



Digital opportunities in Packaging - Thinking outside the box –

Why investors should care: Almost \$2 trillion worth of consumer-packaged goods are sold globally every year, yet more often than not packaging is not a top priority for many brands nor their manufacturers or retailers. Shame because packaging is a key product differentiating factor for the consumer – and as such an integral part of leading Cosmetics and FMCG groups' marketing strategies. Packaging also safeguards revenues in more ways than one by 1/ allowing solutions against counterfeiting, 2/ guaranteeing product integrity, 3/ allowing efficient inventory and logistics management and 4/ being a gateway to consumers.

The emergence of Digital Printing as a breakthrough technology has allowed Packaging to become even smarter - particularly in regard to product Traceability and Customer Engagement, a fertile ground for start-ups like kaiosID (www.kaiosID.com) to offer their digital solutions. Competition is fierce but is arguably also a reflection of the huge market opportunity. Indeed, smart packaging helps solving the numerous challenges faced by brands and manufacturers: fighting against the spread of product diversion and counterfeiting, maintaining product integrity while meeting consumers' demands for more transparency and sustainability. Sector verticals (e.g. consumer, industrials, pharmaceuticals, etc) also calls for specific expertise.

While brands and manufacturers have acknowledged the benefits of Smart Packaging, they have barely started implementing it into their production processes, leaving the potential addressable market huge (the packaging industry represents \$950bn) and virtually untapped (Smart Packaging represents only 4% of the packaging market).

For these reasons, it will not take long for the Digital Traceability space to consolidate. Place your bets!

In this paper we define **Smart Packaging** as packaging that incorporates technology to become more than a mere container. This built-in technology will be used to provide real time information about the product to manufacturers and/or consumers, giving the product a digital dimension.

1. Current challenges faced by manufacturers when it comes to packaging

a. Counterfeiting

Counterfeiting becoming more widespread.

Although governments worldwide have been working hard on establishing an efficient legislation to fight it, the global counterfeiting market still represents c.\$650bn (according to the World Customs Organization) - and keeps growing.



While it has always been a challenge for brands, counterfeiting as an issue has been exacerbated by the secular rise of e-commerce globally - which accelerated with the pandemic – to pervade key sectors like Pharmaceuticals. Fake vaccines are a telling example: dangerous and even lethal vaccines have been increasingly offered on dubious websites and on the darknet, the peer-to-peer network used chiefly for illegal sharing activities (as well as non-approved test kits, masks etc).



Yet they are only the tip of the iceberg: online criminal activities related to COVID-19 have taken a whole new dimension with the surge of digital transactions triggered by the pandemic, a seriously negative development calling for the expertise of leading traceability specialists for the pharmaceutical industry like for instance Advanco.

Meanwhile counterfeiting has remained an on-going issue for the Luxury, Cosmetics and FMCG sectors.



Packaging, the first line of defence. Regardless of the channel through which a product is procured (off- or online), the first line of protection against counterfeiting is its packaging. Manufacturers have tried several methods to protect their products with various degrees of cost, availability, and...success. Barcodes, for example, are very cost efficient yet they are very easy for a counterfeiter to reproduce. Holograms and QR codes are more difficult to reproduce but given their large-scale usage counterfeiters have made the necessary investments to easily replicate them.

Still the most common tracking solutions are bar or QR codes. While they have been widely adopted, they are not without important drawbacks for the brand:

- 1. because they can be very visible, they damage the overall aesthetics of the packaging,
- 2. they can easily be scratched/removed or painted over, putting the product off grid,
- 3. they are easy to copy.

b. Grey markets ("Product diversion")

Unlike counterfeiting, product diversion is legal. Tracking products globally has often become a seriously complex task and manufacturers often struggle to know where, at what price and whom their products have been sold to.

This becomes more than a logistical issue when a company exports its products to many different regions, and has strategic and financial implications as illustrated by the example below:



A UK company wants to enter the Chinese market and forecasts sales of 1M units. For a successful launch in China, they need to lower their price tag. They contract a local distributor who makes more optimistic forecasts and purchases 1.5M units. The local distributor receives the goods but diverts 500k units to Europe through ecommerce and outlets where it can undercut the UK manufacturer's prices and make a decent profit while taking advantage of the distributor marketing and advertising effort - all in a perfectly legal way.

