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Performance Metrics for Food & Beverage Supply Chains
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Performance Metrics for Food & Beverage Supply Chains

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Summary: This research is performed to identify key performance indicators (KPIs) for Food and Beverage (F&B) supply chains at a strategic decision-making level. By interviewing subject matter experts from academia and a global F&B company in China, this research provides a framework of prioritizing KPIs for F&B supply chains. The results obtained from the methodology have been analyzed to provide recommendations to the sponsor about the importance and implementation along with the ownership of the KPIs with the help of a RACI (Responsibility, Accountability, Consulted, Informed) responsibility matrix.

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KEY INSIGHTS

- The proposed framework and methodology can be used at any stage of supply chain to identify most important KPIs for supply chain.
- Upstream traceability to ensure "Sustainable Sourcing" and downstream traceability to ensure "Flexibility of Service" and "Food Security" till it reaches the customer in the best quality and in appropriate time are identified as most important KPIs for F&B supply chains.
- Sourcing, followed by CRM, has been identified as an imperative area to be focused upon for performance improvement, for "Coffee Cup".

Introduction

"Coffee Cup" is a global Food & Beverage (F&B) company with more than 24,000 stores in around 70 countries. They recently ventured in to China, which is a relatively newer market to them. They have around 1,700 stores in more than 90 cities in Mainland China with around 25,000 supply chain partners. China operations are run through three Distribution Centres, located in Shanghai, Beijing and Guangzhou with 10 satellite frozen depots in Beijing, Xi'an, Wuhan, Chengdu, Chongqing, Xiamen, Guangzhou, Kunming, Nanning and Haikou. "Coffee Cup" is in the phase of expanding its operations and business in China. Their vision is to provide "Best-in-Class Services and Operations" to its customers.

Despite their global operations, "Coffee Cup" needs to establish a performance measurement system with relevant key performance indices (KPIs) to support its vision and objectives in China, as the already established KPIs are insufficient to address the diversity of suppliers, varied business nature compared to other regions, tastes and cultural differences and sustainable growth. So, "Coffee Cup" wants to set up its performance measurement system with KPIs which

address Flexibility, Efficiency and Sustainability (FES) in its supply chain.

This research intends to provide "Coffee Cup" with a set of KPIs critical to Flexibility, Efficiency and Sustainability (FES) of supply chain and recommendations related to the implementation of the KPIs in order to support their objectives in the new market, which are "Satisfied Store Partners, Fuel Profitable Growth and Proud Logistics Partners".

Literature Review
Supply Chain KPIs Characteristics & Identification

According to Beamon, (1999), a key point in the definition and implementation of supply chain metrics is that the strategic goals and the supply chain performance measures of an organization are directly linked and the later should be aligned with the former.

In order to measure the performance of any supply chain, metrics have to be defined, upon which the performance of a supply chain should be gauged and have defined some rules which should be kept in context while defining the measures like Name, Objective, Measure etc.

Beamon has identified three types of performance measurements which have further sub-types based upon Resource, Output and Flexibility. Gunasekaran et al., (2004) defined supply chain performance indicators in terms of the various phases of a typical supply chain like Plan, Make, Source and Deliver and further defined sub-matrix on Tactical, Strategic and Operational levels for all of the above mentioned phases. Chan & Qi, (2003) summarized the key performance indicators (KPIs) of supply chain management initially in terms of qualitative and quantitative measures and elaborated various indicators in both of these categories.

Gunasekaran et al., (2004) further state that for improved performance and optimization goals in a supply chain, improvement studies and performance measurement should be a recurring and continuous objective throughout the supply chain. And in order to attain this improvement goal, all stakeholders of the supply chain should work in close coordination and should be dedicated towards the shared objectives like customer satisfaction and enhanced competitiveness.

