



Mega trends in F&B Packaging

Procurement Intelligence | **Thought Leadership Series**

Introduction

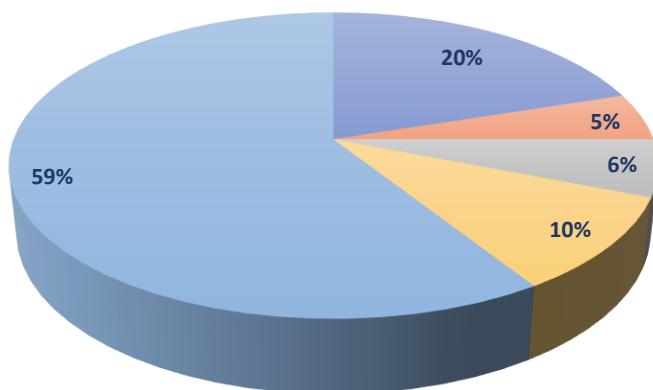
Transformation of packaging from mere wrapping to a branding strategy

The outbreak of COVID-19, and several unprecedented events that followed, has transformed the packaging industry over the last two years. The pandemic has increased consumers’ emphasis on product safety and hygiene, hence prompting manufacturers to offer cost-effective and hygienic packaging solutions. Manufacturers are also focusing on expanding their customer base and market share via packaging innovations and designs. Product packaging makes an overall difference to the placement and presentation of a product in the marketplace. Over the years, packaging has evolved from mere wrapping for transportation of products to more of a marketing strategy with high focus on sustainability, hygiene, and creative packaging to attract more customers.

The F&B sector accounts for the highest demand for the packaging industry. Packaging plays a pivotal role in the F&B industry, as it promotes brand image as well as helps to maintain the actual product quality. F&B companies are preferring Internet of packaging, biodegradable and recycling packaging, 3-D Printing, and green packaging to extend the shelf life of food products and ease the risk of product damage in long-distance shipping. The adoption of such technologies and sustainable packaging materials can help such companies achieve cost savings between 8%-12% on overall packaging cost and reduce package weight by 18%-20%. Furthermore, it can help them reduce the overall lead time and obtain greater visibility into supply chain operations.

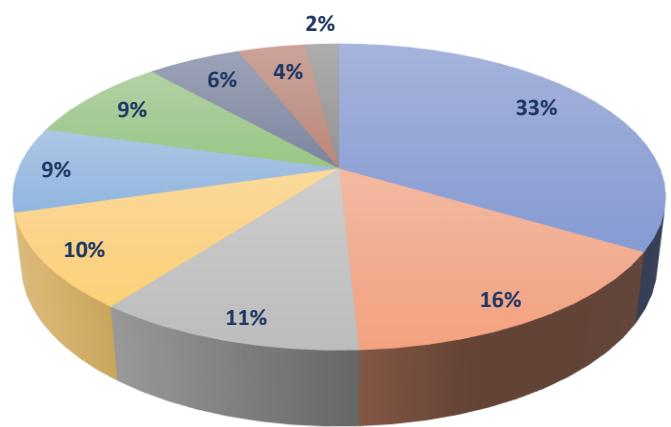
Global packaging market, by end-users (2021)

Base value: US\$1.01 trillion



■ Others ■ Personal care ■ Chemical ■ Pharmaceutical ■ F&B

Global packaging market sales, by packaging types (2021)



■ Flexible plastic packaging ■ Pet bottles
 ■ Glass bottles ■ Corrugated boxes
 ■ Flexible aluminum/paper packaging ■ Metal cans
 ■ Thin-walled plastic containers ■ HDPE bottles
 ■ Others

Mega Trends in F&B Packaging:

The current and expected change in the packaging industry is remarkable and driven by innovation. This paper offers an understanding of the major packaging trends and their underlying factors. The mega trends shaping the future of the packaging industry are as follows:

