

How Supply Chains Can Manage Packaging Megatrends by Employing a Packaging Engineering Role

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By Analysts [John Blake](#)

Packaging megatrends — sustainability, e-commerce and customization — continue to evolve in 2020 requiring changes to package design, materials and handling. This research provides CSCOs with best practices for leveraging internal and external packaging experts.

Overview

Key Challenges

- Supply chain teams are under increased pressure to meet customers' ever-changing expectations for packaging innovation and customization.
- Top trends influencing the global packaging industry require engineering analysis and detailed development to meet product protection and financial targets.
- Manufacturing locations are not equipped to meet the new demands for customized and e-commerce ready packaging.
- Existing packaging assets and in-house technologies limit the ability for supply chains to deliver innovative and optimized packaging.

Recommendations

To implement a successful supply chain strategy for managing packaging megatrends:

- Ensure you achieve supply chain efficiency while developing and modifying packaging by creating a role that represents supply chain interests in packaging initiatives.
- Deliver excellence in supply chain packaging by identifying and developing the capabilities of the packaging engineering role.
- Tackle projects that require specialized skill sets or require short-term dedicated resources by enlisting packaging engineering service providers.

Introduction

Consumers' changing demands and the growth of nontraditional retail outlets are increasing companies' reliance on packaging innovations to enable them to accelerate revenue and preserve brand equity. The top packaging trends expected to impact the packaging industry through 2028 include: ¹

1. Sustainability
2. E-commerce
3. Digitally connected packaging
4. Convenience

Each of these trends has an impact on supply chains and requires changes to packaging design, packaging equipment and packaging materials.

Sustainable packaging initiatives often require changes in packaging suppliers, the types or quantities of materials used, and the equipment used to fill and assemble the packages.

E-commerce has led to new price points and package sizes, often resulting in channel-specific case counts. The additional handling that packaged products see through online retailers such as Amazon requires specific packaging that ensures items arrive without damage.

Digitally connected packaging is growing in application. For example, brand owners leverage digitally connected packaging to combat counterfeit goods, engage with consumers and prevent theft, while providing visibility throughout the supply chain.

Convenience is a trend driven by many factors, including changing demographics and the continual uptake of technology. According to a 2018 Nielsen report, ² consumers are seeking products that meet their specific needs.

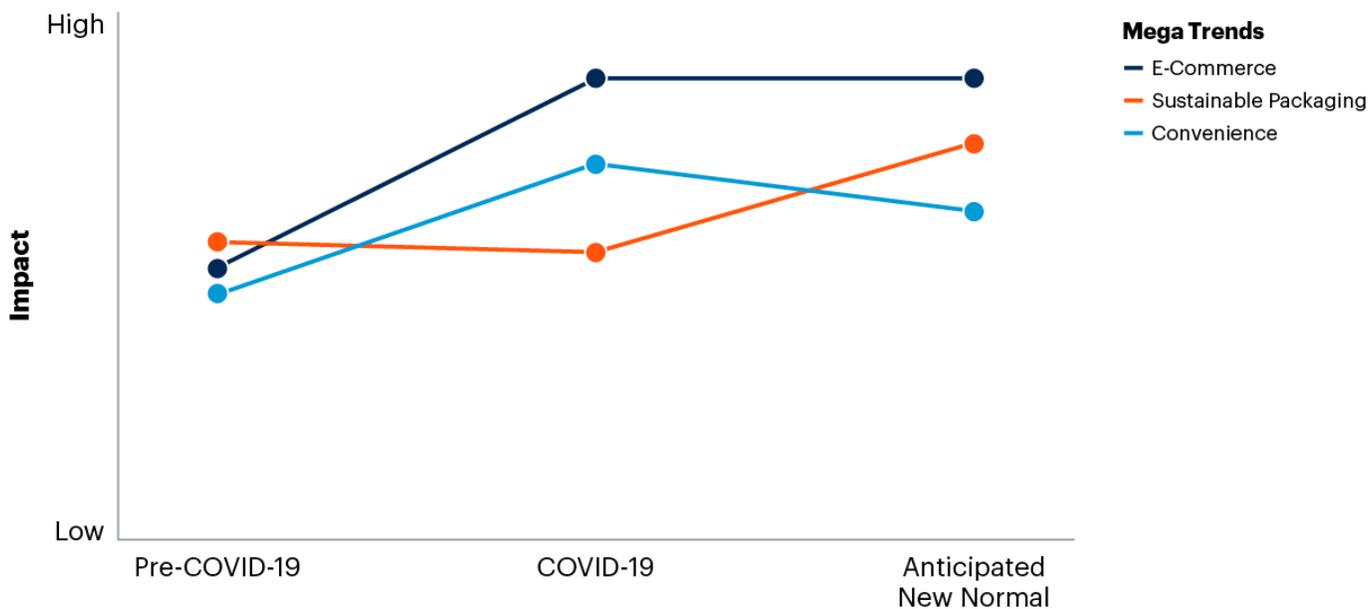
COVID-19 has only heightened the emphasis put on packaging to meet the needs of consumers (see [“Supply Chain Brief: COVID-19 Impact on E-Commerce and Sustainable Packaging”](#)). E-commerce, sustainable packaging and convenience, led by product/personal protection, have all accelerated during the pandemic and are expected to persist postrecovery (see Figure 1).