For F&B supply chain, Traceability and Quality were determined as key concerns by Turi et al., (2014) for all participants and stakeholders, and emphasized on their importance through all stages of production, processing and distribution. In view of steadily increasing competition, feedback from the customers for products and services in general and the F&B industry in particular is gaining importance by the day. Qiao et al.,

(2015) came to an interesting conclusion: "Customers' expectation from different regions is different; in other words, the tolerance of customers to service in developed region is generally not as sensitive as that in developing areas like West China. All these problems would be challenges for operators as well as the further topic for Chinese academia to study." This means that an F&B business looking to expand in a less developed region should pay extra attention to customer sensitivities and preferences while designing and operating their supply chains as a small deviation from customer expecation may result in a large impact on the business and the metrics defined should be more towards establishing strategic relationship between suppliers and customers. Moreover, the metrics set should also cater the nature of the product a firm deals in.

A summary of KPIs identified through literature and categorized in to six key areas of supply chain and within three decision-making levels, i.e., Strategic, Tactical and Operational, is given in Figure 1.
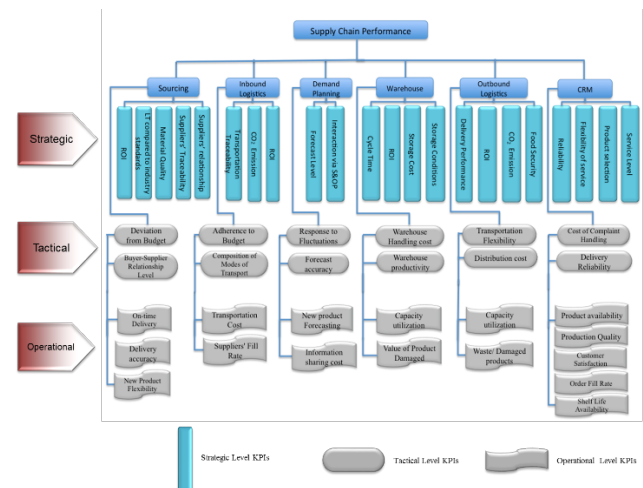

Figure 1 - KPIs Identified and Categorized

Methodology

This research provides a framework of identifying most relevant KPIs for F&B supply chain and a combination of Fuzzy Triangular Sets and Analytical Hierarchy Process (AHP) is used to identify the highly weighted KPIs among the set of Strategic Level KPIs from Figure 1. Fuzzy Set Theory eliminates the bias of opinion of the evaluators, while through AHP, the weights are obtained for each criterion.

This research provides analysis of Strategic Level KPIs, as the KPIs of a company should be aligned with its strategy, while Tactical and Operational Level KPIs

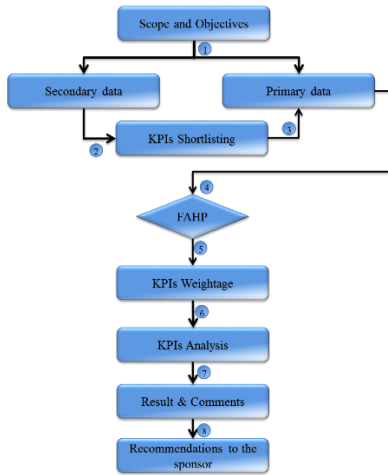are drawn from Strategic Level KPIs. The methodology of this research follows the flow provided in Figure 2.

Figure 2 - Research Methodology

As depicted in Figure 2,

(1) The scope, objective and background is stated initially, followed by secondary data collection, which in this case is the previous research done by researchers in the field of supply chain.

(2) Through secondary data (Literature Review), a list of KPIs is prepared.

(3) KPIs are shortlisted and only Strategic Level KPIs are used for the analysis. Primary Data in the form of input from "Coffee Cup" is obtained for Strategic Level KPIs.

(4) A combination of Fuzzy Set Theory (FST) and Analytical Hierarchy Process (AHP), named Fuzzy Analytical Hierarchy Process (FAHP) is used as a tool in this research. As per FAHP's requirements to prioritize KPIs by assigning them weights, primary data is collected from SMEs in the form of Fuzzy input. This primary data is serving as a principal input to FAHP.