- ✓ **Smart packaging technology:** Increasing adoption of smart packaging to automate packaging operations and reduce packaging costs
- ✓ **Green packaging:** Use of non-petroleum, edible, biodegradable, and recyclable materials for food packaging to reduce carbon footprint
- ✓ **Amalgamation:** Market consolidation driven by the need for new-age packaging solutions such as sustainable and intelligent packaging

Mega Trend 1: Smart packaging technology

“Embedding smart technology into packaging offers value-added benefits and reduces packaging cost by 10%-20%”

Today, packaging is not limited by its basic function of containing a product. It is also intended to preserve, protect, position, transport, store, identify, and market the good. Hence, packaging service providers are utilizing smart technologies as they provide a comprehensive packaging solution by monitoring changes in a product or its environment and act upon these changes. These technologies provide several value-added benefits such as theft protection, customer engagement, waste management, and reduction in overall operational cost. As things stand, the F&B industry is the biggest consumer of smart packing technologies (at 70%). The smart packaging technology within the food and beverage industry can be divided into two categories: **Active packaging and Intelligent packaging.**

Intelligent packaging is used to detect and monitor the internal or external conditions of a package. The packaging communicates that information of the product to the user. Active packaging is engineered to improve the longevity of its contents, especially food products. Furthermore, packaging service providers are adopting these technologies to inform its manufacturer, retailer, and consumer on the product's condition on real-time basis. Among these, intelligent packaging accounted for a share of more than 60% in smart packaging technology in 2021.

The Types of Smart Technologies Used in the Packaging Industry are as follows:

Nanotechnology: Nano-sensors in the food packaging industry aid in detecting the spoilage in foods to avoid chemical contaminants in food items. In recent times, gold, and silver nanoparticles with quantum dots have been employed to detect food pathogens. The adoption of this technology can aid in reducing the overall packaging cost by 10%-15%.

For instance, Nanox Intelligent Materials, which is a developer and manufacturer of nanostructured materials, uses nanotechnology and provides antimicrobial agents for preserving food products.

Internet of packaging (IoP): Since 2018-2019, packaging businesses have begun to implement IoP to ensure efficient storage and offer a longer shelf life for food products. IoP includes technologies such as QR codes, RFID tags, and augmented reality, which aid in ensuring authentication and transparency. Furthermore, it helps detect and communicate complex factors related to food quality and safety as well as optimizes planning along the supply chain (from production to shipping to point of sale, up to the end consumer). The adoption of this technology can aid in reducing the overall packaging cost up to 15%.

For instance, F&B giants such as Coca-Cola, Nestle, and TATA have implemented QR codes to increase social awareness via their food products. A QR code offers numerous advantages such as providing nutritional information on the products, recipes, and guidance on its consumption.

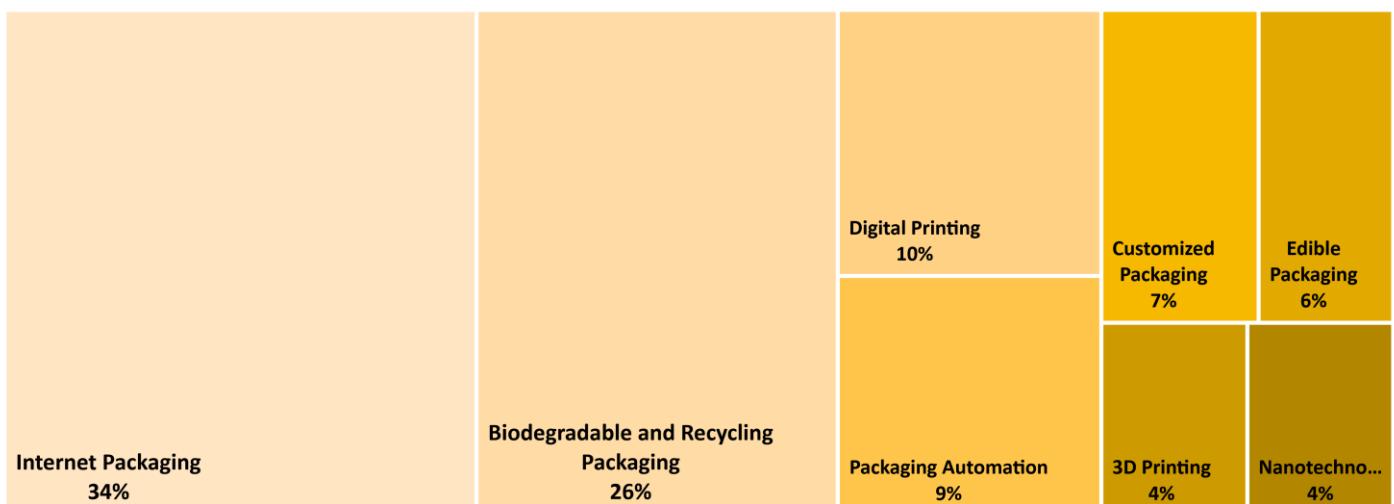
3D printing: The use of 3D printing often eliminates tooling and setup costs associated with traditional manufacturing. The adoption of this technology can aid in reducing the overall packaging cost up to 20%.

