



## **ROLE OF PRODUCT RESEARCH AND DEVELOPMENT ON EARLY SUPPLIER INVOLVEMENT AND PERFORMANCE OF TARDA, KENYA**

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### **ABSTRACT**

**Purpose of Study:** This study investigates the relationship between early supplier involvement and the performance of agricultural projects at the Tana and Athi River Development Authority (TARDA).

**Statement of Problem:** Although extensively studied in manufacturing, early supplier involvement in agricultural supply chains is underexplored, with limited focus on supplier integration in product research and development. This study addresses the gap by examining its impact on productivity and performance in TARDA's farming-related supply chains.

**Methodology:** The study used descriptive and cross-sectional research designs, targeting 90 TARDA employees. Data was collected through structured questionnaires and analyzed using descriptive statistics and regression models to assess the impact of supplier involvement on performance.

**Result:** The findings revealed that supplier involvement practices, such as product research and development, explained 63.3% of TARDA's performance. Respondents agreed that early supplier involvement contributes significantly to implementing new technologies.

**Conclusion:** The study concludes that product research and development is a critical determinant of performance in agricultural projects at TARDA.

**Recommendation:** The study recommends enhancing product research and development strategies, both individually and jointly, to improve project performance.

**Key words:** *Early Supplier involvement, Product research and development.*

## INTRODUCTION

Due to the emergence of globalization and technological advancement, organizations find themselves locked in an ongoing competition for resources and market share. To tackle these challenges, contemporary business entities are adopting diverse strategies, one of which is Early Supplier Involvement (ESI). The purpose of ESI is to fulfil customer expectations by enhancing the development of products shorten time to launch into the market (Meriläinen, 2018). Evidently, successful innovation heavily relies on ESI through collaborative interactions between businesses. By involving suppliers during the initial phases of product development execution, organizations can establish a mutual comprehension of the product design and development process, leading to the discovery of avenues for enhanced quality and reduced expenses. ESI equips businesses with the capability to meet customer demands at the same time refine strategies and tactics that boost competitiveness. (Diabat & Al-Salem, 2015). In the course of product development, the buyer assumes various pivotal roles such as categorizing suppliers based on their technical and design expertise, nurturing an environment of dedication that stimulates suppliers to explore greater creativity and embrace risk-taking. Furthermore, other critical aspects such as cultivating more robust relationships that motivate suppliers to allocate capital in their capabilities of developing products, contributing to engaging suppliers at an early stage and enabling improved and consistent communication have been identified as equally significant (Mandal, 2022). These undertakings collectively establish ESI as a crucial bridge connecting the marketing department, production, and external suppliers during the outlining of new product specifications (Diabat & Al-Salem, 2015). Consequently, ESI plays a substantial role in overseeing supplier management, research and development facet that are both integral in the area of product creation and innovation. In essence, the active participation of the buyer in the product development process through ESI stands as an indispensable element in harmonizing supplier endeavour's and accomplishing successful innovation, thereby augmenting the organization's competitive advantage (Meriläinen, 2018).

TARDA is state agency that receives funding from the government that generates own revenue from other projects such as farming and agro processing of inputs from honey, rice and dairy. TARDA'S operations, like any other organization are subjected to competition from firms and individuals engaged in agricultural production. In support of this Hamid, (2006) explains that globalization has led to increased competitiveness for

limited resources and markets, with local industries facing stiff business rivalry from foreign companies especially multinationals. In response, some firms have integrated along supply chain with suppliers, customers and some shareholders in order to gain competitive advantage through factors like quality management and greener sustainable processes (Arshed, Hameed & Sahe, 2022). Implicit then, early supplier involvement can help TARDA to develop a mutually beneficial working relationship to achieve the set objectives and deliver the stakeholder expectations while gaining superior non-imitable advantage. The need for TARDA to initiate projects besides its core function motivated the study that sought to answer the question; does early supplier involvement have a relationship with performance of TARDA in its non-core functions.

