TATA CONSULTANCY SERVICES

Building on belief

Intelligent packing: Minimize effort, maximize sustainability

Abstract

It may not be wise to judge a book by the cover, but when it comes to packing, the story is entirely different. In fact, in the age of Industry 4.0, the importance of packing goes much beyond its traditional role in shipping, protection of materials in transit, and carrying essential handling information. Thanks to digital enablers, packing today can help organizations to reap benefits that extend from reduced environmental impact and higher productivity to an improved bottom line. Going by the precedents, digitization in the packing and shipping process has the potential to lead to significant benefits for the organization.

We unpack the digital transformation of the packing process and discuss intelligent packing, a conceptual framework for digitization of the packing process applicable across the industries.

Packing it right

Packing, put simply, refers to the protective layer on shipments which also contains handling information. It may seem like a no-brainer but, done wrong, has the potential of dealing businesses a body-blow. Just Imagine the consequences of failing to add a fragile tag to a shipment. Or, not mentioning that the shipment contains hazardous material. What if the shipping address, or tracking and tracing information has an error?

Studies show that e-commerce' return shipments in the U.S. totaled $32 billion in the 2018 holiday season alone, with damage during shipment accounting for about 20-30%. That's more than double the returns seen in traditional retail[1]. This dent, however, extends beyond the bottom line and to the environment. After all, primary and secondary packing account for 10% of the overall cost of all retail products and the material of choice therein is paperboard and fiberboard[2]. According to the American Forest and Paper Association, more than 95% of all products in the US are shipped in secondary packaging made from fluted fiberboard.

In 2018, the packaging waste generated was estimated at 174.1 kg per inhabitant in the EU[3]- and the trend is only growing. In this age where sustainability is the need of the hour, it becomes an organization's responsibility to find ways to reduce its carbon footprint. A robust IT system, apart from introducing process efficiencies, can help organizations to do just that.

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[1] https://test.pfscommerce.com/blog/tag/ecommerce-packaging/

[2] https://packagingblog.org/2017/03/27/5-of-the-most-common-packaging-materials-in-the-world/

[3] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Packaging_waste_statistics

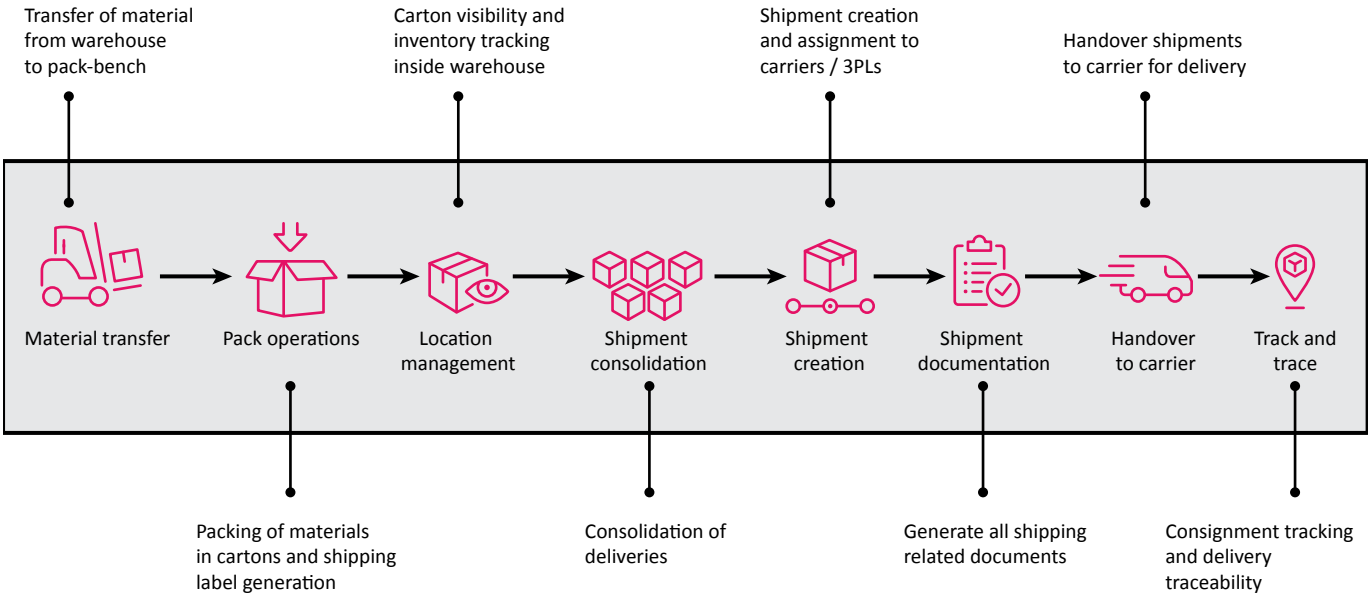

Figure 1: A typical packing and shipping process in an organization

Five focus areas of intelligent packing

The pains that plague packing stem from its manual nature. Automation, where done, is purely based on industry requirement, without proven IT solutions capable of delivering automatic packing instructions, document-generation solutions, or packing material validation for items.