For instance, in 2018, Pepsi utilized 3D printing to create a replica Black Panther mask for soda cans. The company partnered with Protolabs, which employed extrusion technology to create the initial prototypes of these masks. In order to create the final parts, the company opted for HP's Multi Jet Fusion technology, which offers high-quality surface finish and lowers production cost.

Packaging automation: The packaging industry has adopted a new technology RaaS wherein these companies acquire robots as per their requirement (following pay-as-you-go or subscription-based service model). The adoption of this technology can aid in reducing the overall packaging cost 18%-25%.

For instance, RIOS Intelligent Machines offers AI-powered robots, that automates the order fulfilment process for its customers. The company provides a monthly service platform as an alternative financing option, which reduces the labor cost. Furthermore, packaging companies are integrating the robotics solution into their business operation to reduce their overall lead time.

Adoption rate of cutting-edge or smart technologies in packaging industry

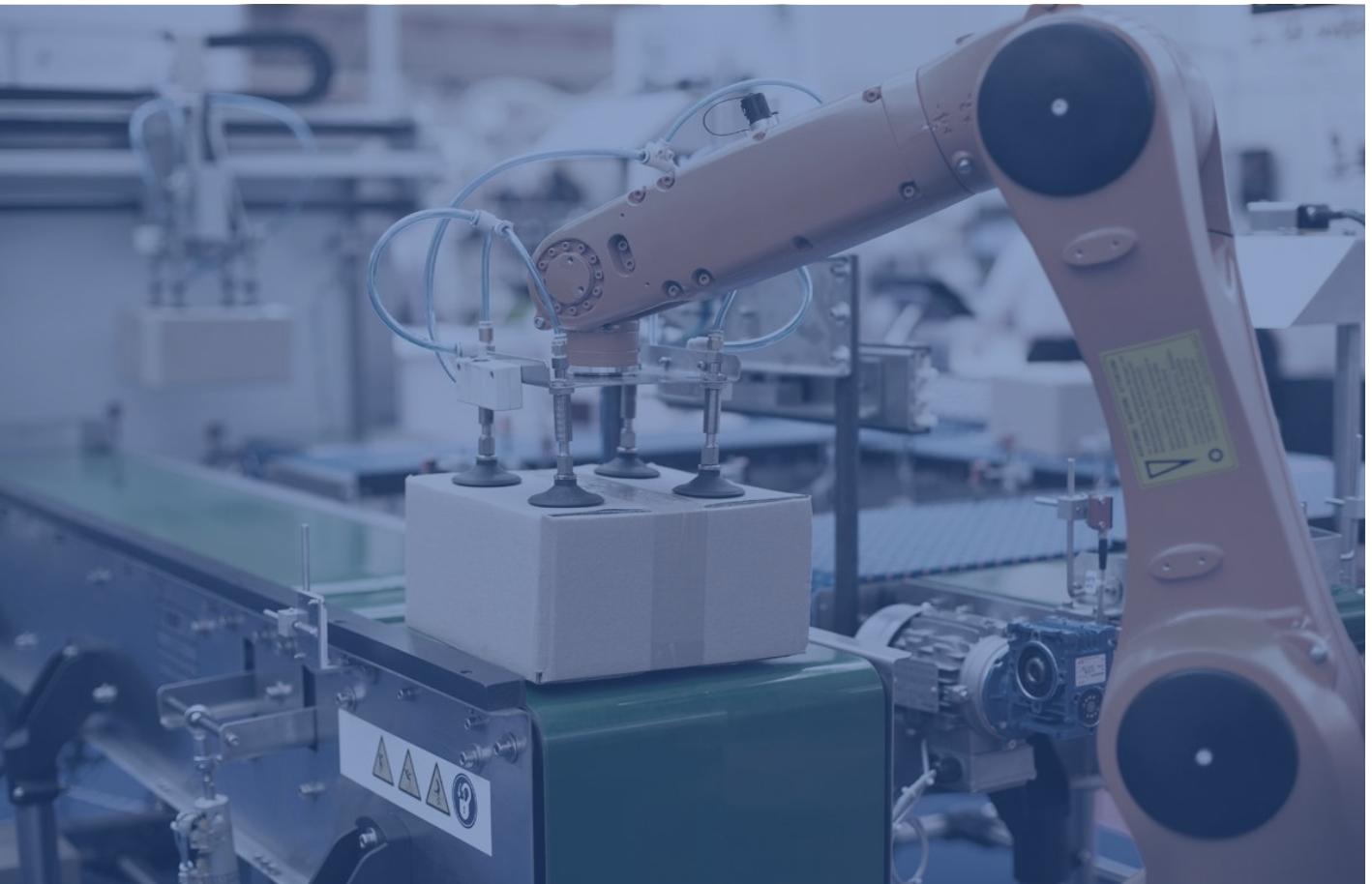


Snapshot into packaging technology: Evolution and cost-saving percentages

The table depicts the evolution of packaging technologies over the years and their focus on innovations in recent times. The adoption of these technologies has resulted in 10%-20% reduction in the overall packaging cost for packaging service providers and manufacturers.

Packaging technology	Year of adoption	Recent changes/innovations	Impact on overall packaging cost	Adoption rate
3D printing	2013-2014	Focus on sustainable packaging	15%-20% reduction	
Nanotechnology	2017-2018	Use of gold and silver nanoparticles, quantum dots	10%-15% reduction	
