Knowledge Sharing and Innovative work Behavior: A Quantitative Study of Pharmaceutical Engineers in Morocco

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Abstract: In the fast-moving industrial environment of the world today, the importance of promoting innovation has clearly increased as a key driver of business performance. Nowhere is this more obvious than in the pharmaceutical industry, where the quest for advances in Research and development is viewed as crucial. Developing an awareness of the drivers of innovative working behavior among workforce members is of the highest priority, and this study investigates the link between knowledge sharing and innovative work behavior among pharmaceutical engineers in Morocco. Despite the increasing relevance of innovation in the pharmaceutical sector, studies on the effects of knowledge sharing in non-Western contexts are limited. This gap demonstrates the necessity for further research aimed at the Moroccan environment, where hierarchical structures and limited R&D capabilities influence knowledge-sharing practices. A sample of 286 pharmaceutical engineers contributed to a quantitative research study. The findings indicate that knowledge donating and knowledge collecting positively impact innovative work behavior, with knowledge donating exerts a greater influence. The paper highlights the value of promoting a culture of knowledge sharing to stimulate innovation. Limitations identified relate to the choice of convenience sampling and the restriction to a single sector. Additional investigation could be conducted in other sectors to better understand the links between knowledge sharing and innovative work behavior.

Keywords: Knowledge sharing, Moroccan context, Pharmaceutical industry, Quantitative study, Innovative work behavior

1. Introduction

The relevance of research and development to the pharmaceutical business is reflected in overall R&D investment in the entire field, as well as at the level of individual firms. Global R&D investment by pharmaceutical and bio-pharma businesses has climbed significantly, from USD 108 billion (2006) to USD 141 billion (2015) (Schuhmacher, Gassmann and Hinder, 2016). As pharmaceutical corporations in low- and moderate-income economies struggle with research and development (R&D) budgets, legislation, foreign competitors and expiring patents, innovation is the key to their success and sustainability. In addition, scientific papers exploring innovation in a context like ours are scarce (Benali, I., Acha, N. and Barka, H. 2021). The pharmaceutical field in Morocco is witnessing energetic growth, embodying a strategic domain orientated around the research, development and provision of advanced medical equipment (El Mokrini, Benabbou and Berrado, 2018). At the heart of this change process, knowledge sharing is a key factor, representing an indispensable component in shaping the IWB of the workforce in this rapidly shifting context (Ganguly, Talukdar and Chatterjee, 2020). Although knowledge sharing has been largely investigated in the context of innovative work behavior in several sectors, little attention has been devoted to studies relating directly to the pharmaceutical industry in Morocco. Most previous investigations have been performed in Western and Asian environments, where company infrastructures, Research and Development budgets and knowledge-sharing processes are quite different (Akkari et al., 2016). In Morocco, the pharmaceutical sector is confronted with some issues, notably a heavy hierarchical culture, restricted Research and Development investment and heavy reliance on imported raw materials (El Mokrini, Benabbou and Berrado, 2018). These issues can affect the way knowledge is shared to promote innovative work behavior. In addition, cultural and organizational obstacles can impede the free flow of knowledge, making it vital to better elucidate the dynamics of knowledge donation and knowledge collection in this particular environment. The Covid-19 crisis proved the pivotal importance of knowledge sharing in stimulating pharmaceutical innovation (Montani and Staglianò, 2022). In the Kingdom of Morocco, this unusual challenge has revealed the importance of better internal cooperation and speedy exchange of knowledge to tailor production systems, maintain supply chains and implement alternative processes. This shows the necessity in investigating knowledge sharing among this sector.

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Despite the increased significance of innovation in the pharmaceutical sector, limited scientific studies have investigated the effect of knowledge sharing on the innovative work behavior of pharmaceutical engineers in non-Western contexts. Although studies have examined this topic in other industries, the cultural, organizational, and economic specificities of the Moroccan pharmaceutical industry are still largely unexplored. In particular, the impact of knowledge sharing in environments with heavy hierarchies and restricted R&D assets have not been examined extensively. This gap in the literature emphasizes the necessity of carrying out this investigation in order to improve our insight into how knowledge sharing mechanisms affect innovation in this vital sector. This research paper attempts to answer this research gap by investigating the fundamental question: To what extent does knowledge sharing impact the innovative work behavior of pharmaceutical engineers in Morocco? By examining this under-explored field, this investigation offers empirical insights and invaluable recommendations for boosting innovative work behavior through effective knowledge sharing practices appropriate to the Moroccan pharmaceutical sector. This research project seeks to shed light on the basic processes that determine this critical connection between knowledge sharing and the spread of innovation in the Moroccan pharmaceutical profession. The contemporary context necessitates an in-depth understanding of the forces that stimulate innovation, not only to keep a competitive place in worldwide business, but also to respond to the rising requirements of the healthcare industry (Liu, Fan and Yang, 2022). Innovation in the pharmaceutical field is a powerful driver in the delivery of more efficacious, secure and accessible drugs, boosting public healthcare around the world. Innovation provides personalized treatments designed to match the situation of each person. At the parallel, it performs a significant contribution to enhancing the provision of healthcare by proposing more widely available drugs and innovative techniques of distribution (Romasanta, van der Sijde and van Muijlwijk-Koezen, 2020). Innovation facilitates regulatory compliance and reinforces medication reliability and security (Darwish et al., 2020). Sharing knowledge among collaborators has a tremendous impact on the productivity of pharmaceutical businesses (Bhatti et al., 2021). By fostering innovation and creativity, it boosts the drug discovery chain. Sharing knowledge also supports ongoing training, helping staff to remain informed of new advances in the sector (Azeem et al., 2021). In conclusion, knowledge sharing is an indispensable component for boosting competitiveness and long-term prosperity for pharmaceutical businesses. Therefore, the aim of our investigation is to study the link between knowledge sharing processes and IWB in pharmaceutical businesses. Thus, the objective of this research is therefore to investigate how the donation and collection of knowledge affect IWB in the pharmaceutical sector in Morocco. This paper adopts a structured design approach. The literature review discusses the constructs of knowledge sharing and innovative behavior at work, investigating their interconnection. The methodology presents research design, the study population and the data collection approach. The findings section provides a description of the study's results, with a subsequent discussion explaining the findings and their deeper implications. The paper is completed with an examination of the research's limitations and recommendations for directions of possible future investigation.

