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# Manufacturing Firms' Performance and Operational Innovation: The Impact of the External Environment

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**The goal of this study was to investigate the effect of external environment on the relationship between innovation and firm performance in the Kenyan context. Treating product, process, market, and technological innovation as dimensions of operational innovation, the study empirically tested the effect on firm performance while examining the moderating effect of external environment (customer and supplier, rules and regulation, economic conditions, and trade unions). One hundred and eighty-two (182) firms were actively used in this survey research. The recommended model was tested using hierarchical regression using PROCESS macro in SPSS. Findings suggested that trade unions play moderating role in the association between operational innovation and firm performance while customer suppliers, rules and regulations and economic conditions have no link to the association. Importantly, the outcome of this work positively contributed to the existing literature by examining mechanism between external environment and the firms' performance in Kenya with the implementation of various operational innovations.**

*Keywords: External environment, firm performance, manufacturing firms, operational innovation, moderation*

*JEL: M11, M16, N67*

Firm performance is mediated by an interplay of many factors, which can be categorized as internal and external business environmental factors. Samad (2022) noted that internal resources such as innovation capabilities and external factors such as technology and the environmental system positively affect firm performance. This means that firms that want to achieve the ultimate performance must exploit their available resources, for example, by applying innovative technology to their products, processes, and markets (Hung and Chou, 2013). The holistic application of innovative technology in business operations is recognized as operational innovation in this study and expressed by Hammer (2004) as the only certain way of gaining lasting superior performance. In this case, operational innovation would provide opportunities for businesses to enter specific markets by helping them obtain sources of competitive advantage, which influences firm performance (Hou *et al.*, 2019).

Despite these findings and a seemingly straightforward way of boosting firm performance, the performance of manufacturing firms in Kenya has been a concern lately. Reports show that about 30

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manufacturing firms have closed in under a decade in the country, while others have seen a decline in performance (Munda, 2023). The Kenya Association of Manufacturers ([KAM], 2022) attributes this to external environmental factors such as a high cost of doing business, high energy costs, high taxation rates, and high competition from imports (Munda, 2023), while a recent study conducted by Alex *et al.* (2023) attributes the poor performance to issues in production and operation management. This can be interpreted to mean that the ability of a firm to perform depends on different environmental factors.

Past studies, such as Nandakumar *et al.* (2010) evaluated the moderating influence of the external environment and organizational structure on the productivity of manufacturing firms. However, these studies have mostly focused on developed countries, in this case, the UK, and have investigated the environment as a whole instead of the individual influence of different environmental factors on firm performance. Again, few studies have explicitly explained the moderating impact of environmental factors on the relationship between operational innovation and firm performance. Thus, this study fills this gap by empirically examining the moderating role of the environment's sub-variables on the relationship between innovation and firm performance. The sub-variables under investigation are customers, suppliers, economic conditions, government agencies, and trade unions. The study also focuses on Kenya's dwindling yet promising manufacturing industry, exploring operational innovation in Kenyan manufacturing firms, thus determining how the external environment affects their ability to innovate and perform well. Since manufacturing firms in Kenya contribute significantly to their gross domestic product (GDP) (KAM, 2020), the findings from this study could be applied to boost their performance in different sectors of the economy. The findings could also provide a framework for explaining the varying performance of manufacturing firms in other developing countries.

This inquiry targets to answer four research questions:

Q1: Does combined effect of product, process, market, and technological innovation affect firm performance?

Q2: What is the impact of product, process, market, and technological innovation on firm performance?

Q3: Does combined effect of customer, supplier, economic conditions, and trade unions critically moderate the relationship between innovation and firm performance?

Q4: What is the impact of customer, supplier, economic conditions, and trade unions on the relationship of innovation and firm performance?

The rest of this study is organized as follows: next section will present a literature review elaborating on the theoretical foundation and development of the hypotheses is reported; third section mentions

study's methodology. In fourth section, the results, are presented and discussed in section five, while the sixth, seventh, and eighth sections describe the conclusion, implications, limitations and future directions, respectively.

## LITERATURE REVIEW

### Theoretical Underpinnings

The anchoring theory for this study is Schumpeter's innovation theory of entrepreneurship. This is also supported by the stakeholder theory, and resource-based view (RBV), which all present link between organizational processes and their performance.

### Schumpeter's Innovation Theory of Entrepreneurship

This theory, coined by Joseph Schumpeter in 1932, is part of the economic theories of entrepreneurship (Upadhyay and Rawal, 2018). According to Schumpeter (1934), economic change results from innovation-originated market power championed by an entrepreneur, who helps firms develop new products, processes, and industry structure, and acquire new markets and sources of semi-finished goods or raw materials. The entrepreneur is, therefore, regarded as an agent of change, "a creative distractor," and consequently, for the sector and country, in this case, manufacturing and Kenya, respectively.

The theory is applicable in this study because it is based on the premise that to gain profit, one must innovate. This means that Kenyan manufacturing firms that innovate can create new opportunities for growth and investment. It is also applicable since in his later works as Schumpeter eliminated the criticism that his theory over glorifies the role of the innovator and innovation in economic development by holding that innovation is not only an individual initiative but can involve cooperation of various actors (Śledzik, 2013). This highlights the part played by a country's external business environment factors.

### Resource Based View

Closely related to Schumpeter's theory is Edith Penrose's resource-based view theory (Dekkers *et al.*, 2014), which examines how a firm can achieve and sustain competitive advantage. According to Penrose (1959), businesses that want to gain a competitive edge over others should possess rare, valuable, distinctive, and immovable resources. Possession of these competitive resources, categorized as tangible and intangible (Barney, 1991), requires some level of innovation to exploit Research and Development (R&D), eliminate resistance to change, reduce costs, and increase the competitive advantage of firms. This highlights the model's encouragement to understand a firm's resources and capabilities, which can then be exploited to drive innovation. In context, since innovation is key for growth

and sustainability in today's contemporary business environment, the resources and capabilities possessed by Kenyan manufacturing firms, that is, operational innovation, should contribute positively to their performance.