Packaging automation	2018-2019	Adoption of RaaS	18%-25% reduction	
IoP	2018-2019	Use of QR codes, RFID tags, and AR	10%-15% reduction	

Level of adoption Low Moderate High



Use-case Scenarios of F&B Manufacturers that have Implemented Smart Packaging Technology for their Operations:

Big Shock!, which is a leading energy drink brand in The Czech Republic, was on the lookout for an intelligent beverage that would indicate whether its contents were at the ideal consumption temperature.

In October 2021, the company partnered with Ardagh Metal Packaging, which is a global leader in metal and glass packaging, to develop this out-of-the-box solution. The latter's consultants helped the former print its beverage cans with color-changing thermochromic ink. The special-colored inks exhibit color changes which led to instant attention from customers as and when the drink warmed or cooled

Carlsberg, which is a leading Danish brewer group, wanted its beer to taste fresher for longer without unwanted taste changes.

The company launched ZerO2 cap, which is a high-end technology that removes oxygen from the headspace in the beer bottle, and hence, keeps the drink fresh much longer. By introducing an oxygen-absorbing scavenger in its smart bottle cap, it succeeded in extending the shelf life of its beer by 15% without compromising on its freshness.

AAA20Group, which is robotics automation company aimed at reducing labor costs and eliminating the prohibitive cost of equipment ownership for its clients.

AAA20Group, which is a subscription-based robotic solutions provider, delivers automation solutions to its clients catering to different industries including F&B. The company provides specialized palletizing robots, which can be acquired on lease to reduce capital requirements and lower fixed costs.

