

Factors Influencing Supply Chain Performance in the Public Sugar Sector - A Case of Nzoia Sugar Company Limited

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Abstract: This paper sought to evaluate the effect of technology adoption, early supplier involvement, low-cost sourcing and backward integration on supply chain performance in the public sugar sector, guided by four objectives: To assess effectiveness of technology adoption on supply chain performance, to assess the role of early supplier involvement on supply chain performance, to evaluate effectiveness of low-cost sourcing on supply chain performance and to evaluate effectiveness of backward integration on supply chain performance. Purposive sampling was used to select a target population of 60 respondents. Questionnaires were used as the main data collection instruments. Descriptive and inferential statistics was used in data analysis aided by SPSS software. From the findings, technology adoption and early supplier involvement were found to be positively correlated to supply chain performance. Thus the above factors should be considered as major determinants in influencing supply chain performance in the public sugar sector.

Keywords: Agile Supply, Backward integration, Collaborative Relationship, Corporate Strategy, Outsourcing, Supply Chain, Supply Chain Management.

1. INTRODUCTION

The sugar industry in Kenya is facing a paradigm shift, as it wakes up to the reality of COMESA safeguards quota accompanied by exigencies of world sugar market competition. The industry trend is shaping up with new entrants and stiff competition as the country embraces trade liberalization policies, and hence need for all players in the sugar sub-sector to seek new ways of doing business. Competitive forces change over time and hence need for organizations to derive new ways of doing business. The entry of Butali Sugar Mills limited into the supply market has been a big challenge to Nzoia Sugar Company limited and hence need to maintain market leadership position within its operating environment, thus basis for the problem under study.

In order to compete effectively in the world market, firms must have a network of competent suppliers. A supplier development program is designed to create and maintain such a network and improve various supplier capabilities through collaborative strategic alliances that are necessary for the buying organization to meet increasing competitive challenges (Kanaan and Tan, 2006). This helps to create a link between purchasing strategy and the firm's overall corporate competitive strategy. Firms tend to expand by acquiring suppliers and distributors into their organizational architecture to initiate their corporate strategy in the early stages of product development. Firms may be effective but fail to be efficient, and hence a challenge of striking a balance between the two. Supply chain performance therefore provides basis for an

organization to assess how well it is processing towards predetermined objectives and targets, by identifying its strengths and weaknesses. This helps management to decide on future initiatives with the goal of improvement based on total quality management and continuous improvement.

Globally, sugar is considered a strategic commodity with a multifunctional role in the economic development of over 127 producer countries. According to Kidero, E. (2006), dramatic shifts have occurred in the global sugar production and consumption trends removing much of the surplus that was being sold in the international market below market price. Sugar in the world market and other low cost producers such as Malawi, Zambia and Swaziland, who are members of COMESA and SADC, pose a great danger to the Kenya sugar industry due to zero tariff tax regimes. This has created undue competition to Kenyan millers and hence need to seek new ways of doing business in order to maintain market leadership position within their operating environment.

It is on this basis that such companies are undergoing changes through product diversification to strengthen their revenue base in the current turbulent business environment (Duggan, 2010). Such directional strategies seem to be providing competitive edge for companies against their competitors and hence maintaining market leadership position within their operating environment.

In order to enhance global competition, firms in the public sugar sector are struggling to optimize their profits through creation of distinctive capabilities for competitive advantage. This is done through effectiveness of the supply chain function to enhance low-cost sourcing. The primary function of the supply chain function is to provide the correct item at the required time at the lowest possible cost. It is on this basis that public entities are carrying out performance measurement within their supply chains.

However, this measurement may not take into account factors that relate to supplier stability, material quality issues and supplier discounts. A number of studies have been carried out on purchasing and the results have shown that there is no one common method of measurement for every purchasing department. However, firms use a number of key measures to evaluate performance of the supply chain function. These may include: cost saving, vendor quality, differentiation, delivery metrics and inventory flow. The overall effectiveness of the supply chain function change over time and hence need to be assessed and modified on periodic basis. Recent government interventions at improving service delivery in the sugar sector while promoting general socio-economic growth have yielded various blue prints the most recent being the Kenya Vision 2030. It is therefore necessary that millers develop strategies to improve service delivery through collaborative working relationships with their key suppliers to meet supply needs and expectations.

