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DOES REGULATORY FRAMEWORK MODERATE THE NEXUS BETWEEN INTER-FIRM NETWORKS AND FIRM PERFORMANCE? EMPIRICAL EVIDENCE FROM PHARMACEUTICAL MANUFACTURING FIRMS IN NAIROBI CITY COUNTY, KENYA

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Abstract

The pharmaceutical industry plays a critical role in Kenya's healthcare system and contributes modestly to the Gross Domestic Product. However, pertinent contextual literature provides plausible evidence that the performance of pharmaceutical manufacturing firms in Kenya has unsettling fluctuations. In this respect, the study analysed the moderating role of the regulatory framework on the effect of inter-firm networks on firm performance. Positivist research philosophy was adopted as a broader perspective for guiding the research methodology of the study. The study was underpinned by the regulation's theory, resource-based view theory, and

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the balanced scorecard model. In addition, the study utilized descriptive and explanatory research designs. The target population was 43 pharmaceutical manufacturing firms in Nairobi City County. The unit of observation comprised top and middle-level management employees, accounting for a population of 344 subjects. A pilot study was conducted at Medivet Pharmaceuticals in Kiambu County to assess the validity and reliability of the questionnaire. Data analysis included qualitative and quantitative analysis. A linear regression model was used for analysing the quantitative data. Diagnostic tests of normality, linearity, multicollinearity, and homoscedasticity were assessed to confirm that the assumptions of linear regression were not violated. Analysis of common themes was used as a basis for analysis of qualitative responses. The study found that the regulatory framework moderates the relationship between interfirm networks and firm performance. The study recommends that policymakers and regulatory bodies in Kenya should develop a comprehensive regulatory framework that supports and enhances the performance of pharmaceutical manufacturing firms. Policymakers should engage with industry stakeholders to understand the challenges and opportunities posed by existing regulations, and continuously review and update policies to reflect evolving market dynamics and technological advancements.

Keywords: Firm Performance; Inter-Firm Network; Virtual Inter-Firm Networks; Pharmaceutical Industry; Regulatory Framework

INTRODUCTION

Growth in the global pharmaceutical manufacturing industry is massive and expanding, driven by aging populations, rising chronic disease prevalence, and rising disposable incomes in developing countries. A few large multinational corporations dominate the global pharmaceutical manufacturing industry. North America (including the United States and Canada) accounts for 49.1% of global pharmaceutical sales in 2021, while Europe accounts for 23.4%, China accounts for 9.4%, Japan accounts for 6.1%, Latin America accounts for 3.7%, and Africa and Asia (excluding China and Japan) accounts for 8.4% (European Federation of Pharmaceutical Industries and Associations, 2022). According to the African Development Bank, with a market share of less than 3%, Africa imports more than 70% of its medicines at a cost of $14 billion per year (African Development Bank, 2023). The African pharmaceutical market is expected to be worth $30 billion by 2021.

Interfirm networking influences a firm's performance (Burlina, 2018). Research and development networks and interfirm partnerships, according to Cai and Szeidl (2017), can have an impact on business performance. Taneri and De Meyer (2017) contend that

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biopharmaceutical alliances influence a company's performance. Strategic inter-firm knowledge transfers, according to Omale, Orji, Oladele, and Olaniyi (2017), have an impact on performance. Interfirm networks, according to Wanyanga Vugigi and Keter (2020), improve access to quality medicines and customer base among East African pharmaceutical firms. Businesses can benefit from interfirm networks through new markets, technologies, resources, and opportunities for cost savings and risk sharing. The research interrogated the connection between interfirm networks and firm performance in research and development networks, virtual interfirm networks, interfirm partnerships, and knowledge-sharing networks (Tajeddini & Ratten, 2020; Sharafi & Brown, 2020).

The Pharmacy and Poisons Board imposes strict regulations on pharmaceutical manufacturing companies in Kenya. The regulatory framework influences interfirm networking within pharmaceutical manufacturing firms because of the government's involvement in licensing and safeguarding of rights through various legislations. According to Ndemezo, Charles, Angelique, and Ndikubwimana (2018), government policy advances the manufacturing industries tremendously due to high interfirm networks. Strengthening intellectual property rights (IPR) laws, according to Balachandran and Hernandez (2016), encourages foreign firms to collaborate with a broader range of firms from reforming countries because they can rely on formal means to protect their assets. It is responsible for issuing operating licenses and ensuring standard compliance.

Firm performance denotes a company's financial and operational achievement. It is typically measured using financial ratios like revenue, profit, and return on equity (Ahmed & Ali, 2023). Non-financial metrics such as customer satisfaction, employee turnover, and market share can also be used to measure firm performance (John, 2022). There are numerous approaches to measuring firm performance, and the best approach varies depending on the company's specific goals and objectives. A variety of factors can influence firm performance. These factors include the company's industry, strategy, management team, and competitive environment (Oamen & Omorenuwa, 2022). Companies can improve their performance over time by understanding the factors that affect firm performance. Karimi and Kavindah's (2021) study on strategic management practices and performance of Kenya's national hospital insurance fund operationalized performance through marketing effectiveness, quality of service, and customer satisfaction.

Interfirm networks are made up of related organizations that interact or network in some way in order to provide expanded products and services (Martin-Rios & Erhardt, 2017). It refers to the relationships and connections that exist between businesses within a given industry. The authors' conceptualization of the forms of interfirm networks differed. Konopielko and

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Trechubova (2019) used research and development networks to conceptualize an interfirm network. Franco and Haase (2020) measured interfirm networks using interfirm partnerships. Khan and Siddiqui (2018) conceptualized an interfirm network using information sharing.

Thus, the variables of interfirm networks used in the current study include research and development networks, virtual interfirm networks, interfirm partnerships, and knowledge sharing networks. Informal R&D networks, equity joint ventures, and non-equity joint ventures will be included in the research and development networks, while virtual interfirm networks will be defined by virtual teams, virtual enterprise, and virtual organization. Marketing alliances, supplier alliances, and production alliances are examples of interfirm partnerships, as are knowledge-sharing networks that include knowledge and skills transfer, knowledge diversity, and inter-organizational systems.

The regulatory framework includes the procedures or guidelines that organizations must follow in order to continue operating (Eckerstorfer *et al*., 2019). This is a collection of rules, guidelines, and regulations that organizations must follow in order to operate within a specific industry or sector (Ismael & Emeagwali, 2019). It establishes the context in which organizations operate and can have an impact on their operations, decision-making processes, and overall performance. The regulatory framework can be beneficial or detrimental to an organization. A positive regulatory framework enhances the process of interfirm networks, whereas a negative regulatory framework discourages investments and reduces the performance of organizations (Nwosu, Awurum, & Okoli, 2015). The regulatory framework was used as a moderating variable in the study. The regulatory framework was chosen as a moderator on the assumption that the regulatory environment can influence the relationship between interfirm networks and performance of pharmaceutical manufacturing firms in Nairobi City County, Kenya.

Pharmaceutical manufacturing firms in Kenya have been found to perform generally poorer than other manufacturing firms (KNBS, 2017). They face high input costs and insufficient markets for their products. There are also high production costs, a lack of technological infrastructure, and intense competition. Access to financial resources is a major constraint in pharmaceutical manufacturing firms (Basu, 2015; Wairimu, 2015; Wangari, 2017; Cornish, 2017). According to Gitonga (2016), access to start-up capital and financial management has an impact on the performance of these firms in the country. As a result, performance has been deteriorating. Table 1.1 depicts the performance of Pharmaceutical Manufacturing companies in Kenya from 2017 to 2022.

The declining profits reflect deteriorating customer satisfaction, sales volume, and market share. With this poor performance, there is a risk of job losses, an insufficient supply of medicines, reduced investments both internally and externally, and decreased revenue to the

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government, among other negative consequences. This can have serious consequences for the industry, economy, and society at large. The reasons for pharmaceutical manufacturers' declining performance in Kenya are numerous. Increased competition, changes in government regulations, changes in consumer demand, and rising production costs are all possible factors.