Broadly, literature reveals that studies on early supplier involvement (ESI) and performance have primarily focused on manufacturing firms, where procurement of tangible products is central, while similar research on complex processes like farming remains scarce. Hamid (2016) examined how purchasing and ESI influence supplier involvement in manufacturing firms, while Kiggundu (2018) investigated the relationship between ESI and organizational performance at Mukwano Industries in Uganda. Oyola (2017) explored support systems for managing supplier participation in new product development, offering recommendations for supplier engagement during early stages. Similarly, Kimwaki (2022) analyzed ESI's impact on supply chain performance in Kenya's food and beverage sector. Despite these contributions, these studies emphasize the need for continuous exploration of ESI, given its diverse constructs and the unique nature of product innovation across industries. This study, therefore, aims to fill the gap by examining the role of product research and development in ESI and its effect on the performance of TARDA's agricultural projects.

The study underscores the significance of TARDA in resource development along the Tana and Athi river basins, leveraging supply chain management principles. While ESI is well-documented in manufacturing supply chains as a critical driver of competitive advantage and performance, its role in agricultural contexts is often overlooked. In agricultural supply chains, knowledge from suppliers—such as geneticists, climatologists, soil scientists, and mechanical engineers—is typically passive, yet it directly impacts productivity. This study emphasizes the need to enhance supplier integration in agricultural supply chains to address these gaps and capitalize on the potential of ESI to boost productivity and performance in TARDA's agricultural projects.

## LITERATURE REVIEW

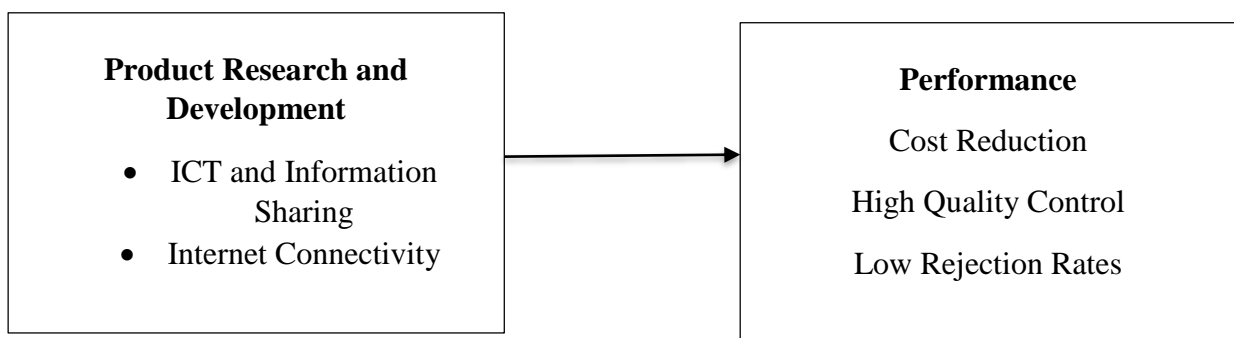
Resource dependence theory and agile supply chain model were found to be suited to support the study in line with tenets of deductive approach to research which has been adopted by the study. Wachiuri, (2015) and Ochieng (2014) explains the idea of anchoring research on a theory because it provides means by which a set of interconnected concepts can be conceptualized to explain an existing or emerging issue that is not well understood. This view is supported by Kombo *et al* (2006) by who observe that an underlying theory can help in generating new ideas. The agile security model was introduced in 1991 by Lehigh University's Iaccoca Institute. Manufacturing agility places its focus on the capacity to react swiftly to unpredictable market demands, surrounding changes in both capacity and diversity of products. The origins of the concept of agility in business can be linked to flexible manufacturing systems. Manufacturing agility revolves around reducing lead times and has proven effective particularly when, market demand remains uncertain and product life cycles are short. (Ivanov *et al.*, 2017). According to Uitto *et al.*, (2015), supply chain agility possesses a strong ability to embrace compliantly to rapidly changing environments, making it well-suited to achieving high levels of customer satisfaction. Oliveira-Dias *et al.*, (2022) describe the agility as the successful pursuit of competitive advantage in terms of adaptability, the speed, creativity, forward-thinking, excellence, and financial success. This is achieved by combining adaptable resources and embracing the best practices within an environment abundant in knowledge, all aimed at delivering customer-centric products and services within a rapidly evolving market. Bhamu and Singh (2014) argued that establishing strong supplier relations enable companies to cultivate agile supply chains by reducing the lead time between organizations. Additionally, Kamalahmadi and Parast (2016) stress that agility plays a crucial role in enabling supply chains to quickly adapt to changes in product research and development and effectively manage external disruptions