Problem Statement

The entry of new Sugar Millers in the supply market has led to stiff competition for cane supply, and hence supply gap as a result of cane shortage. This has resulted into supply interruptions accompanied by cane poaching and legal battles that have greatly affected performance capacity of Nzoia Sugar Company limited. According to Porter, E. (1998), an industry's profit potential is largely determined by the intensity of competitive rivalry within that industry. It is therefore imperative that such companies apply Porter's Five Forces model through innovation to position themselves strategically in the operating environment and take advantage of opportunities to overcome such threats. This study therefore sought to evaluate effectiveness of the Supply Chain Function in the public sugar sector, with reference to Technology adoption, early supplier involvement, backward integration and low-cost sourcing as key independent variables. This will provide basis for development of strategies for curbing supply risks associated with unhealthy competition, and hence need for proper Supply Chain Management in the public sugar sector.

General Objective

To evaluate factors influencing supply chain performance in the public sugar sector.

Specific Objectives

1. To assess effectiveness of technology adoption on supply chain performance in the public sugar sector.
2. To assess the role of early supplier involvement on supply chain performance in the public sugar sector.
3. To evaluate effectiveness of low-cost sourcing on supply chain performance in the public sugar sector.

4. To evaluate effectiveness of backward integration on supply chain performance in the public sugar sector.

Justification of the Study

The study aimed to add knowledge base to existing Supply Chain Management (SCM) literature in Kenya, with reference to Supplier relationships in the public sugar sector. The study aimed at helping practicing managers as decision makers in the sugar industry to develop strategies for development of key suppliers to maximize output. This will also enable suppliers to improve their productivity and efficiency at least cost. Finally, the study shall help policy makers like Public Procurement and Oversight Authority (PPOA), Ministry of Agriculture (MOA), out grower Institutions and Kenya Sugar Board (KSB) in formulation of supplier relationship policies in regard to sugar supply chain management.

2. LITERATURE REVIEW

The study was guided by Resource-based theory of competitive advantage and Contingency theory.

2.1. Resource-based Theory

Supply Chain Management is understood to be a set of practices for managing relationships and coordinating transformational activities from raw material suppliers to ultimate customers (Cravens, 2006). Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. According to Lambert (2004), operating an integrated supply chain requires continuous information flow based on customer relationship management and customer service.

2.2. Contingency theory

Contingency theory encourages responsiveness and flexibility to changes in environmental factors through structure and culture (Bew, 2007). Task performance and individual and group satisfaction are more important design criteria than permanence or unity of design type. Nonetheless, most companies are faced with a challenge of rapid changes in public procurement requirements that mounts pressure on the supply chain function. In this light, interactions between various elements, professionalism, staffing levels, budget resources, organizational structure, procurement regulations and control policies have greatly influenced organizational performance. In addition, supply chains are faced with challenges emanating from external factors such as socio-cultural factors, technological factors, economic factors, environmental factors, political environment, legal factors and ethical factors (STEEPLE) and hence, in many companies, management has reached conclusion that optimizing the product flows cannot be accomplished without implementing the entire process approach to business through cross-functional teams.

2.3 Conceptual Framework

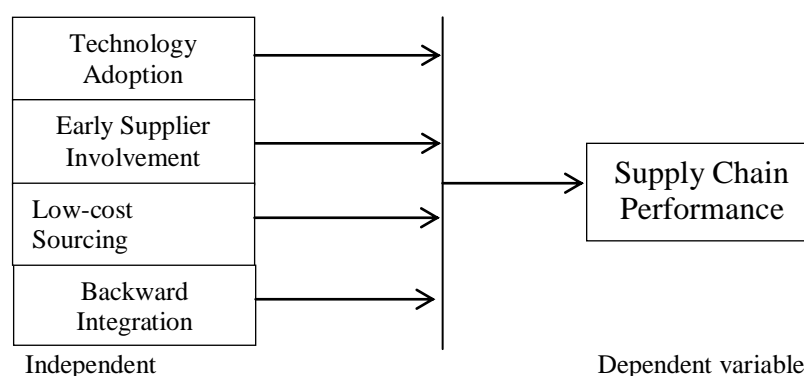


Figure 2.4. Conceptual model: Effectiveness of supply chain.