### Stakeholder Theory

Another theory informing this study is the stakeholder theory, detailed by Edward Freeman in 1984. According to this theory, organizations must create value for all its stakeholders and not just the shareholders. The beliefs, opinions, and goals of stakeholders must therefore be factored in the strategic goals and objectives of the firm (Freeman, 1984). This means that the relationship between the business and its primary stakeholders such as customers, employees, and suppliers, and secondary stakeholders such as regulators and civic institutions must be nurtured. It also means that stakeholder pressures, which is defined by Helmig *et al.* (2016) as a stakeholder's ability to influence an organization's decisions, in this case, pressure from customers, suppliers, trade unions have the ability to influence the innovative capacity of Kenyan manufacturing firms, and thus their performance either positively or negatively. Still, Parmar *et al.* (2014) state that while the theory helps examine the impact of environmental factors on the relationship between innovation and firm performance, this is dependent on the nature of the stakeholders' engagement.

### Study Variables

#### –Operational Innovation

The concept of operational innovation comes from innovation, which depicts the development and acceptance of new goods, services, concepts, and ways of operation to realize organization's potential (Drucker, 1988). Over the years, the definition of innovation has been under scrutiny and has been studied in various dimensions, including as a single construct (Barasa *et al.*, 2019; Das *et al.*, 2018), concerning destructive and radical innovation (Lee *et al*, 2019) and also product and process innovation (Loften, 2014). However, all these studies lacked congruence as to what entails innovation dimension. As such, the present study contextualized innovation under four dimensions; product, process, marketing, and technology innovation, which are among the areas connected to the operations of any organization (Gunday *et al.*, 2011; OECD, 2005). Operational innovation, therefore, will be studied under these four dimensions.

### Product Innovation

This is combination of technologies placed commercially to meet market needs. It focuses on improvement of properties and quality of the finished product (Mbogori *et al.*, 2018). It is necessitated

by shrinking of product life cycles, dynamism in customer preferences, technological developments, globalization of the markets (Atalay *et al.*, 2013) and stiff competition (Cooper, and Cronin, 2000). The main aim of product innovation is to generate superior customer value, gain competitive advantage and ensure long-term success through the development and commercialization of new products and services (De Massis *et al.*, 2015). Studies hold product innovation as appointer on sales revenue, profitability and business performance (Mitrega *et al.*, 2012; O'Cass and Sok, 2015; Vecchiato, 2017).

### -Process Innovation

Process innovation is the utilization of a production method or major modifications to particular tools, software, or equipment in order to lower costs associated with production and distribution, improve the quality, production, or delivery of new or improved products, increase the productivity or flexibility of a supply activity or productive activity, and decrease environmental hazards (Maier, 2018). This translates to improving human resource management (HRM) effectiveness. This involves the adoption of substantially enhanced or revolutionary methods of production by an organization. This may include adopting new ways of operations, altering equipment.

### -Marketing Innovation

Involves the implementation of new marketing methods backed by the creative use of Product, Price, Promotion and Place, (4Ps) of marketing with the aim of satisfying customer needs and preferences (OECD, 2005). This is closely linked to the idea of Lee *et al.* (2019) who sees it as the firm's ability to approach the market, effectively use the channels of communication, and deliver product and service to capture potential or existing customers. Factors in the 4Ps broadens the definition of marketing innovation and therefore was used in this study.

### -Technical Innovation

This involves the implementation of new ideas and approaches to company operations; it relates the firm with the outside world. As noted by Atalay *et al.* (2013), it is beneficial to the organization as it helps to reduce costs such as inventory, transaction costs and other expenses. It also helps firms to increase personnel productivity and gaining access to more trade assets.

Importantly, while these dimensions of operational innovation are advantageous to the firm in different capacities, successful operational innovation depends on many different factors within these dimensions (Fellnhofer, 2019). This makes it continuously evolving process.

### -The External Environment

The influence of the external environment on the day-to-day operations of company or industry presents

unique threats and opportunities that ultimately determine its performance and sustainability (Abayomi and Oyobami, 2012). Similarly, attractive external environment promotes external investment and domestic private investment (Wei *et al.,* 2009). Its components which include political factors, social-cultural factors, and industrial, institutional, and infrastructural factors; industrial well-being, business and legal frameworks, and industrial actions affects businesses directly and indirectly. On the other hand, the environment enables business activity by availing the critical resources for production as reflected by RBV theory. The firm, in this case, aligns itself accordingly to obtain these resources directly (Ombaka *et al.,* 2015) and gaining competitive advantage depending on the degree of alignment. Similarly, the environment can disable business activity wherein the firm mitigates threats that would prevent them from exploiting these resources and thus gaining a competitive edge over their peers (Freeman, 1984).

In this study, the following elements of the external environment were considered: customers, and suppliers, economic conditions, Rules and Regulations (government agencies) and trade unions.

### -Customers and Suppliers

This has been focused in many marketing studies. Indeed, neglecting customers and suppliers of firm loosens the cornerstone of any business. Roots of this is found in the stakeholder's theory. It controls the upstream and the downstream of the supply chain. Customers consume products or services of the firm while supplier mainly provide quality raw material and consumables of the firm. Right raw materials must be supplied to produce quality product to the final consumer (Harb and Trad, 2023).

### -Economic Condition

According to Albin (2021), economic conditions provide a degree that is seen rationally and places a person in a position in society. They include interest rate, foreign exchange rate, and inflation rate prevailing in a country. This affects the firm's operational liquidity level since it offers one of the most important resources for operations.

### -Rules and Regulations

The legal environment entails: laws and rules that affect how businesses operate both outside of and inside of organizations, such as tax, accounting, and labor laws, and laws governing corporations and competition; the Constitution's provisions (universal laws and values that the state, acting on behalf of the entire community, deems paramount and deserving of enforcing, along with citizen rights and obligations) (Ietto-Gillies, 2023).

### -Trade Union

They are a crucial ally of the government, often working together to shape social policy through tripartite agreements. Nonetheless, trade unions' standing is established by their proclaimed autonomy from employers, the government, political parties, and other organizations. Protecting the rights and interests of those whose lives are dependent on their jobs and whose income comes mostly from wages or salaries is (or was) the organization's major goal (Bagić and Ostojić, 2023).