The Agile Supply Chain Model supports product research and development by fostering collaboration, innovation, and continuous improvement, ensuring early supplier involvement and enhancing supply chain performance. Modern businesses improve organizational performance by incorporating suppliers early in product design, development, and market launch. This involves supplier selection, participation in product research and development, and gathering market intelligence on inputs, substitutes, and consumer behaviour. Wieteska (2020) defines research and development as activities to

improve or create new products and processes. Suppliers engaged in early supplier involvement contribute quality materials and innovation, enhancing sustainability (Multaharju et al., 2017). This collaboration drives innovation in product development, boosting performance and profitability while supporting the growth and replacement of outdated products (Eccles & Serafeim, 2013).

### Conceptual Framework

According to Kothari (2004) conceptual framework refers to a depiction, whether in written or visual form, of the anticipated relationships between variables, which are essentially the attributes or features being examined.



**Figure 1: Conceptual framework**

Source: Research, 2024)

In this study, early supplier involvement (ESI) was the independent variable, represented by supplier selection, supplier relationship management, and product research and development. Organizational performance, the dependent variable, was measured using cost reduction, savings, low inventory holdings, quality control, and lower rejections. The conceptual framework highlighted a relationship between ESI and organizational performance. According to Saunders and Lewis (2017), the independent variable explains variations in the dependent variable, which is the outcome being predicted. This study focused on how ESI influences TARDA's performance through these measurable indicators.

### RESEARCH METHODOLOGY

The study adopted descriptive research design to examine the relationship between the variables under study. Kothari (2004) opine that the design enables collection of information about the current state of a problem under investigation as well as provide data that can be quantified for generalization purpose. Cross section design was also applied

because data was collected within a short period of time from a target population of senior managers in project management, finance, and procurement, as well as clerks in the stores department TARDA head offices. This unit of observation was all the staff who had direct or indirect roles in procurement process because it was thought to possess information that could be relied on to make conclusions on the issue of investigation (Mugenda & Mugenda ,2003; Saunders & Lewis, 2017). Finance department was included because it plays a vital role in supporting and facilitating early supplier involvement initiatives, through provision of financial assets, risk analysis, oversight, and strategic partnership. Whereas, project departments contributed to success of early supplier development initiatives and the overall achievement of project goals by providing project-specific technical expertise in form of reports, risk management, and supports innovation efforts. A total of 90 respondents took part in the study and no sampling was done because total populations was relatively small. Table 3.1 below shows the distribution of the respondents according to departments from which they were drawn.

**Table 1: Target population**

No	Target Group	Population	Category		
			Finance	Procurement	TARDA Teams
1.	Senior Managers	5	1	1	3
2.	Managers	11	2	2	7
3.	Supervisors	17	3	3	11
4.	Storekeepers Clerks	57	6	15	36
	<b>Total</b>	<b>90</b>	<b>12</b>	<b>21</b>	<b>57</b>

A structured questionnaire was utilized to collect data, offering a cost-effective and efficient method for gathering large amounts of information while minimizing bias and ensuring confidentiality (Kothari, 2004; Mugenda & Mugenda, 2008). A pilot study involving nine employees (10% of the target population) was conducted at Athi Water Office, enabling improvements to the instrument and procedures. Descriptive statistics, including frequency, mean, standard deviation, and percentages, were used to analyze patterns, while a Likert scale converted qualitative data into quantitative form. A multiple linear regression model was applied to assess the contribution of the independent variable

(ESI) to the dependent variable (organizational performance). The model took the form of equation summarized as shown below;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$$

Y = Performance

X<sub>1</sub> = Supplier selection

X<sub>2</sub> = Supplier Relationship Management

β<sub>0</sub> = Constant of the regression equation

β<sub>1</sub>, β<sub>2</sub>, β<sub>3</sub> and β<sub>4</sub> = regression coefficients that will be estimated

ε = error term or disturbance term.

## RESEARCH FINDINGS AND DISCUSSION

The questionnaire consisted of four sections where data concerning the variables was operationalized by use of a five –point Likert scale. Table 2 below shows the response rate where 90 questionnaires had been sent out and 83 (92%) were responded to. The response rate was considered adequate, a position supported by Kothari and Garg (2015) who emphasized that a rate of 50% is adequate, 60% good, and more than 70% as exceptionally good for making conclusions. Therefore 92% was exceptional and was attained probably because all the respondents were housed in the same building.