Figure 1: Impact of COVID-19 on Packaging Megatrends



Impact of COVID-19 on Packaging Megatrends

Illustrative



Source: Gartner
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The dynamic nature of the retail marketplace calls for sustainability and the continued growth of e-commerce. It also increases the reliance on packaging to do more work to protect, distribute and market products than ever before.

Consumer need for customization and convenience is also changing the retail landscape, as shown by the growth of e-commerce. However, as the focus turns to the growth in e-commerce, other channels (such as pharmacy, discount, club store, grocery and traditional retail) can't be ignored. Within these channels, retailers and consumers are setting specific product assortment requirements. The retail outlets have become destinations to meet consumers' very different needs through price point, quality, use and variety – all enabled in full or in part by the packaging design. Product design is often referenced within supply chain planning – but packaging is what usually differentiates or defines the product offering.

In our research, we have found that leading companies design collaborative structures in their organizations to ensure that product and packaging design considerations are addressed within supply chain management. This research outlines best practices for incorporating the packaging engineering expertise into the supply chain strategy function.

Analysis

Ensure Supply Chain Efficiency

Packaging and packaging engineering is still a relatively immature discipline despite being close to a \$1 trillion industry and playing an increasingly important role in nearly all industries. Many companies still do not employ packaging engineers and in many cases leave the packaging engineering responsibilities to marketing, procurement or suppliers.

Where dedicated packaging engineering resources do exist within organizations, we find that there is no single consistent reporting relationship when viewed cross-industry, or even within a given industry. Packaging engineers can report into research and development, engineering, marketing, procurement, manufacturing and sometimes supply chain.

The function that leads packaging typically drives the packaging agenda. As a result, packaging initiatives often suffer from a lack of cross-functional coordination. Supply chain leaders have a vested interest in packaging because it affects costs of goods, sustainability initiatives, and costs for manufacturing and shipping. Often we find that the supply chain is not included in the packaging conversation. As a result, it needs to react and adjust to deliver suboptimal options that do not include consideration of the full capabilities and impact on the end-to-end supply chain.

To address the challenges of packaging, create a role or add responsibilities to represent supply chain interests and build packaging capabilities into the supply chain function. Depending on reporting relationships, budgets and cross-functional alignment, different approaches are taken to address supply chain interests:

1. Maintain current organizational roles while directly including supply chain in the packaging development and decision-making processes. This approach will improve the orchestration of the end-to-end packaging process and often applies when packaging reports into a function other than supply chain.
2. Introduce a supply chain packaging engineer role to represent supply chain interests in the development process or to lead packaging programs in full. This approach applies where no packaging expertise exists internally or for specific programs where there is heavy emphasis on the supply chain.
3. A combination of 1 and 2.
4. Maintain one packaging organization that designs and develops packaging but has the discipline to consistently incorporate views from across the business functions.

Whichever approach you determine is achievable based on the current conditions of budgets, resources and functional alignment, ensure supply chain interests are represented in packaging-related programs. Do not assume that individual roles have the visibility and knowledge of end-to-end processes when creating new or making modifications to packaging. It's common that most of the

focus in early development stages is put on customer or consumer feedback, or packaging material costs and areas such as capital requirements or transportation costs are overlooked

Deliver Excellence in Supply Chain Packaging

Define the supply chain packaging role by focusing on the key responsibilities and capabilities that packaging engineers possess. ³ Recognize that packaging engineers who report into marketing, procurement or any other function will have goals and deliverables that differ from supply chain priorities. An engineer reporting into marketing will often have innovation, growth and consumer preferences as key priorities. Although these are good for meeting marketing objectives, the proposed package that emerges from the development process may not fit the manufacturing assets, cost structure or distribution efficiencies of the supply chain. Therefore, influence the direction and final results of the packaging development process by introducing a role that:

- Possesses the skills and knowledge of packaging engineering
- Orchestrates solutions to packaging-driven challenges across the supply chain and operational groups through a deep understanding of the elements that make supply chains successful

Package engineering encompasses a unique and specialized set of responsibilities and skills. Packaging engineers possess a deep understanding of materials – their use and manufacture, product protection (including damage prevention and shelf life) and distribution (including protective packaging, pallet design and transportation methods). Align the key skills and requirements of packaging engineers with your supply chain priorities and create a role-specific job description. Use the lists of responsibilities in Table 1 to create a supply chain packaging role that can support the supply chain organization.

