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Leveraging Business Analytics and Knowledge-Based HRM Practices to Enhance Organizational Agility and Drive Innovation Performance

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ABSTRACT

The main aim of this study is to evaluate how new Business Analytics (BA) technologies can improve knowledge management in HRM and influence innovation output. The researchers will use a quantitative method by distributing an online questionnaire to professionals in the pharmaceutical field. Information will be collected on how BA, new knowledge in Human Resource Management (HRM), agility, and innovation influence the organization's results accordingly. This study uses PLS-SEM for reliability and hypothesis validation. The findings of this study empirically validate the study's hypotheses, confirming a significant and positive effect on BA, knowledge-based HRM (KBHRM) practices, and Organizational Agility (OA) on innovation performance (IP). This study suggests that it is essential for innovation performance to consider the following determinants: BA, KBHRM practices, and OA; all hypotheses received strong empirical support. The regression model confirms that these factors jointly account for a significant portion of the variance in innovation outcomes. The findings of this study suggest that managers are looking to improve the organizational IP. The senior leadership should lead the integration of BA into the strategic decision-making process at an organization by investing in cutting-edge analytical tools, the development of data competency within teams, and the definition of key performance indicators (KPIs) that link analytics efforts to the outcomes of innovation. Practical conclusions highlight organizations interested in improving the performance of innovation via BA, KBHRM practices, and OA. Arguably, firms should focus their investments on developing BA capabilities, such as advanced data processing tools and employees' data literacy, to facilitate evidence-based decision-making and drive innovation.

Keywords: Business Analytics, Knowledge-based HRM Practices, Organizational Agility, innovation performance, Human Resource Management, Data-Driven Decision Making, Organizational Innovation.

Introduction

Increasingly, businesses are utilizing analytics to enhance the management of knowledge and human resources within their organizations (Bahuguna, Srivastava, & Tiwari, 2024). From merely reporting, analytics in HRM are now being used to provide insights through innovative prediction tools. They make it convenient for HR teams to handle key operations, such as sharing knowledge among employees, teaching new talents, and recruiting the right workers (Bangura, 2024). Currently, organizations rely on HRM analytics to identify future trends in the workforce, recognize shortcomings in employee skill sets, and develop targeted programs for individual workers (Qamar & Samad, 2022). HR professionals can enhance their decision-making by evaluating employee performance, potential attrition, and potential based on gathered data (Strohmeier, Collet, & Kabst, 2022). Companies using analytics in HRM shape their management strategies for future circumstances by applying insights gained from trends and predicted developments (Enad Al-Qaralleh & Atan, 2022). BA has a greater impact when paired with agility within an organization. Agile organizations can utilize data insights to support both their current goals and plans (Huang, Yang, Zheng, Feng, & Zhang, 2023). As a result, businesses can adjust to new situations and continue operating efficiently. Technology and process agility, combined with analytics, give organizations the edge to quickly catch new

trends and opportunities (Qamar & Samad, 2022).

In terms of strategy, using BA helps an organization become more resilient. Assessing data to determine whether changes are possible helps companies prepare by creating contingency plans and supporting business continuity (Shukla, 2023). If organizations apply analytics to different changes, they are better able to handle challenges. HRM is experiencing significant changes due to the increasing influence of BA (Lim, W., et al., 2024). The application of analytics in HRM can help companies achieve faster and more creative performance (Wolniak, Dolata, Hadryjańska, & Wysokińska-Senkus, 2024). The combination of analytics and agility within an organization enables better knowledge management and facilitates successful teamwork (Al-Shammari, Ahmed Al Bin Ali, Abdulla AlRashidi, & Salem Albuainain, 2024). As a result, a company gains an advantage that enables it to succeed over a long period, despite changes in the business world (Thakral, Srivastava, Dash, Jasimuddin, & Zhang, 2023). Using data and BA in HRM will always be very important for effectively running a company's workforce (Penpokai, Vuthisopon, & Saengnoree, 2023).