That's where intelligent packing, with its two-layered approach, comes into play. As its first step, called process consulting, Intelligent Packing uses extensive contextual knowledge and a deep-dive into the packing process to define the business rules and lay out the features of a solution. This also becomes the bedrock for finalizing the technologies that will be used to create the solution (see Figure 2).

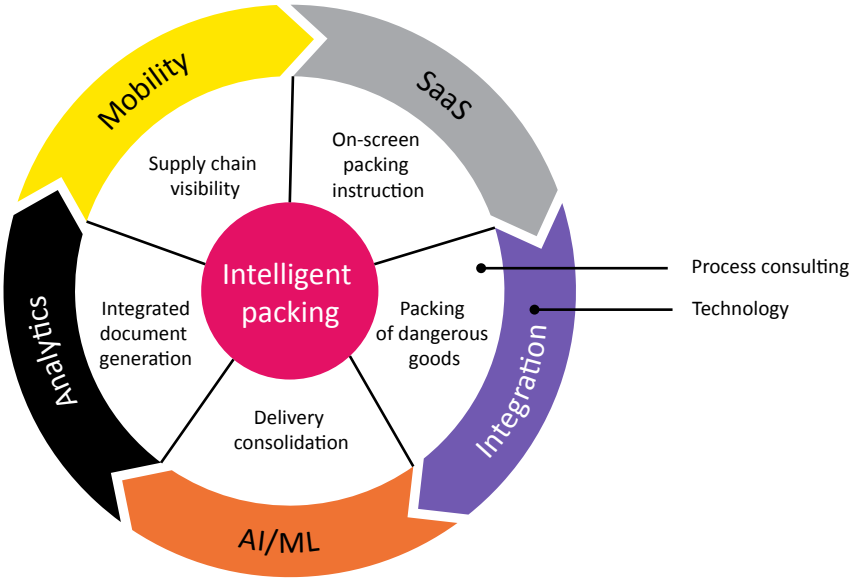

Figure 2: Indicative features and technology of intelligent packing

On-screen packing instruction

Traditionally, packers are given a shipment-dependent instruction manual or checklist to get the job done. The process, apart from being manual-intensive, is often heavily dependent on the experience of the packers. As a corollary, it is prone to errors.

Done intelligently, shipment or delivery-specific packing instructions can be generated based on a set of well-defined business rules. The problem of consolidation can be addressed by simply swapping inventory classification with a material classification-based rule. Similarly, mapping packing material against material classification can automate packing material selection. In fact, technology solutions can automate processes including the maximum quantity that can be packed in a carton, the transport mode to be used, and item attributes. Furthermore, depending on the industry-specific regulations and organization requirements, a database can be defined along with required master data to enable the automated on-screen packing instructions.

Packing of dangerous goods

Shipping dangerous goods (DG) is fraught with challenges. Regulations govern everything from DG material, quantity shipped, and the mode of shipment, to handling and the packing material used. Mistakes in this regard can attract not just stringent fines but dent the goodwill of the company and adversely affect the environment.

Intelligent packing, through integrations with DG Information System application, can provide customized packing instructions based on the DG type and generate guidelines and validation to mitigate errors. Such a system's capability can also extend to suggesting packing material or carton depending on the DG, along with labelling requirement. This automation can ensure the availability of labels for the packer before triggering the final validation with the DG Information System application. Furthermore, a quantity-based validation can also be put in place to ensure that, below a defined limited quantity, a particular DG can be regarded as normal goods depending on the mode of shipment.

Integrated document generation

A shipment is only as safe as its documentation is error-free. That's why documentation remains an inherent pain point. The challenges posed by the sheer volume of documentation are further complicated by the fact that its requirements change based on the type of materials, mode of transport, and carrier. But what makes it truly problematic is that it is done not just manually, but also involves using disparate systems.