The four independent variables determine effectiveness of the supply chain system in the public sugar sector with reference to Nzoia Sugar Company limited. Supply Chain function therefore coordinates cross-functional teams across other departments to ensure cost efficiency and effectiveness. This is effected through application of ICT and automation technologies that streamlines operations and processes, increases productivity, reduces labour costs and secures competitive advantage and pricing.

2.3.1 Technology Adoption

For companies to pursue cost advantage, a strong research and development team is critical, responsible for capturing new ideas and translating them into business processes that provide deliverable products and services. Technology adoption in agriculture is pertinent as it gives an indication on the rate or extent of uptake of new technologies and identify associated constraints (Anon., 2005).

It has been recognized that Agricultural extension accelerates development in the presence of other factors such as markets, Agricultural technology, availability of supplies, production incentives and transport (Kibet, et al 2005). It is through technology dissemination that new cane varieties with positive attributes such as faster maturity and high sucrose content have been adopted by millers and farmers. Technology and automation have radically changed the way businesses and supply chains operate by opening up new supply markets, changing business processes, raising supply chain capacity, management of information and feedback, opportunities for cost reduction and supporting development of supply chain relationships. However, these approaches have associated risks such as huge capital inputs, compatibility issues and risk of controlling access to data systems. The researcher therefore sought to evaluate technology dissemination through new cane varieties, information management systems and supplier-to-supplier extension strategy as a measure to avert supply risks associated with supply shortages. The Company has also initiated e-procurement initiatives in its operations where suppliers send quotations via the company corporate website to increase transparency and reduce procurement cycle times. These measures are critical since to a large extent contribute to procurement efficiency within the organization.

According to Annon (2005), innovation capability has increasingly emphasized the importance of effective business processes in optimizing the flow of value to the customer. Hand in hand with this is the recognition that processes such as product development, supply, and quality management are essentially horizontal cutting across functional and organizational boundaries and hence need for collaborative measures throughout the supply chain.

2.3.2 Early Supplier Involvement

Early Supplier Involvement encourages effective cross-functional teams at the initial stages of product development and hence companies benefit in various ways such as to tap technical expertise and experience from suppliers in quality production. Cross-functional teams may take different forms: multifunctional teams, multi-skilled teams, project teams and virtual teams. Cross-functional procurement teams are particularly valuable in increasing team members' awareness of the big picture and process focus of their tasks and decisions. They enable a wider pooling of viewpoints, expertise and resources to represent a wider range of stakeholder interests. In practice, miller companies gain in terms of accurate and technical specifications, improved quality and sustainable performance, technology leverage and reduction in production costs. This also promotes supplier loyalty to particular companies due to shared vision and competence and hence security of supply. Companies are pushing towards building long-term relationships with their key suppliers based on strategic alliances and partnerships. They are using supplier relationship management to optimally balance competitive cost pressures with collaborative engagement across the supply base. It is with the realization that suppliers and collaborative relationships can make strategic difference to an organizational capability of providing continuous improvement in customer satisfaction (Leenders et al., 2006) that Nzoia Sugar Company limited is developing closer supplier relationships accompanied by supplier participation.

2.3.3. Low-Cost Sourcing and Production

Low-cost sourcing is becoming an important tool for optimizing the overall performance of an organizational supply chain and hence competitive advantage gained through such procurement processes. Most firms have adopted the strategy of outsourcing its non-core activities such as transport in new market areas, cleaning services, catering and IT systems management. This involves delegating non-core activities under contract to specialist external service providers on long-term relational basis (Lysons and Farrington, 2012). This has enabled firms to focus managerial staff and resources on its core distinctive competence and leverage economies of scale of suppliers with potential to add value at less cost.