Mega Trend 2: Green Packaging

“Combining packaging with sustainable goals helps in achieving recycling rate of around 75%”

The packaging industry is moving toward new norms, namely ‘sustainable,’ ‘green,’ or ‘eco-friendly’ packaging, to reduce the carbon footprint. To achieve this goal, manufacturers are focusing on light weight and low CO2 emission packaging materials such as bagasse and hemp packaging. Furthermore, they are adopting various methods such as compression molding technology and packaging redesign to reduce the weight of packaging products by 10%-20%. Further, the government regulations related to environmental issues and global warming are also forcing packaging companies to focus on green packaging.



The F&B sector accounts for the major share (50%) in the global sustainability market due to the surge in demand for non-petroleum, edible, biodegradable, and recyclable materials for food packaging among customers. Manufacturers are making the bottles and lids of food products from healthier and more easily degradable materials such as bamboo, rice husk, and gelatin films, which are inherently less hazardous to the environment. Furthermore, they have increased the adoption of non-plastic materials such as glass, hemp, Polylactic acid

(PLA) based-packaging, and bagasse-based packaging. This results in lower carbon footprint and cheaper manufacturing cost.

For instance, The use of recycled glass reduces CO2 emissions by ~58%, thereby saving 670 kg of CO2 emissions for every MT of glass manufacturing. The recycling rate for glass, paper, and PLA-based packaging is above 75%, whereas pulp-based and hemp packaging is fully recyclable.

Cost of sustainability: The rise in prices of raw materials such as resin, lumber (timber), Ethylene-vinyl Alcohol (EVOH), and kraft paper has resulted in driving up the manufacturing cost of corrugated packaging, paper-based packaging, and barrier food wrapping. In 2022, the prices of fiber, resin, and other packaging materials are expected to stabilize. However, the recent Russia-Ukraine geopolitical conflict has raised the energy prices, which would negatively affect the packaging industry. We would discuss the impact of Russia-Ukraine geopolitical conflict on the packaging industry in the later section of the whitepaper.

Type of packaging material	Recycling rate in 2021	Average price change (2021 vs 2020)	Reason for price increase
Corrugated	80%-90%	9%	Increase in crude oil prices due to energy crisis
Paper	75%-100%	5%	Rise in price of kraft paper
Barrier food wrapping	70%-75%	6%	Shortage of Ethylene-vinyl Alcohol (EVOH), a key raw material

CLUBZERO

Industry leaders in the F&B industry such as Starbucks and McDonald's engaged with a returnable packaging service provider to utilize its technology in their businesses.

In 2021, Starbucks and McDonald's engaged with ClubZero to install a circular system and QR codes on their reusable cups for collecting, washing, and reusing the cups previously used by customers.

GENTLEBRAND

PACKAGING TAILORS

Gentlebrand, which is a packaging design agency, has developed a glue-free label on PET bottles to avoid contaminations.

The company has developed a glue-free label made of organic seed paper, which is installed on its PET bottles to avoid contamination by conventional inks and glues.

kua

A Sydney-based B2B coffee manufacturer partnered with Unleashed Software to install a serial number tracking system on its coffee cups.

In 2021, Kua Coffee partnered with Unleashed Software to deploy a serial number tracking system to track and monitor its used coffee cups. According to one of the company's officials, every kilogram of used coffee cups collected can eliminate CO2 emissions by 0.6 times.

DIAGEO

Diageo, which is a leading alcoholic beverage company with brands such as Bailey's, Guinness, and Smirnoff, focused on reducing its packaging weight by 11% in 2020.

In 2020, Diageo reduced its packaging weight by lowering the use of plastics in its beverage containers. Furthermore, in the same year, the company used 46% of recycled materials for manufacturing its products.