Statement of the Problem

Pharmaceutical firms are crucial for the health and well-being of Kenya. By producing safe and effective medicines, these firms help ensure people have access to the essential medicines they need (Mailu, Ntale & Ngui, 2018). At the same time, a strong pharmaceutical industry drives economic growth and enhances the competitiveness of Kenya in the global market. Therefore, these pharmaceutical manufacturing firms in Kenya need to strive for high performance to support public health, contribute to the country's economic development, and maintain their competitiveness in the industry (Kiriinya, Ngugi, Mwangangi & Odhiambo, 2018).

The pharmaceutical industry in Nairobi City County has been facing a substantial decline in performance over recent years. The industry has seen a consistent drop in the net profit margins from 8.1% in 2017 to 3.8% in 2022. Initially, there was a slight but steady increase in sales growth from 1.96% in 2016 to a peak of 2.07% in 2018, indicating a period of modest market expansion and revenue growth. During this time, net profit margins also improved, peaking at 8.10% in 2017. However, by 2022, sales growth had decreased to 1.78%, and net profit margins had fallen significantly to 3.80%. In 2023, there was a slight rebound in net profit margins to 4.09%, while sales growth showed a marginal increase to 1.79%.

A knowledge gap has emerged from the review of existing literature. For instance, while Konopielko and Trechubova (2019) conceptualized R&D networks based on R&D spending and the number of patents, the current study measured R&D networks using informal R&Ds, equity joint ventures, and non-equity joint ventures as its parameters, thus highlighting a conceptual gap. Similarly, Li and Feng (2019) present a conceptual gap as they measured virtual interfirm networks through knowledge and learning networks. In contrast, this study conceptualized virtual interfirm networks using virtual teams, virtual enterprises, and virtual organizations. Additionally, Burlina (2018) measured research and development networks through cooperation, resource mobilization, and e-collaboration networks. However, the present study conceptualized research and development networks using informal R&Ds, equity joint ventures, and non-equity joint ventures. Furthermore, studies by Chalmers, Mannetta and Sensini (2020), Momanyi, Armurle and Nyaboga (2020), Franco and Haase (2020), and Bowen and Kimencu (2019) present a contextual gap, as none of these investigations centred on pharmaceutical firms for their case studies.

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The evident gaps in existing research underscore the significance of this study. While prior research provides a foundation, none have holistically examined the combined effects of research and development networks, virtual interfirm networks, interfirm partnerships, and knowledge-sharing networks on pharmaceutical manufacturing firms' performance, particularly in the context of Nairobi City County. Moreover, including the regulatory framework as a moderating variable brings a comprehensive perspective to the study. By bridging these knowledge gaps, this research offers invaluable insights tailored to the pharmaceutical manufacturing industry in Kenya.

Objectives of the Study

This study assessed the moderating effect of the regulatory framework on the relationship between interfirm networks and performance of pharmaceutical manufacturing firms in Nairobi City County, Kenya.

Research Hypothesis

H_0: The Regulatory framework does not moderate the relationship between interfirm networks and performance of pharmaceutical manufacturing firms in Nairobi City County, Kenya.

THEORETICAL LITERATURE REVIEW

Regulatory theory, resource-based view, and balanced scorecard framework were carefully reviewed to provide a theoretical foundation for this survey.

Regulation Theory

The regulation theory, also known as the new regulation approach, emerged in the late 1970s and early 1980s as a response to shortcomings of traditional economic theories in explaining the dynamics of capitalist economies (Boyer & Saillard, 2002). The theory posits that capitalist economies are characterized by periods of relative stability called "regimes of accumulation." These regimes are characterized by specific patterns of economic organization, modes of production, and distribution of income and wealth (Boyer, 2005). Each regime is associated with a particular mode of regulation, which refers to the set of institutional arrangements and rules that govern economic activities and maintain social order (Boyer & Saillard, 2002).

The theory assumes that regulations are not neutral but reflect the interests of different social groups and power relations within society (Boyer, 2005). It recognizes that regulations are influenced by political and social struggles, and they can be shaped by the state, social

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movements, and economic elites (Lipietz, 2000). The theory proposes that over time, tensions and contradictions emerge within a regime of accumulation, leading to crisis situations. These crises arise from imbalances between productive forces, social relations, and institutional arrangements. They may be triggered by factors such as technological changes, shifts in global markets, or social conflicts (Boyer, 2005). In the regulation theory, regulation is not limited to state intervention but encompasses a broader range of institutional arrangements, including labour market regulations, financial regulations, and social welfare policies (Boyer & Saillard, 2002).

A number of criticisms have been levelled against the theory. One of these is that it tends to oversimplify the complexity of economic systems and the diverse factors influencing economic behaviour (Jessop, 1999). Critics argue that the theory often overlooks the significance of power dynamics and class wrangles in shaping regulations and fails to adequately address issues of social inequality (Froud *et al.,* 2006). Additionally, some argue that the theory does not fully account for the influence of globalization and technological advancements on economic processes and regulations (Amable, 2003).

The theory was significant in offering a conceptual framework for understanding how regulations shape interfirm networks and performance. By considering the regulatory framework as a moderating variable, the study examines how regulations form the link between interfirm networks and performance. Additionally, the theory helps in understanding how regulations impact knowledge-sharing networks, interfirm partnerships, and virtual interfirm networks. By incorporating the Regulation Theory, the study can gain important perspectives on the effect of regulations in facilitating or hindering the formation, functioning, and outcomes of interfirm networks in the pharmaceutical industry in Nairobi City County, Kenya.

Resource-Based View

Penrose (1959) indicated that competitive advantage in producing goods or services better or cheaper than rivals can influence other firms to know more about the factors influencing the competitive advantage, thus stimulating performance. The competitive advantage gained by efficiently using an organization's resources can increase the customer base and thus increase the overall performance (Distanont & Khongmalai, 2020; Njiru & Kinyua, 2022). Resources, both tangible and intangible, are crucial for organizations. Physical assets encompass funding, financial access, and geographical positioning, among other things, while abstract assets are comprised of expertise, abilities, prestige, and business ingenuity (Peng, 2001). A company's expansion and prosperity are primarily attributed to its unique resources

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and exceptional proficiencies, which establish a foundation for achieving and maintaining a competitive edge (Barney, 2014).

The theory assumes that competitive advantage arises from efficiently using an organization's resources, which can increase customer base and overall performance (Distanont & Khongmalai, 2020). Tangible resources include financial access and physical assets, while intangible resources encompass expertise, abilities, and business ingenuity (Peng, 2001). According to Barney (2014), a company's expansion and prosperity depend on its unique resources and exceptional proficiencies that establish a foundation for achieving and maintaining a competitive edge. The superior outcomes for businesses arise not only from possessing more or enhanced assets but also from leveraging their unique strengths, which are the tasks that a specific company outperforms its competitors (Coff, 2007; Mbulwa & Kinyua, 2021).

The theory has a number of criticisms. It fails to exhaustively address the varying abilities of employees within organizations, as each worker possesses distinct levels of productivity and effectiveness (Bratton, 2007). Moreover, Muhammad, Scrimgeour, Reddy, and Abidin (2015) contend that the framework focuses solely on a company's internal structure, neglecting external influences such as market demand and consumer preferences for specific products. Consequently, the resource-based view overlooks the importance of the customers who consume the products created, despite a company's resources and potential for achieving a competitive advantage.

This theoretical framework was relevant to the present research. An organization's assets play a critical role in determining its competitive advantage and elevated performance. As such, the pharmaceutical manufacturing firms' competitive edge and performance in Nairobi City County can be explained by the improvement of research and development networks, digital intercompany connections, collaborative partnerships between companies, and knowledge-sharing systems. Therefore, the theory is considered relevant to the investigation of competitive advantage as a variable.

Balanced Scorecard Model

The Balanced Scorecard (BSC) model was developed by Kaplan and Norton in the early 1990s. This model provides organizations with a broad view of their performance by integrating financial and non-financial measures (Kaplan & Norton, 1992). The BSC is designed to help managers translate their strategic objectives into a set of performance indicators, which are then organized into four perspectives: financial, customer, internal business processes, and learning and growth (Akkermans & Van Oorschot, 2018). By integrating these perspectives, the BSC

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enables organizations to balance short-term and long-term goals, as well as to consider both quantitative and qualitative performance measures.