It's more than just money at risk. Product diversion has become an even more important issue for manufacturers: this is because all kinds of grey markets for products have flourished with the e-commerce boom.

This is particularly true of the beauty industry where product diversion is harming brands in sometimes irreversible ways. Grey market sellers typically attract customers online through deep discounts on websites seemingly approved by the brand owner. Yet given these sellers have not actually been authorised, not only will the transaction lower the brand's revenues, but neither the authenticity nor the integrity of the product will be guaranteed. If the customer ends up having a poor experience, this will tarnish the brand's reputation.

c. Product integrity

Manufacturers also need to ensure the integrity of their products by monitoring the product environment (cold chain for example) from the warehouse down to the consumers' to protect the latter and ensure an optimal product experience. This is also true of fragile perfume bottles for instance.

d. The "Packaging dilemma": Transparency vs. Sustainability

More for less. Out of ecological awareness, consumers have increasingly been asking for re-usable and/or recyclable packaging - less "material intensive", often reduced in size and more efficient to make it eco-friendly. At the same time, consumers have been looking for ever more information about the products within the packaging such as their provenance, composition, allergen presence etc as well as more recently a kind of story-telling or at least the story behind their existence.

Most consumers are not completely satisfied with the proposed packaging, often judging it incomplete or not transparent enough. Moreover, the trend of "Consuming and Eating Well and Responsibly" has steadily gained in traction over the past few years – as illustrated by the success of consumer apps Open Food Facts or Yuka, demonstrating the increasing consumers' need to get more information about the product.

All of this is in line with companies' - and investors' - growing ESG considerations pushing for more transparency in packaging, something UK company Provenance for isntane is focused on addressing.

Companies therefore face a kind of "packaging dilemma" whereby they ought to reduce the writing surface of packaging while giving as much information as possible about their products.

e. Consumer's trust and engagement

Pressure is on for brand owners and manufacturers. The ultimate goal for any brand/manufacturer is to sell more products to more customers. Beyond the intrinsic qualities of the product itself, this can be done through greater customer satisfaction and loyalty, putting user experience at the heart of the product and marketing strategy. By being able to connect the consumer to the product, smart packaging enables digital customer engagement.

Packaging can play a crucial role in generating a positive customer experience by being appealing, informative and engaging. Stronger engagement and higher loyalty are of strategic importance for brands given that the cost to retain existing customer is much cheaper than that of getting new customer.

It does require investment though, at least purely to enable technology within packaging – which often manufacturers have been delaying over time or even reluctant to do up until now.

Brands are arguably at a junction in regard to packaging: they need to apply anticounterfeiting measures that are extremely difficult to detect and circumvent, yet easy to integrate into their industrial processes at the same time. On top of that, these measures also need to be cost effective and part of a broader sustainable trend to positively engage increasingly demanding and tech-savvy consumers. Who said packaging was boring?

2. Digital Printing - the democratization of Smart Packaging

Digital printing is the technology allowing for Smart Packaging to be used at a large scale and for a limited cost.

Digital printing allows for a high degree of customization (which traditional printing is incapable of providing) as well as higher security and traceability. It also opens the door to customer interaction and is more environmentally friendly, among other technical benefits as per below:

	Traditional printing	Digital printing
Cost	Lower cost per unit for longer runs	Lower cost per unit for shorter runs
Sampling time	3-4 weeks	Immediate
Pollution	High level of waste	Low level of waste
Customisation	One single printed design for each printing batch	Allows to print a unique and variable design on each single unit
Image quality	Better resolution and color fidelity	Color accuracy improving, yet cannot exactly match all colors

No wonder it is revolutionising packaging in several ways:

a. Affordability and flexibility

Thanks to the limited number of tools used and the limited number of manual pre-press procedures, digital printing allows to be cost efficient and fast to market. This is a key benefit especially for the cosmetics industry which constantly needs to adapt to new trends and consumers' needs.

Digital printing allows smaller batch sizes, mass customization, frequent artwork changes and speed to market.

b. Security

Digital printing allows to print a different design on each single package or label, with visible or invisible ink. Each pack will look the same, yet they will feature differences that cannot be seen by the naked eye.



c. Sustainability

While digital printing still requires the use of ink and chemicals, the impact on the environment is substantially reduced because the need for pre-press procedures is eliminated.