2. Theoretical Framework, Hypothesis Formulation and Field of Investigation

In this point, we present a summary of the existing research literature on the primary concepts and theoretical framework employed to study the effect of gift-donating and knowledge-collecting on the IWB. The output of this section constitutes the research model.

2.1 Conceptualizing Innovative Work Behavior

The accelerating development of technology has driven companies to innovate in pursuit of competitiveness and long-term sustainability (Iqbal et al., 2020a). As a consequence, organizations have attempted to rethink many fields, such as work conception (Bysted, 2013). As digitization has resulted in changes in client expectations, the requirement for workers to adopt innovative work behaviors and develop new solutions has also intensified (Li et al., 2019). Innovative work behavior has been described as conducts linked to the initiation, direction and guidance of new or valuable thoughts/products, work processes for corporations (De Jong and Den Hartog, 2010). As a multi-step development procedure, IWB (Sethibe and Steyn, 2017) is a motivational process that is shaped by workers' qualifications, expertise and backgrounds (Bammens, 2016). Innovative work behavior is complex conduct that favorably influences corporate and employee effectiveness, identifies and generates novel thoughts, and involves citizenship behavior (Janssen, 2000).

It has been shown that innovative individuals are generally more inclined than non-innovative individuals to experiment, make mistakes and accept new risks (Sönmez and Yıldırım, 2014). All actions designed to accomplish corporate purposes, including new processes, new strategies, new products, and the R&D of new techniques, assuming that all aspects have been considered in the course of innovative work behavior (Yuan and Woodman,

2010). (De Jong and Den Hartog, 2010) and (Al-Omari, M.A., Choo, L.S. and Ali, M.A.M. 2019) conceived innovative work behavior as encompassing four components: idea exploration(1), idea generation(2), idea promotion(3) and idea implementation(4) : (1) The identification of novel insights resulting in innovation solutions or vulnerabilities; (2) Idea generation entails the quest for alternative methods of overcoming difficulties and enhancing the actual situation; (3) The promotion of ideas is described as the dynamic spreading of new views, by forming partnerships and alliances, with the purpose of securing the approval and trust of the stakeholders implicated; (4) Implementation, which entails transforming thought into action, experiencing innovation, adjusting it and integrating it into working procedures.

2.2 Knowledge Sharing

Knowledge sharing is defined as a social exchange in which workers exchange expertise, know-how and competencies inside the corporation (Lee, Tao, Li and Sun, 2021). Knowledge sharing is "a human conduct that comprises a set of actions involving the interchange of explicit and/or implicit feedback, and the incorporation of thoughts and expertise that enable knowledge for innovation inside companies" (Kumar and Che Rose, 2012). Knowledge sharing is a learning procedure between workers aimed at supporting each other to increase their capabilities, overcome difficulties and boost their productivity at work (Nguyen, Siri and Malik, 2021). Knowledge sharing covers the procedure for providing appropriate knowledge directly to co-workers inside the company (Grant, S.B. 2016)**;** (Zhang and Jiang, 2015). This is a pivotal process through which organizational stakeholders participate in knowledge development, innovation and, eventually, increased competitivity (Marouf and Khalil, 2015). (De Ridder and van den Hooff, 2004) consider knowledge sharing to be a phenomenon in which workers typically interchange their implicit and explicit information to generate new knowledge. Knowledge sharing is described as the exchange of job-related information, guidance and know-how to support and cooperate with colleagues in performing day-to-day duties, finding new solutions to challenges and generating new thoughts (Nguyen, 2021). Moreover, (Ortiz, J. et al., 2017) affirms that knowledge sharing arises when individuals energetically divulge their business knowledge or expertise to individuals in order to enable them to acquire new insights. Knowledge sharing is a continuous process of shifting experience and corporate knowledge into business procedures via lines of communication among workers, teams and companies (Sedighi et al., 2016).