(5) FAHP calculates weightage of each KPI based upon the input.

(6) As part of this research methodology, the highly weighted KPIs have been analyzed to emphasize their importance for the industry and for "Coffee Cup".

(7) The results of testing pilot data through this methodology are summarized and discussed.

(8) This analysis of most important KPIs is further used to provide recommendations on using these KPIs along with their ownership and accountability, to "Coffee Cup".

A breakdown of Strategic Level KPIs in FES is given in Figure 3.
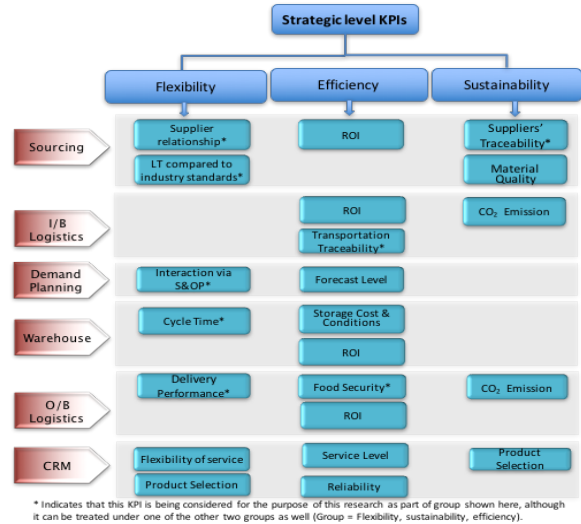

Figure 3 - Flexibility, Efficiency & Sustainability KPIs

SMEs input from both, i.e., F&B industry and Academia is obtained to calculate weightages of Strategic Level KPIs through Fuzzy Analytical Hierarchy Process (FAHP) within FES. The results obtained are summarized below:

Group	KPIs	Area	Weightage
Flexibility	Flexibility of Service	CRM	26%
	Product Selection	CRM	19%
	Delivery Performance	Outbound Logistics	15%
	Interaction via S&OP	Demand Planning	12%
	Supplier Relationship	Sourcing	12%
	Cycle Time	Warehouse	9%
	LT compared to Industry Standard	Sourcing	7%
	Total %age		100%
Efficiency	Food Security	Outbound Logistics	23%
	Reliability	CRM	17%
	Return on Investment	ALL	16%
	Service Level	CRM	16%
	Storage Conditions	Warehouse	9%
	Storage Cost	Warehouse	9%
	Forecast Level	Demand Planning	6%
	Traceability	Inbound Logistics	4%
	Total %age		100%
Sustainability	Suppliers' Traceability	Sourcing	37%
	Material Quality	Sourcing	34%
	CO_2 Emission	Logistics	17%
	Product Selection	CRM	12%
	Total %age		100%

Table 1 - Analysis Results for Flexibility, Efficiency & Sustainability KPIs

The analysis shows that in Flexibility, "Flexibility of Service" has been identified as the highly weighted KPI followed by "Product Selection". In Efficiency, "Food Security" was ranked as the most important KPI followed by "Reliability". In Sustainability, "Suppliers' Traceability and Material Quality" were identified as highly weighted KPI. As a result, "Sourcing" and "CRM" have been identified as the

most critical areas in supply chain to be focused upon by "Coffee Cup", as shown in Figure 4.

