocal culture that, while not directly influencing ICP, is essential for a thriving knowledge-sharing ecosystem.

In synthesizing these theoretical insights and practical recommendations, the present study advances the academic discourse and provides actionable strategies for pharmaceutical firms striving to navigate the complex innovation landscape. It underscores the importance of strategic knowledge management as an integral component of a firm's innovation agenda, thereby contributing to the enhancement of competitive advantage in a dynamic and challenging industry.

7. Conclusions

This paper illuminates the critical role of innovation capability and performance (ICP) as a cornerstone for securing a competitive edge in the pharmaceutical industry. Through a comprehensive review of the literature encompassing ICP, knowledge sharing (KS), and key determinants such as organizational culture, management support, IT support, trust, and reciprocal benefit, we have provided a multifaceted analysis of innovation drivers. Our findings reveal the pivotal role of KS as a conduit through which the essential factors more robustly enhance ICP. The direct impact of these determinants, while significant, is amplified through the facilitation of knowledge exchange within firms. This insight is instrumental for pharmaceutical companies aiming to harness their full innovative potential and underscores the need for fostering a knowledge-rich environment.

This work represents a novel contribution to the field by being one of the first empirical studies to dissect the interconnections between knowledge-sharing (KS) determinants and innovation capability and performance (ICP) within the pharmaceutical industry. It breaks new ground by moving beyond the traditional siloed analysis of KS or ICP, instead unveiling the crucial mediating role of KS in amplifying the impact of key organizational factors on innovation outcomes. The study's proposed framework introduces a pioneering perspective, emphasizing previously under-represented elements such as organizational culture and trust as foundational to fostering a conducive environment for innovation. By highlighting the indirect yet significant influence of IT support and reciprocal benefit through KS, this research provides actionable insights for industry leaders, suggesting that the strategic cultivation of knowledge-sharing practices can substantially enhance a firm's innovative capabilities and performance. The findings set the stage for further research, particularly in exploring how IT and reciprocity can be optimized to drive innovation,

thereby offering a fresh, comprehensive lens through which the pharmaceutical industry can strategize and thrive in its complex and competitive landscape.

For future research, we propose several directions to extend the understanding of this domain. A deeper investigation into how IT support can be leveraged beyond its facilitative role in KS to directly influence ICP is needed. The role of reciprocity in KS and its potential to convert into measurable innovation outcomes warrants a more detailed examination. Moreover, expanding the research to include additional industry-specific factors, such as regulatory changes, patient-centric approaches, and digital transformation's impact on innovation, could provide a holistic picture of the innovation landscape in the pharmaceutical sector. Furthermore, cross-industry comparative studies could offer insights into whether the relationships observed in the pharmaceutical context hold true in other sectors, potentially unveiling universal principles of innovation management. Longitudinal studies assessing the long-term impact of KS on ICP could also contribute to a more dynamic understanding of these processes.

Author Contributions: Conceptualization, S.S.M.Y. and H.Y.L.; methodology, S.S.M.Y.; formal analysis, H.Y.L.; writing—review and editing, S.S.M.Y. and H.Y.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research is funded by the CPCE, HK PolyU [project reference number SP-CB2017-114(J)].

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data available on request due to restrictions.