The model assumes that the financial perspective focuses on traditional metrics, like revenue growth, profitability, and return on investment, which are crucial for evaluating the organization's economic performance (Akkermans & Van Oorschot, 2018). The customer perspective emphasizes the importance of understanding customer needs and preferences and includes measures related to customer satisfaction, retention, and market share. Additionally, internal processes examine the proficiency of the organization's core operations, with measures like process cycle time, quality, and innovation (Hansen & Schaltegger, 2016). Lastly, the learning and growth perspective is concerned with adaptation, innovation, and improvement in an organization's performance over time. This perspective incorporates measures related to employee skills, organizational culture, and technological capabilities (Hoque, 2014; Kaplan & Norton, 2001).

The model has been widely adopted as a strategic management tool. However, it is not without criticism. One criticism is that the BSC model may oversimplify the complex nature of organizational performance by relying heavily on a set of predefined metrics and indicators (Ittner & Larcker, 2003). Critics argue that this standardized approach may not adequately capture the unique dynamics and strategic goals of different organizations (Simons, 2000). Additionally, the BSC model's heavy focus on quantifiable measures may overshadow the importance of qualitative factors, such as organizational culture and employee satisfaction, which are difficult to measure using traditional financial metrics (Epstein & Wisner, 2001). Despite these criticisms, the BSC model remains a valuable framework for alignment of organizational activities to strategy across multiple dimensions. It provides a structured approach to performance measurement, but should be complemented with broad knowledge of context and strategic priorities.

The model is significant in examining the performance of pharmaceutical manufacturing companies. By using the BSC model, organizations can gain a more holistic view of their performance and align their activities with their strategic objectives, ensuring long-term success and competitiveness in the marketplace. The adoption of BSC can enhance the increase in performance of the pharmaceutical manufacturing companies and thus become more competitive.

EMPIRICAL LITERATURE REVIEW

Mutangili, Awuor, and Cheluget (2020) examined the impact of regulation on international procurement practices and supply chain performance of Kenyan energy development organizations. Their cross-sectional survey study found that the regulatory

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framework significantly moderated this relationship. However, a conceptual gap exists in this study. The moderating effect of the regulatory framework on procurement practices was examined. The current study investigates its role in the association between interfirm networks and performance, providing insights into a different sector and set of inter-organizational relationships.

Getange (2020) investigated the impact of rules and regulations on the correlation between transformational leadership and public service effectiveness. The study found that the regulatory environment significantly moderated this relationship. Nevertheless, a contextual gap exists in this study. While the study focused on state-owned firms and public service effectiveness, the current study examines pharmaceutical manufacturing firms in the private sector, providing insights into how regulatory frameworks influence interfirm networks and performance in a different industry context.

Alabi, David, and Aderinto (2019) examined the effects of government policies on SME growth in South-Western Nigeria, concluding that supportive policies would promote SME growth. Similarly, the study identified factors hampering business growth in Ghana. However, a conceptual gap exists in these studies. While they focus on general policy effects on business growth, the current study specifically examines how the regulatory framework moderates interfirm networks and firm performance in the pharmaceutical industry, for a more targeted analysis of regulatory impacts.

Ajia (2021) studied the relationship between leadership and state company success in Kwara State, Nigeria, finding that regulatory frameworks moderate the link between leadership quality and organizational success. While the study concentrated on companies owned by the state in Nigeria, the current study examines pharmaceutical manufacturing firms in Kenya, providing insights into how regulatory frameworks influence interfirm networks and performance in a different country and industry context.

Ayam (2019) investigated the relationship between the regulatory environment and employee commitment and performance in Ghana's private social security firms. The study found that the regulatory framework statistically affected this connection and correlated positively with social security provision. Nevertheless, a contextual gap exists in this study. The current study examines pharmaceutical manufacturing companies in Kenya, offering insights into how regulatory frameworks influence interfirm networks and performance in a different industry and national context.

Pedo, Kabare, and Makori (2018) analysed how the legal framework influenced outcomes of PPP efforts in Kenya's road sector. Their exploratory and descriptive study found that the regulatory structure enhanced the effectiveness of PPPs in road development.

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However, a conceptual gap exists in this study. While the study focused on PPPs in the road sector, the current study examines how the regulatory framework moderates the relationship between interfirm networks and performance in the pharmaceutical industry, providing insights into a different type of inter-organizational relationship and industry context.

CONCEPTUAL FRAMEWORK

The conceptual framework that shows the proposed relationship between interfirm networks, the regulatory framework, and firm performance is presented in Figure 1.

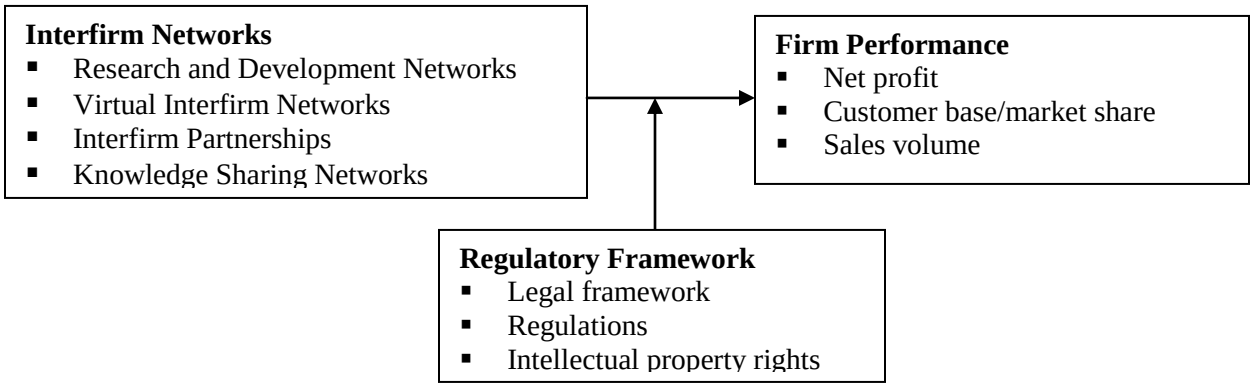

Figure 1: Conceptual Framework

In the figure, interfirm networks is conceived as the explanatory variable and is indicated by research and development networks, virtual interfirm networks, interfirm partnerships, and knowledge sharing networks. Regulatory framework, as the moderating variable, is indicated by legal framework, regulations, and intellectual property rights. Additionally, firm performance as the dependent variable is indicated by net profit, customer base/market share, and sales volume.

METHODOLOGY

Positivism was adopted as a research philosophy for this study. This research paradigm is characterized rationalistic, empiricist philosophy and reflects a deterministic approach in which outcomes are attributed to certain events or causes (Creswell, 2009; Kinyua, 2015). Accordingly, the resource based perspective has presented firm perspective as a causal outcome of firm resources particularly so for intangible resources (Jones & Hill, 2009; Kinyua, Muathe & Kilika, 2015; Kimaru & Kinyua, 2018). In this study, firm performance has been hypothesized as a causal outcome of interfirm networks albeit with regulatory framework playing as moderator of the causal link. Furthermore, Mertens (2005) contends that as long as

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observations are free from personal biases or values, plausible explanation of causal nature for phenomena in social sciences. The positivism philosophy, is therefore suitable examining the moderating role of regulatory framework in the link between interfirm networks and firm performance.

This study employed both descriptive and explanatory designs, as they complement each other. Descriptive research design gathers data to characterize a phenomenon, situation, or population, focusing on what, when, where, and how of the research problem (Patten & Newhart, 2017). In essence descriptive research provides a good measure of objectivity as observation made are free of manipulation (Sekeran, 2011; Kungu, Kahuthia & Kinyua, 2020; King'oo, Kimencu & Kinyua, 2020). Explanatory research design is appropriate when the goal is to understand an issue better and develop hypotheses explaining specific phenomena without controlling or manipulating variables (Rahi, 2017). In this study, the relationship between variables was examined through hypothesis testing. Adopting both descriptive and explanatory designs enabled a mixed research methodology, making these designs the most effective for the study.