Knowledge sharing is classified under the following components: knowledge donating and Knowledge collecting. The first is to successfully communicate knowledge, expertise and capabilities with other employees. This might be accomplished in a multitude of manner, such as teaching, coaching, tutoring, attending seminars and so on. The knowledge donating is grounded in the premise of providing what we have acquired to contribute to the advancement and progression of other individuals (Chen et al., 2021). Knowledge collecting: This comprises the cycle of examining, collecting, and gathering knowledge from a diverse range of sources. It's about collecting pertinent and valuable knowledge and then applying it to resolve issues, to create new insights and to be innovative. Knowledge collecting can entail documentary investigation, data analysis, observation, investigation and so on (Herjanto, Amin and Fatimah, 2024). The two components of knowledge sharing expand knowledge and foster progression in numerous areas of lifecycle, regardless of the business or scientific environment (Islamy, Yuniarsih and Wibowo, 2020).

2.3 The Link Between Knowledge Sharing and Workers' IWB

Several investigations into knowledge management have strengthened the idea that knowledge sharing results in enhanced corporate performance, such as innovation (Du Plessis, 2007). Innovation is described as "a process by which economic or social utility is derived from knowledge via the generation, propagation and conversion of knowledge to create novel or materially advanced products or services that are employed by the community" (Kahn, 2018). Modern corporations struggle to preserve their position of strength in the market by upgrading their talented and imaginative labor force. Much research has been devoted to the value of qualified HR and human capital in tackling corporate problems linked to sustainability and innovation (Long, C.S et al., 2014). Multiple findings have demonstrated that knowledge management is critical to enhancing corporate effectiveness (Kim, Newby-Bennett and Song, 2012). As knowledge is the greatest corporate asset, it provides new business outputs to be obtained, which also encompasses innovation (Areed, S., Salloum, S.A. and Shaalan, K. 2020). Knowledge sharing creates the potential for resolving problems as well as increasing productivity at the workplace (Rajabi Farjad, Mirsepasi and Naderi Mehrbani, 2021). Knowledge is the fundamental foundation of the innovation cycle. Besides a limited number of publications on knowledge sharing and IWB, the earlier studies remain limited in the drivers that encourage workers to embrace IWB (Akram et al., 2020). in the view of (Tran et al., 2021), a firm that fosters knowledge-sharing within its teams is expected to stimulate new thinking and new corporate initiatives, resulting in greater innovation actions. Many scientists have identified that

knowledge sharing exerts a significant beneficial effect on innovative behavior. Knowledge sharing provides individuals with the ability to transmit their skills to other individuals and provides others with the possibility of learning useful skills. (Azeem et al., 2021) examined the role of knowledge sharing in fostering innovation, finding that it has a significant effect on innovation.

Finally, scientific literature has also emphasized the importance of more in-depth analysis of innovation and knowledge sharing (Long, C.S et al., 2014). This paper discusses these major facets of knowledge sharing in association with innovative work behavior, which have received little debate in the field of scientific research. Innovation is the product of the mutual interchange of knowledge between workforce members. Sharing knowledge yields useful insights that then facilitate and predict innovative behavior (Castaneda and Cuellar, 2020). As a result, it can be postulated that the knowledge donating and collecting has a beneficial effect on the innovative working behavior of employees inside the corporation. While knowledge sharing is vital for promoting innovative work behavior, it is not without its shortcomings. Certain investigations emphasize that the withholding information for risk of compromising an internal competitive advantage can slow down the process of knowledge sharing (Davenport and Prusak, 2000). Furthermore, in environments similar to North Africa, cultural constraints that include inflexible hierarchies and a low degree of corporate trust can impede the sharing of knowledge (Hislop, D. 2013). In response to such challenges, a range of new solutions has evolved, notably informal learning and open innovation. Open innovation drives firms to exchange knowledge with external stakeholders to foster innovation and creativeness (Chesbrough, 2003). Informal learning is rooted in spontaneous unstructured exchanges, promoting innovation while avoiding the necessity of using structured knowledge management processes (Weick and Sutcliffe, 2001). These observations demonstrate that a flexible form of knowledge sharing, which considers cultural and corporate characteristics, is vital for successfully promoting innovative work behavior. Our work proposed the hypothesis that knowledge is indispensable for innovative behavior and that, as a result, KS plays a favorable effect on the generation of innovative work behavior among workers inside the firm. Drawing on previous debates and the examination of early articles, the next hypotheses are presented.

H1: knowledge donating influences pharmaceutical engineers' IWB positively and significantly.

H2: Knowledge collecting influences pharmaceutical engineers' IWB positively and significantly.