Three key areas of responsibility for packaging engineering consist of package design, package analysis and package orchestration. ³ Packaging design is most often associated with new products, but it must be included in all efforts to make changes to packaging. Package design goes beyond the physical appearance and selection of materials to include impact on sustainability, transportation and interaction with packaging equipment. Packaging analysis involves responsibilities ranging from scoping cost optimization to feasibility and identification of new technologies. Packaging orchestration involves the oversight to ensure projects are completed within time and budget. In addition to managing projects, responsibilities include supporting co-packers, engaging with suppliers and supporting manufacturing.

Table 1: Packaging Engineering Responsibilities Span Design, Analysis and Orchestration

Key Area	Responsibilities

Packaging Design

- Develop packaging for new product launches, line extensions and emerging retail channels.
- Manage and execute the design, evaluation, testing and qualification of new and modified package components through to final shipment.
- Ensure that package designs and systems will operate efficiently on existing and new packaging lines through line trials and validation.
- Interface with the manufacturing sites to ensure a smooth transfer of knowledge and technology from pilot to production scale for materials, pack forms and packaging equipment.
- Provide recommendations for relevant equipment modification and/or purchase and determine the impact of new packaging design on existing and new automation at manufacturing locations
- Modify package designs to optimize manufacturing and labor efficiencies.

Packaging Analysis

- Develop and execute protocols for package sourcing, purchasing, installation and validation of equipment, as well as developing and validating packaging processes.
- Identify packaging cost reduction opportunities and validate the options to ensure product quality.
- Lead analysis of nonstandard package components and corrective actions to eliminate deviations from standard.
- Identify and develop feasible packaging concepts and technical solutions based on supplier technologies and internal/external manufacturing capabilities.
- Identify and validate new packaging technologies.

Packaging Orchestration

- Lead packaging growth, cost optimization and quality projects through scoping, validation and commercialization phases.
- Determine and document component equipment interfaces and capabilities.
- Provide technical support and training to manufacturing regarding packaging systems and machinery.
- Lead in-plant material qualifications for packaging changes across primary, secondary and tertiary packaging.
- Assess the technical capabilities of and provide technical packaging support to contract manufacturers and third-party logistics providers.
- Engage with packaging suppliers to assess new materials and formats, and to maintain projected costs.

Source: Gartner (July 2020)

Factor Industry-Specific Technical Requirements Into Supply Chain Packaging Roles

In designing a supply chain packaging role, recognize that the core competencies of the position will remain constant, but specific technical requirements will be differentiated by industry. Specify the role requirements for your industry by emphasizing key industry requirements:

- Life sciences: Has a much greater emphasis on regulatory and technical documentation. It also requires knowledge of methods of sterilization for medical device packaging.
- Chemical industry: Has specific packaging requirements regulated by government agencies as well as strict labeling requirements.
- Food and beverage: Has an emphasis on shelf life to maintain product quality while minimizing costs in a comparatively low-margin sector. Material and product interaction is also a focus, as well as understanding the deteriorative effects of food products.
- Consumer goods: Puts greater emphasis on mold development and dispensing systems, high capital mold qualification and the filling of gases and liquids.
- Industrial and consumer electronics: Specific packaging engineering skills focus on structural analysis, determining the effects of loads on structures and conducting thermal and electrical simulations.

See Table 2 for industry-specific technical requirements. ⁴ Develop a job description specific to your needs by differentiating between foundational skills and industry-specific experiences and

responsibilities.