### -Firm Performance

Firm performance reflects a firm's success, that is, the degree to which it has achieved preset goals (Gaya *et al.*, 2013). The preset goals can range from financial to non-financial, measured equally using financial or non-financial metrics. For instance, financial performance has, for the longest time, been used as an indicator of organizations' effectiveness in revenue generation. This could be in the form of revenues and earnings over a certain period, multiplier for securities, profitability levels and aggregate portfolio returns (Ryan *et al.*, 1999). While most companies utilize these indicators (Kim *et al.*, 2018), they have several limitations, including inaccuracy caused by fiscal year delays and detail discrepancies (Lynch and Cross, 1991). They are given excessive attention that make them vulnerable to manipulation. Non-financial performance, on the other hand, can involve measuring leadership effectiveness (Whiting and Woodcock, 2011) and performance management, usually measured using the balanced scorecard (Namada *et al.*, 2014). The balanced scorecard boosts the strategic view of the firm's plan by measuring both the financial and non-financial aspects of the firm, such as worker satisfaction, environmental performance, corporate investment responsibility level, client satisfaction, company effectiveness and progress, and market price (Kaplan and Norton, 1998). However, not all non-financial performance is expensive. In most cases they are out of control of the CEOs of the firm and also available with everybody within the firm compared to financial statements. This highly influence customer relationship which has direct impact on the financial performance of the firm and therefore shall be used in this study.

## Hypothesis Development

### -Operational Innovation on Firm Performance

Operational innovations (product, process, market and technology) come as a result of change in the environment and the firm must react to them either positively or negatively for survival (Becheikh *et al.*, 2006). Earlier studies indicated that innovation significantly influence firm performance (Uzkurt *et al.,* 2013; Camisón and Villar-López, 2014; Nguyen *et al.,* 2018). Others confirmed a positive effect on some aspects of innovation, while others indicated an insignificant effect on performance (Calantone and Garcia, 2002; Loften, 2014; Jianmin and Zhan, 2016). Consequently, it is imperative to further empirical investigation for clearer understanding of this relationship. Based on earlier research findings,

it is clear that innovation has some direct impact on the performance of the firm. The contribution of individual dimension of innovation compared to the effect of main construct remains unclear. Thus, this study proposes the following hypotheses:

$H_{1a}$: The combined innovations positively affect firm's performance.

$H_{1b}$: Product innovation positively affects manufacturing firm's performance.

$H_{1c}$: Process innovation positively affects manufacturing firm's performance.

$H_{1d}$: Marketing innovation positively affects manufacturing firm's performance.

$H_{1e}$: Technological innovation positively affects manufacturing firm's performance.

### Operational Innovation and Firm Performance: Moderation Role of External Environment

As aforementioned, the external environment of organizations encompasses cultural values, the legal framework of a country, and demographic factors, determines the influence of innovation on firm's performance. The major determinant mostly are government's legislative activities. The energy and creativity needed in an organization are in the youths, and it is prohibitive to employ a person of the age of 13 to 16 in Kenya (International Labor Organization, 1972). This is clearly a policy which prohibits industry from usage of beneficial talents on the underage youths. This directly affects the innovation level of the firms. Similarly, on the taxation system, there have been several cases of firms avoiding paying taxes to remain afloat in Kenya. Due to the poor taxation system, leading to double taxation, the disposable income of the firms steadily reduces and therefore ends up allocating less funds to the research and development department. The environmental management and coordination Act of 2013 outlines the irreducible minimum for hazardous chemical waste. To remain compliant with this Act, firms are forced to continuously improve their production processes. This influences the rate at which firms innovate, resulting in different levels of competitive advantage.

Nandakumar *et al.* (2010) evaluated the moderation influence of external environment and organizational structure against the business strategic height and productivity of United Kingdom (UK) manufacturing firms. They used 124 manufacturing companies from the electrical and mechanical subsectors where the respondents were the CEOs. Data analysis was done using the multivariate statistical approach. They concluded that the dynamism and hostility of the external environment moderates the association between business strategy and competitive performance. They used only two constructs of the external environment: dynamism and hostility, which constituted small fraction of the external environment. This current study considered suppliers and customers, stakeholders, rules and regulations, economic conditions, and trade unions, amongst others. This study, therefore supports the

proposition of the moderation of relations of operational innovation and firm performance by the external environment and develop the following hypotheses:

$H_{2a}$: Combined effect of customer and supplier, rules and regulations, economic condition, Trade union (external environment) has significant moderating effect on the relationship between operational innovation and performance of manufacturing firms.

$H_{2b}$: Customer and supplier has significant moderating effect on the relationship between operational innovation and performance of manufacturing firms.

$H_{2c}$: Rule and regulations have significant moderating effect on the relationship between operational innovation and performance of manufacturing firms.

$H_{2d}$: Economic condition has significant moderating effect on the relationship between operational innovation and performance of manufacturing firms.

$H_{2e}$: Trade union has significant moderating effect on the relationship between operational innovation and performance of manufacturing firms.

Based on the literature review, study model was constructed as shown in Figure 1.

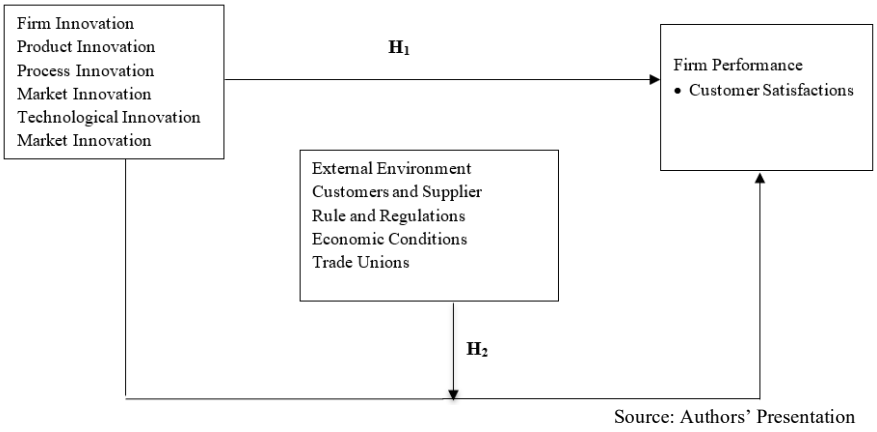



***Figure 1. Conceptual Framework***

## METHODOLOGY

### Sample and Procedure

Sample size of 298 was determined following the random sampling technique, whereas sample size was identified using Krejcie and Morgan (1970) from the population of 1313 firms. This sample size was

further classified under 14 manufacturing sector categories to know precisely how many firms per sub-group were involved in the investigation. Out of the 298 questionnaires administered, 186 were returned representing the areas of agriculture industries, energy, electrical, and electronics industries, leather industries, building, construction, and mining industries, chemical and allied industries, pharmaceutical and medical equipment industries, motor vehicle and accessories, and paper and board industries. Upon screening for completeness, four questionnaires were removed resulting to 182 respondents. This created an acceptable response rate of 62 percent.