Although BA is a known innovation driver, little research has been conducted on how it aligns with knowledge-based human resource management and the organization's agility (Le & Ha, 2024). While both BA and agility make it easier to make good decisions, aligning them with KBHRM will further enhance their ability to drive innovation. Still, there is insufficient evidence in books to demonstrate how these factors interact to drive innovation (Le, 2024). It is unclear how agility helps bridge the link between business analysis and innovation in the pharmaceutical sector. A business that does not focus on these aspects may struggle to remain competitive. Consequently, this study aims to evaluate the effects of BA, agility, and KBHRM on innovation, thereby providing a guide for utilizing HRM to enhance agility (Le & Son, 2024).

Very little research has considered the link between BA, OA, and KBHRM practices in terms of innovation (Côrte-Real, Ruivo, & Oliveira, 2020; Gavrilova & Zawadzki, 2023). The researchers find that their results pose challenges for understanding how these factors interact to improve HR management (Gupta & Dayal, 2024). The goal of this study is to examine a critical yet rarely explored problem in HRM.

The study enhances the understanding of HRM by providing a method that links BA, agility, and Knowledge-based B ideas to foster better innovation (Hamieddine, Tigani, Akioud, Saadane, & Chehri, 2024). Apart from completing the latest knowledge, it teaches HR managers and analysts how to apply analytics to encourage company-wide innovation (Leicht-Deobald et al., 2022). Another step in research could utilize the findings to explore the role of analytics in HRM in enhancing an organization's ability to survive and generate new ideas (Turi, Khwaja, Tariq, & Hameed, 2023).

In HRM, the effective use of BA has become crucial for managing knowledge, thereby contributing to increased innovation (Badmus, Rajput, Arogundade, & Williams, 2024). By balancing people management, decision-making, and knowledge using analytics tools and data visualization, BA is valuable to HRM (Jaggia, Kelly, Lertwachara, & Chen, 2023). When firms implement KBHRM practices, BA supports the creation of a stimulating work environment and enhances employee abilities (Mohammed, Al-Okaily, Qasim, & Al-Majali, 2024). If a company is agile, it uses the knowledge and insights BA learns more effectively. IP in a company is driven by combining the approaches outlined above, consisting of dynamic capabilities and resource-based strategies (Schmitt, 2023). Yet, there are many remaining questions about how these factors influence each other in businesses and various sectors, so they need to be studied further.

Research Objectives

- To explore how a combination of BA, KBHRM, and OA impacts innovation.
- Research will document how BA can stimulate IP, contributing to the field of pharmaceuticals.
- To combine BA, KBHRM, and agility to boost innovation and ensure that the company stays ahead of the competition.

Literature Review and Theoretical Development

Theory of Planned Behavior (TPB)

The TPB emphasizes the psychological factors underlying relevant behaviors and is frequently used as a model to understand various sustainable behaviors, including sustainable transportation usage (Song, Bai, Wu, & Wang, 2023). TPB can be applied to explain how BA, KBHRM practices, and OA influence IP (Hemsworth, Muterera, Khorakian, & Garcia-Rivera, 2024). TPB holds that aspects of behavioral intention, such as the impetus that affects innovation, are influenced by three fundamental elements: attitude towards innovation, subjective norm within the organization, and perceived behavioral control (Prikshat, Kumar, Patel, & Varma, 2025). The BA in this model is also an important facilitator, as it enhances data-driven insights, which have a significant impact on shaping managers' attitudes towards innovative projects (Fawehinmi, Yusliza, Tanveer, & Abdullahi, 2024). Subjective norms that support HRM practices, such as talent development and knowledge sharing, are established through the influence of a culture that values creativity and continuous learning, as seen in KBHRM practices. The agility of organizations increases the perceived behavioral control, as it gives the firms the adaptive capacity to introduce their innovations successfully (Khasni, Keshminder, Chuah, & Ramayah, 2023). Empirical evidence on innovation management suggests that a synergistic effect of these variables enhances innovation intentions, ultimately leading to improved innovation performance. This aligns with TPB's notion that intention, driven both cognitively and contextually, is a primary predictor of effective innovative behavior (Sapry & Ahmad, 2024).

Business Analytics (BA)

Offering data that helps improve the company's efficiency and decision-making, BA supports the enhancement of knowledge management within HRM (Adaga, Egieya, Ewuga, Abdul, & Abrahams, 2024). To identify common trends, anticipate the workforce's future needs, and suggest suitable HR policies, BA relies on various analytics methods, including descriptive, predictive, and prescriptive analytics (Mohammed et al., 2024). The use of these tools and real-time data visualization enhances information sharing, helps identify knowledge gaps, and ensures that no knowledge is wasted (Mahmood, T., & Mubarik, M. S., 2020).. Through BA, HR processes become more aligned with and responsive to the company's objectives (Al-Okaily, Teoh, & Al-Okaily, 2023).