Mega Trend 3: Amalgamation

Increasing M&A deals indicate that the packaging supply market is recovering in a post-pandemic scenario

The packaging supply market is highly fragmented; however, market consolidation can create different headwinds for some suppliers while tailwinds for others. The market consolidation is driven by the need for new-age packaging solutions (sustainable and intelligent), which is achieved by acquiring small-scale companies that focus on sustainable and customizable packaging solutions. In the global packaging industry, M&A deal volumes declined by 35% in 2020 compared to 2019 due to the COVID-19 pandemic. However, they increased by 31% in 2021 compared to 2020 as the packaging supply market was on the path of recovery in the post-pandemic scenario.

The M&A deal volumes for the packaging industry had increased by 31% in 2021 compared to 2020.

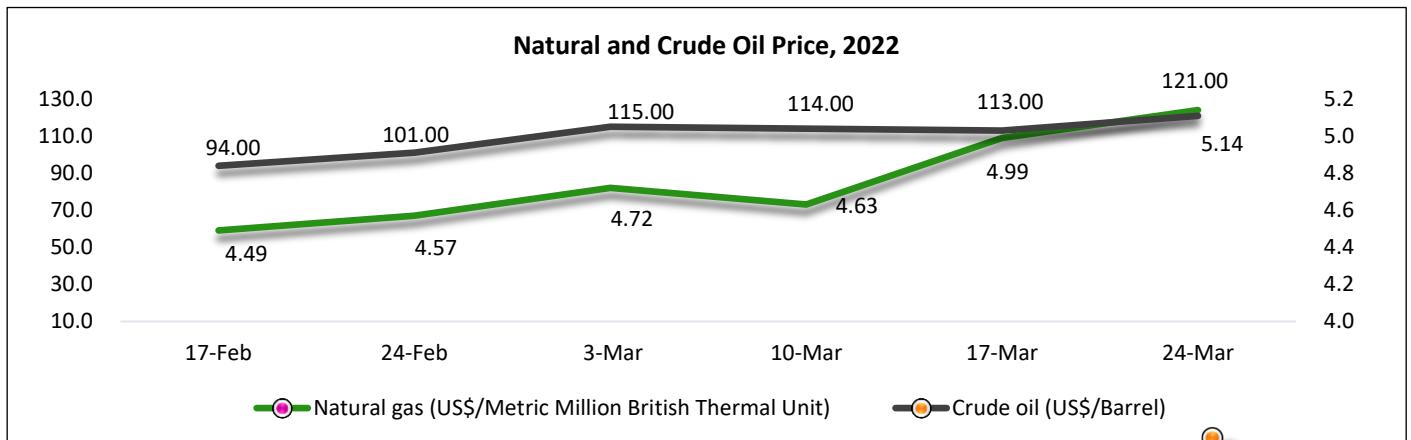


Acquirer	Target company	Insights on the deal
CCL Industries	Desarrollo e Investigación S.A. de C.V. and Fuzetouch Pte. Ltd.	CCL Industries, which is the world's largest provider of specialty label, security, and packaging solutions, acquired Desarrollo e Investigación S.A. de C.V. and Fuzetouch Pte. Ltd. to expand and diversify its product portfolio.
Sonoco	Ball Metalpack	Sonoco acquired a division of Ball and Platinum Equity to expand its geographical footprint and increase its product portfolio.
Ardagh Metal Packaging	Gores Holdings V	Ardagh Metal Packaging merged with Gores Holdings V to expand its product offerings, strengthen its market position, and achieve its sustainability goals.
Oji Holdings	Empire Packages	Oji Holdings acquired Empire Packages to expand its corrugated packaging portfolio.