### Study Design

This study adopted the quantitative research design and used the questionnaire data collection method appropriate for data collection among subjects distributed in a wide area (Kristjansson *et al.*, 2013), in this case, across the country. Specifically, a structured undisguised questionnaire with close ended questions supported by Likert scale was used. This type of questionnaire was used to eliminate bias linked to direct questions, and also the likelihood of non-response bias through the range of response questions. Five-point Likert scale was used: (1= strongly disagree, 2 = disagree, 3= neither disagree nor agree, 4= agree, 5= strongly agree). Critical to note is that the study focused on firm executive (one per firm), who presumably know more about the issues under investigation. The sections of the survey instrument included; I demographic, II innovation, III environment and IV, V firm performance. The executives could easily express their opinion on various items as reflected in the questionnaire.

### Instruments

The study variables scales used to drive this study are as follows:

Operational innovation: This was based on 24-items scale presented by Kimwomi (2015), which considered each of the four permissible attributes of innovation.

External environment: This was based on the study of Nandakumar *et al.* (2010) which had items which factored all the four dimensions of external environment

Firm performance: Since objective financial performance may differ due to industry related factors, making objective data acquired across industries misleading (Covin and Slevin, 1989). It was therefore decided to use a subjective measure of performance for this study. This was adopted from the study of Venkataraman (2004). It contained six subjective items.

### Analysis Technique

Upon data cleaning, analysis was done using SPSS v 27. Specifically, examination of the hypotheses and evaluation of moderation effect using hierarchical multiple regression approach. The multi-modera-

tion effect was examined using PROCESS v4 macro of SPSS (Hayes and Igartua, 2021).

## RESULTS

In the following section we provide an overview of constructs' mean, standard deviation, and correlation, matrix, common method bias, and construct reliability and validity. The correlation (see Appendix-I – Table 1) between operational innovation dimensions and external environment dimensions were all significant.

### Common Method Bias (CMB)

Unrotated factor solution approached was used to examine the Harman's one factor test. It revealed that data's CMB was within the acceptable threshold, the variance explained 33.73 percent, and this was clearly below 50 percent (Christie *et al.*, 2016).

### Reliability and Validity

Through exploratory factor analysis, using the rotated component matrix, Average Variance Extracted (AVE) and Composite Reliability (CR) was evaluated with the aid of excel. Lambda, (λ) factor loading of an item while N indicating total number of items. Epsilon (ε) was determined by ($1- \lambda^2$), AVE was worked based on; $\frac{\Sigma\lambda^2}{N}$. Similarly, CR of each construct was examined from $\frac{(\Sigma\lambda)^2}{(\Sigma\lambda)^2+(\Sigma\epsilon)}$ the results were as reflected in Table 2 (see Appendix-II).

The loadings were above 0.50, illustrating convergent validity (Hair *et al.*, 2014). Cronbach's alpha which evaluated the internal consistency reliability of the construct was adopted. The results indicated values higher than 0.70, this reflected positive construct reliability test (Bernstein and Nunnally, 1994). Also revealed, the Variance Inflation Factor (VIF) positive results (VIF < 10) (Anderson *et al.*, 2019) indicating limited multicollinearity challenges.

### Diagnostic Tests

Under this section, linearity, normality, and homoscedasticity were tested before linear regression analysis could be done. Linearity test was conducted to assess whether there was significance in the mean of the values of the outcome variable for each successive increase of the predictors. The relationship between the independent variables is linearly dependent if the significance level of the linearity deviation is greater than 0. The results indicated, $p$-value of 0.628, which is in excess of 0.05, as a reflection of linearity.

The test for homoscedasticity which examines error term for normal distribution, was scrutinized by employing the Koenker approach, null hypothesis is rejected with $p > 0.05$. According to the Koenker

test results, $p$–value ranged from 0.308 to 0.704 for the model simulating influence of the external environment. This indicated that the assumption of homoscedasticity was not broken because the $p$–value were in excess of 0. 05.

The 4Shapiro Wilk4test4was done to assess the assumption of normality. The null hypothesis ($H_0$) was 1that the sample1 data is normally1 distributed1 against the 1alternative that the 1data comes from other distributions. Tabachnick and Fidel (2001) suggested that if Shapiro–Wilk statics test shows a non–significant result (sig. value more than 0.05), the rejection threshold is not met and the data is regarded as assuming normal distribution. In this regard, data from the study variables followed normal distribution, and since all the $p$–values were more than 0.05 level of significance the normality, assumption was not violated.

## Demographic Profile of Respondents

The demographic profile of the sample is illustrated in Table 3.

| Company Profile | | Frequency | Percent |
|---|---|---|---|
| Length of operation in years | 0-5 | 29 | 15.9 |
| | 6-11 | 34 | 18.7 |
| | 12-17 | 76 | 41.8 |
| | 18-24 | 17 | 9.3 |
| | 25 and above | 26 | 14.3 |
| Firm Ownership | Local | 66 | 36.3 |
| | Foreign | 48 | 26.4 |
| | Both | 68 | 37.4 |
| Size of the organization | 10 and below | 35 | 19.2 |
| | 11-50 | 38 | 20.9 |
| | 51-100 | 54 | 29.7 |
| | 101-150 | 32 | 17.6 |
| | 151 and above | 23 | 12.6 |

Source: Authors' computation

***Table 3. Respondents' Demographic Characteristics (n=182)***

### Descriptive Statistics

The response rate was 62%, considered adequate for research by Vasileiou *et al.* (2018). The descriptive analysis involved the mean, standard deviation of innovation, the external environment, and the firm's performance. The descriptive statistics of firm innovation had the following sub–constructs: process, market, product, and technological innovation, while those of the external environment, as mentioned

earlier, included the sub-constructs of rules and regulations, customers and suppliers, rules and regulations, trade unions and economic conditions. On the other hand, firm performance was treated as a single construct under customer satisfaction indicators. The descriptive analysis was performed and the results were as indicated in Table 4.