**Table 2: Response Rate**

Category	Frequency	Percentage (%)
Responses	83	92
Non-Responses	7	8
<b>Total</b>	<b>90</b>	<b>100</b>

Source: Research Data 2024

### Descriptive Analysis of Variables

Descriptive analysis was conducted to determine general trends of the variables that were operationalized by use of five-point Likert scale that contained responses on a range of 1 to 5 which represented disagree (1) and progressively to strongly agree (5). The results are summarized in tables 3 which provide means and standard deviation of items that sought to explain Product research and development.

**Table 3: Product Research & Development**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
We involve suppliers in implementing new technology	83	4.22	0.415
Involvement of suppliers in product research and development increases market demand	83	4.30	0.462
Involvement of suppliers in product research and development lead to improvement of quality product	83	4.20	0.406
Early supplier involvement on product research and development helps in executing product research policies and designs	83	4.27	0.471
Early supplier involvement on product research and development leads to low rejections	83	4.31	0.492
<b>Average</b>	<b>83</b>	<b>4.26</b>	<b>0.449</b>

Field data, 2024

The first statement had a mean of 4.22 and a standard deviation of 0.415, which shows that the majority of the respondents agreed that TARDA involve suppliers in implementing new technology. The mean and standard deviation for the second statement were 4.3 and 0.462, which demonstrates that the majority of those targeted strongly agreed that Involvement of suppliers in product research and development increases market demand. The Third question had a mean of 4.2 and a standard deviation of 0.406, indicating that most respondents agreed that involvement of suppliers in product research and development lead to improvement of quality product. The mean and standard deviation for the fourth statement were 4.27 and 0.471, respectively. This shows that early supplier involvement on product research and development helps in executing product research policies and designs. The mean and standard deviation for the fifth statement were 4.31 and 0.492, respectively, which implies that early supplier involvement on product research and development leads to low rejections. The overall descriptives for all the items had a had an SD of 0.449 and an overall mean of 4.26 and the research findings show that proper product research and development enhance the performance of agricultural projects at TARDA.



**Table 4: Performance of TARDA Projects**

<b>Variables</b>	<b>N</b>	<b>Mean</b>	<b>Std. Deviation</b>
Early supplier involvement leads to a low-cost reduction	83	4.25	0.437
Early supplier involvement promotes low inventory holding	83	4.39	0.49
Early supplier involvement leads to product quality control	83	4.35	0.504
Early supplier involvement leads to an increase in organizational profit and savings	83	4.37	0.487
Early supplier involvement leads to low rejections	83	4.3	0.462
<b>Average</b>	<b>83</b>	<b>4.33</b>	<b>0.476</b>

Field data, 2024

The findings indicated that early supplier involvement (ESI) positively impacts TARDA’s agricultural projects. Respondents agreed that ESI led to cost reduction (mean 4.25), lower inventory holdings (mean 4.39), improved product quality control (mean 4.35), increased organizational profits and savings (mean 4.37), and reduced rejections (mean 4.3). With an overall mean of 4.33 and a standard deviation of 0.476, the results highlight the significant role of ESI in enhancing project performance.

**Early Supplier Involvement on Performance of Agricultural Projects at TARDA**

Analysis of early supplier involvement on performance of agricultural projects of TARDA was conducted by use of a multiple linear regression model in order to predict the extent to which the independent variable explained the dependent variable. The analysis began by determining whether ESI had a linear relationship with performance by calculating Pearson’s Correlation coefficient. The coefficient ranges between -1 to +1 where the negative sign implies that the variables have a linear relationship but in an opposite direction. When Pearson’s coefficient sign is positive it means that when the independent variable increases dependent variable increases and when negative both variables decrease in the same direction. When the coefficient is zero or close to zero, the variables have no significant relationship. Pearson’s correlation was determined and findings indicated on Table 5

**Table 5: Correlations Matrix**

		<b>Organizational Performance</b>
Product research and development	Pearson Correlation	0.343
	Sig. (2-tailed)	0.002
	N	83
		Correlation is significant at the 0.05 level (2-tailed).

