SMART AND SMARTER

The promise of intelligent packaging inches nearer to practical everyday reality in keeping pace with the fast-changing retail landscape

BY GEORGE GUIDONI, EDITOR

In today's fiercely competitive global retail environment, packaging must do far more than simply protect the container's contents and draw eye contact with the passerby shoppers.

Increasingly, new considerations of extended shelf-life, improved product and brand security, greater transparency and full product traceability are driving robust global demand for technology-based packaging and labeling solutions to validate product authenticity, deter counterfeiting, monitor freshness and track environmental conditions—just for starters.

It's all part of the larger goal of ensuring a more positive consumer experience from the moment of purchase—be it at the store or a home delivery—to eventual disposal of the package, preferably in the most environmentally-friendly way possible.

According to a recent report published by **Allied Market Research**, the global smart packaging market size is estimated to reach nearly $38 billion by 2022, growing at a brisk annual rate of 6.9 per cent from 2016 levels.

"Changes in lifestyle patterns due to rapid urbanization, particularly in emerging economies, and growth in consumption of beauty products with advancement in technology are driving the growth of the smart packaging market," according to the study, titled *Smart Packaging Market: Global Opportunity Analysis and Industry Forecast*.

Also often referred to as 'active' or 'intelligent' packaging, some of these technologies—such as oxygen scavengers, anti-microbials and thermochromatic inks—have been around for years, without necessarily being called smart *per se*.

But it is really the advent of smartphone technology and the growing interconnectivity of all sorts of devices in today's Internet of Things age that are providing the perfect launch platform for a full-on smart packaging revolution in mainstream consumer markets, according to the technology's proponents,

As the Allied Market Research study points out, "The emergence of printed electronics holds out the promise of enhanced traceability and data capture, with the potential to integrate brand owner and consumer via web-based apps and social media.

"The challenge for brand-owners and packaging producers is to understand the

Manufactured by Jones Packaging in London, Ont., the CliniPure cartons utilize the ThinFilm Electronics OpenSense NFC (near field communications) labels embedded inside the cartons to enable smartphone users to easily authenticate the photochemical product packed inside.

possibilities and to identify the solutions to realize them," the report states.

In North America, efforts to promote wider use of smart packaging technologies are spearheaded by the Ottawa-based **intelliFLEX Innovation Alliance,** which includes the *intelliPACK* program of educational and skill-training events and initiatives the group administers jointly with strategic partner **PAC Packaging Consortium**, with support of the **National Research Council (NRC)**.

Under the program, intelliPACK's Leadership Council organizes a series of seminars and conferences throughout the year across North America covering the design, process and materials used in the manufacture and application of printed electronics and other fledgling smart packaging technologies.

So far, the global healthcare industry has been one of the more enthusiastic adopters of the smart packaging technologies, largely for product traceability purposes.

"The integration of barcodes, RFID (radio frequency identification) tags or sensors is highly useful within the industry as it monitors authenticity of medicines and provides the patients, pharmacists and other healthcare professionals with details about the expiry date, consumption, and dosages," the Allied Market Research report points out.

"In addition, smart packaging industry helps the healthcare sector to deal with challenges such as counterfeit and patient compliance, thereby providing complete security."

Likewise, the personal care product manufacturers are also ramping up their use of so-called "smart coding" techniques to combat counterfeiting and ensure product authenticity.

The ability to share and gather vast amounts of date and information offers a multitude of consumer market research opportunities for leading multinational CPG brand-owners and other manufacturers, according to Christina Cvetan, who works at the R&D Packaging Capability, Print & Connectivity department of global consumer products powerhouse **Unilever plc.**

"Unilever has been involved in the development of "smart" packaging for many years, focusing more recently on the emerging printed electronics capability and the ability to enable a connected package," Cvetan says.
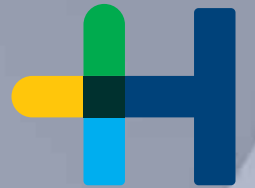
"Connected smart package solutions will enable the physical package to provide intelligence and experience via the digital world," she explains.

"The intelligence capability provides the ability to drive more sustainable packaging and to track and report end-to-end impacts that can lead to design and ef-

From Left: PAC president James Dowhham shares the spotlight with keynote speaker Joe Jackman, chief executive officer of Toronto-based branding and graphic design firm Jackman Reinvents, and Peter Kallai, president of the intelliFLEX Innovation Alliance, at last year's Get Smart Summit conference on smart packaging technologies in Mississauga, Ont.

Deploying the near-imperceptible Digimarc Barcode technology at supermarket self-checkout aisles expedites the whole process by virtue of not having to manipulate the package in order for the scanner to read the UPC code, resulting in shorter lineups and happier shoppers.

Digimarc's chief evangelist Larry Logan takes the stage at an industry seminar to explain the benefits of his company's patented Digimarc Barcode technology used for a broad range of smart packaging applications such as product authentication and self-checkout automation.

ficiency improvements.

"The experience delivery also provides an opportunity to enhance the customer, shopper and consumer engagements," Cvetan adds, "along with an opportunity to gather specific data and insights across the packaging touch-points that can then be used to deliver an enhanced user experience and improve any package design."

With an estimated 2.5 billion people worldwide using a Unilever brand product, the extra cost of implementing smart packaging solutions ultimately outweigh the future costs of ignoring the technology altogether, according to Cvetan.

"Manufacturing advancements in printed electronics, sensors and communication capabilities are driving affordability—making it more attractive and practical for users," says Cvetan, advising aspiring end-users to do proper research and due diligence prior to selecting the right smart technology to suit their application-specific needs and objectives.

"The rapid pace of technology developments is moving so quickly that it can be a challenge to maintain focus on a specific technology or capability," she says. "It requires disciplined focus, speed and close collaboration to trial, prove, learn and execute successfully."