| Study Variables | Sample Size | Minimum | Maximum | Mean | Standard Deviation |
|---|---|---|---|---|---|
| Product | 182 | 2.00 | 5.00 | 3.50 | 0.620 |
| Process | 182 | 1.00 | 5.00 | 3.36 | 1.174 |
| Market | 182 | 2.00 | 5.00 | 3.67 | 0.536 |
| Technology | 182 | 2.33 | 5.00 | 3.66 | 0.596 |
| Innovation practices | 182 | 2.25 | 4.58 | 3.49 | 0.559 |
| External Environment | 182 | 1.06 | 4.94 | 3.31 | 1.174 |
| Customer and suppliers | 182 | 1.00 | 4.83 | 3.21 | 1.18 |
| Rules and Regulations | 182 | 1.00 | 5.00 | 3.34 | 1.16 |
| Economic Conditions | 182 | 1.00 | 5.00 | 3.41 | 1.24 |
| Trade Unions | 182 | 1.00 | 4.85 | 3.36 | 1.23 |
| Performance | 182 | 1.64 | 4.82 | 3.33 | 0.839 |
| Valid N (listwise) | 182 | | | | |

Source: Authors' computation

***Table 4. Descriptive Statistics***

## Hypothesis Testing

Hierarchical regression reflected that combined effect of dimensions of operational innovation influenced firm performance ($\beta$ = .49, $p$ < .001) hence hypothesis $H_{1a}$ was supported. However, the interaction term operational innovation * external environment ($\beta$ = .20, $p$ >.05) hence failed to support hypothesis $H_{2a.}$ Operational innovation explained the variance in firm performance even after it was controlled. The two-way interaction term for operational innovation and external environment explained 5 percent variance in firm performance. The total variance in firm performance explained by the model was 75 percent. The results of the regression analysis are shown in Table 5.

To further understand the influence of each dimension of operational innovation on firm performance, further simple regression was done with product, process, market and technological innovation as independent variable while firm performance as dependent variable. The results in Table 6 (Appendix-III) indicated that constant ($\beta$ = −.28, $p$ < 05); product innovation (ProdInn) ($\beta$ = .35, $p$ < 05); process innovation (ProcInn) ($\beta$ = .26, $p$ <.05); market innovation (MktInn) ($\beta$ = .18, $p$ <.05) and technical innovation (TechInn) ($\beta$ = .10, $p$ <.05) were all significant. Product innovation had the highest influence, and the least was market innovation. Thus, supporting hypotheses $H_{1b}$, $H_{1c}$, $H_{1d}$, and $H_{1e}$.

The following part examined the moderating effect of each of the dimensions of external environment

| Predictor | Firm Performance | | |
|---|---|---|---|
| | B | $R^2$ | $\Delta R^2$ |
| **Moderator Analysis** | | | |
| **Step 1** | | | |
| Control Variables | | .10 | |
| **Step 2** | | | |
| Operational Innovation | .49*** | .68 | .58*** |
| **Step 3** | | | |
| External Environment | .11 | .70 | .02 |
| **Step 4** | | | |
| Operational Innovation * External Environment | .20* | .75 | .05* |

Source: Authors' computation
Note: N= 182, Control variables: Age of Firm, Number of fulltime employee, Firm ownership
Note: * $p < .05$ *** $p < .001$

***Table 5. Moderation Results***

on the relationship of operational innovation and firm performance. These include: Customer and suppliers, rules and regulation, economic conditions, and trade union. This was done using PROCESS macro (version 4.2) procedure for SPSS (Hayes and Igartua, 2021). Biesen, and Smith, (2022) used similar approach in their study of daily relationship satisfaction and depressed mood as moderated by support satisfaction.

### Moderating Effect of Customer and Supplier

Hayes *et al.,* (2021) procedure was used where operational innovation was the independent variable, dependent variable as firm performance and moderating variable as customer and supplier. The results of the coefficient summary are indicated in Table 7 (see Appendix-IV).

Customer and supplier, operational innovation, and interaction term explained 27.87 percent of changes in firm performance which was significant, ($R^2$ =.27, $p$ < 05). In Table 7, interaction between operational firm innovation and customer supplier (Int-1) was insignificant ($\beta$ = -.30, SE = .27, $t$ = 3.44, $p$ >.05), indicating that customer and supplier do not moderate the relationship between operational innovation and firm performance, rejecting hypothesis $H_{2b}$.

### Moderating Effect of Rules and Regulation

Again, Hayes *et al.* (2021) procedure was used; operational firm innovation was the independent variable; the dependent variable remained firm performance; and the moderating variable was rules and regulations. The results of the coefficient summary are indicated in Table 8 (see Appendix-IV).

The results indicated rules and regulation, operational innovation, and interaction term explained 38.35 percent of changes in firm performance which was significant, ($R^2$ =.3835, $p$ < 05). In Table 8, the interaction between operational firm innovation and rules and regulation (Int-1) was insignificant ($\beta$ = −0.30, SE = 0.27, $t$ = 3.448, $p$ >.05), indicating rules and regulation do not moderate the relationship between operational innovation and firm performance, hence rejecting hypothesis $H_{2c}$.

### Moderation Effect of Economic Conditions

Once again, Hayes *et al.*'s (2021) technique focused on operational firm innovation as the independent variable, the dependent variable as firm performance, and the moderating variable as customer and supplier. Table 9 (see Appendix-IV) displays the findings of the model's coefficient summary.