Knowledge-based (KB) HRM Practices

To enhance workforce performance and improve the organization's outcomes, KBHRM strategies focus on managing, distributing, and applying knowledge within the organization (Yasmin et al., 2024). They require organizing knowledge that stems from workers' skills and training, along with expertise outlined in procedures and documents (Alzub, 2023). KBHRM supports learning and adaptability in the workplace by providing workers with the correct information at the right time. By utilizing informative platforms, mentoring, and individual

training programs, KBHRM ensures that employees' skills are improved and aligned with company goals (Shahin, Chong, & Ojo, 2025). By identifying where workers lack knowledge, aligning their learning paths, and relying on BA-driven plans, utilizing BA with KBHRM methods yields improved results (Sarfraz, Khawaja, Khalil, & Han, 2023).

Organizational Agility (OA)

If a company can quickly respond to changes in the industry, this is called OA. It has two practices: strategic agility and operational agility. Strategic agility involves reallocating resources to capitalize on new opportunities, while operational agility entails optimizing operations for greater efficiency (Mrugalska & Ahmed, 2021). Staying competitive in business depends on HRM being agile, as it encourages diverse HR practices and aligns HR activities with company objectives. When BA is part of an organization, agility increases because BA supplies real-time information, predictive analysis, and different scenarios that facilitate quick and informed decision-making (Walter, 2021). Moreover, by applying the knowledge gained in BA to address contemporary issues, agility enhances knowledge management (KM) (Motwani & Katatria, 2024).

Innovation Performance (IP)

The ability of a company to create and apply innovative concepts, procedures, or goods that support long-term success and competitive advantage is referred to as IP (Zhang, Zeng, Liang, Xue, & Cao, 2023). Businesses obtain important insights that improve decision-making, spot chances for innovation, and maximize personnel skills by incorporating BA into HRM (Audretsch & Belitski, 2023). To foster innovation and meet market demands, knowledge production, sharing, and application are made possible via BA-driven KM processes (Ahmed, S., et al, 2023). IP becomes a quantifiable and durable result when agile HRM, KM, and BA methods are aligned. This promotes continuous improvement and keeps a competitive advantage in fast-paced sectors (Chen & Kim, 2023).

Hypothesis Development

The Role of Business Analytics in Driving Innovation Performance

The use of BA helps companies innovate more effectively by analyzing information that informs decisions and reveals new trends, as well as how to utilize innovation resources properly. Today, organizations that rely on analytics can understand new opportunities, resolve difficulties, and improve by adopting new strategies (Daradkeh, 2023). If companies utilize current analytical tools, they can make informed decisions, inspire creativity, and quickly introduce effective solutions, thereby increasing their likelihood of success in challenging markets (Talukder, Islam, & Karim, 2024). BA provides valuable insights for informed business decisions. Choices made based on intuition and limited facts may not be the most effective solutions. Alternatively, analytics provides insights that organizations can use to make informed and strategic decisions (Alaskar, 2023). In this way, resources are allocated to key innovation projects that help mitigate risks and generate greater rewards. For example, using predictive analytics, businesses can predict what the market and customers want and adjust their business plans accordingly (Khan, Talukder, Islam, & Islam, 2024).

Furthermore, BA enables the identification of fresh opportunities and trends (Rahaman, Rani, Islam, & Bhuiyan, 2023). In choosing resources for innovation, the influence of analytics is significant. Supporting creativity often requires investing time, money, and specialized skills. BA enables companies to identify which projects are most valuable and essential for achieving

the organization's goals (Chaudhuri, Chatterjee, Vrontis, & Thrassou, 2024). Since data plays an increasingly important role, BA is essential for helping businesses make progress and deal with any challenges that come their way.

H1: BA has a significant impact on IP.