2.4 Field of Investigation

During the previous ten years, the Moroccan healthcare sector has been reinforced by the government's commitment to improving the pharmaceutical sector. Morocco's domestic pharmaceutical industry serves more than 70% of the market, with the residual 30% supplied by international suppliers such as Galencia, Pfizer and Pharma. In the wake of the COVID-19 crisis and the pharmaceutical sector's fast-changing environment, additional efforts are essential to adjust the economic structure of the Moroccan pharmaceutical sector. Morocco's pharmaceutical business is the second most profitable chemical industry in the kingdom, after phosphate manufacturing, which was integrated into the national plan for the promotion of priority industries in 2013. The Moroccan pharmaceutical business is ranked as one of the five best-performing businesses on the African continent. It is estimated to be valued at about 2.5 billion USD and represents about 0.13% of the total medicines trade in terms of value. The Moroccan pharmaceutical manufacturing industry achieves a sales figure of 13.7 billion DH (1.4 billion USD). Moroccan pharmaceutical exports have demonstrated dynamic expansion in the past few years. The kingdom exported pharmaceuticals to a total value of 1 billion USD, largely to certain countries in sub-Saharan Africa and the Middle East in 2023 (El-Akhdar, Mardhy and Kerak, 2015). The kingdom devotes approximately 0.8% of its Gross Domestic Product to R&D, a proportion that is still weak by international standards. The kingdom has the benefit of reduced production expenditures than European countries but continues to be reliant on imports of drug raw materials (Timur, Picone and DeSimone, 2011). While funding in R&D continue to be inadequate in relation to more advanced economies from the European union (Timur, Picone and DeSimone, 2011) and USA (Karamehic et al., 2013). In Europe, the pharmaceutical industry is estimated to represent 300 billion USD by 2025, i.e. 120 times the volume of the kingdom industry. Firms are spending 16-18% of their turnover on R&D, and some 60% of drugs sold are generics (Hernlund et al., 2013). In the USA, the industry is valued at 500 billion USD, with investments equivalent to 20% of turnover, i.e. approximately 100 billion USD annually. The United States is a leading producer of biotech and pharmaceutical innovation (Karamehic et al., 2013). In contrast, Kingdom's drug industry will generate approximately 2.5 billion USD by 2025, with 40% of the market devoted to generics, but it continues to outstrip these economies in both research and development investment and market volume. Nevertheless, it continues to be a regional leader in the African continent. The kingdom offers a supportive legal framework for the drug sector, with measures

aimed at enhancing access to medicines and encouraging domestic production. Nevertheless, significant challenges remain, notably regarding import dependency (El-Akhdar, Mardhy and Kerak, 2015)**.** The effects of public health policy reforms and the rising popularity of generic medicines present opportunities for market share development in Africa and elsewhere. From a cultural point of view, the Moroccan labor force combines a combination of traditional practices and contemporary innovations, with a slight resistance to the quick changes in managerial or technological infrastructures common in more mature pharmaceutical industries (Rana and Roy, 2015)**.**

3. Methodology and Data Analysis

3.1 Methodological Choice

The research methodology adopted in this research follows a quantitative method to investigate the association existing between KS and IWB among pharmaceutical engineers in Morocco. Data analysis is conducted using statistical tests including correlation analysis and multiple regression analysis to assess the hypotheses presented.

The questionnaire contains 16 items, structured into 3 major parts, dealing with topics such as Knowledge donating, Knowledge collecting and Innovative Work Behavior. Pharmaceutical engineers were requested to answer by means of a four-point Likert scale: (1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree). The 4-point Likert scale was adopted to avoid neutral answers and enhance measurement reliability. (Krosnick, 1991)**;** (Chang, 1994). Its ability to eliminate the possibility of a middle position obliges participants to adopt a precise viewpoint, thus enhancing comparability of findings and statistical significance (Cummins and Gullone, 2000); (DeVellis, 2017)**.**

The variables were operationalized following scales validated in the published literature: KD: Measured by items about readiness to share information, for example « When I have learned something new, I tell my colleagues about it ». KC: Measured by items regarding the intensity and efficiency of information collecting, for example « Colleagues in my company share knowledge with me when I ask them to». IWB: Measured by items on the generation, promotion and implementation of innovative ideas, for example « I Create new ideas for difficult issues ». To measure the sub-measures of knowledge sharing, our investigation employed the scale developed by Lin (2007). To measure innovative behavior, we employed the 9-item scale developed by (Janssen, 2000) **(Appendix 1).** Reliability (Cronbach's alpha) and validity (factorial analysis) tests were conducted to assure the robustness of the findings. We adopted the convenience approach because of lack of access to the whole population of pharmaceutical engineers in Morocco. The unavailability of an exhaustive database of these engineers, and the complexities associated with identifying the engineers available to contribute to the research, restricted the use of random sampling. This method was selected because it ensures rapid, cost-effective data gathering and a high enough response rate for meaningful statistical analysis. Nevertheless, we are aware that convenience sampling could result in a selection bias. In seeking to reduce this bias, we broadened the sources of respondents by inviting engineers from a wide range of businesses and from different levels of experience. Participants were reached mostly by email using professional and university networks, with phone follow-up to boost the answer rate. Anonymity and confidentiality of answers were strictly preserved throughout the process.