2.3.4 Backward Integration Strategy

Firms tend to develop growth and diversification strategies through seeking ownership or increased control over their key suppliers on mutual understanding. This is meant to cut concept-to-customer development time, improve quality, reduce costs and ensures continuous supplies. It allows companies to exploit the capabilities, technologies and efficiency of their

key suppliers (Kanaan and Tan, 2006) through involvement in the early stages of product cycle. Diversification is considered the most high risk strategy as the organization faces initial learning curve problems with both the product and the market. Organizations therefore adopt related diversification that involves directions for growth in the scope of the enterprise. This may involve horizontal integration, backward integration and forward integration. According to Hoyt, J., (2000), backward integration brings about profits including saving transaction costs, stabilizing production and sales. Most sugar companies have established nucleus estates as a supply risk management strategy to compensate for short-term fluctuations in cane supply. This makes such companies suppliers of their own raw materials and hence controlling inputs to its business. It is advantageous in that it provides secure supply and control over input quality and cost. According to Omollo (2012), contract farming is instrumental in providing growers access to supply chain markets and price stability as well as technical assistance. Contractors provide input and farm investment on credit and in return expect delivery of raw materials in specified quantities, terms, quality and set prices. Well-coordinated contract farming systems assist in development of less privileged farmers. In any organization, purchasing department forms a link between the company and its suppliers. This can enable an organization to develop its suppliers in terms of expanding their supply base in terms of regular training, visits and built-in quality. Supply relationship management is about developing a two way mutually beneficial relationship with most strategic supply partners that deliver greater levels of innovation and competitive advantage. The main goal is to streamline and make more effective processes between an organization and its suppliers just as customer relationship management is intended to streamline processes between an organization and its customers. In Kraljic terms, moving the sourcing of a bought-out item from competitive pressure to a single-sourced partnership increases both supply risk and profit impact. Such partnerships tend push all affected purchases towards the strategic quadrant. Strategic purchases therefore offer large rewards if successfully managed, but demand allocation of large amounts of management attention and threaten heavy penalties if sourcing arrangements fail. Firms therefore segment and prioritise their portfolio of supply chain relationships, based on their relative profitability or potential impact.

3. RESEARCH METHODOLOGY

The study adopted descriptive research design. According to Orodho (2004), descriptive research is a design of collecting information by interviewing and/ or administering a questionnaire to sample of individuals. Mwangi (2009) observes that a descriptive survey design involves measuring a variable or a set of variables as they exist naturally. Descriptive research design was suitable for this study since it is the most appropriate method of collecting information by interviewing and/or administering a questionnaire to a group of individuals who serve as a sample population (Orodho 2004). The study adopted use of structured questionnaires with same themes but wordings changed to reflect different institutional management perspective. Personal interviews were also conducted since the target population is highly knowledgeable on aspects related to supply chain management in the public sugar sector. Inferential statistics was used where Pearson correlation and regression analysis were applied by aid SPSS.

4. RESEARCH FINDINGS AND DISCUSSION

4.1 Response rate

To determine the number of respondents who actively participated in the study, an analysis of the response rate was conducted as shown in Table 4.1. The response rate comprised of 52 respondents who constituted 86.7% of the total sample size. The non-response rate comprised of 8 respondents who constituted 13.3% of the total questionnaires issued. The response rate of 86.7% meant that collected data met generalization standards since according to Cooper & Schindler (2003), a response rate above 30% of the total sample size can be generalized to represent opinions of the entire population.

Table 4.1: Response rate

| Response rate | Frequency | Percent |
|---------------|-----------|---------|
| Response | 52 | 86.7 |
| Non-response | 8 | 13.3 |
| Total | 60 | 100 |

4.2 Reliability Analysis

The gathered data was subjected to reliability analysis using Cronbach's alpha coefficient of reliability. The critical value for Cronbach's alpha is 0.7, and in this case the average score for all variables was found to be 0.708. From this test, it can be concluded that the results are reliable and stable. An alpha coefficient of more than 0.7 indicates that the gathered data has relatively high internal consistency (Zinbarg et al. 2005), and could be relied upon to assess factors influencing Supply Chain Performance in the public sugar sector, with reference to Nzoia Sugar Company limited.

Table 4.2: Reliability statistics

| Cronbach's Alpha | No. of Items |
|------------------|--------------|
| .708 | 24 |

4.3 Inferential Analysis

For meaningful analysis, inferential statistics was carried out using regression model to establish the effect of independent variables to the dependent variable. Regression model established how and to what extent each of the independent variables explained the dependent variable as. From table 4.3, Pearson's correlation matrix for the variables was used in analysis. The results of technology adoption were positively correlated with supply chain performance, $F = 0.713^*$ $P\text{-value} < 0.05$. It is significant at 95% confidence level showing that firms that are adopting technology and innovation within the changing business environment are likely to increase supply chain efficiency and effectiveness.