Research Data, 2024

Table 5 above indicates that product and development had a linear positive relationship with performance ( $r = 0.343$ ,  $p = 0.002$ ). After establishing a linear relationship between constructs of independent and performance was established. prediction of the relationship was determined by running a regression analysis and the results were recorded in the table 4.8 which shows fitness of the model, and coefficients of supplier selection and supplier relationship.

**Table 6: Early Supplier Involvement and Performance**

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>		
1	0.796	0.633	0.538		
ANOVA a					
<b>Model</b>	<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Regression	9.937	1	.585	6.608	.000
Residual	5.750	83	.088		
Total	15.687	82			
Coefficients a					
<b>Model</b>	<b>Unstandardized Coefficients</b>	<b>Standardized Coefficients</b>	<b>t-value</b>	<b>Sig.</b>	
(Constant)	1.043		2.382	.000	
Product research and development	0.1156	0.1154	2.5744	0.0002	

b. Predictor: product research and development

Dependent Variable: Performance

Research Data, 2024

Results show R square value of 0.796 which indicated a strong positive linear relationship between supplier selection, supplier relationship management and R squared of 0.633 which meant that 63.3 % of variation in performance of TARDA agricultural projects was explained early supplier involvement. The P value had a value of .000 which was less than 0.05 significance level implying that the model was fit to predict the relationship. All the beta coefficients were significant (P= .000) For every unit increase of product research and development; performance increased by 0.1156 units. Therefore, revising the model  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$  become,  $Y = 1.043 + 0.1156X$

### **Discussion of key findings and Summary**

Product research and development was found to have a moderate, positive and significant relationship with performance of agricultural projects of TARDA as shown by  $r=0.343$ . The correlation was significant with a p-value of 0.002 which was less than 0.05. From the findings, it is deduced that product research and development influenced performance of agricultural projects. The prediction values were, for every unit of a unit increase in product research and development result to 0.1156 performance of Agricultural projects of TARDA, as given by the coefficients in the model. Therefore, early supplier involvement explained 63.3 % of variation in performance of the agricultural projects of TARDA and 36.3% of performance was explained by other factors that were not considered in the study. The contribution of product research and development of 0.1156 can be explained by the fact that in product research and development per every unit of production. Therefore, revising the model;  $Y = \beta_0 + \beta_1 X_1$ ,  $Y = 1.043 + 0.1156X_1$

To evaluate the performance of agricultural projects of TARDA in relation to product research and development. When evaluating claims about how product research and development, the performance variance across agricultural projects of TARDA is explained by the findings, which point to the major effect of product research and development on performance. A substantial positive linear association between product research and development and agricultural projects of TARDA performance was also discovered by the study. According to the study, the success of TARDA agricultural projects performance in Kenya and the function of product research and development are

strongly correlated. Consequently, the study discovered that performance agricultural projects of TARDA is influenced by product research and development.

## **CONCLUSION**

The study concludes that product research and development is a critical factor influencing the performance of agricultural projects at TARDA. The findings demonstrate a positive linear relationship between product research and development and the performance of these projects, as evidenced by the Pearson correlation coefficient. This suggests that effective product research and development practices have contributed to improved performance in TARDA's agricultural initiatives. Therefore, integrating product research and development strategies is likely to enhance the success and sustainability of agricultural projects within TARDA.

## **RECOMMENDATION**

The study recommends that organizations design and implement effective product research and development strategies to ensure long-term advantages, support the expansion, and enhance the performance of agricultural projects. Emphasis should be placed on integrating product research and development within early supplier involvement initiatives, as this accelerates product development, fosters innovation, and leverages the combined knowledge and resources of both the organization and suppliers. This collaboration is more likely to result in high-quality, innovative products and cost savings. Maintaining open communication, building trust, and establishing a shared vision are essential for successful partnerships.

Additionally, the study recommends that future research be conducted under varying circumstances to further explore the relationship between product research and development and the performance of agricultural projects. Comparable studies should examine different constructs of early supplier involvement and their impact on organizational performance. Further investigations could also focus on how product research and development within early supplier involvement affects industries beyond agriculture, such as transportation and logistics, to provide broader insights into its applicability and benefits.

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