3.2 Data and Analysis Methods

Content data showed the findings as follows: 136 participants were women, while 150 were men. Respondents were between 30 and 50 years of age. Pharmaceutical engineers were e-mailed and requested to complete a self-administered research survey. At the beginning, 400 questionnaires were delivered, but only 286 were answered and received for review. The questionnaire was administered in English, the predominant language employed in the workplace. This guaranteed that participants clearly comprehended the different questions and were able to respond precisely. Our research was undertaken with pharmaceutical engineers employed in Morocco kingdom, an influential element as cultural specificities and organizational structures could have a significant effect on the findings, in particular hierarchy, which could in turn have an effect on the manner in which knowledge is exchanged. Descriptive statistics were employed to summarize the data gathered and offer an overall perspective on the principal features of the respondent population. A factorial analysis was completed to verify the convergent and discriminant validity of the concepts, verifying that the variables were accurately reflected in the model. Secondly, a regression analysis was conducted to investigate the influence of knowledge donating and knowledge collecting on innovative work behavior. This allowed us to establish meaningful standardized coefficients, revealing strong relationships between the variables. SPSS 27 software

has been employed for all statistical analyses, guaranteeing methodological accuracy and an accurate analysis of the findings.

4. Findings and Statistical Analysis

4.1 Summary of Descriptive Data Analysis

Table 1 indicates that the variables knowledge donating, knowledge collecting, and innovative behavior are assessed on a scale ranging from 1 to 4. The mean score for 'knowledge donating' is 3.31, accompanied by a standard deviation of 0.971, suggesting a notably high level of knowledge sharing. Similarly, knowledge collecting has an average score of 3.11 with a standard deviation of 0.954, reflecting a strong tendency for acquiring knowledge. Regarding innovative behavior, the mean score is 3.23, with a standard deviation of 1.05, highlighting a significant inclination toward engaging in innovative activities.

Table 1a: Descriptive Statistics of the scales

	N	Minimum	Maximum	Mean	Std. Deviation
Innovative Work Behavior	286	1	4	3.23	1.051
Knowledge Collecting	286	1	4	3.11	.954
Knowledge donating	286	1	4	3.31	.971
Valid N (listwise)	286				

The descriptive statistics of the items in each construct (Kd, Kc, Iwb) have a minimum value of 1 and a maximum value of 4, and the mean values range from 3.05 to 3.40, indicating that the responses tend to be in the upper part of the scale. Among them, Kd1 has the highest mean (3.40), while Kc5 has the lowest mean (3.05), indicating slight variations in the response trend between the different items. The standard deviations range from 0.92 to 1.08, showing relatively similar variability in the responses. Overall, the data reveals a general preference for high scores, with slight fluctuations between the different categories.

Table 1b: Descriptive Statistics of the items

	Minimum	Maximum	Mean	Std. Deviation
Kd1	1	4	3.40	1.000
Kd2	1	4	3.25	.950
Kd3	1	4	3.28	.960
Kc1	1	4	3.15	.980
Kc2	1	4	3.05	.920
Kc3	1	4	3.13	.960
Iwb1	1	4	3.30	1.050
Iwb2	1	4	3.15	1.030
Iwb3	1	4	3.25	1.070
Iwb4	1	4	3.20	1.000
Iwb5	1	4	3.28	1.060
Iwb6	1	4	3.18	1.020
Iwb7	1	4	3.22	1.040
Iwb8	1	4	3.27	1.080
Iwb9	1	4	3.24	1.050

4.2 Exploratory Factor Analysis

In the aim to test the convergent and discriminant validity of the constructs of our study, a factor analysis was conducted with the aid of principal component analysis (Table 2). To assess whether the data were adequate for PCA, the KMO test of sampling adequacy and Bartlett's test are employed. (Hair et al., 2014). The results of a factor analysis test demonstrate that the dataset complies with the basic requirements of factor analysis and exhibits suitable correlations. The KMO value was 0.79, and the Bartlett coefficient test revealed statistical

relevance ($p < 0.001$). Principal component analysis (PCA) with Varimax rotation has then been performed to categorize all variables into principal components. The Kaiser test was carried out to define the set of factors, retaining only those principal components whose eigenvalues were greater than 1, while those with eigenvalues below 1 were considered irrelevant and eliminated. The factor analysis resulted in a three-factor solution, accounting for a satisfactory total cumulative variance of 78.96%. Principal component analysis further showed that items designed to measure the same construct loaded significantly onto the same principal component, with the lowest loading being 0.65. This suggests shared common variance, thereby confirming convergent validity. Moreover, items intended to measure different constructs mainly loaded onto separate components, which supports strong discriminant validity.

Table 2: Rotated component matrix[a]

	Component		
	1	2	3
Kd1	.71		
Kd2	.77		
Kd3	.65		
Kc1		.69	
Kc2		.88	
Kc3		.76	
Iwb1			.78
Iwb2			.72
Iwb3			.82
Iwb4			.91
Iwb5			.81
Iwb6			.72
Iwb7			.73
Iwb8			.72
Iwb9			.66
Extraction Method: Principal Component Analysis.			
a. 3 components extracted.			