The Impact of Knowledge-Based HRM Practices on Innovation Performance

Approaches to HRM that rely on knowledge help businesses by encouraging their staff to share, create, and utilize various forms of organizational information. Such practices are implemented to encourage employees to think creatively, address problems, and use the necessary tools for innovation (Nguyen & Le, 2024). With dedicated platforms for sharing knowledge, talent development, and regular learning, HRM in the knowledge age enhances employees' contributions to new ideas and helps the organization stand out (Elayan, Hayajneh, Abdellatif, & Abubakar, 2023). KBHRM is primarily focused on supporting the organization in creating and sharing knowledge. Collaboration platforms, such as forums, provide a space for employees to share their thoughts, ideas, and experiences with others, enabling them to tackle complex situations (Santoso, Indrawati, & Nugroho, 2023). Assisting in the development of their talent can prepare workers to be innovative and adapt as their organization faces new challenges. An essential aspect of KBHRM is emphasizing lifelong learning, as this encourages individuals to be open to new ideas and adapt to change (Shahin, Chong, & Ojo, 2024).

Furthermore, using KBHRM strategies helps workers improve their problem-solving skills through encouraging them to think in different ways. Taking this approach to problem-solving teaches individuals to think and act differently, which plays a key role in new developments (Than, Le, Le, & Nguyen, 2023). Those who trust themselves and are familiar with the rules are most likely to present innovative new ideas and test creative approaches for the benefit of the company. Having an informed and skilled workforce, thanks to HRM, encourages them to generate innovative ideas. Through information-sharing programs, efforts to develop skills, and consistent learning, these practices help people at work utilize their creativity and address challenging issues (Abrar, Awan, & Rehmani, 2025). When organizations utilize KBHRM, they establish an environment that fosters innovation.

H2: KBHRM practices have a significant impact on IP

Organizational Agility as a Catalyst for Innovation Performance

An agile organization allows organizations to deal with uncertainty and continue operating during sudden changes. Today, the speed of adaptation can make the difference between reaching your goals and not meeting them (Fasnacht & Proba, 2024). The agile model enables companies to implement new strategies, update existing approaches, and continually innovate to meet the requirements of both customers and the industry (Guo, Yin, & Liu, 2023). It is evident that being agile benefits organizations by fostering innovation, which in turn helps them grow and remain ahead of their competitors (Homayoun, Salehi, ArminKia, & Novakovic, 2024). Agile organizations utilize flexible structures, allowing lower-level workers to make decisions on the spot (Dahms, Cabrilo, & Kingkaew, 2025). Firms that are agile motivate their teams to try new things, respond to feedback, and adjust their strategies when necessary. This approach enables innovators to develop and present solutions that align effectively with the organization's objectives (Aljawarneh, 2024). Agility enables organizations to move freely and avoid being hindered by problems that prevent them from innovating (Durrani et al., 2024). It is also essential that agility helps a company optimize its processes to improve and add new ideas. When faced with new issues and changes, agile organizations adjust their resources,

revise their primary priorities, and simplify their work processes (Xu, Zhang, Sun, Tang, & Li, 2024). An agile company is more prepared to expand new ideas (Yikilmaz & Cekmecelioglu, 2023). If the company needs to introduce a new product, change its business strategy, or implement new disruptive technology, agility helps make these changes easier and more successful. As a result, innovation continues to drive and support the organization's growth in the years to come. Being agile as an organization significantly enhances the company's innovation, enabling the business to keep pace with industry changes (Jing, Zheng, & Guo, 2023). Agility empowers a company to adapt quickly, make steady progress, and optimize the utilization of its resources, thereby facilitating continuous innovation (Saha, Sáha, Gregar, & Sáha, 2020).

H3: OA has a significant positive impact on IP.