Acknowledgments: The authors would like to thank the Hong Kong Polytechnic University and the Hang Seng University of Hong Kong for supporting this research.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Robb, A.; Rohrschneider, M.; Booth, A.; Carter, P.; Walker, R.; Andrews, G. Enhancing organisational innovation capability—A practice-oriented insight for pharmaceutical companies. *Technovation* **2022**, *115*, 102461. [CrossRef]
2. Heredia-Calzado, M.; Duréndez, A. The influence of knowledge management and professionalization on the use of ERP systems and its effect on the competitive advantages of SMEs. *Enterp. Inf. Syst.* **2019**, *13*, 1245–1274. [CrossRef]
3. Hung, Y.; Huang, S.; Lin, Q.; Tsai, M. Critical factors in adopting a knowledge management system for the pharmaceutical industry. *Ind. Manag. Data Syst.* **2005**, *105*, 164–183. [CrossRef]
4. Baines, A.D. Problems Facing the Pharmaceutical Industry and Approaches to Ensure Long Term Viability. Master's Thesis, University of Pennsylvania, Philadelphia, PA, USA, 2010. Available online: http://repository.upenn.edu/od_theses_msod/33 (accessed on 10 November 2019).
5. Tufts Center for the Study of Drug Development. Cost to Develop and Win Marketing Approval for a New Drug Is $2.6 Billion. 2014. Available online: https://f.hubspotusercontent10.net/hubfs/9468915/TuftsCSDD_June2021/pdf/pr-coststudy.pdf (accessed on 22 March 2019).
6. Cancer Research, U.K. How Long a New Drug Takes to Go through Clinical Trials. 2015. Available online: http://www.cancerresearchuk.org/about-cancer/find-a-clinical-trial/how-clinical-trials-are-planned-and-organised/how-long-it-takes-for-a-new-drug-to-go-through-clinical-trials (accessed on 14 November 2017).
7. Leavitt, M.P. The Role of Knowledge Management in New Drug Development. 2003. Available online: https://pdfs.semanticscholar.org/9075/6392004dfe02f43896f2f4ef1040488e676f.pdf (accessed on 19 November 2018).
8. Li, Y.L.; Tsang, Y.P.; Wu, C.H.; Lee, C.K.M. A Multi-Agent Digital Twin–Enabled Decision Support System for Sustainable and Resilient Supplier Management. *Comput. Ind. Eng.* **2023**, *187*, 109838. [CrossRef]
9. Segate, R.V. Securitizing Innovation to Protect Trade Secrets between" the East" and" the West": A Neo-Schumpeterian Public Legal Reading. *UCLA Pac. Basin Law J.* **2020**, *37*, 59.
10. TianRan, Z.J.T. Using intelligent ontology technology to extract knowledge from successful project in IoT enterprise system. *Enterp. Inf. Syst.* **2021**, *16*, 1913240. [CrossRef]
11. Alavi, M.; Leidner, D. Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Q.* **2001**, *25*, 107–136. [CrossRef]