4.3 Reliability Assessment Through Cronbach's Alpha

Before beginning the correlation analyzes and testing our hypotheses, we will study the reliability of the measurement scales studied with the help of Cronbach's Alpha. The findings of the reliability analyze of the constructs demonstrate that "Knowledge donating" with three items obtained a Cronbach's alpha coefficient of .762, denoting excellent reliability.

Reliability Statistics	
Cronbach's Alpha	N of Items
.762	3

Similarly, the "Knowledge Collecting" variable showed an alpha coefficient of .801 with three items, suggesting satisfactory reliability.

Reliability Statistics	
Cronbach's Alpha	N of Items
.801	3

The "Knowledge Sharing" variable combining the two previous variables presented satisfactory reliability with an alpha of around .783.

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.783	6

Finally, the variable "Innovative Behavior" presented the highest alpha coefficient, at .872, with nine items. These results support the reliability of the variables studied in this research.

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.872	9

4.4 Examination of Correlation Relationships

The correlation matrix (Table 3) illustrates the link between the variables of knowledge donating, knowledge collecting, and innovative behavior. The correlation coefficients are statistically significant at the 0.05 level. A notable positive correlation is found between knowledge donating and knowledge collecting ($r = .47$, $p < 0.05$), as well as between knowledge donating and innovative behavior ($r = .60$, $p < 0.05$). Furthermore, there is a significant positive correlation between knowledge collecting and innovative behavior ($r = .59$, $p < 0.05$).

Table 3: Pearson's Correlation Coefficient Matrix

		Innovative Work Behavior	Knowledge Collecting	Knowledge donating
Innovative Work Behavior	**Pearson Correlation**	--		
	N	286		
Knowledge Collecting	**Pearson Correlation**	.594**	--	
	Sig. (2-tailed)	<.001		
	N	286	286	
Knowledge donating	**Pearson Correlation**	.600**	.469**	--
	Sig. (2-tailed)	<.001	<.001	
	N	286	286	286
**. Correlation is significant at the 0.01 level (2-tailed).				

4.5 Hypothesis Evaluation Using Multiple Regression Analysis

The results concerning the overall fit of the model are shown in Table 4. This table shows an R^2 value of 0.49, indicating that 49% of the variance in innovative work behavior (IWB) can be explained by the predictor variables

Table 4: Goodness of fit

Model	R	R Square	Adjusted R Square
1	.696[a]	.485	.481
a. Predictors: (Constant), Knowledge Collecting, Knowledge donating			

The analysis of variance (ANOVA) reveals that the Fisher test further supports the model's relevance, with an F-statistic of 133.07 for 2 and 283 degrees of freedom. Then, the regression model provides a significantly better fit to the data compared to a model with no predictors.

Table 5: Analysis of variance [a]

The analysis of variance, presented in Table 5, confirms the relevance of the regression model, with an F-statistic of 133.07 and a significance threshold of less than 0.001. This suggests that the model significantly explains the variance in the innovative work behavior of pharmaceutical engineers.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	152.592	2	76.296	133.069	<.001[b]
	Residual	162.261	283	.573		
	Total	314.853	285			

a. Dependent Variable: Innovative Work Behavior

b. Predictors: (Constant), Knowledge Collecting, Knowledge donating

The results of the regression analysis presented in the table below demonstrate a significant impact of the variables knowledge donating and knowledge collecting on innovative behavior, with standardized coefficients of 0.441 and 0.446, respectively. This implies that a one-unit increase in knowledge donating corresponds to a 0.441 increase in innovative behavior, while a one-unit rise in knowledge collecting is associated with a 0.446 increase in innovative behavior. Both coefficients are statistically significant, with t-values of 8.285 and 8.519, and p-values both below 0.001. Concerning multicollinearity, the Variance Inflation Factor (VIF) values for both knowledge donating (2.283) and knowledge collecting (1.982) are below the threshold of 5, indicating no significant multicollinearity issues and thereby consolidating the robustness of our model.

Table 6: Regression coefficients and collinearity diagnostics[a]

The regression coefficients and collinearity diagnostics are presented in Table 6. This table shows standardized coefficients of 0.441 for knowledge donation and 0.446 for knowledge collection, both with significant t-values, confirming their positive impact on innovative work behavior. Furthermore, the collinearity indices (VIF) are below 5, indicating the absence of multicollinearity issues in our model.