Linear regression model was adopted as an estimation technique for test hypothesized relationship between the research variables in this study. The rationale for picking the linear regression model was primarily due to its ability to analyse causality amongst variables besides the fact that performance of Pharmaceutical companies in this study is conceptualized as a continuous variable. Moreover, it is stated by Zellner and Tobias (2001) that the linear regression model allows the review of relationships while maintaining statistical efficiency. Moderation analysis was carried out using the two-stage approach recommended by Baron and Kenny (1986). The two stages are thus given;

$$Y = \beta_0 + \beta_1 X + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Equation 1}$$

$$Y = \beta_0 + \beta_1 X + \beta_2 X*M + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Equation 2}$$

Where:

Y = Firm Performance

X = Interfirm networks

M= Regulatory framework

X*M = Interaction Term

β_0 = Constant

$\beta_1, \beta_2, \beta_3$= Beta coefficients

ε = Error term

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The first stage in the analysis is essential for confirming that there is a causal relationship that can be moderated. However, the second stage is critical for confirming if the regulatory framework moderates the effect of interfirm networks on firm performance.

The study targeted 43 pharmaceutical manufacturing firms in Nairobi City County, justified by the fact that more than 70% of the pharmaceutical manufacturing firms are based in Nairobi City County, according to the Pharmacy and Poison Board (2021). Based on the Pharmacy and Poison Board (2021) report, there are 31 large and 12 medium pharmaceutical manufacturing firms in Nairobi City County.

Four management staff were randomly selected from top and middle level management teams using the proportionate approach to attain an appropriate representation from the large and medium sized strata of the target pharmaceutical manufacturing firms in Nairobi City County. This probabilistic approach resulted in the selection of 344 management employees from who research specific observation could be made.

Structured questionnaire was used to collect data from top/middle-level management employees in Nairobi pharmaceutical firms. The use of closed ended questions was necessary for gathering quantitative data on the phenomena that were at the core of this study. As a widely used scale, the 5-point rating scale was used in the development of the closed-ended questions. The pilot study was conducted in Medivet Pharmaceutical and the data gathered the randomly chosen 34 employees (10% of the sample) was useful for testing the reliability of the research instrument. Medivet Pharmaceutical is located in Thika urban setting which offers a fairly similar operating environment as Nairobi City County.

Test of validity was used to examine if the research instrument accurately assesses its intended construct and if the research findings are truthful (Golafshani, 2003). Content validity signifies the degree to which test items are relevant and representative of the variable that is the object of observation. To confirm content validity, the questionnaires were examined by supervisors and lecturers from the School of Business, who are experts in the field. Modifications suggested by these experts were incorporated into the survey tool to improve clarity and comprehensiveness. Construct validity reveals the extent to which test items measures the theoretical construct that it is intended to measure. Content and construct validity were ensured through a rigorous review of relevant body of theoretical and empirical literature.

Reliability is primary concerned with the internal consistency of the results deriving from test items in a research instrument. Chronbach alpha index has enjoyed a wide acceptance across many disciplines as an appropriate measure for the internal consistency of test items

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that represent a particular variable (Creswell & Cresswell, 2018). The reliability results for this study are displayed in the Table 1.

Table 1: Reliability Results

Research Variable	Cronbach's alpha	Comments
Interfirm networks	0.814	Reliable
Regulatory framework	0.830	Reliable
Firm Performance	0.784	Reliable

Table 1 demonstrates that Cronbach's alpha coefficients for various constructs were all above 0.7. Gliem (2003) contends that any set of items for a research construct that attains a chrobach alpha index not less than 0.7 is purpose of collecting data in the field. In light of this, it can be observed that all the three constructs had Cronbach's alpha index exceeding 0.7 and as such the research instrument was reliable.

The field data gathered in this study were analysed on the basis of response rate, descriptive statistics, inferential statistics, and thematic analysis.

FINDINGS AND DISCUSSION

Response Rate

The study received 242 questionnaires that were completed properly. This means that only those including questionnaires that did not have any missing values were considered for further analysis. The response rate was 70.35%, which is above 60% threshold recommended by Zhao, Wang, Hemani and Bowden (2020) for ensuring adequate representation in analyses. Such a high response rate enhances the reliability of the survey's outcomes.

Table 2: Response Rate

Category	Respondents	Response	Percentage
Large	Managers (Directors, CEOs)	86	35.5
	Supervisors	90	37.2
Medium	Managers (Directors, CEOs)	31	12.8
	Supervisors	35	14.5
Total		**242**	**100**

Table 2 demonstrates that 72.7% of the respondents were from large manufacturing pharmaceutical companies, of whom 35.5% were managers and 37.2% were supervisors. On the other hand, 27.2% of the respondents were from medium manufacturing pharmaceuticals, of whom 12.8% were managers and 14.5% were supervisors.

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Descriptive Statistics

The study variables were research and development networks, virtual interfirm networks, interfirm partnerships, knowledge sharing networks, regulatory framework, and performance. The descriptive statistics are presented in subsequent sections.

Research and Development Networks

Research and development networks were the first independent variable for this study. The variable was operationalized using informal R&Ds, equity joint ventures, and non-equity joint ventures. The means and standard deviations of various attributes of research and development networks are portrayed in Table 3.

Table 3: Descriptive Statistics of Research and Development Networks

Statement	Mean	Std. Deviation
The organization engages in informal research and development networks to increase performance.	3.68	1.04
Equity Joint Ventures have influenced the performance of the organization.	4.04	0.22
Research and development networks have improved the organization to innovate and introduce new products.	3.99	0.97
The research and development activities are integral to our mission of advancing the organization's capabilities	3.33	1.05
The non-equity joint ventures influence the performance of the organization.	4.11	0.24
The research and development networks have enhanced the coordination of activities in the organization	4.23	0.13
Average	**3.89**	**0.61**

The aggregate mean for research and development (R&D) networks was 3.89 (SD=0.61). This indicates respondents agreed that these networks influence firm performance. The low deviation indicates low variability among the responses from the respondents. It can be concluded that the responses were clustered around the mean; hence, it was a true estimator of the population. The respondents agreed that research and development networks had enhanced the coordination of activities in the organizations with a mean of 4.23 (SD=0.13). Secondly, respondents indicated that non-equity joint ventures influence the performance of the organization with a mean of 4.11 (SD=0.24).

Thirdly, the respondents agreed that equity joint ventures influenced performance with a mean of 4.04 (SD=0.22). Fourthly, respondents agreed that research and development networks have contributed to innovation and introduction of new products and services in pharmaceutical companies with a mean of 3.99 (SD=0.97). Fifthly, the mean of 3.68, which

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approximates 4, and a standard deviation of 1.04 indicate moderate variation in the agreement among respondents that the organization engages in informal research and development networks to increase performance. Lastly, the respondents agreed that research and development activities were integral in advancing the organization's capabilities with a mean of 3.33 (SD=1.05). However, the moderate deviation indicates some level of variability in the responses from the respondents.

Virtual Interfirm Networks

The second independent variable was virtual interfirm networks. The variable was operationalized through virtual teams, virtual enterprise, and virtual organization. The results of each attribute of virtual interfirm networks' mean score and their respective standard deviations are illustrated in Table 4.

Table 4: Descriptive Statistics of Virtual Interfirm Networks

Statement	Mean	Std. Deviation
The organization has invested in the virtual team using technology to communicate and collaborate with other firms.	4.26	0.07
The virtual organization involving other firms using the networks has increased our performance.	4.02	0.23
The organization engages in electronic linking to achieve the production and marketing process.	3.88	0.86
The organization has invested in the virtual team using technology to communicate and collaborate with other firms.	3.75	1.12
The virtual enterprise has improved the way organization responds to the changing environment.	3.81	0.25
The organization temporarily forms alliances with other firms to share skills and core competencies	4.13	0.09
Average	**3.98**	**0.43**

Table 4 indicates that the aggregate mean for virtual interfirm networks is 3.98 (SD=0.43), indicating a general positive perception with low variability among respondents on the significance of these networks. The respondents agreed that pharmaceutical manufacturing firms have invested in virtual teams by using technology to communicate and collaborate with other firms, with a mean of 4.26 (SD=0.07). This high rating underscores the critical role that technology plays in fostering effective communication and collaboration between firms, while the low standard deviations indicate a low variation in their responses.