A significant 41.91 percent of variations in company performance was described by the economic conditions, operational innovation, and interaction term ($R^2$ =.41, $p$ < 05). Table 9 shows that the relationship between operational innovation and firm performance was not moderated by economic conditions. The interaction between operational firm innovation and economic conditions (Int-1) was not significant ($\beta$ = −0.40, SE = 0.63, $t$ = −10.448, $p$ >.05) hence rejected hypothesis $H_{2d.}$

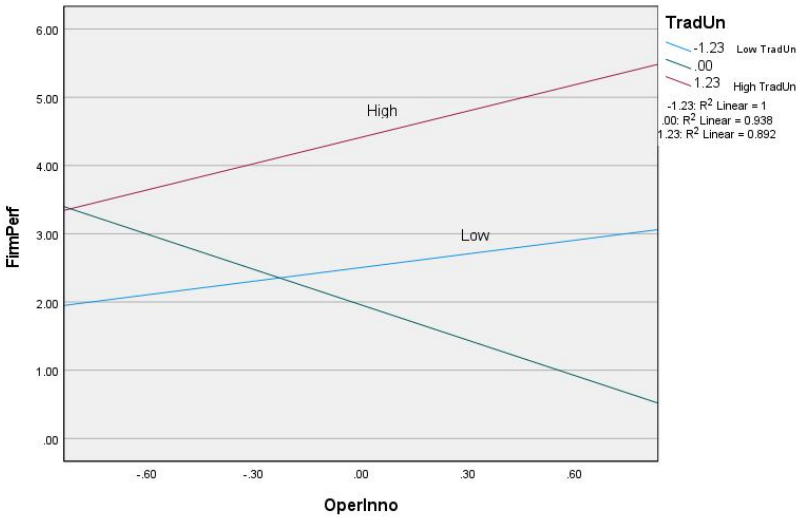
### Moderation Effect of Trade Unions

To investigate this, the Hayes *et al.* (2021) process was applied. The study regarded operational innovation as the independent variable, firm performance as the dependent variable, and trade union as the moderating variable. Table 10 (see Appendix-IV) displays the summary of the model coefficients.

A remarkable 76.40 percent of changes in company performance were explained by trade unions, operational innovation, and interaction terms ($R^2$ =.76, $p$ < 05). In Table 10, the trade union moderates the association between operational innovation and firm performance, supporting hypothesis $H_{2e.}$ The interaction between operational innovation and trade union (Int-1) was significant ($\beta$ = −0.325, SE = 0.195, $t$ = −55.428, $p$ <.05). Slope analysis was carried out with the code for visualization verified in order to clearly comprehend the moderation nature, guided by Hayes *et al.*'s (2021) approach. The nature of the moderation effect is shown in Figure 2. The line is steeper for low trade unions ($R^2$ =.93) This shows that at low level trade unions (TradUn), the impact of firm innovation is weaker in comparison to high trade unions. As the level of trade unions decreased ($R^2$ =.89) the strength of the relationship between operation innovation and firm performance decreased.

## DISCUSSION

This investigation looked at the effect of the external environment on the relationship between operational




Source: Authors' Presentation

***Figure 2. Visual Output for Low and High Trade Union Moderation Effect***

innovation and the performance of manufacturing firms in Kenya. Hypotheses were tested using linear regression analysis which revealed that the external environment of the firm does not moderate the relationship between firm innovation and performance. For accuracy, the study considered the effect of the individual sub-constructs, that is, the suppliers and customers, rules and regulations, trade unions, and economic conditions.

While studies show that the influence of customers and suppliers encourages the implementation of innovative practices by the firm, thus propelling the firm to higher levels of performance (Racela, 2014), the study's findings indicated that customers and suppliers are less critical factors in determining firm performance. This means that the relationship between operational innovation and performance is not moderated by customers or suppliers ($H_{2b}$). This contradicts the findings of Racela (2014), which state that firms that work with customers and cooperate with suppliers meet their growth and profitability targets. In this case, the limitations of the stakeholder theory are highlighted in this study in that company executives do not have control over these stakeholders (customers and suppliers) since they deal with the firms based on their needs (Wahjoedi, 2022).

Again, the study failed to reject the second sub-hypothesis that rules and regulations do not moderate the relationship between firm innovation and firm performance ($H_{2c}$). A reason for this is that rules and regulations apply to all firms in the respective industries and, therefore, cannot give one specific firm a competitive advantage over the other. These findings disagree with the findings of Rennings and Rammer

(2011) and Kitching *et al*. (2015), who argue that rules and regulations indeed have moderating effect on the firm performance. Rules and regulation rarely focus on the objective of the firm but other stakeholders, this study's results reveal that rules and regulations are not a determining factor of firm performance, even after implementing innovation.

Further, economic conditions were found to have no significant moderating effect on the relationship between firm innovation and firm performance ($H_{2d}$), meaning the study did not reject the hypothesis. These findings align with those of Hussain *et al*. (2021), who found that indicators such as high interest rates reduce firm performance but, at the same time, fail to account for other economic indicators such as Gross Domestic Product (GDP) growth, inflation rate, and unemployment rate which influence firm performance at different rates.

The last sub-hypothesis, trade union, had significant moderating effect on the relationship between firm innovation and firm performance ($H_{2e}$). While trade unions moderate this relationship, the degree and type (positive or negative) of impact depends on the level of establishment of the trade unions and the operation environment. This tallies with the findings of D'Art and Turner (2004) that trade unions directly affect the profit-sharing policies of businesses in Europe. Trade unions remain vibrant in most firms globally with low membership due to retrenchment (Shiraz, 2006), meaning their influence on firm performance is not strong as before.

From these findings, the relationship between firm innovation and performance does not depend on factors of the external environment, that is, customers and suppliers, regulations, economic conditions. An explanation for this can be based on the dynamism of the external environment, as characterized by poor economic conditions that affect the propensity of manufacturing firms to innovate (Wakaisuka-Isingoma *et al*., 2016). However, trade unions had a significant moderating influence on the relationship between firm innovation and performance because trade union members are within the firm and involved directly in most of production processes of the firm.

## CONCLUSION

The study objective which guided this inquiry; to investigate the effect of the external environment on the relationship between operational innovation and the performance of manufacturing firms in Kenya. Moreover, it demonstrates the impact of customers and suppliers, rules and regulation, economic conditions and trade union on the relations of operational innovation and firm performance. The findings revealed fairly strong and significant positive association between firm performance and operational innovation moderated by the external environmental, trade unions. This consistent with the provisions of stakeholders and RBV theories. The participation of trade union officials in the decision-making

process of the firm affects its performance. Overall, any aspect of human resources influences the firm's overall performance. Interestingly, customer, supplier and economic conditions least moderated the relationship between innovation and firm performance. This deviates from the normal perception since every firm is unique with its own environment.