Impact of the Russia-Ukraine Geopolitical Conflict on the Packaging Industry

The geopolitical conflict has resulted in volatile prices for crude oil and natural gas, which are essential commodities for packaging materials

The recent Russia-Ukraine geopolitical conflict has disrupted the energy supply, thereby rendering the prices of crude oil and natural gas volatile. In the past few weeks, the price of crude oil has been highly fluctuating (US\$94/barrel on February 17, 2022; US\$101/barrel on February 24, 2022; US\$113/barrel on March 17, 2022). However, on March 24, 2022, its price reached the highest level compared to the previous weeks. Similar fluctuations were observed in the prices of natural gas, which reached a record high of US\$5.14/MMBtu on March 24, 2022, compared to the previous few weeks. Russia is the third-largest producer of crude oil and the second-largest producer of natural gas in the world. Hence, this conflict has affected the price and demand for packaged materials made from crude oil and natural gas such as resin, fiber, ethylene, polyethylene, and polystyrene. The packaging industry is an energy-intensive industry hence, this event has created bottlenecks in business operations, which has affected the cost of several packaging types such as corrugated, paper, and barrier food wrapping



In early March 2022, some of the large packaging service providers announced production stoppages due to high energy prices. Few of the examples are as follows:

- Pro-Gest, which is an Italian packaging group, temporarily stopped the production of approximately 1 MMT of containerboard (25% of the total production capacity in Italy) due to escalating natural gas prices. After one week of downtime, the company partly resumed its packaging operations at its mills.
- Further, in March 2022, Leipa Group, which is a German producer of containerboard machines, temporarily shut down one of its factories due to huge energy prices and supply chain disruptions.

What approach should buyers/procurement leaders follow in this scenario?

- Look for alternatives: Buyers or procurement leaders could look for alternatives such as hemp and bagasse-based packaging (less crude-oil dependent packaging materials) to avoid supply chain disruptions and shortages in packaging materials.
- Map best-fit suppliers: Supply chain and procurement leaders should map their best-fit Russian and Ukrainian suppliers. Since most disruptions in the case of a conflict could arise at the raw material level, mapping could be done from the viewpoint of the supplier's raw material procurement.

Road Ahead: What Organizations Can do to Optimize their Category Management Strategies

Over the last two years, we are witnessing a surge in packaging material prices. This can be attributed to supply chain disruptions and increase in key raw material prices. Hence, procurement professionals are under pressure to curtail their operating costs to prepare for future challenges.

The three key strategies and initiatives that buyers can consider are as follows:

1) Focus on packaging design for brand identity: Packaging has become an essential part of the marketing mix as it help buyers communicate product information directly to consumers. A good packaging design will attract attention, protect food products, and enhance consumer experience which, in turn, will help in building brand awareness. The COVID-19 pandemic resulted in high growth in e-commerce sales, which further increased the requirement of good packaging design for buyers.

Some of the features (related to packaging design) that buyers can keep in mind while providing food products to their consumers are as follows:

- **Durability:** Buyers should ensure that their product packaging is durable as e-commerce product distribution has 3 times more touchpoints compared to traditional retail
- **Lightweight:** Shipping costs account for 20%-25% of the total cost. Hence, buyers should shift toward lightweight packaging, such as paper, plastic, and others, for lower shipping cost

2) Assess current supplier pool: Currently, the packaging industry is facing volatility in prices of the key packaging raw materials due to supply chain disturbance in crude oil/natural gas. Hence, buyers should diversify their supplier base to mitigate the supply chain risks. Furthermore, they can look to engage with suppliers with a diverse portfolio of packaging materials to transition to a new packaging design, if required, in future

3) Prepare for future of packaging: Since majority of the buyers are majorly focused on achieving sustainable goals, engaging in long-term relationships with green packaging service providers would be a feasible business strategy. These green packaging materials include the following:

- **Sugarcane** fiber can be used as a substitute for wood and plastic in the production of pulp, paper, and board. This reduces carbon emissions by 7% in comparison to plastic
- **Sodium alginate or seaweed** is extracted from marine brown algae, which is used as an alternative material in the food packaging industry
- **Chitin and chitosan** contain biological features, such as antibacterial and antioxidant capabilities, which are used for biodegradable food packaging
- **Coir or coconut fiber** is used in the packaging industry for the purpose of safeguarding and protecting delicate food products as these act as shock absorbers

Hence, packaging service providers should consider these sustainable packaging materials instead of traditional crude oil-based packaging materials to minimize food waste and cut emissions in the long run.

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