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	T	Sig.	Tolerance	VIF
1	(Constant)	.274	.162		1.696	.091		
	Knowledge donating	.441	.053	.400	8.285	<.001	.438	2.283
	Knowledge collecting	.446	.052	.412	8.519	<.001	.505	1.982

a. Dependent Variable: Innovative Work Behavior

Figure 1 shows the normal P-P (Probability-Probability) plot of the standardized regression residuals, which is used to test the assumption of normality in the residuals of our regression model. As indicated by the plot, the points closely follow the diagonal line, demonstrating that the residuals are approximately normally distributed. This confirms the validity of the normality assumption, which is crucial for making reliable statistical inferences from our model

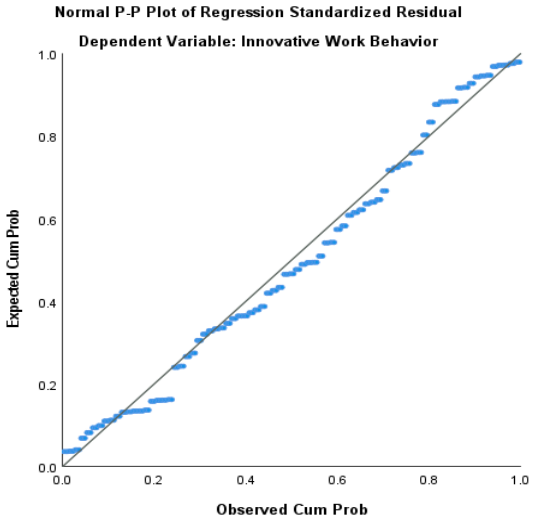

Figure 1: Normal P-P of standardized regression residuals

5. Analysis and Interpretation of Findings

The aim of this scientific research is to examine the effect of knowledge sharing on the innovative behavior of pharmaceutical engineers in Morocco. The experimental results of this survey strengthen the fundamental theoretical hypotheses. As a result of a detailed and methodologically accurate examination of the published papers, two major hypotheses have arisen, which have been consistently expanded and practically verified. This investigation aims to improve scientific insight by shedding light on the intricate interplay linking the interaction of KS processes and the encouragement of IWB in the pharmaceutical engineering field. The first hypothesis suggests that KD exerts a positive and statistically significant influence on the IWB of pharmaceutical executives.

The emerging evidence from this paper lends powerful weight to this hypothesis, pointing to the role of KD in promoting IWB. The study's conclusions underpin the suggestion that pharmaceutical engineers committed to the sharing of tacit and explicit knowledge inside their enterprise tend to exhibit a significantly higher level of devotion to the business's success. This conclusion is in keeping with the original paper by (Kmieciak, 2021)**,** who reported a positive correlation between KD and IWB. The second hypothesis posits that KC is positively correlated with the IWB of pharmaceutical executives. Our results validate this affirmation, supporting the underlying hypothesis. These insights reveal that employees with a desire to gain new knowledge in the corporate setting are significantly more likely to adopt a creative and innovative conduct inside their workplace which will improve the company’s performance. These results are in line with (Chen et al., 2021) insights, which reveal a positive correlation between KC and the IWB of IT firms. The KC process boosts workforce cognitive and intellectual capabilities, boosting the know-how pool critical to innovation. This perspective is endorsed by the pivotal papers of Smith (2006), who emphasize the importance of knowledge collecting in boosting competencies, resulting in the cultivation of IWB. The conclusions of this paper agree with existing scientific studies, in particular the research carried out by (Du Plessis, 2007)**,** who established that knowledge sharing operates as a catalyst to promote IWB. In agreement with these points, (Migdadi, 2020)**,** one of the leading academics in this field, has also stressed the positive benefits of KS in developing and sustaining IWB inside organizations. In addition, the empirical findings of this paper uncover important insights, proving that knowledge donating (KD) and knowledge collecting (KC) have a statistically relevant effect on staff's innovative behavior (IB). Our study indicates that giving and gathering knowledge play a major part in the promotion of innovative working behavior. (Swan and Newell, 2000) explains the notion of knowledge exchange covers much broader issues than merely the exchange of ideas: it refers to the harmonization, optimization and conversion of knowledge into practical, meaningful information. When staff learn actively from their workmates, they greatly boost their capacity to be creative (Obeidat, Al-Suradi and Tarhini, 2016)**.**

The empirical findings discussed strengthen the substantial and statistically relevant role of knowledge donating (KD) and knowledge collecting (KC) in the innovative behavior of pharmaceutical engineers. Analysis of the findings reveals that while Knowledge Collecting (KC) has a positive and significant effect on the Innovative Work Behavior (IWB) of pharmaceutical engineers, its influence is less marked than that of Knowledge Donating (KD). This result can be attributed to a number of organizational and behavioral reasons, such as the active

contribution of knowledge donating to the acceleration of innovation, when engineers actively share their skills and knowledge with others, they ensure fast access to practical thoughts and potential solutions, shortening the time required to test and introduce new processes, This finding is in agreement with the research by (Chen et al., 2021) who found that firms where knowledge sharing is promoted are more successful in implementing innovative practices, in addition, knowledge collecting requires a receptive and individual process, where the engineer must search for, understand and interpret data before using it. In contrast, knowledge donating creates an immediate collective workflow, where ideas are shared immediately, enabling a dynamic and collaborative exchange inside the company (Swan and Newell, 2000).