Secondly, the respondents agreed that their organizations form temporary alliances with other firms to share skills and core competencies with a mean of 4.13 (SD=0.09). The low standard deviation indicates low variation in the responses. Thirdly, the respondents agreed that

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virtual organizations involving other firms using the networks have increased performance in the manufacturing pharmaceutical companies, with a mean of 4.02 (SD=0.23). The low standard deviation indicates low variability in the responses given. Thirdly, the respondents agreed that their organizations engage in electronic linking to achieve the production and marketing process with a mean of 3.88 (SD=0.86). The mean of 3.81 and a standard deviation of 0.25 indicate that the respondents agreed that the virtual enterprises have improved the way organization responds to the changing environment.

In contrast, the respondents agreed that knowledge-based networking strengthens the inherent link between information access in the industry, thus high performance with the lowest mean of 3.75 (SD=1.12). The mean score, although lower than the aggregate, suggests that respondents recognize some potential in knowledge-based networking but may perceive its impact as less immediate or robust compared to technology-driven collaborations. The significant standard deviation indicates a wider divergence of opinions, which may reflect differing experiences or understanding of the benefits of knowledge-sharing networks within the industry.

Interfirm Partnerships

The third independent variable was interfirm partnerships. The variable was operationalized through marketing alliances, supplier alliances, and production alliances. Table 5 shows the mean scores and their respective standard deviation for each attribute of interfirm partnerships.

Table 5: Descriptive Statistics of Interfirm Partnerships

Statement	Mean	Std. Deviation
The organization has been involved in marketing alliances to increase its performance.	3.77	0.87
The partnership with other firms has enriched the entry to new product/market domains.	4.12	0.34
The organization participates in supplier alliances to improve performance.	4.08	0.43
The organization collaborates with others to expand its networks.	3.97	0.68
The production alliances have increased the performance of the organization.	4.27	0.19
The organization collaborates with other firms based on mutual relationships.	3.91	0.44
Average	**4.02**	**0.49**

Table 5 demonstrates that the aggregate mean of interfirm partnerships is 4.02 and the standard deviation is 0.49. This suggests that respondents generally recognize the significance

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of these partnerships in enhancing firm performance. The respondents agreed that production alliances have increased the performance of the organization with a mean of 4.27 (SD=0.17). This suggests that respondents perceive production-focused partnerships as particularly influential in driving organizational performance. Secondly, the respondents agreed that partnerships with other firms have enriched the entry to new product/market domains with a mean of 4.12 and a standard deviation of 0.34. The low standard deviations indicate low variation in their responses.

Thirdly, the respondents agreed that the organization participates in supplier alliances to improve performance with a mean of 4.08 (SD=0.43). Fourthly, the respondents, with low variation in their responses, agreed that their organizations collaborate with others to expand their networks, as indicated by a mean of 3.97 (SD=0.68). Fifthly, respondents agreed that their organizations collaborate with other firms based on mutual relationships with a mean of 3.91 (SD=0.44). In contrast, the respondents agreed that the organizations have been involved in marketing alliances to increase their performance with a mean of 3.77 (SD=0.87). This lower rating implies that the perceived impact of marketing alliances on performance is less significant compared to production alliances.

Knowledge Sharing Networks

The fourth independent variable of this study was knowledge sharing networks. Knowledge sharing networks were operationalized into knowledge and skills transfer, knowledge diversity, and inter-organizational systems. Table 6 presents this summary.

Table 6: Descriptive Statistics of Knowledge Sharing Networks

Statement	Mean	Std. Deviation
The organization has social networks that enable the transfer of information with other firms to increase performance.	3.89	1.02
Knowledge-based networking strengthens the inherent link between information access in the industry, thus achieving high performance.	3.77	1.14
The organization has established an inter-organizational system to increase information sharing.	4.21	0.41
The Knowledge diversity supported by the networks is the basis of maintaining high performance.	4.32	0.15
Linking knowledge networks to companies' growth strategy promotes high performance.	3.81	1.16
Combining employees' knowledge and skills has increased the organization's performance.	4.17	0.23
Average	**4.03**	**0.69**

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Table 6 indicates that knowledge-sharing networks had an aggregate mean of 4.03 and a standard deviation of 0.69. This reflects agreement among respondents about the positive influence of these networks on firm performance. The respondents agreed that knowledge diversity supported by the networks is the basis of maintaining high performance, with a mean of 4.32 (SD=0.15). The low standard deviation indicates low variability in their responses. This indicates that diverse knowledge sources are perceived as crucial for maintaining competitive performance. Secondly, the respondents agreed that the organization has established an inter-organizational system to increase information sharing with a mean of 4.21 (SD=0.41). Thirdly, the respondents agreed that combining employees' knowledge and skills has increased the organization's performance with a mean of 4.17 (SD=0.23).

Fourthly, the respondents agreed that their organizations have social networks that enable the transfer of information with other firms to increase performance, with a mean of 3.89 (SD=1.02). The standard deviation indicates moderate variation in their responses. Fifthly, the mean of 3.81 and a standard deviation of 1.16 indicate that the respondents agreed that linking knowledge networks to companies' growth strategy promotes high performance. In contrast, the lowest-rated statement, with a mean of 3.77 and a standard deviation of 1.14, indicates that knowledge-based networking strengthens information access in the industry, thus achieving high performance. This lower score implies that the perceived impact of knowledge-based networking on performance is less significant, suggesting variability in how different firms view the mechanisms and platforms for knowledge sharing.

Regulatory Framework

The regulatory framework was adopted as the moderating variable. It was operationalized into a legal framework, regulations, and intellectual property rights. The summary of the descriptive statistics of the regulatory framework is presented in Table 7.

Table 7: Descriptive Statistics of Regulatory Framework

Statement	Mean	Std. Deviation
The operations in the organization comply with all business laws in Kenya.	4.18	0.87
The organization adheres to tax administration policies.	4.02	0.62
The protection of intellectual property rights has been satisfactory.	4.08	1.06
The regulations by the government influence the types of interfirm networks.	3.98	0.42
The managers review interfirm networks based on the changes in the regulatory framework.	4.47	0.22
The organization complies with government policies on the protection of the environment.	3.79	0.57
Average	**3.75**	**0.63**

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Table 7 indicates that the aggregate mean of the regulatory framework is 3.75 and a standard deviation of 0.63. The mean is approximately 4, indicating agreement among respondents regarding how the regulatory framework shapes firm practices. The statement with the highest mean of 4.47 and a standard deviation of 0.22 indicates that the respondents agreed that the managers review interfirm networks based on the changes in the regulatory framework. The low standard deviation indicates low variation in the responses given. This suggests that respondents strongly believe in the importance of managerial reviews of interfirm networks in light of regulatory changes. Secondly, the mean of 4.18 and a standard deviation of 0.87 indicate that the respondents generally agreed that the operations in the organization comply with all business laws in Kenya. The low standard deviation indicates low variation in their responses. Thirdly, the respondents agreed that the protection of intellectual property rights has been satisfactory in the manufacturing pharmaceutical companies with a mean of 4.08 (SD=1.06). The standard deviation indicates a moderate level of variation in their responses.

Fourthly, the respondents agreed that their organizations adhere to tax administration policies with a mean of 4.02 (SD=0.62). Fifthly, the respondents agreed that the regulations by the government influence the types of interfirm networks with a mean of 3.98 (SD=0.42). In contrast, the respondents agreed that organizations comply with government policies on the protection of the environment with a mean of 3.79 (SD=0.57). The lowest score indicates some variability in how firms perceive their compliance with environmental regulations.