12. Kharabsheh, R.; Magableh, I.; Zuriqat, K. Factors Affecting Knowledge Sharing (KS) in Jordanian Pharmaceutical Companies. Paper Presented at the 584-XXII. 2012. Available online: https://search-proquest-com.ezproxy.lb.polyu.edu.hk/docview/1326757158?accountid=16210 (accessed on 25 March 2019).
13. Bouthillier, F.; Shearer, K. Understanding Knowledge Management and Information Management: The Need for an Empirical Perspective. 2002. Available online: http://www.informationr.net/ir/8-1/paper141.html (accessed on 9 January 2019).
14. Terziovski, M.; Morgan, J.P. Management practices and strategies to accelerate the innovation cycle in the biotechnology industry. *Technovation* **2006**, *26*, 545–552. [CrossRef]
15. Tsang, Y.P.; Fan, Y.; Feng, Z.P.; Li, Y. Examining supply chain vulnerability via an analysis of ESG-Prioritized firms amid the Russian-Ukrainian conflict. *J. Clean. Prod.* **2024**, *434*, 139754. [CrossRef]
16. Paroutis, S.; Al Saleh, A. Determinants of knowledge sharing using Web 2.0 technologies. *J. Knowl. Manag.* **2009**, *13*, 52–63. [CrossRef]
17. Bartol, K.M.; Srivastava, A. Encouraging Knowledge Sharing: The Role of Organizational Reward Systems. *J. Leadersh. Organ. Stud.* **2002**, *9*, 64–76. [CrossRef]
18. Chua, A. Knowledge sharing: A game people play. *Aslib Proc.* **2003**, *55*, 117–129. [CrossRef]
19. Pan, L.S.; Scarbrough, H. A Socio-Technical View of Knowledge Sharing at Buckman Laboratories. *J. Knowl. Manag.* **1998**, *2*, 55–66. [CrossRef]
20. Davenport, T.H.; Prusak, L. *Working Knowledge: How Organizations Manage What They Know*; Harvard Business School Press: Boston, MA, USA, 1998.
21. Bandera, C.; Keshtkar, F.; Bartolacci, M.R.; Neerudu, S.; Passerini, K. Knowledge management and the entrepreneur: Insights from Ikujiro Nonaka's Dynamic Knowledge Creation model (SECI). *Int. J. Innov. Stud.* **2017**, *1*, 163–174. [CrossRef]
22. Chen, Z.S.; Lu, J.Y.; Wang, X.J.; Pedrycz, W. Identifying digital transformation barriers in small and medium-sized construction enterprises: A multi-criteria perspective. *J. Knowl. Econ.* **2024**, 1–37. [CrossRef]
23. Bock, G.W.; Zmud, R.W.; Kim, Y.G.; Lee, J.N. Behavioral Intention Formation in Knowledge Sharing: Examining the Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate. *MIS Q.* **2005**, *29*, 87–111. [CrossRef]
24. Vijayabanu, C.; Renganathan, R.; Srinivasakumar, V.; Vijayanand, V. Upshot of Knowledge Management Practices in Pharmaceutical Industry-case study. *Res. J. Pharm. Biol. Chem. Sci.* **2016**, *7*, 1687–1690.
25. Ismail Al-Alawi, A.; Yousif Al-Marzooqi, N.; Fraidoon Mohammed, Y. Organizational culture and knowledge sharing: Critical success factors. *J. Knowl. Manag.* **2007**, *11*, 22–42. [CrossRef]
26. Nguyen, T.L. Assessing Knowledge Management Values By Using Intellectual Capital to Measure Organizational Performance. Ph.D. thesis, Nova Southeastern University, Fort Lauderdale, FL, USA, 2016.
27. Lee, J.C.; Shiue, Y.C.; Chen, C.Y. Examining the impacts of organizational culture and top management support of knowledge sharing on the success of software process improvement. *Comput. Hum. Behav.* **2016**, *54*, 462–474. [CrossRef]
28. Wu, W.L. To share knowledge or not: Dependence on knowledge-sharing satisfaction (Report). *Soc. Behav. Personal.* **2013**, *41*, 47–58. [CrossRef]
29. Leonard-Barton, D. *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation*; Harvard Business School Press: Boston, MA, USA, 1995.
30. Titi Amayah, A. Determinants of knowledge sharing in a public sector organization. *J. Knowl. Manag.* **2013**, *17*, 454–471. [CrossRef]
31. Lee, D.J.; Ahn, J.H. Reward systems for intra-organizational knowledge sharing. *Eur. J. Oper. Res.* **2007**, *180*, 938–956. [CrossRef]
32. Wang, D.; Ozden, M.; Tsang, Y.P. The impact of facilitating conditions on electric vehicle adoption intention in China: An integrated unified theory of acceptance and use of technology model. *Int. J. Eng. Bus. Manag.* **2023**, *15*, 18479790231224715. [CrossRef]
33. Hicks, C.R.; Dattero, R.; Galup, D.S. The five-tier knowledge management hierarchy. *J. Knowl. Manag.* **2006**, *10*, 19–31. [CrossRef]
34. Tsang, Y.P.; Fan, Y.; Lee, C.K.M.; Lau, H.C. Blockchain sharding for e-commerce supply chain performance analytics towards Industry 5.0. *Enterp. Inf. Syst.* **2024**, 2311807. [CrossRef]
35. Soo, K.S. Why Workers Share or Do Not Share Knowledge: A Case Study. Ph.D. Thesis, Indiana University, Bloomington, IN, USA, 2006.
36. Ying, L.; Liu, X.; Li, M.; Sun, L.; Xiu, P.; Yang, J. How does intelligent manufacturing affects enterprise innovation? The mediating role of organisational learning. *Enterp. Inf. Syst.* **2022**, *16*, 630–667. [CrossRef]
37. Anwar, S.; Prasad, K.D. Factors influencing knowledge sharing behaviour: Developing a theoretical framework. *Int. J. Manag. Prudence* **2011**, *3*, 7–11.
38. Boateng, H.; Agyemang, G.F. A qualitative insight into key determinants of knowledge sharing in a public sector institution in Ghana. *Inf. Dev.* **2016**, *32*, 35–43. [CrossRef]
39. Stoddart, L. Managing intranets to encourage knowledge sharing: Opportunities and constraints. *Online Inf. Rev.* **2001**, *25*, 19–29. [CrossRef]
40. Hajizadeh, H.; Makvandi, F.; Amirnejad, G. The effective coaching factors in operational managers of Persian gulf petrochemical company in motivation of human resources. *Int. J. Eng. Bus. Manag.* **2022**, *14*, 18479790211037222. [CrossRef]
41. Dosa, T.A.; Al-husseini, J.S. Top Management Support as an Enabling Factor for Academic Innovation through Knowledge Sharing. *Int. J. Educ. Pedagog. Sci.* **2017**, *11*, 2045–2205.