Research by the International Data Corporation shows that digital printing can reduce supply chain waste by up to 26% and cuts the carbon footprint of printing by 65 to 80% through digitizing the print process – altogether dramatically improving time-to-market and removing the need for minimum order quantities.

d. Customizing

In contrast with traditional printing, which features physically set content, digital printing allows to customize printed units very easily.

This allows for more creativity in a marketing point of view: personalised packaging, numbered and limited editions, seasonal campaigns etc.



3. Smart packaging/Digital tagging

With traditional packaging, customers are limited to the visual information they can glean from the packaging itself, which means that the brand and product companies are limited in terms of the information they are able to share.

All these issues are being addressed by smart packaging, i.e. by embedding technology into packaging in the form of a digital tag – which is essentially the making products connected and (somewhat) intelligent.

a. Brand protection

By integrating sophisticated encryption coding, smart packaging protects the manufacturers against counterfeiting, diversion, or misuse of their product.

The most straightforward solution manufacturers can employ to combat counterfeiting is to make their pack design difficult to copy. To this end, smart packaging uses embedded and visual cues to prevent counterfeiters copying the design.

For example, brands can use watermarks to secure their packaging: watermarks are designs or patterns that are embedded into paper during the production process. Another example is invisible inks such as UV and IR-sensitive inks that are completely invisible to the naked eye and must be detected with specific readers. They are applicable to all types of material and are used in anti-counterfeiting to prevent unauthorised photocopying.

Importantly, what is true of the manufacturer is also true of the ultimate purchaser of the product: connected packaging ensures the consumer knows exactly the provenance of the product and can assess its authenticity.

b. Traceability

Smart packaging allows the manufacturer to monitor in real time the condition of a packaged product wherever it is. A wealth of data becomes available to the manufacturer and to players across the supply chain, ranging from the product's exact location to its temperature, external environment conditions potentially affecting it, movement etc.

The manufacturer is therefore better able to monitor the quality, storage conditions and the outside environment of its product from the warehouse to the consumer's hands, avoiding production and distribution issues.

Beyond protection against theft, Smart Packaging offers opportunities in regard to the supply chain management, transport, and logistics – allowing for better planning and inventory management.

c. Sustainability

Given that all kinds of information can be stored into a digital or smart tag, the packaging itself can be reduced to the bear minimum and hereby helps avoid using large containers or substantial amount of plastic.

Smart packaging's applications also include reporting on or improving product shelf life, reducing product damage during shipping, and mitigating loss events in the supply chain.

Better logistics and reduced waste also contribute to reducing the CO2 footprint throughout the life cycle of the product.

d. Consumer satisfaction and loyalty

Besides brand protection, product tracking and product information, manufacturers can use Smart Packaging to communicate and engage in a dialogue with customers - and in the process learn more about them.

The data generated by both the consumer and operational applications of connected packaging can be analysed to generate insights into consumer trends as well as to create shareable experiences and even communities – ultimately conspiring to increase the trust in the brand.

Last but not least, real-time engagement data help manufacturer to fine-tune their marketing campaigns, leading to increased sales and more efficient operations.

4. Smart packaging: the virtual clone of the product

Essentially, the smart tag allows the product to have an online/digital existence, making it the digital clone of the packaging enclosing all the necessary information. The Metaverse is not far.

'19 Crimes' wines

The Australian group Treasury Wine Estates uses augmented reality to improve customer experience. The group rented the Alcatraz prison to present its innovation: a mobile application that brings labels to life. By pointing their smartphone camera to the label, customers can make the criminals in the front label speak to them.



Source: youtube.com

Following the launch, the number of '19 Crimes' bottles sold went from 4 million to 18 million bottles in 18 months! Who said crime didn't pay?

By connecting the brand with the consumer, smart packaging opens the door to a whole new world of marketing opportunities.

While until now packaging has essentially been uni-directional, it is suddenly able to offer each consumer a different experience: smart packaging allows the manufacturers to completely rethink their interactions with the end-consumer. Suddenly able to connect to the product, the consumer gets a wealth of information about it and more directly connects with the brand. In turn, brands have the potential to immerse consumers into their universe and their values.