Conceptual Framework

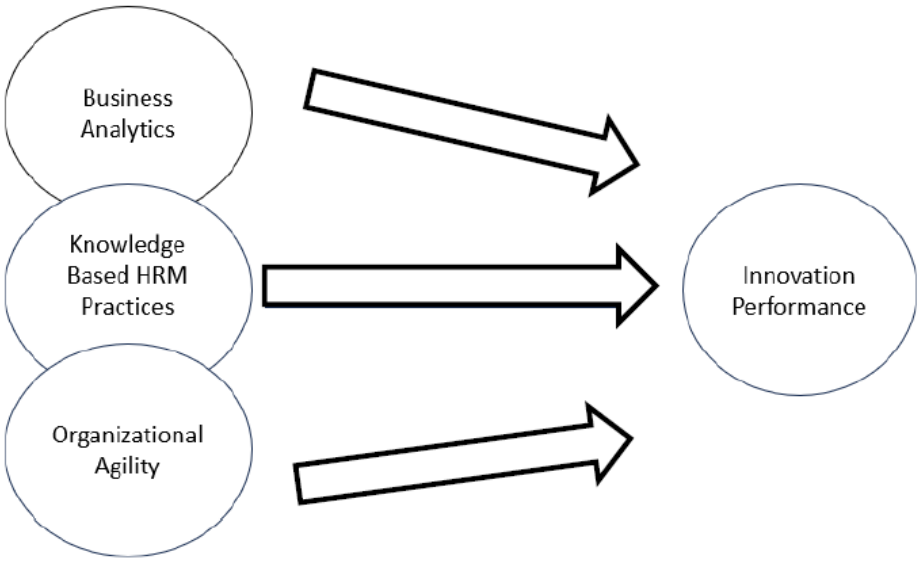

Figure 1: Conceptual Framework

Research Methodology

Sampling Techniques

In this study, a quantitative approach, snowball sampling, is a good choice since it allows connections with individuals who are experts in BA, managing OA, innovative human resource management, and good performance in innovation. Depending on the chosen theories, the study formulates hypotheses and collects numeric data from experts in manufacturing, services, and technology through a carefully designed survey. At the beginning of using this method, a select group of involvement managers, members of the HR team, or analytics experts is identified by their involvement in these domains. They are then expected to refer individuals who have the same experience and qualifications. When snowball sampling is used in conjunction with recommendations, this method is appropriate, as it enables researchers to reach small and precise groups whose skills are vital for answering the research questions.

Data Collection Method

The online survey focused on the connections between IP, the ability to change, BA, and HRM practices in the pharmaceutical sector. Respondents to the study were groups working on

innovation, managing people, or analyzing data in pharmaceutical R&D, production, and commercial sectors. Since Likert scales are accurate and dependable for gathering thoughts on attitudes and performance, we employ them in the survey. To ensure that experts participate in the study, the researcher selected them using a quantitative snowball sampling method. To ensure reliable results that are broadly applicable, a sample of 200 professionals was chosen for analysis. The strategy targets individuals to ensure the collection of accurate and relevant data related to these industries.

Data Analysis Techniques

The investigation included a calculation of the Pearson correlation to determine the relationship and strength between the pairing of BA, OA, and KBHRM practices with IP (Rahaman et al., 2023). The consistency of the questions measuring each variable was assessed using Cronbach's alpha, which ensures the survey's dependability (Yousfani, Haider, Qureshi, & Ishaq, 2024). SPSS was used for importing data and performing various types of analyses. SPSS tools, including statistics, data management features, and reporting options, make it a suitable choice for researchers and analysts working on a wide range of topics.

Table 1: Constructs and items overview

S.No.	Constructs	Items
1.	Knowledge-Based HRM practices (Enad Al-Qaralleh & Atan, 2022)	KBHRM1 When recruiting, we pay special attention to relevant expertise. KBHRM2 When recruiting, we pay special attention to the learning and development abilities of candidates. KBHRM3 When recruiting, we evaluate the candidates' ability to collaborate and work in various networks. KBHRM4 The sharing of knowledge is one of our criteria for work performance assessment. KBHRM5 The creation of new knowledge is one of our criteria for work performance assessment. KBHRM6 The ability to apply knowledge acquired from others is one of our criteria for work performance assessment. KBHRM7 We offer our employees opportunities to deepen and expand their expertise. KBHRM8 We offer training that provides employees with up-to-date knowledge. KBHRM9 Our employees have an opportunity to develop their competence through training tailored to their specific needs. KBHRM10 Competence development needs of employees are discussed with them regularly. KBHRM11 Our organization rewards employees for sharing knowledge. KBHRM12 Our organization rewards employees for creating new knowledge. KBHRM13 Our organization rewards employees for applying knowledge.