S – Sourcing   W – Warehouse
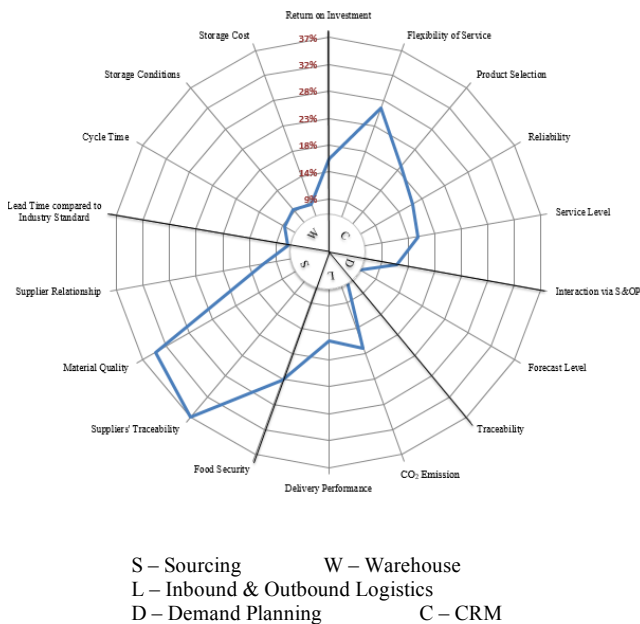L – Inbound & Outbound Logistics
D – Demand Planning   C – CRM

Figure 4 - KPIs priority after Analysis

A proposal for implementing and assigning the ownership of KPIS is provided in Table 2.

KPIs	Examples of Key Metrics	Supply Chain	Purchasing	Production	Logistics	Sales & Marketing	Finance	R&D
Flexibility of Service	Maintaining promised Fill Rate	A	R			R	C	
Product Selection	Product Introduction and development	A			I	R		C
Delivery Performance	No. of on time deliveries to retail stores	A		C	R			
Interaction via S&OP	Supply & Demand synchronization	A		C		R	I	
Supplier Relationship	Establishing Strategic Relationships conducive to flexible operations	A	R		R		C	I
Cycle Time	Flexible & Efficient process to meet set cycle time	A	C	R	R	I		
LT compared to Industry Standard	LT as per industry norms	A	R		C	I	I	C
Food Security	Elimination of contamination & Theft risks	A		R	R	C		I
Reliability	Fulfillment of promises to customers	A	R	C	R	C		I
Return on Investment	Higher Profit compared to investment	R	C		C	R	A	I
Service Level	Maintaining promised Service Level	A	I	C	R	R		
Storage Conditions	Adequate arrangements to maintain quality during storage	A	C	C	R			I
Storage Cost	Continuous efforts to optimize storage cost	A	R	C	R		I	
Forecast Level	Efficient way of forecasting as per firm's needs	A	R	R	C	I		
Traceability	Visibility of shipment from start to end	A	R		R	C		I
Suppliers' Traceability	Visibility of sourcing from all tiers of suppliers	A	R	C	I			I
Material Quality	Continuous Quality checks to ensure promised quality	A	R	R	C	I		I
CO2 Emission	Monitoring and putting efforts to reduce emission levels from operations	A		R	R			C
Product Selection (Sustainability)	Efforts towards development of environment friendly products	A	C	I		I		R

Table 2 - RACI Table for KPIs Ownership

Conclusion

For a F&B company to get a competitive edge in new markets like China, it needs to focus on establishing a strong performance measurement system with accountability and result-oriented approach. The KPIs defined for this system should be aligned with the supply chain strategy, which supports the overall vision of the firm.

In a developing region, like China, F&B firms need to focus more on building relationships with suppliers and customers. Effective communication on both ends of the supply chain helps in maintaining a check on material sourcing means and quality and ensures the optimality of the services being provided to the consumers. A comprehensive set of KPIs is mandatory to implement to achieve it. Upstream traceability to ensure ethical sourcing and material quality, while downstream traceability to ensure food security and flexibility of service is vital for sponsor company for performance improvement.

Even within a broad list of KPIs, there are some five to six metrics which are of high importance to the company. These metrics should be identified through some in-depth analysis and should be assigned an ownership so as to measure the impacts and ensure the implementation. This way, the performance measurement system should be made effective with monitoring, reporting and continuous improvement.

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