Table 2: Industry-Specific Packaging Engineer Skills and Responsibilities

Category	Industry-Specific Skills and Responsibilities
Industrials and Consumer Electronics	<ul style="list-style-type: none">■ Provide container and truckload packing schemes■ Support field and factory problem resolution■ Have experience using principles of structural analysis to determine effects of loads on structures■ Have experience using standards, specifications, rules and requirements (ASTM, ISTA, NMFC) for the proper packaging of goods moving by motor carrier■ Maintain accurate dimensions and weights data■ Assist in supplier selection and transition■ Manage/drive/support OSAT to provide package design, thermal and electrical simulation, and assembly support
Food and Beverage	<ul style="list-style-type: none">■ Understand and have a working knowledge of packaging materials and equipment, and how they interact■ Have experience with flexible barrier materials, paperboard, corrugated materials, CAP/MAP, display and club store packaging, VFFS and HFFS equipment, automatic cartoning and case packing, and overall plant operations■ Conduct value analysis and cost reduction activities on packaging materials and labor reduction■ Be responsible for determining packaging material specifications to maintain product integrity; This includes developing appropriate design to maximize long-term quality and shelf life of product, while minimizing or reducing cost■ Understand application of AQL or similar to testing and statistical sampling; be able to write packaging quality specifications, including defect definitions and sampling/test plan■ Be proficient with ArtiosCAD and other packaging-specific software

Life Sciences

- Author, review and/or approve regulatory and technical documentation, including (but not limited to) bills of materials, package component specifications, standard operating procedures and technical reports.
- Manage and execute design, evaluation, testing, and qualification of new and modified package components
- Have knowledge of methods of sterilization and design requirements for medical device packaging
- Lead material qualifications for packaging changes, such as resin material changes
- Create sterilization pallet patterns and nonsterile pallet patterns for manufacturing locations

Consumer Goods

- Connect with the consumer and predict/shape the user experience through marketing research and consumer science activities
- Have in-depth knowledge of one or more of the following materials and processes used in the construction and manufacturing of cosmetic packaging:
 - Extrusion/injection molding
 - Dispensing systems (airless, pumps)
 - Custom compact design
 - Propel/repel mechanism
- Provide a comfortable environment, but with regular exposure to factors such as temperature extremes, moving machinery, loud noise, and fumes that cause noticeable discomfort or a moderate risk of accident or illness.
- Be proficient with ArtiosCAD and other packaging-specific software.
- Define optimum palletization plans, ensure supply chain constraints are taken into consideration and enter palletization specifications in SAP, and ensure 100% accuracy between data entry and physical measurements.

AQL = acceptable quality limit; CAP = controlled atmosphere packaging; HFFS = horizontal form fill and seal; ISTA = International Safe Transit Association; MAP = modified atmosphere packaging; NMFC = National Motor Freight Classification; OSAT = outsourced assembly and test; VFFS = vertical form fill and seal

Source: Gartner (July 2020)

Enlist Packaging Engineering Service Providers for New Projects

Often new projects, special requests or one time innovations require enlisting packaging engineering services to provide the required expertise. Outside resources provide the benefit of deep technical

knowledge that doesn't exist within the current team and the ability to have a subject matter expert step in and provide immediate results. This type of arrangement is often deployed when a completely new packaging format or assembly process is required. In-house experts are the go-to personnel for projects that involve known formats and packaging that will run on the existing manufacturing assets. Outside experts are well-suited for projects that are new to the organization such as converting from metal cans to rigid plastic packaging, introducing stand up pouches for the first time, and developing e-commerce ready packaging.

New packaging formats require knowledge of different filling and sealing equipment and the impact on shelf life and product protection. They also require qualifying new packaging material suppliers. The equipment for packaging can require specialists who focus solely on packaging equipment and have built relationships with OEM. A key area of difficulty exists when bringing packaging unit operations together into a single production line. This often requires working with multiple OEMs that specialize in specific operations by conveying, forming, loading, sealing, case filling, labeling and palletizing. Projects can require teams of experts that focus on specific operations such as sealing, package design, package integrity and testing.

Projects with significant levels of risk, investment or time constraints can benefit by the inclusion of engineering project management solution providers. Many organizations launch into complex projects without the required project leadership skills, suffer from a lack of defined scope or scope creep, and need an independent third party to break down cultural blinders and work across silos. For special packaging engineering requirements, organizations can reach out to a specific set of companies that provide contract engineers with expertise in areas such as pharmaceutical, food and beverage, and industrial packaging. Other service providers include third-party package testing facilities, package equipment, line layout consultants and packaging suppliers who maintain design and testing services for their customers. Utilize these external services for complex, high risk, high priority and capital-intensive programs.

Evidence

¹ See [“Four Key Trends That Will Shape the Future of Packaging to 2028,”](#) Smithers.

² [“The Quest for Convenience,”](#) Nielsen.

³ Gartner Secondary Research Services (SRS) summary of packaging engineer job descriptions.

⁴ Gartner SRS summary of key packaging engineer industry-specific skills and responsibilities.

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