2.	Business Analytics (Enad Al-Qaralleh & Atan, 2022)	BA1 The organization predicts and prepares for the future by proactively evaluating scenarios or potential tradeoffs. BA2 Decision making is based on rigorous analytic approaches (e.g., quantitative modeling, simulation). BA3 The organization manages data to enable the sharing and aggregation of data across departments/business units. BA4 Business information and analytics differentiate us within the industry. BA5 Improving our information and analytics capability is a top priority.
3.	Organizational Agility (Enad Al-Qaralleh & Atan, 2022)	OA1 We have the ability to rapidly respond to customers' needs. OA2 We have the ability to rapidly adapt service production to demand fluctuations. OA3 We have the ability to rapidly cope with problems from suppliers, partners and environment. OA4 We rapidly implement decisions to face market changes. OA5 We continuously search for forms to reinvent or redesign our hotel. OA6 We see market changes as opportunities for rapid capitalization.
4.	Innovative performance (Enad Al-Qaralleh & Atan, 2022)	IP1 Percentage of new products in the existing product/service portfolio has increased within last years. IP2 Number of new product and service projects has increased within last years. IP3 Ability to introduce new products and services to the market before competitors has increased within last years" IP4 Innovations introduced for work processes and methods has increased within last years. IP5 Quality of new products and services introduced has increased within last years.

Analysis Results

Assessment of the formative construct

The reliability and content validity of the questionnaire are both evaluated. After a panel of specialists revised and retested the questionnaire twice to ensure its validity, and before its final distribution to gather numerical data from experts across various sectors, including manufacturing, services, and technology, where reliability is assessed using Cronbach's alpha and content validity. Additionally, we calculated the construct-level Cronbach's alpha coefficient. Values of whole constructions exceed 0.7, as shown in Table 1, where Cronbach's alpha of 0.643 indicates internal consistency, which is moderate. Thus, the study's measurements are deemed adequate, while their reliability is called into question. Table 2 provides the correlation analysis of various variables. The correlation coefficient is a statistical measure that describes the nature, strength, and direction of the relationship between two variables. It varies between -1 and +1. The correlation coefficient value of 1 indicates a perfect positive linear relationship; a value of -1 indicates a perfect negative linear relationship, and a

correlation coefficient value of 0 implies no linear relationship. From the table, it can be inferred that there is a strong positive relationship between innovation performance and OA ($r = 0.347$, $p < 0.01$). This implies that with the improvement of IP, OA also tends to be high.

Table 2: Reliability statistics

Cronbach's Alpha	No. of Items
0.643	29

Table 3: Correlation Analysis

		IP	BA	KBHRM Practices	OA
IP	Pearson Correlation	1	.347**	.375**	.339**
	Sig. (2-tailed)		.000	.000	.000
	N	205	205	203	205
BA	Pearson Correlation	.375**	1	.408**	.253**
	Sig. (2-tailed)	.000		.000	.000
	N	205	205	203	205
KBHRM Practices	Pearson Correlation	.339**	.408**	1	.225**
	Sig. (2-tailed)	.000	.000		.001
	N	203	203	205	203
OA	Pearson Correlation	.347**	.253**	.225**	1
	Sig. (2-tailed)	.000	.000	.001	
	N	205	205	203	205

****. Correlation is significant at the 0.01 level (2-tailed).**

Measurement of the final research model

The present study tested all of its hypotheses using SPSS's multiple linear regression. In this study, we normalized all variables by using their means, which provides a measurement of the variable along all its dimensions. The impact of BA as a Tool for Improving Knowledge Management in HRM Practices is seen in Table 3. The table shows a 24.3% variance, indicating a modest positive relationship. The regression analysis testing the effect of BA on Knowledge Management in HRM Practices yielded an R-squared value of 0.243 and an Adjusted R-squared value of 0.231. It explains 24.3% of the variance in the dependent variable. Without the p-values for the coefficients and the overall model, it is not possible to draw a definitive conclusion regarding the statistical significance of the findings.