Firm Performance

Firm performance was adopted as the dependent variable. The variable of firm performance was operationalized using net profits, customer base/market share, and sales volume. The summary of performance is presented in Table 8.

Table 8: Descriptive Statistics of Performance

Statement	Mean	Std. Deviation
The net profits of the organization have been increasing in the last five years	4.01	1.34
The organization has increased its customer base in the last five years	3.47	1.27
The sales volumes in the organization have been increasing in the last five years	3.72	0.78
The organization has introduced new products in the market in the last five years	3.37	1.22
The organization has increased its market share in the last five years	3.69	0.86
The organization has increased its production in the last five years	3.66	1.02
Average	**3.40**	**1.08**

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Table 8 illustrates that the aggregate mean of performance was 3.40 (SD=1.08). The respondents agreed that net profits of the organization have been increasing over the past five years, with a mean of 4.01 (SD=1.34). This was the highest mean, and the standard deviation indicates moderate variation in their responses. Secondly, respondents agreed that the sales volumes in their organizations have been increasing over the past five years with a mean score of 3.72 (SD=0.78. Thirdly, the respondents agreed that the organization has increased its market share over the past five years with a mean of 3.9, which approximates 4 (SD=0.86). Fourthly, respondents agreed that the organization has increased its production over the past five years with a mean score of 3.66, which approximates 4 (SD=1.02). The standard deviation indicates moderate variation in their responses. Fifthly, the respondents agreed that the organization has increased its customer base over the past five years with a mean of 3.47 (SD=1.27). In contrast, the respondents agreed that the firms have introduced new products in the market over the past five years with a mean of 3.37 (SD=1.22). Comparing these scores to the aggregate mean of 3.40 and a standard deviation of 1.08, it becomes clear that overall perceptions of firm performance are positive, but with a noticeable emphasis on profitability over product introduction.

Diagnostic Tests

In statistics, diagnostic tests are used to assess the quality and validity of a statistical model. Conducting diagnostic tests ensures that conclusions drawn from a statistical model are valid and trustworthy. To ensure the requirements for regression are met, the following diagnostic tests were carried out.

Normality Tests

The study employed the Kolmogorov–Smirnov test to examine normality. The null hypothesis states that the data has a normal distribution. This hypothesis is not rejected when $p>0.05$. The results are exhibited in Table 9.

Table 9: Normality Test

	Kolmogorov–Smirnov test.		
Variables	**Statistic**	**Df**	**Sig.**
Research And Development Networks	0.100	242	0.084
Virtual Interfirm Networks	0.181	242	0.068
Interfirm Partnerships	0.164	242	0.072
Knowledge Sharing Networks	0.093	242	0.903
Regulatory Framework	0.141	242	0.208
Firm Performance	0.092	242	0.149

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Table 9 demonstrates that the data were normally distributed because p>0.05 for variables (research and development networks, virtual interfirm networks, interfirm partnerships, knowledge sharing networks, regulatory framework, and performance. This suggests that the assumption of normality is met, allowing for parametric statistical analyses such as regression to be validly applied. Since the data does not significantly deviate from normal distribution, it implies that the statistical tests performed in this study are more likely to yield reliable results, enhancing the accuracy of the regression analysis. A normally distributed population is one in which the data has a bell-shaped distribution with a symmetrical spread around the mean.

Linearity Test

This assumption states that variables should have a linear relationship. The correlation matrix assessed linearity. The null hypothesis states that the relationship between the variables is linear. The null hypothesis proposes a linear relationship among the variables. It is not rejected when p-value <0.05; this hypothesis is not rejected. Table 10 demonstrates the summary.

Table 10: Linearity Test

Correlation							
		Performance	Research and Development	Virtual Interfirm Networks	Interfirm Partnerships	Knowledge Sharing Networks	Regulatory Framework
Performance	Pearson Correlation	1	0.318	0.457	0.371	0.286	0.540
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000
	N	242	242	242	242	242	242

The correlation matrix showed p-values less than 0.05, confirming the assumption of linearity, as recommended by Creswell and Clark (2017). This implies that the residuals are normally distributed. Since the assessment accepts the linearity assumption, the implication is that there is a linear relationship between the independent variables and the dependent variable, supporting the use of linear regression analysis. This ensures that the residuals are normally distributed and the model fit is appropriate, leading to a more accurate interpretation of the relationship between variables.

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Multicollinearity

The multicollinearity test was done using the Variance Inflation Factor (VIF). Table 11 presents the multicollinearity results.

Table 11: Multicollinearity Results

Predictor	VIF
Research and Development	1.030
Virtual Interfirm Networks	1.054
Interfirm Partnerships	1.588
Knowledge Sharing Networks	1.678

Table 11 demonstrates that all variables showed VIF values below 10, indicating that multicollinearity is not present. VIF values below 10 suggest that the predictor variables are not highly correlated, as recommended by Katrutsa and Strijov (2017). Consequently, the stability and reliability of the model's coefficient estimates are enhanced, allowing for a clearer understanding of each variable's effect on the dependent variable. Therefore, each variable contributes unique and valuable insight to the overall analysis without excessive overlap with other predictors.

Heteroscedasticity

The study employed the Breusch-Pagan test to examine whether heteroscedasticity exists. The study results on the heteroscedasticity test are presented in Table 12.

Table 12: Breusch-Pagan Test

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.000	4	0.000	0.000	1.000[b]
	Residual	237.000	237	1.000		
	Total	237.000	241			

a. Dependent Variable: Standardized Residual

b. Predictors: (Constant), Knowledge Sharing Networks, Research and Development, Virtual Interfirm Networks, Interfirm Partnerships

Table 12 demonstrates a p-value greater than 0.05, indicating that heteroscedasticity is not present in the data. The constant variance of residuals across the levels of the independent variables confirms the assumption of homoscedasticity, which is necessary for valid regression analysis. The implication of this finding is that the regression results are not biased by unequal variances, allowing for accurate statistical inference and enhancing the reliability of the study's conclusions.

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Inferential Analysis

The objective of the study was to assess the moderating effect of the regulatory framework on the relationship between interfirm networks and the performance of pharmaceutical manufacturing firms in Nairobi City County, Kenya. This process was done in two steps as recommended by Baron and Kenny (1986). In the first step, the initial regression model was developed to examine the direct relationships between the independent variables, research and development networks, virtual interfirm networks, interfirm partnerships, and knowledge-sharing networks, and the dependent variable, firm performance (Table 13).

Table 13: Regression Analysis of Interfirm Networks on Performance

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.587	0.190		8.350	0.000
	Interfirm Networks	0.282	0.088	0.203	3.205	0.002
a. Dependent Variable: Firm Performance						

Table 13 demonstrates that performance would be 0.282 when interfirm networks are maintained at zero. Interfirm networks have a significant effect on performance with a β of 0.282 and $p<0.05$. The regression equation thus becomes;

Y = 1.587 + 0.282X……..(i)

Where; *Y = Firm Performance*, *X = Interfirm networks*

In step two, the independent variables interacted with the regulatory framework. The findings are exhibited in Table 14.

Table 14: Regression Analysis of Interaction Term

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
	Model	B	Std. Error	Beta	T	Sig.
1	(Constant)	1.035	0.839		1.233	0.219
	Interfirm Networks	0.497	0.396	0.036	1.255	0.000
	Regulatory Framework	0.499	0.379	0.536	1.317	0.002
	Interaction Term	0.267	0.176	0.285	1.517	0.000
a. Dependent Variable: Performance						

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Table 14 demonstrates that when both the independent and moderating variables are held at a constant of zero, performance would be 1.035. Interfirm networks have a significant effect on performance with a β of 0.497 and p<0.05. The moderating variable, regulatory framework, has a significant effect on performance with a β of 0.499 and p<0.05. Additionally, the results show that the interaction term is significant (β 0.2.67 and p=0.000).
The fitted regression models in moderation analysis were;

Y = 1.587 + 0.282X ……. (ii)

Y = 1.035+ 0.497X+0.499 M+ 0.267X*M …… (iii)

Where; *Y = Firm Performance*
X = Interfirm networks
*X*M = Regulatory framework*
*X*M = Interaction Term*

Under step two, if the regulatory framework is significant under the interaction term, it moderates the link between interfirm networks and performance. The significant p-values associated with the interaction term led to the rejection of the null hypothesis. Hence, the conclusion is that the regulatory framework has a moderating effect on the connection between interfirm networks and the performance of pharmaceutical manufacturing firms in Nairobi City County, Kenya. This finding suggests that compliance with regulatory standards can enhance the effectiveness of these networks by ensuring that they operate within a conducive legal environment.