For example, by alerting consumers when they are running low on a specific product, smart packaging can help brands to motivate (or even automate) replenishment, stimulating customer loyalty and avoiding competition from other brands at point of sale. Timer functions also could alert customers to remind them to take their medication. Displays will play explanation videos and give digital notifications about promotions, competitions, and product contents. According to IFOP, more than 65% of French consumers would find it easier to buy products with interactive packaging – and would consider it as a strong positive for the brand.

Phantom, the first "connected fragrance" by Paco Rabanne

In 2021, French fashion brand Paco Rabanne has begun rolling out Phantom — its "first connected scent" — in a refillable robotshaped bottle that lets purchasers "connect to the Phantom universe" of interactive games and other features. This packaging was elaborated in collaboration with VPI (Faiveley Plast Group) and Puig. Consumers purchasing the fragrance can access a range of digital content - including information about the product - by tapping an NFC chip embedded in the bottle cap with their smartphone.



Consumers access digital content by tapping the NFC chip in the bottle cap with their phone. Source: Paco Rabanne.

In addition to allowing Paco Rabanne to offer customers added value in the form of music playlists and "an Instagram sticker in the shape of the robot for whimsical selfies", the implementation of NFC tags has also enabled it to add a sustainability dimension by informing customers that the bottle is refillable and sending them a video showing them how to refill it. Yet, this last comment needs to be taken with a pinch of salt as the NFC technology requires adding millions of electronic chips to the packaging, making recycling more difficult.

Finally, connected packaging give brands the opportunity to collect data regarding consumers and their behaviours. This end-user data is precious to manufacturers who can leverage it to make better business decisions and gain more customers.

Ipsylon - Innovative skin care product from Seritech

Barcelona-based Seritech has partnered with Swiss digital traceability specialist kaiosID for their new Skincare brand Ipsylon.

Ipsylon products consist in patches that directly inject molecules like hyaluronic acid under the skin through dissolving micro needles. Ipsylon has chosen kaiosID to develop their consumer engagement app to guide the consumer during his user journey. Consumers can connect to the product with their smartphone to know how to use the patches.

"As our IPSYLON skincare brand is very innovative, we wanted a digital solution to guide and support the consumer in his journey. With kaiosID we can build a solution to educate the consumers while engaging them in a direct way. Implementing kaiosID at an early stage for our product launch will also allow us to smoothly implement their brand protection solution when expanding to other markets" - **Richard Joye, Co-Founder and CEO @Seritech.**

5. The inescapable rise of smart packaging

While the QR code is almost ubiquitous, relatively few manufacturing companies have so far made the step to integrate digital traceability solutions into their packaging.

Their slow pace can be explained by a number of reasons – all destined to fade over time:

- 1. a general apprehension of technology by traditional (read legacy) packaging businesses: for the people working in printing departments of established packaging groups, digital printing is often (wrongly) perceived as complex to understand and to implement and just a source of extra headache.
- 2. a reluctance to shift manufacturing processes in light of technology cycles that are increasingly shorter ,i.e. the fear of investing in a technology that could then be outpaced by another and where regulatory requirements play an increasing role, like with GDPR.
- 3. the sheer cost of integrating smart applications within large production processes has been a noticeable barrier to adoption. Yet as new players enter the market, smart packaging democratizes itself and as with every adoption curve, gets cheaper and easier to integrate.
- 4. the lack of industry standards. Rather than picking a specific technology and impose it as the norm, we believe regulation will push manufacturers to better track their products whatever the technology they choose with a focus on protecting the end consumer. Industry regulation will likely be limited to safekeeping personal data (GDPR) and to supervising how the product interacts with the consumer. Technology standardisation will more likely emerge from the sector consolidation that is poised to take place.

Last but not least, these short-term factors need to be set against the growing sustainability and ESG imperative: as kaiosID puts it in a recent publication by ESG packaging leader Quadpack.

(*), "The future lies in sustainability (...) Connected packaging is a big help to communicate about the brand's sustainability efforts"

(*) Quadpack's The Future of Packaging series: https://www.quadpack.com/assets/13374792/the-future-of-packaging-connected-personalised-and-sustainable/

6. Typology of the main tagging systems in Packaging

QR codes - Barcodes - Datamatrix

Black and white 2D codes that are used to share information about the products on which they are marked. They can be read by imaging devices such as scanners or smartphone cameras.