The results for early supplier involvement are positively correlated to supply chain performance, $F = 0.796^*$ $P\text{-value} < 0.05$. It is significant at 95% confidence level showing that firms that are adopting this strategy are likely to record supply chain effectiveness through continuous improvement based on supply risk management strategies. However, results for low-cost sourcing and backward integration show negative correlation and hence not significant in this study. The two independent variables cannot therefore be accounted for in the dependent variable.

Table 4.3: Correlation Table

| | Supply Chain Performance | Technology Adoption | Early Supplier Involvement | Low-Cost Sourcing and Production | Backward integration |
|----------------------------|--------------------------|---------------------|----------------------------|----------------------------------|----------------------|
| Supply Chain Performance | 1 | | | | |
| Technology Adoption | .713* | 1 | | | |
| Early Supplier Involvement | .796* | .026 | 1 | | |
| Low-Cost Sourcing | -.050 | -.097 | -.119 | 1 | |
| Backward Integration | -.127 | -.097 | -.078 | .258 | 1 |
| | .370 | .493 | .581 | .064 | |

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

*correlation is significant at the 0.05 level (2 tailed)

From model summary table 4.4, the value of R square is 0.635. This implies that 63.5% of variance in the independent variables can be accounted for in the dependent variable. The regression result indicates that all the independent variables are significant in determining the effectiveness of the supply chain function ($F = 2.622$, $p < 0.023$) indicating the applicability of the overall model.

Table 4.4: Regression Model

| | R | R ² | Adjusted R ² | Std error | F | Sig f | Durbin Watson |
|---|------|----------------|-------------------------|-----------|-------|-------|---------------|
| 1 | .686 | .635 | .480 | .42897 | 2.622 | .023 | 2.349 |

A. Predictors: (Constant), Technology Adoption, Early Supplier Involvement, Low-Cost Sourcing, Backward Integration
 B. Dependent Variable: Supply Chain Performance

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The study used descriptive statistics and it aimed at assessing factors influencing supply chain performance in the public sugar sector, guided by four objectives: To assess effectiveness of technology adoption on supply chain performance, to assess the role of early supplier involvement on supply chain performance, to evaluate effectiveness of low-cost sourcing on supply chain performance and to evaluate effectiveness of backward integration on supply chain performance.

5.1.1. Technology adoption

From the study, Majority of the respondents agreed that technology adoption is critical in improving effectiveness of the supply chain function in the public sugar sector. 50.0% of the respondents agreed that provision of new cane varieties had improved supply chain efficiency through supply risk management, 42.4% of the respondents were in agreement with research and development initiatives and 48.1% of the respondents agreed that e-procurement initiatives had improved supply chain efficiency and hence reduced production cycle times. When subjected to regression analysis, 0.480 was the partial regression coefficient of Technology adoption. This shows that with influence of other explanatory variables held constant, an increase of one percent in Technology adoption makes Supply Chain Performance to increase by 0.480 in the same direction.

These findings were consistent to Annon (2005), who found out that technology and innovation have increasingly emphasized the importance of effective business processes in optimizing the flow of value to the customer and hence efficiency in supply chain performance. This was also consistent to Kannan and Tan (2006), who found out that companies exploit capabilities and technologies of their key suppliers to enhance efficiency and effectiveness of their supply chains.

5.1.2. Early Supplier Involvement

Majority of the respondents agreed that early supplier involvement has a lot of impact on supply chain performance in terms of attracting supplier expertise and capabilities. From the findings, 50.0% of the respondents agreed that supplier training and joint goal setting improves effectiveness of the supply chain function. 57.8% of the respondents seemed to agree that formation of cross-functional teams between the buying organization and its key suppliers is critical in improving supply chain performance in the public sugar sector. When subjected to regression analysis, 0.617 was the partial regression coefficient for early supplier involvement. This shows that with influence of other explanatory variables held constant, an increase of one percent in Early Supplier Involvement makes Supply Chain Performance to increase by 0.617 in the same direction. This is consistent with Leenders et al. (2006), who found out that suppliers and collaborative relationships can make strategic differences to an organizational capability of providing continuous improvement and hence supply chain efficiency.