The findings align with Mutangili, Awuor, and Cheluget (2020), who found that the regulatory framework significantly influences the relationship between international procurement practices and supply chain performance in Kenyan energy development organizations. Getange (2020) demonstrated a significant effect of the regulatory environment on the connection between performance and transformational leadership. Alabi, David, and Aderinto (2019) concluded that government policies and initiatives are crucial for SME growth in the region, particularly in Nigeria.

Ajia (2021) suggested that regulatory frameworks moderate the relationship between leadership quality and organizational success in Kwara State, Nigeria. Ayam (2019) established that the regulatory framework moderates the link between employee commitment and performance in Ghana's private social security firms. It also positively correlates with the provision of social security. Pedo, Kabare, and Makori (2018) found that the regulatory

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framework significantly enhances the success of PPPs in road development in Kenya. The success is also partially attributed to government policies that mediate the effects of the regulatory environment.

Analysis of Qualitative Data

Analysis of qualitative responses was carried out by identifying the dominant themes and the respective presentation done in prose form.

Theme 1: Enhanced Collaboration

Research and development (R&D) networks are vital for improving firm performance by fostering collaboration and accelerating innovation. These networks facilitate partnerships with academic institutions, research labs, and other pharmaceutical companies, enabling firms to pool expertise and resources. The research and development networks have been essential for accessing cutting-edge technologies and sharing knowledge that would have been difficult to develop independently. Consequently, joint research projects have opened doors for new innovations and market expansion. The collaborative framework of R&D networks allows firms to tap into diverse expertise, strengthening their ability to develop innovative drugs and contributing to faster, more successful R&D outcomes.

Theme 2: Efficiency

The virtual interfirm networks have a transformative effect on enhancing communication and efficiency across the pharmaceutical firms in Nairobi City County. Digital tools and platforms have eliminated geographical and organizational barriers, allowing firms to share information in real time. Additionally, the virtual network has optimized the supply chain, enabling better coordination with suppliers and distributors, which reduces delays and costs. Managing partnerships and making decisions virtually has streamlined operations and market entry strategies. These operational benefits underscore how virtual interfirm networks boost research and development capabilities, improve business processes, and facilitate entry into new markets, demonstrating their value among firms.

Theme 3: Strategic Alliances

The interfirm partnerships play a critical role in enhancing the performance of pharmaceutical manufacturing firms in Nairobi City County through resource sharing, joint ventures, and strategic alliances. These partnerships provide access to new markets, shared

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technology, and the ability to leverage complementary strengths. The strategic partnerships allow pharmaceutical manufacturing firms to enter markets that were previously challenging by utilizing shared distribution networks. Through joint ventures, the firms have gained access to advanced drug formulation technologies, which have improved their production processes. This collaborative approach fosters growth opportunities and supports firms in maintaining competitiveness within the rapidly evolving pharmaceutical sector. Strategic partnerships with suppliers and distributors have expanded market reach and enabled faster response to demand. Such partnerships streamline operations and provide access to additional resources and capabilities, enhancing market presence and performance.

Theme 4: Continuous Learning

Knowledge-sharing networks facilitate the transfer of information, best practices, and innovative ideas. These networks promote collaboration across firms and research institutions, supporting continuous learning and innovation. Collaborating with universities and research organizations through a knowledge network has broadened access to expertise and resources that drive. By fostering environments where information is freely exchanged, knowledge-sharing networks empower pharmaceutical firms to strengthen R&D processes, streamline operations, and better serve the healthcare sector. Additionally, the knowledge-sharing network enables firms to keep in touch with current industry trends, share experiences, and learn from others' successes and challenges. Access to shared research insights and scientific breakthroughs within the network has significantly accelerated the product development process. This culture of shared learning serves as a catalyst for ongoing improvement and innovation.

Theme 5: Market Access

Understanding local regulations is vital, especially when expanding into markets with different requirements. Compliance with regulatory standards has improved product quality and opened doors to global markets. Firms view adherence to strict regulatory frameworks as not only a legal obligation but also a means of building credibility and trust in the market. Regulatory frameworks, therefore, function as strategic tools that influence both market positioning and the overall performance of pharmaceutical firms. Collaboration with a regulatory expert has streamlined lengthy product approval processes, ensuring a faster time-to-market that sets firms apart from competitors. Consequently, regulatory frameworks have a great impact on product development and market entry.

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Theme 6 Investment in Research and Development

Continuous investment in research and development has allowed the introduction of breakthrough therapies that differentiate among competitors. Focusing on customer needs and developing products that address unmet medical conditions has positioned firms as market leaders. Ultimately, this emphasis on innovation and responsiveness to customer needs helps firms build strong reputations, command premium prices, and secure market leadership.

Theme 7: Technology Adoption and Regulatory Compliance

Technology adoption and regulatory compliance are critical in sustaining a competitive edge. The firms' strong brand and commitment to technology adoption have kept them relevant and appealing to both healthcare providers and patients. Ensuring compliance with regulatory standards builds trust with stakeholders, translating into market loyalty and preference for their products. Ultimately, pharmaceutical firms achieve competitive advantage through innovation, strategic partnerships, operational optimization, and regulatory compliance, solidifying their industry standing.

Theme 8: Continuous Improvement

Continuous improvement in product development and customer satisfaction drives firm performance. Growth has been achieved by focusing on innovation and delivering quality products that meet market needs. The firms have also expanded into new markets to increase sales volume and revenue, which in turn has enhanced overall firm performance. These strategies have enabled firms to improve profitability, market share, and brand equity, contributing to long-term sustainability and competitiveness.

Theme 9: Cost reduction and Process Optimization

Cost reduction and process optimization are critical for maintaining profitability and competitiveness. Streamlining the production process has significantly lowered operational costs and improved our margins, allowing firms to reinvest in research and development and marketing. Implementing lean manufacturing practices has enhanced our efficiency, reduced wastage, and ultimately improved our firm's performance. These improvements in internal operations have translated into higher profitability, better product quality, and increased market responsiveness. Similarly, a leadership approach that fosters a culture of continuous improvement, innovation, and collaboration was seen as fundamental to high performance in the competitive pharmaceutical sector.

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CONCLUSION

The research findings reveal compelling insights into the dynamics that influence the performance of pharmaceutical manufacturing firms in Nairobi City County, Kenya. A key conclusion from the analysis is that interfirm networks significantly impact performance, as demonstrated by the strong positive correlation coefficients. This emphasizes the significance of strategic collaboration and resource-sharing for organizational success in the pharmaceutical sector.

RECOMMENDATIONS FOR PRACTICE

The study recommended that policymakers and regulatory bodies in Kenya should develop a comprehensive regulatory framework that supports and enhances the performance of pharmaceutical manufacturing firms. This framework should balance the need for compliance with the promotion of innovation, collaboration, and competitiveness. Policymakers should engage with industry stakeholders to understand the challenges and opportunities posed by existing regulations, and continuously review and update policies to reflect evolving market dynamics and technological advancements. The regulatory framework should provide clear guidelines on intellectual property protection, antitrust regulations, environmental standards, and data privacy, while also incentivizing research and development, knowledge sharing, and interfirm collaborations.

REFERENCES

African Development Bank (2023). *African Development Bank unveils the African Pharmaceutical Technology Foundation at the 2nd International Conference on Public Health in Africa.* Retrieved from https://www.afdb.org/en/news-and-events/press-releases/african-development-bank-unveils-african-pharmaceutical-technology-foundation-2nd-international-conference-public-health-africa-57650

Ahmed, S. M. M., & Ali, T. (2023). Administration Expenditure and Sales Performance of Pharmaceutical Sector of Pakistan: A Comparison Between Local and Multinational Companies (A Case Study of Multinational and Local Pharma Companies). *Journal of Marketing and Management*, *14*(1), 1-17.