Based on the analysis, the indicator scores demonstrate that BA, KBHRM Practices, and OA all statistically and positively affect the dependent variable. Table 4 results show that BA significantly improves the outcome variable ($p = 0.000$), making a moderately strong contribution with a positive beta coefficient of 0.362 and a Beta of 0.244. This approach to

HRM is strongly related to better performance (B = 0.218, B = 0.183, p = 0.008).
In Tables 3 and 5, the main findings and results of the regression analysis indicate the relationship between BA, OA, and knowledge-based HRM practices on IP. The findings of the regression analysis illustrate that BA, OA, and knowledge-based HRM practices have a significant and positive relationship with the dependent variable IP, with the results of (R-square = 0.232; F = 21.321; β = 0.493; t-value = 3; and p-value = 0.000). The findings of the regression analysis suggest that BA, OA, and knowledge-based HRM practices have a significant and positive relationship with the dependent variable IP. The R-square value of 0.232 indicates that about 23.2% of the variation in IP can be explained by these factors. According to the ANOVA test results, there is a statistically significant difference in innovation performance between the analyzed groups. The F-statistic of 21.321 indicates that the model did a good job of capturing the replication in the levels of IPs, as it is significantly higher than 1, meaning that the replication explained by the model was more than what occurred by sheer random error. The p-value of 0.0006 also supports this conclusion, as it is significantly lower than the generally accepted 0.05 level of significance.

Table 4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.493[a]	.243	.232	5.022

Table 5 Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1613.057	3	537.686	21.321	.000[b]
	Residual	5018.451	199	25.218		
	Total	6631.507	202			

a. Dependent Variable: IP
b. Predictors: (Constant), OA, KBHRM Practices, BA

Table 6 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.108	3.489		1.177	.240
	BA	.362	.102	.244	3.551	.000
	KBHRM Practices	.218	.081	.183	2.682	.008
	OA	.327	.084	.251	3.896	.000

Discussion of the findings
The findings of this study empirically validate the study's hypotheses, confirming a significant and positive effect on BA, KBHRM practices, and OA on IP. The regression analysis validates these relationships and confirms their robustness, as all the hypotheses are accepted based on

statistical significance.

Hypothesis 1 (H1), which asserted that BA influences IP greatly, had equally been strongly supported ($\beta = 0.493$, $p < 0.001$). This implies that organizations that utilize data-derived insights through BA are in a better position to recognize trends, make informed choices, and be creative. The ability to analyze large datasets enables firms to predict market shifts, improve operational efficiency, and develop effective competitive strategies, thereby enhancing their innovative potential.

Hypothesis 2 (H2) is also supported, which assumes a significant enhancement of the KBHRM practices in the IP ($p < 0.001$). Knowledge-centric Human Resource (HR) practices, such as continuous learning, talent development, and knowledge-sharing platforms, foster a work environment that encourages employees to generate new ideas and solutions.

Hypothesis 3 (H3), which postulated a significant positive impact of OA on IP, is also supported ($p < 0.001$). Agile organizations, with flexible structures, speedy decision-making, and inter-functional working, are well-suited to address the ever-changing market needs and tech disruptions. The research findings indicate that agility enables a firm to be more efficient in experimenting, iterating, and implementing innovative processes. This complements current studies that support agility as a means of driving innovation in rapidly changing business environments.

Theoretical Implications

The theory of planned behavior can be viewed as a valuable model for explaining the role of the BA, KBHRM, and OA in the IP. According to this theory, behavioral intentions direct behavior and are influenced by attitudes, subjective norms, and perceptions of behavioral control. Conducting research in the context of this study, this factor is likely to reinforce positive attitudes towards innovation, as the importance of using BA and making decisions based on data is acknowledged by both employees and leaders to enhance performance and achieve innovation. Subjective norms refer to the social expectations that encourage innovation, which are communicated through knowledge-based HRM practices that emphasize continuous learning, knowledge transfer, and the formation of intellectual capital. These practices help develop a culture in the workplace where innovation is practiced and anticipated. OA increases perceived behavioral control, which can be understood as an individual's question about their ability to perform a behavior. Flat organizations, rapid decision-making processes, and inter-functional teamwork enable employees to feel more confident in their ability to contribute to innovation. Under the condition that employees feel supported and able to accomplish more, there is a higher chance of their engaging in innovative behaviors. In this way, the three factors related to organizations form the psychological drivers, as mentioned in the theory of planned behavior, and ultimately contribute to elevated rates of IP.