5.1.3. Low-Cost Sourcing and Production

From the findings, majority of the respondents (59.5%) supported e-procurement initiatives in the public sugar sector as a measure to reduce sourcing costs during procurement. This is meant to reduce production cycle times as agreed by 51.9% of the respondents. However, 58.5% of the respondents seemed to disagree with the issue of reduced production cost. This was attributed to their attitude towards cost reduction measures intended to minimize labour and overhead costs such as layering and downsizing of human resource manpower. When subjected to regression, 0.008 was the partial regression coefficient for Low-Cost Sourcing. This shows that with influence of other explanatory variables held constant, an

increase of one percent in Low-Cost Sourcing makes Supply Chain Performance to increase by 0.008 in the same direction.

5.1.4 Backward Integration

In relation to backward integration, majority of the respondents seemed to agree with supply risk management strategies through development of nucleus estates to buffer seasonal supply shortages in the company, with 50.0% of the respondents agreeing that supplier contracting is critical since it improves supplier loyalty and hence efficiency in supply chain performance. Such suppliers will want to see the organization successful not just in terms of profit optimization but corporate responsibility. However, when subjected to regression analysis, -0.100 was the partial regression coefficient for backward integration. This shows that with influence of other explanatory variables held constant, one percent in backward integration makes Supply Chain Performance to decrease by- 0.100 in the opposite direction.

5.2: Conclusion

5.2.1. What is the effect of technology adoption on supply chain performance in the public sugar sector?

Majority of the respondents seemed to agree that technology adoption is critical in determining effectiveness of the supply chain function in the public sugar sector. This was shown by results of technology adoption with positive correlation to supply chain performance, $F = 0.713^*$ $P\text{-value} < 0.05$. It is significant at 95% confidence level showing that firms that are adopting technology and innovation within the changing business environment are likely to increase supply chain efficiency.

5.2.2. What is the role of early supplier involvement on supply chain performance in the public sugar sector?

Majority of the respondents agreed that early supplier involvement through cross-functional teams, supplier visit, training and joint goal setting is important in supply chain performance as it enables faster and more efficient product design and development processes. It also allows the buying organization to tap supplier expertise and capability in the early stages of product development. This was shown by results with positive correlation to supply chain performance, $F = 0.796^*$ $P\text{-value} < 0.05$. It is significant at 95% confidence level showing that firms that are adopting this strategy are likely to record supply chain efficiency through continuous improvement based on supply risk management strategies.

5.2.3. What is the effect of low-cost sourcing on supply chain performance in the public sugar sector?

Majority of the respondents (59.5%) supported e-procurement initiatives in improving supply chain performance in the public sugar sector, as a measure to reduce sourcing costs during procurement. However, 58.5% of the respondents seemed to disagree with the issue of reduced production cost. This was attributed to their attitude towards cost reduction measures intended to minimize labour and overhead costs such as delayering and downsizing of the company's human resource manpower.

5.2.4. What is the effect of backward integration on supply chain performance in the public sugar sector?

Majority of the respondents seemed to agree with supply risk management strategies through development of nucleus estates to buffer seasonal supply shortages in the company, with 50.0% of the respondents agreeing that supplier contracting is critical since it improves supplier loyalty and hence efficiency in supply chain performance. However, when subjected to regression analysis, backward integration had a partial regression coefficient of -0.100. This shows that with influence of other explanatory variables held constant, backward integration makes Supply Chain Performance to decrease by- 0.100. These findings therefore imply that low-cost sourcing and backward integration are not significant in this study as shown by negative correlation to the dependent variable, supply chain performance.

5.4: Recommendations

- In order to pursue cost advantage in the supply market, buying organizations need to enhance productivity through technology adoption and ensure automated procurement system based on e-sourcing strategies for cost efficiency. They need also to establish a strong research and development team that translates new ideas into business processes for competitive advantage.

- Firms need to exploit differential advantage through incorporating suppliers in the early stages of product development based on quality control, supplier expertise and support for innovation. This should be done through cross-functional teams from suppliers' side and buying organizations. Development of response teams based on supplier forums and quality circles is critical in improving supply chain visibility.

5.5: Suggestions For Further Research

Further studies can be carried out on other factors such as supplier development initiatives, sustainable green procurement, reverse logistics, procurement regulations, supply risk management and low-cost country sourcing in global supply chains.

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