Aketch, J., *et al.* (2020). *Gender Dynamics in Leadership within Manufacturing Industries in Kenya*. Journal of Gender Studies.

Akkermans, H. A., & Van Oorschot, K. E. (2018). *Relevance assumed: a case study of balanced scorecard development using system dynamics*. Palgrave Macmillan, London.

Ayaydin, H., & Karaaslan, İ. (2020). The Effect of Research and Development Investment on Firms' Financial Performance: Evidence from Manufacturing Firms In Turkey. *Bilgi ekonomisi ve yönetimi dergisi*, *9*(1), 23-39.

Burlina, C. (2018). Inter-firm networks and firm performance: The case of Italy. *Marco Fanno 3(2), 189- 216*.

Chalmers, D. K., Mannetta, E. W., & Sensini, L. (2020). R&D and Internationalization: Effect on the Performance of SMEs. *International Journal of Advances in Management and Economics*, *9*(3), 39-48.

Creswell, J. W. (2009). *Research Design: Qualitative and Mixed Methods Approaches.* SAGE: London, UK.

Coff, R. W. (2007). Human assets and management dilemmas: Coping with hazards on the road to resource-based theory. *Academy of Management Review*, *22*(2), 374-402.

Licensed under Creative Common

Dadfar, H., Dahlgaard, J. J., Brege, S., & Arzaghi, B. J. (2020). International strategic alliances in the Iranian pharmaceutical industry: An analysis of key success and failure factors. *Total Quality Management & Business Excellence*, *25*(7-8), 812-826.

Eckerstorfer, M. F., Engelhard, M., Heissenberger, A., Simon, S., & Teichmann, H. (2019). Plants developed by new genetic modification techniques—comparison of existing regulatory frameworks in the EU and non-EU countries. *Frontiers in Bioengineering and Biotechnology*, *7*, 26.

European Federation of Pharmaceutical Industries and Associations (2022). The Pharmaceutical Industry: A Key Asset to Scientific and Medical Progress. Retrieved from https://www.efpia.eu/media/637143/the-pharmaceutical-industry-in-figures-2022.pdf

Getange, B. N. (2020). *Transformational Leadership, Organizational Culture, Regulatory Framework and Performance of State Corporations in Kenya* (Doctoral dissertation, MUA).

Gichuki, A. (2018). *Impact of Kenya Tradenet System on Operational Performance of Bulk Importers Pharmaceutical Companies in Nairobi* (Doctoral dissertation, University of Nairobi).

Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The qualitative report*, *8*(4), 597-606.

Hoque, Z. (2014). 20 years of studies on the balanced scorecard: trends, accomplishments, gaps and opportunities for future research. *The British accounting review*, *46*(1), 33-59.

Jones, G. R. & Hill, C. L. (2009). *Strategic Management: An Integrated Approach*. Houghton Mifflin: Boston, USA.

John, A. (2018). Effect of Green Supply Chain Management Practices on the performance of manufacturing firms in Kenya. *GSJ*, *6*(8), 669-672

John, M. K. (2020). *Strategic Alliance Practices and Organization Performance of Selected Companies in The Energy Sector in Kenya* (Doctoral dissertation, Kenyatta University).

John, Z. A. (2022). The impact of strategic human resource management on the organizational sales performance: Case of national pharmaceutical companies in Pakistan.

Kimaru, I. W. & Kinyua G. M. (2018). Relationship between Financial Resources and Performance of Credit Only Microfinance Institutions in Kenya. *International Journal of Innovative Research and Advanced Studies*, 5(12), 1-6.

Kung'u, S. M., Kahuthia, J. & Kinyua, G. (2020). Analysis of the Effect of Strategic Direction on Performance of Motor Vehicle Assembly Firms in Nairobi City County, Kenya. *International Journal of Managerial Studies and Research*, 8(8), 82-94.

King'oo, R. N., Kimencu, L. & Kinyua, G. (2020). Empirical Analysis of Effect of Information Technology Capability on Performance of Private Universities in Kenya: *International Journal of Managerial Studies and Research*, 8 (11): 52 – 61.

Kinyua, G. M. (2015). *Relationship Between Knowledge Management and Performance of Commercial Banks in Kenya*. Doctoral Thesis, Kenyatta University; Nairobi, Kenya

Kinyua, G. M., Muathe, S. M. A. & Kilika, J. M. (2015). Influence of Knowledge Transfer and Knowledge Application on Performance of Commercial Banks in Kenya. *Journal of Emerging Issues in Economics, Finance and Banking,* 4(2), 1648-1660.

Mailu, R. N., Ntale, J. F. & Ngui, T. K. (2018). Strategy implementation and organizational performance in the pharmaceutical industry in Kenya. International Academic Journal of Human Resource and Business Administration, 3(2), 33-47.

Mbulwa, J. & Kinyua, G. (2021). The Role of Strategy Formulation on Service Delivery: A Perspective of Turkana County in Kenya. *International Journal of Innovative Research and Advanced Studies*, 8(3): 16 – 23.

Mertens, D. M. (2005). *Research Methods in Education and Psychology: Integrating Diversity with Quantitative and Qualitative Approaches* (2nd ed.). Sage: Thousand Oaks, UK.

Momanyi, G. W., Armurle, G., & Nyaboga, Y. (2020). The Relationship Between Intellectual Capital, Research and Development, and Organizational Performance of Tea Processing Firms in Kenya. *International Journal of Academic Research in Business and Social Sciences*, *10*(11), 360-383.

Mutangili, S. K., Awuor, E., & Cheluget, J. (2020). Moderating Effect of Regulatory Framework in The Relationship Between International Procurement Practices and Supply Chain Performance of Energy Development Agencies in Kenya. *African Journal of Emerging Issues*, *2*(3), 1-19.

Licensed under Creative Common

Ndemezo, E., Charles, K., Angelique, D., & Ndikubwimana, J. B. (2018). Innovation and Firms' Performance in the Rwandese Manufacturing Industry. A Firm Level Empirical Analysis. *A Firm Level Empirical Analysis (June 1, 2018). UoK Scientific Journal ISSN*, *2522*.

Ndikubwimana, P. (2016). The role of financial institutions in promoting innovation of SMEs in Rwanda: An empirical review. *Journal of Economics, Management and Trade*,14(2) 1-14.

Njiru, M. J. & Kinyua, G. (2022). Organizational Performance as an Outcome of Entrepreneurial Orientation in the Context of Reinsurance Companies in Kenya. *International Journal of Managerial Studies and Research,* 10(2): 51-60.

Omale, S. A., Orji, M. G., Oladele, T., & Olaniyi, K. B. (2017). Improving Corporate Venture Investment through Strategic Inter-Firms Knowledge Transfer: An Empirical Evaluation of Service Firms in Nigeria. *Journal of Investment and Management*, *6*(1), 44-49.

Rafique, M., Hameed, S., & Agha, M. H. (2018). Impact of knowledge sharing, learning adaptability, and organizational commitment on absorptive capacity in pharmaceutical firms based in Pakistan. *Journal of Knowledge Management*.

Rafique, M., Nawaz, M., Syed, T., & Agha, M. (2017). Technology Transformation in Pharmaceutical Industries of Pakistan through joint efforts of R&D and Manufacturing Departments-A Process Centered Approach. *Sindh University Research Journal-SURJ (Science Series)*, *49*(1), 16-37

Saunders, M., Lewis, P., & Thornhill, A. (2012). *Research methods for business students.* Harlow: Pearson. London

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48(6), 1273-1296.

Tabesh, H., Kelly, L., & Poulose, C. (2018). Herding Behaviour in the Nairobi Securities Exchange. *Journal of Applied Business and Economics*, *20*(3).

Zhao, Q., Wang, J., Hemani, G., & Bowden, J., (2020). Statistical inference in two-sample summary-data Mendelian randomization using robust adjusted profile score.

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