Practical Implication

The results of this research enable several practical conclusions for organizations seeking to enhance innovation performance through BA, KBHRM practices, and OA. Arguably, firms should focus their investments on developing BA capabilities, such as advanced data processing tools and employees' data literacy, to facilitate evidence-based decision-making and drive innovation. Secondly, knowledge-centric practices such as structured mentorship programs, collaborative platforms for knowledge sharing, and continuous learning initiatives should be adopted by the HR department to empower workers who can effectively bring their innovative ideas to life. Thirdly, organizations should promote agility by de-layering

hierarchical structures and adopting cross-functional teams and flexible processes, which will enable them to quickly adjust to market changes. Additionally, BA, HR strategies, and agile methodologies should be integrated into a single system, so that insights gleaned from data inform talent development and agile structures facilitate experimentation and iterative improvement. If these three aspects —analytics, HRM, and agility —are merged, organizations can develop a sustainable innovation ecosystem that promotes competitiveness in ever-changing markets. Policymakers and industry players can also utilize such insights to develop training and incentives that promote data-driven and agile work cultures, thereby enhancing overall economic growth and technology development.

Managerial Implication

The findings of this study are crucial to managers looking to improve the organizational IP. First, the senior leadership should lead the integration of BA into the strategic decision-making process at an organization by investing in cutting-edge analytical tools, developing data competency within teams, and defining key performance indicators (KPIs) that link analytics efforts to the outcomes of innovation. Second, HR managers need to institutionalize KBHRM practices by designing mechanisms for sharing knowledge, introducing structured learning and development, and fostering a culture of constant innovation through cross-functional collaboration. Third, operations managers should promote OA by embracing flexible project management processes (e.g., agile sprints), decentralizing decision-making authorities, and creating rapid prototyping capabilities to enhance speedy innovation cycles. Of critical importance, executives must ensure congruency among these three dimensions, i.e., embedding analytics-driven insights into HR practices while retaining agile structures that enable quick adjustments. Middle managers play a crucial role in implementing this integration by promoting data literacy workshops, guiding high-potential talent, and eliminating bureaucratic impediments to experimentation. Those organizations that bring these elements into proper synchronization are likely to produce superior IP, thereby attaining a competitive advantage in dynamic markets. The study reinforces the point that it is not a serendipitous incident, but a systematically available concept that can be purposefully developed through managerial actions within the bounds of analytics, HR, and operations.

Conclusion

In conclusion, BA, KBHRM, and OA are demonstrated to play crucial roles in enabling companies to achieve high levels of innovation. The study's evidence shows that every factor contributed positively to the outcomes of innovations. The results from the regression model indicate that all of these factors jointly account for a significant part of the changes in IP. The study explains that using BA helps gather insights from data that can influence important decisions and boost innovation. Additionally, the study highlights that practical knowledge-based approaches in HRM facilitate the development and promotion of intellectual capital, as well as a culture of innovation and new ideas within the workplace. Additionally, the study highlights that being flexible, making quick decisions, and involving multiple departments enable companies to respond effectively to market changes and innovations.

Future Research Agenda and Limitations

Although this research study provides valuable insights into the relationship between BA and knowledge-based HRM practices, OA, and IP, several limitations warrant mention. First, the cross-sectional nature of the SPSS-analyzed data prevents making causal inferences because

relationships are observed at a given moment in time, not changes that occur over time. Second, the use of self-reported survey data may lead to common method bias, even though statistical solutions have been developed to mitigate this during analysis. Third, although the regression model was statistically significant, the moderate R-squared value (0.232) implies that other unaccounted-for variables (i.e., leadership styles, technological infrastructure, or external market pressures) may help explain the performance of innovation.

Future studies should address these gaps by employing longitudinal designs to establish causation, utilizing multi-source data (e.g., employee surveys and archival performance metrics) to control for bias, and examining different samples across diverse industries and geographic regions to enhance generalizability. Additionally, qualitative case studies can broaden our knowledge of the dynamics between BA, HRM practices, and agility in real-life settings. The researchers may also identify moderating variables (such as organizational size and industry volatility) and mediating mechanisms (including employee creativity and digital transformation maturity) to render the model more comprehensive. Understanding in the area. There are many software programs other than SPSS for various research methodologies. Researchers can study multiple programs, such as Partial Least Squares (PLS) software, e.g., SmartPLS, as well as other examining instruments, including structural equation modeling (SEM) software, such as AMOS or LISREL.

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