## IMPLICATIONS

Results indicate that trade union moderates the relationship between operational firm innovation and firm performance. Based on this, firm managers of manufacturing firm in Kenya should be focused on trade union matters. They should allow the employees to join the union and also remit their monthly deductions on time. This motivates the employees and translates to the high level of commitment needed for innovative processes. This consequently increases the strength of operational innovation and firm performance.

The information regarding components of operation innovation and environment if well documented and made available online widening accessibility translates to robust performance. Firms can strategize on the implementation of the operational innovation starting with product innovation ($\beta$ =.35, $p$ = .001) which had the highest impact and ending with technical innovation ($\beta$ =.109, $p$ = .012) lowest impact on the overall importance to the firm performance. This study has contributed to the literature of operational innovation where most studies consider elements as innovation with less regard to the effect of environment.

The government to can create firm friendlier labor laws to help limit and reduce the challenges facing manufacturing enterprises like importation of technology with respect to personnel policies. This study has contributed to the literature on innovation by illustrating the contributory effect of the element of innovation.

## LIMITATIONS AND FUTURE DIRECTIONS

The study has other constraints besides time constraints, like a narrow scope. The sector targeted is manufacturing within Kenya. The study's target respondents are top executives from their respective organizations, and as with the questionnaire, getting their responses proved challenging. To overcome this challenge, some interviews were scheduled outside regular business hours in order to contact as many respondents as possible. Based on the approach used for data gathering, common method biasness was of challenge, only one executive was involved. However, factor analysis test indicated positive results for the required minimum thresholds.

Furthermore, many participants were hesitant to disclose or provide critical details for fear that the researcher would use their responses against them. This, on the other hand, was addressed. Further, the study had a methodological limitation regarding the respective constructs. The author detached the financial performance from the study, as the respondents could not provide the necessary meaningful information; instead, non-monetary indicators were used based on the perceptions of the respondent.

In terms of firm experience; 0-5 years were 15.9 percent, second lowest and 12-17 years was the highest constituting 41.8 percent of the sample, it was assumed they have equal period of experience this is conflicting. Future studies should consider only firms with 10 years of experience in operations in the sample frame and compare the results.

The manufacturing firms of Kenya distributed throughout the country were the focus of this study, and the majority of them were medium-sized and continuing to gain experience. This is critical in light of the argument that implementing operational innovative is a process that takes a long time to reap benefits in firm performance. A similar longitudinal study with similar sample should be contacted to compare the empirical findings.

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Appendix-I

| Variable | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| Product innovation | 3.50 | 0.61 | (.77) | | | | | | | |
| Process innovation | 3.35 | 1.17 | .41 | (.81) | | | | | | |
| Market innovation | 3.37 | 0.84 | .31 | .04 | (.75) | | | | | |
| Technological Innovation | 3.37 | 0.69 | .11 | .26 | .35 | (.83) | | | | |
| Customer and supplier | 3.21 | 1.18 | .12** | .07* | .23 | .11** | (.70) | | | |
| Economic conditions | 3.42 | 1.24 | .48** | .27* | .25** | .23 | .09** | (.74) | | |
| Rules and regulation | 3.30 | 1.16 | .23** | .38 | .17* | .42 | .36** | .24 | (.89) | |
| Trade union | 3.36 | 1.23 | .49** | .22 | .41** | .48 | .52** | .31* | .46** | (.84) |