6. Conclusion and Managerial Implications

This research investigated the pivotal role of knowledge sharing in the fostering of innovative behavior by pharmaceutical engineers in Morocco. Using a strict methodological framework founded on quantitative research, the findings of this examination underline the importance of knowledge sharing (KS) in the Moroccan pharmaceutical industry, whether from a managerial or theoretical viewpoint. By implementing appropriate strategies, techniques and management methods that encourage the sharing of knowledge, organizations can not only promote innovation and boost productivity but also consolidate their competitive advantage in the global marketplace. The positive and significant findings concerning hypotheses H1 and H2 emphasize the fundamental relevance of promoting an organizational culture that encourages KS among pharmaceutical engineers which will push them to adopt innovative work behavior.

These findings are in alignment with prevailing theories on knowledge management and corporate innovation, demonstrating that the transfer and gathering of knowledge are vital drivers for boosting worker productivity and corporate performance. An interesting observation can be deduced from an examination of the results of the two components of knowledge sharing. On the one side, KD creates a supportive, participative culture in which engineers can exchange their know-how and develop the firm's collective capabilities. On the other side, knowledge gathering becomes more and more central to the process of producing innovative behavior, as it assists engineers in gaining new expertise, acquiring new insight. The managerial repercussions of this investigation are enormous. pharmaceutical businesses are expected to introduce more robust knowledge management processes, and ongoing learning to facilitate both the donation and collection of knowledge. It is also critical to develop a spirit of innovation, encouraging engineers to discuss and debate with each other, and to adopt a lifelong learning mindset. In addition, executives and HR leaders are expected to implement incentive mechanisms such as performance appraisal, and incentives for individuals who engage constructively in knowledge-sharing efforts.

The example of the Covid-19 crisis highlights the crucial role of knowledge sharing in accelerating innovation. During the pandemic, rapid knowledge exchange among pharmaceutical engineers, researchers, and organizations worldwide enabled the swift development of vaccines and treatments. In Morocco, collaborations between laboratories and institutions helped pharmaceutical companies quickly adapt to new production and distribution challenges. This example underscores that fostering knowledge-sharing practices not only enhances innovation but also strengthens resilience in times of crisis.

In short, this investigation points to a strategic issue for the Moroccan pharmaceutical business: enhancing intra- and inter-organizational collaboration to maximize the returns on innovation. In a worldwide environment characterized by accelerating technological developments and rigorous regulatory requirements, it is essential for pharmaceutical businesses to incorporate strategies based on co-development, collaboration with universities and membership of international scientific communities. The managerial implications of these findings are numerous. Moroccan pharmaceutical corporations are expected to implement collaborative platforms and provide special incentives to motivate sharing knowledge. It would also be advantageous to implement strategies for on-going training and the digitization of information circulation procedures to improve access to the best qualifications and scientific progress. In a highly regulatory and competitive industry, fostering a culture of collaboration and cooperation can be a major strategic asset. Although this research makes valuable advances in our understanding of the association between knowledge sharing and innovative work behavior, it has several limitations. First, the fact that the research concentrates on a single industry restricts the generalizability of the results to other sectors with varying organizational structures or resource deployment. Future investigations could investigate other industries, such as technology or manufacturing, to get a deeper insight into the universal applicability of knowledge-sharing techniques in various organizational environments. Second, although robust, the methodology applied in this research is based exclusively on quantitative measures, which restrict the understanding of qualitative dimensions that may affect knowledge sharing, like

personal incentives or organizational culture. More in-depth investigations could employ a mixed-method approach, using both quantitative surveys and qualitative interviews, to develop a more detailed insight into the personal and organizational forces that promote or inhibit knowledge sharing. Third, future investigations could investigate the moderating and mediating influences of leadership styles, technology, and organizational culture on the link between knowledge sharing and IWB, thereby furnishing a more complete picture for promoting innovation within the Moroccan pharmaceutical industry. Finally, Advanced exploration of the contribution of digital techniques and artificial intelligence to enhance knowledge sharing may also be a valuable avenue of investigation. Further investigations may examine the contribution of artificial intelligence and digital knowledge management systems to facilitating knowledge sharing and innovation for pharmaceutical organizations. The successful application of AI-based platforms could enhance real-time knowledge interchange and maximize the collaborative innovation cycle.

AI statement: "No artificial intelligence tools were used in this study."

Ethical statement: "This research was conducted in accordance with all applicable ethical guidelines."

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Appendix 1

Constructs	Items
Knowledge donating	When I have learned something new, I tell my colleagues about it When they have learned something new, my colleagues tell me about it Knowledge sharing among colleagues is considered normal in my company
Knowledge collecting	I share information I have with colleagues when they ask for it I share my skills with colleagues when they ask for it Colleagues in my company share knowledge with me when I ask them to Colleagues in my company share their skills with me when I ask them to
Innovative work behavior	I create new ideas for difficult issues I search out new working methods, techniques, or instruments I generate original solutions for problems I mobilize support for innovative ideas I acquire approval for innovative ideas I make important organizational members enthusiastic for innovative ideas I transform innovative ideas into useful applications I introduce innovative ideas into the work environment in a systematic way I evaluate the utility of innovative ideas