Key pros: Cost, easy to integrate within industrial processes, fast readability, consumers accustomed to it

Key cons: Security (can easily be copied, scratched off, painted over), Aesthetics (very visible)

Key players: Scantrust, Antares Vision, Packaging companies Best for: Food and beverages, non premium

packaged goods



Individual identification system - Image recognition

The entire packaging of each product is covered with a hidden or invisible pattern, unique for each item, which is digitally printed and can be scanned with a smartphone app.

Key pros: Aesthetics (invisible or integrated into the design), consumer experience, security (can not be scratched off, removed or painted over) **Key cons:** Requires taggant or digital printing

Best for: Premium and prestige packaged goods

Key players: KaiosID, YPB, Digimarc



RFID (Radio frequency identification)

RFID stickers/labels use wireless radio waves to identify products through a chip embedded in the object.

Key pros: batch scanning capability Key cons: aesthetics, consumer interaction (specific reader needed), low security level, costly if serialized, slow, not sustainable	Integrated Antenna Microchip
Key players: Avery Denison, Tageos, Identiv, Sappi Best for: Logistic and stock management	

NFC (Near-field communication)

NFC technology enables short-range communication between compatible devices. This requires at least one transmitting device, and another to receive the signal. Usually an NFC chip would be embedded in the packaging and the consumer has to enable the NFC technology (which is included in most smartphones today) to connect to the packaging

Key pros: invisible **Key cons:** Not sustainable, costly, difficulty to fit the chip in, needs to be the right material

Key players: Avery Denison, Identiv, Wisekey, Smartrac

Best for: Luxury goods, cosmetics



Blockchain

A Blockchain is a database of records, called blocks that can be interlinked, or chained, using a hidden code. This is useful in a supply chain involving transport and transactions that can be recorded as blocks. Each block contains a cryptographic link to the previous block plus information on when a transaction occurred, who was involved and much more. The Blockchain technology can be linked with any product identification technology.

Key pros: traceability, integrity of data **Key cons:** cost, not sustainable, need to be paired with a security element on the product, otherwise useless



Key players: Authena, Aura, Arianee Best for: Food, Pharmaceuticals, Luxury goods

7. Conclusion



Source: Deloitte analysis, Smithers

Although the global packaging market is very fragmented and highly competitive, smart packaging represents big revenue upside for its main players. In 2020, the global smart packaging market was only valued at c.\$40bn by Deloitte, a mere 4% of the c.\$950bn whole industry.



Stage of market adoption

Brands and manufacturers have started grasping the strong potential benefits for them that smart packaging offers in regard to product tracability as well as customer experience, all feeding into a virtuous process (less leakage, increased satisfaction, more revenues etc).

While the addressable market is huge, smart packaging inherently has a disruptive facet and unsurprisingly innovation has been been largely driven by start-ups - each offering its own specific digital solutions, at the risk of limiting its own growth. At this junction, the space is ripe for consolidation and some listed firms (e.g. Antares Vision etc) may jump in given the M&A opportunities: now is the time to get on board the smart packaging train.

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Source: Deloitte analysis, Smithers

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COMPANIES MENTIONED IN THIS REPORT:

Name	Website		
Advanco	www.advanco.com		
Antares vision	www.antaresvision.com		
(AV IM, €600m market capitalisation)			
Arianee	www.arianee.org		
Arylla	<u>www.arylla.com</u>		
Aura	www.auraluxuryblockchain.com		
Avery Denison	www.averydennison.com		
Authena (Acatena)	www.authena.io		
Ensurge (Thinfilm)	www.ensurge.com		
kaiosID	www.kaiosID.com		
Provenance	www.provenance.org		
Quadpack	www.quadpack.com		
(ALQP FP, c.€110m market capitalisation)			
Scantrust	www.scantrust.com		
Seritech	www.seritech.com		
Yuka	www.yuka.io		

KEY INTERNATIONAL ORGANISATIONS MENTIONED:

Interpol: <u>www.interpol.int</u>

Open Food Facts: https://world.openfoodfacts.org

World Customs Organisation: <u>www.wcoomd.org</u>

AIPIA – Active and intelligent packaging association : https://www.aipia.info

Inbound Capital acts as sole advisor to kaiosID

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