Eliminating the pain points calls for a one-stop solution — integrated document generation — that can fetch all relevant information from the connected system (ERP, Carrier IT system) to generate required documents, along with shipping labels.

Delivery consolidation

When it comes to streamlining transportation, ERP just does not make the cut, primarily because each delivery has to be handled individually and as there is no scope of consolidating different deliveries for a specific customer or for a specific route. Not only does this increase costs, it also comes with a greater carbon footprint.

The fact that reducing transportation costs can benefit both the bottom line and the environment is a universally accepted fact. That's why it is critical to have a solution capable of consolidating opportunities for different shipments rather than relying on the experience of the people on ground.

Post completion of the packing process based on material type, shipment method, and destination, consolidation opportunities could be suggested, depending on the consolidation rules. This could involve automation in decision-making, thereby making the process more robust and error-free, thus reducing freight cost. The added benefit of consolidation is that it has a positive impact on the environment in terms of reduced fuel consumption and less usage of paperboard. Also, the capability to modify shipment information (mode of transport, carrier, freight forwarder, ship to and freight terms) beyond the ERP can be enabled considering the business need, such as consolidation opportunity, last-minute change requests from customer, among others.

Supply chain visibility

Last-mile tracking is a capability much-needed but unavailable in ERP. While shipments can be tracked to the drop zone after pick-ups from the warehouse, there are no systems to track the movement from drop-zone to hand-over location. This gap often causes problems, including mixing of items from different deliveries, and misplaced cartons, among a host of other issues.

A location management solution can greatly benefit traceability through automated task creation for inventory movement from pack bench to dock area. Dynamic on-screen track-and-trace allows for seamless, real-time tracking even after shipments have left the premises and all the way through to delivery with carriers and freight forwarders. The solution can completely transform customer-service operations by extending the visibility of shipment to customers, thus acting as a growth lever for the organization.

Intelligent packing: Using digital to deliver gains

Process innovation	Improvements	Benefits
On-screen packing instructions	Cycle time reduction	3% gain in productivity and cost savings leading to sustainable bottom-line growth 70% reduction in shipment error leads to improved OTD performance and customer satisfaction
Packing of dangerous goods	Reduction in shipment error	
Integrated document generation	Reduction in shipment error Cycle time reduction	
Delivery consolidation	Reduction in transportation cost Reduction in carbon footprint	20% reduction in carbon footprint
Supply chain visibility	Increase in shipment visibility Improved customer service	90% increase in shipment visibility leads to better customer service

Figure 3: Intelligent packing provides tangible gains across the value chain

Way forward

Organizations should focus on more than just the top line or bottom line when improving processes. A prerequisite in this matter is a focus on sustainability, which in turn drives long-term benefits in terms of reduction of environmental impact, while also minimizing cost. Minimizing the negative impact on environment and application of AI/ML can add further benefit the packing process.

Right-sizing of cartons

A first step to reducing environmental impact is through right-sizing the cartons. Currently though, this is overlooked despite the many benefits it accrues.

Right-sizing cartons helps the organization reduce packing material consumption significantly, leading to reduction in cost and carbon footprint. Moreover, it also reduces the amount of filler material needed to secure the packing while mitigating chances of damage during transit, or storage.

Application of AI/ML plays a pivotal role in making the IT system truly "intelligent". A leading e-commerce organization has extensively used AI/ML to achieve the goals of the Paris Agreement 10 years early — reaching net zero carbon by 2040. Since 2015, the company has reduced the weight of its outbound packaging by 33%, eliminating 915,000 tons of packaging material worldwide. This is equivalent to over 1.6 billion shipping boxes[4]. Based on the history of volume shipped, item attributes (weight, volume etc.) AI/ML-based applications can optimize carton size. It can be developed as a self-learning platform capable of fine-tuning and usage-optimization.

Right steps towards sustainability

Tracking the consumption of packing material helps organizations take informed decisions regarding consumption trends, associated costs, and environmental impacts. As enterprises track deliveries shipped, they can also keep a log of different packing material used for shipment. This can help organizations track the consumption of different packing materials and in turn, track the carbon credit. Also use of renewable packing material further reduces environmental impact.

A consultative approach is highly suggested before finalization of the solution and technology landscape as the process challenges vary from industry to industry. The contextual knowledge helps to plug process gaps and bring an outside-in perspective to build a robust and sustainable solution.

[4] https://venturebeat.com/2020/09/14/how-amazon-is-using-machine-learning-to-eliminate-915000-tons-of-packaging/

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