42. Al Saifi, S.; Dillon, S.; McQueen, R. The Relationship between Management Support and Knowledge Sharing: An Exploratory Study of Manufacturing Firms. *Knowl. Process Manag.* **2016**, *23*, 124–135. [CrossRef]
43. Barachini, F. Cultural and social issues for knowledge sharing. *J. Knowl. Manag.* **2009**, *13*, 98–110. [CrossRef]
44. Raed, K.; Ra'ed, M.; Gharibeh, A.H. The impact of knowledge sharing enablers on knowledge sharing capability: An empirical study on Jordanian telecommunication firms (Report). *Eur. Sci. J.* **2013**, *9*, 237.
45. Levin, D. Nurturing Interpersonal Trust in Knowledge-Sharing Networks. *Acad. Manag. Exec.* **2003**, *17*, 64–77.
46. Mooradian, T.; Renzl, B.; Matzler, K. Who Trusts? Personality, Trust and Knowledge Sharing. *Manag. Learn.* **2006**, *37*, 523–540. [CrossRef]
47. Tohidinia, Z.; Mosakhani, M. Knowledge sharing behaviour and its predictors. *Ind. Manag. Data Syst.* **2010**, *110*, 611–631. [CrossRef]
48. Casimir, G.; Lee, K.; Loon, M. Knowledge sharing: Influences of trust, commitment and cost. *J. Knowl. Manag.* **2012**, *16*, 740–753. [CrossRef]
49. Viriyasitavat, W.; Xu, L.D.; Sapsomboon, A.; Dhiman, G.; Hoonsopon, D. Building trust of Blockchain-based Internet-of-Thing services using public key infrastructure. *Enterp. Inf. Syst.* **2022**, *16*, 2037162. [CrossRef]
50. Nayak, S.; Jena, D.; Patnaik, S. Mediation framework connecting knowledge contract, psychological contract, employee retention, and employee satisfaction: An empirical study. *Int. J. Eng. Bus. Manag.* **2021**, *13*, 18479790211004007. [CrossRef]
51. Richard, O.C.; McMillan-Capehart, A.; Bhuian, S.N.; Taylor, E.C. Antecedents and consequences of psychological contracts- Does organizational culture really matter. *J. Bus. Res.* **2009**, *62*, 818–825. [CrossRef]
52. Chung, W.; Mustaine, E.; Zeng, D. A computational framework for social-media-based business analytics and knowledge creation: Empirical studies of CyTraSS. *Enterp. Inf. Syst.* **2021**, *15*, 1460–1482. [CrossRef]
53. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39. [CrossRef]
54. Chin, W.W.; Thatcher, J.B.; Wright, R.T. Assessing common method bias: Problems with the ULMC technique. *MIS Q.* **2012**, *36*, 1003. [CrossRef]