Source: Author's presentation
Note: ** *p*-value < .01, * *p*-value < .05

***Table 1. Correlation Matrix***

Appendix–II

| Items | M | Std | FL >0.50 | α > .70 | C.R | AVE | VIF <10 |
|---|---|---|---|---|---|---|---|
| **Product Innovation** | 3.50 | 0.620 | | .713 | .896 | .634 | 4.021 |
| PD1 | 3.49 | .979 | 0.784 | | | | 4.243 |
| PD2 | 3.65 | .086 | 0.764 | | | | 3.552 |
| PD3 | 3.31 | .519 | 0.885 | | | | 5.695 |
| PD4 | 3.20 | .954 | 0.759 | | | | 5.319 |
| PD5 | 3.47 | .360 | 0.784 | | | | 2.458 |
| **Process Innovation** | 3.36 | 1.174 | | .948 | .925 | .617 | 3.816 |
| PR1 | 3.17 | 1.233 | 0.689 | | | | 2.261 |
| PR2 | 3.51 | 1.156 | 0.628 | | | | 3.564 |
| PR3 | 3.27 | 1.243 | 0.854 | | | | 2.876 |
| PR4 | 3.47 | 1.090 | 0.862 | | | | 4.452 |
| PR5 | 3.26 | 1.250 | 0.781 | | | | 3.124 |
| PR6 | 3.47 | 1.116 | 0.868 | | | | 2.134 |
| **Marketing Innovation** | 3.67 | 0.536 | | .822 | .908 | .570 | 3.432 |
| MKT1 | 3.68 | 1.081 | 0.698 | | | | 2.848 |
| MKT2 | 3.72 | 1.124 | 0.734 | | | | 4.028 |
| MKT3 | 3.03 | .969 | 0.747 | | | | 3.561 |
| MKT4 | 3.06 | 1.004 | 0.788 | | | | 4.493 |
| MKT5 | 3.68 | 1.081 | 0.737 | | | | 3.467 |
| MKT6 | 3.72 | 1.124 | 0.821 | | | | 4.620 |
| **Technological Innovation** | 3.66 | .596 | | .645 | .926 | .622 | 3.578 |
| TECH1 | 3.65 | 1.022 | 0.706 | | | | 2.756 |
| TECH2 | 3.69 | .977 | 0.829 | | | | 4.777 |
| TECH3 | 3.53 | .890 | 0.854 | | | | 4.374 |
| TECH4 | 4.05 | 1.068 | 0.823 | | | | 4.425 |
| TECH5 | 3.65 | 1.022 | 0.800 | | | | 4.365 |
| TECH6 | 3.69 | .977 | 0.706 | | | | 2.684 |
| **Customer and suppliers** | 3.21 | 1.18 | | 954 | .923 | .628 | 3.423 |
| CS1 | 2.64 | 1.170 | 0.801 | | | | 3.352 |
| CS2 | 3.25 | 1.167 | 0.856 | | | | 4.412 |
| CS3 | 3.43 | 1.023 | 0.761 | | | | 4.200 |
| CS4 | 3.17 | 1.033 | 0.715 | | | | 2.166 |
| CS5 | 3.49 | 1.037 | 0.814 | | | | 3.872 |
| CS6 | 3.27 | 1.223 | 0.801 | | | | 3.955 |
| **Economic conditions** | 3.41 | 1.24 | | .921 | .969 | .682 | 4.654 |
| EC1 | 3.53 | 1.432 | 0.833 | | | | 4.936 |
| EC2 | 3.24 | 1.251 | 0.860 | | | | 4.517 |
| EC3 | 3.47 | 1.316 | 0.784 | | | | 4.919 |
| **Rules and Regulations** | 3.34 | 1.160 | | .955 | .989 | .746 | 2.834 |
| RR1 | 3.36 | 1.303 | 0.864 | | | | 3.643 |
| RR2 | 3.26 | 1.250 | 0.905 | | | | 3.231 |
| RR3 | 3.46 | 1.382 | 0.802 | | | | 2.886 |
| RR4 | 3.43 | 1.327 | 0.833 | | | | 3.354 |
| RR5 | 3.14 | 1.330 | 0.887 | | | | 2.156 |
| RR6 | 3.48 | 1.320 | 0.863 | | | | 1.564 |
| RR7 | 3.16 | 1.332 | 0.891 | | | | 3.534 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Trade Unions** | 3.36 | 1.230 | | .888 | .806 | .676 | 3.42 |
| TU1 | 3.28 | 1.276 | 0.824 | | | | 3.562 |
| TU2 | 3.45 | 1.323 | 0.820 | | | | 2.876 |
| **Performance** | 3.33 | 0.839 | | .968 | .966 | .827 | 4.456 |
| PERF1 | 2.64 | 1.270 | 0.869 | | | | 5.425 |
| PERF2 | 3.25 | 1.267 | 0.895 | | | | 4.245 |
| PERF3 | 3.43 | 0.723 | 0.893 | | | | 4.792 |
| PERF4 | 3.17 | 1.333 | 0.895 | | | | 4.675 |
| PERF5 | 3.49 | 0.867 | 0.875 | | | | 5.494 |
| PERR6 | 3.27 | 1.243 | 0.900 | | | | 5.438 |
| PERF7 | 3.46 | 0.703 | 0.787 | | | | 3.197 |
| PERF8 | 3.26 | 1.250 | 0.866 | | | | 2.678 |
| PERF9 | 2.64 | 1.270 | 0.817 | | | | 4.045 |

Source: Author's computation

***Table 2. Construct Validity and Reliability***

Appendix–III

| | B | *p* |
|---|---|---|
| (Constant) | -.2830 | .000 |
| ProdInn | .3565 | .001 |
| ProcInn | .2674 | .000 |
| MktInn | .1890 | .000 |
| TecInn | .1090 | .012 |

Source: Author's computation
Note: ProdInn: product innovation; Procinn: process innovation; MktInn: market innovation; Techinnov: technological innovation

***Table 6. Results of Product, Process, Market and Technical Innovation Effects on Firm Performance***

Appendix-IV

| | *β* | se | *t* | *p* | LLCI | ULCI |
|---|---|---|---|---|---|---|
| constant | -2.433 | 0.0723 | -22.7078 | 0.000 | -3.3757 | -3.0903 |
| Operational innovation (X) | -0.0482 | 0.0683 | -0.705 | 0.4818 | -0.183 | 0.0867 |
| CustSup (W) | 0.648 | 0.0205 | 47.2767 | 0.000 | 0.9279 | 1.0087 |
| Int_1 | -0.3.00 | 0.27 | -3.448 | 0.0625 | 0.0076 | 0.0667 |

Source: Author's computation

***Table 7. Customer and Supplier Moderating Effect on Relationship between Operational Innovation and Firm Performance***

| | *β* | se | *t* | *p* | LLCI | ULCI |
|---|---|---|---|---|---|---|
| Constant | -2.433 | 0.0723 | -22.7078 | 0.000 | -3.3757 | -3.0903 |
| Operational innovation (X) | -0.0482 | 0.0683 | -0.705 | 0.4818 | -0.183 | 0.0867 |
| RulesReg (W) | 0.648 | 0.0205 | 47.2767 | 0.000 | 0.9279 | 1.0087 |
| Int_1 | -0.3.00 | 0.27 | -3.448 | 0.0625 | 0.0076 | 0.0667 |

Source: Author's computation

***Table 8. Rules and Regulation Moderating Effect on Relationship between Operational Innovation and Firm Performance***

| | ***β*** | **se** | ***t*** | ***p*** | **LLCI** | **ULCI** |
|---|---|---|---|---|---|---|
| constant | -2.433 | 0.0723 | -21.7078 | 0.000 | -3.4757 | -3.0903 |
| Operational innovation (X) | -0.0482 | 0.0683 | -0.705 | 0.000 | -0.183 | 0.0867 |
| EconCond.(W) | 0.341 | 0.0114 | 25.2767 | 0.000 | 0.9279 | 1.0087 |
| Int_1 | -0.4.00 | 0.63 | -10.448 | 0.0825 | 0.0076 | 0.0667 |

Source: Author's computation

***Table 9. Economic Conditions Moderating Effect on Relationship between Operational Innovation and Firm Performance***

| | ***β*** | **se** | ***t*** | ***p*** | **LLCI** | **ULCI** |
|---|---|---|---|---|---|---|
| constant | -2.433 | 0.0723 | -21.7078 | 0.000 | -3.4757 | -3.0903 |
| Operational innovation (X) | -0.0482 | 0.0683 | -0.705 | 0.000 | -0.183 | 0.0867 |
| Trade union (W) | 0.341 | 0.0114 | 25.2767 | 0.000 | 0.9279 | 1.0087 |
| Int_1 | -0.325 | 0.195 | -55.428 | 0.0115 | -0.0076 | -0.0667 |

Source: Author's computation

***Table 10. Trade Union Moderating Effect on Relationship between Operational Innovation and Firm Performance***