One company that has enjoyed considerable success in marketing its own patented technology for smart packaging applications is the Beaverton, Ore.-based software developer **Digimarc Corporation**.

Founded in 1995, the publicly-traded company got its start by developing digital watermarking technologies that were initially used to protect government documents and digital cinema markets, recently expanding its focus to retail markets following the 2014 launch of its near-invisible *Digimarc Barcode* technology.

As the company's deftly-titled chief evangelist Larry Logan explained in a recent interview, smart packaging is poised to become the next big must-have in today's increasingly chaotic and competitive retail landscape for brands to protect their market share and nurture brand loyalty among the tech-savvy millennial consumers.

Q. What are the key value-added benefits of smart packaging compared to traditional packaging?
A. Traditional packages are fine to protect and promote the product, but in today's digital era they don't effectively communicate with consumers and the data-driven supply chain systems that are crucial for ensuring on-shelf availability (OSA) and maintaining profit margins for retailers and brands.

Smart packaging delivers more data to make every step in the supply chain more reliable and efficient—from the matching of component parts during the manufacturing process to initiating effective product recalls for consumer brands.

For retailers, particularly for 'fresh food' labels, smart packaging can facilitate dynamic markdowns to help move items that might soon expire without all the manual effort common today.

For consumers, smart packaging delivers greater product transparency, whereby shoppers can instantly access nutrition facts, other ingredients and information about product origin.

As for brands, they can communicate directly with consumers via mobile devices to continue the conversation at home, whether that means providing recipes, how-to tips, consumer reviews, cross-selling suggestions, or other opportunities to maintain a digital dialogue.

Q. What exactly is so 'smart' about Digimark's technology?
A. At Digimarc, we deliver machine-readable codes by subtly altering the graphic elements within the packaging artwork to convey meaningful information.

In normal usage, this change is imperceptible and cannot be discerned by consumers. However, computing devices such as retail scanners, machine vision cameras, and mobile devices can instantly detect the data.

We use the actual artwork pixels to be the carrier for the code, in essence creating what we call "signal rich art." It cannot be removed or altered, which helps prevent theft and counterfeiting.

And, because the Digimarc Barcode is largely imperceptible, it can be replicated across most surfaces of the packaging, which means it scans faster and more reliably regardless of the angle or rotation it's presented to the scanner, or in case the UPC gets damaged in some way.

Traditional barcodes are usually on the bottom or back of a box, requiring cashiers to manipulate the package at checkout. This takes time and effort, which has historically lead to long lines for shoppers and significant workplace injury claims for cashiers the retailers who employ them.

Q. Which products are best-suited for smart packaging applications?
A Any consumer packaged good can be a good candidate for using Digimarc Barcode—especially those featuring CMYK process printing.

When using other technologies such as RFID (radio frequency identification) or NFC (near-field communications), retailers and brands often have to limit their application to more premium products, at higher price-points, to help defray the increased per-unit costs owing to expensive chips or hardware installations.

Q. How big of an issue is affordability for more widespread smart packaging adaptation?
A. The costs of some of these technolgies, including RFID and NFC, have come down over time, which makes them ever more likely to be used beyond the luxury product categories to which they were relegated in the past.

But perhaps more importantly, the widespread adoption of smartphones—nowadays found in almost every purse or pocket throughout much of the developed world—has opened up huge opportunities across many industries.

Insofar as it relates to retail and product packaging, consumers can now swiftly scan products to compare prices online, while instantly accessing consumer reviews, instructional videos and other helpful content.

And as the cost of scanners, detectors and machine vision camera systems, including inventory management robots, continues to fall in the future, all these innovations will become much readily accessible to many retailers and brands.

Q. To what extent is smart packaging a consumer-driven development?

A. Many analysts note that the Internet of Things now includes packaging—resulting in significant investment towards network-enabled devices that reduce costs and improve the shopping experience for consumers.

Consumers expect and demand that products are transparent, and they desire access to content that cannot fit on a package. Because they want instant access to more and better information about the products they buy and the foods they eat, smart packaging is an obvious area of future focus for retailers and brands.

Also, a smart package is an ideal way to foster greater brand affinity and one-to-one engagement between the CPG and its users, which is a powerful capability for brands that are under the challenge of lost market share.

Q How does your smart packaging technology measure up against competing alternatives?

A. One of the most obvious advantages of Digimarc Barcode is our flat-rate pricing. Brands buy the Digimarc Barcode, license it on an annual basis, and pay their graphics vendors a one-time fee for its application to their packaging

After that, there are no per-unit costs, regardless whether suppliers ship 10,000 or 10 million packages. This cost certainty is very attractive to many companies.

Moreover, our solutions are very broad-based, so that in addition to facilitating consumer engagement and improved front-of store efficiency, we can reduce the frustration with self-checkout by making scan-and-go more reliable and easier for the shopper.

In terms of performance, Digimarc Barcode is more reliable and efficient because it is a platform solution benefitting each step along the package journey—from manufacturing to the consumer at home, post-purchase.

And although Digimarc Barcode has been applied to all forms of printing, it is at its best when working with process printing (CMYK) because it limits the visibility to the human eye, while maximizing detection capabilities for computer devices.

Q With all that said, what is holding back a more widespread adoption of smart packaging in the mainstream consumer retail channels.

A. We must appreciate that we are talking about a very new consumer behavior. To some extent, the fact that

the vast majority of shoppers aren't accustomed to scanning products in their pantry or on store-shelves has contributed to the inertia.

But that's already beginning to change. Shoppers are savvier today, and younger generations who've grown up immersed in technology are becoming a larger percentage of the workforce and the economy.

On the corporate side, some retailers are waiting for critical mass of smart packaging on shelves, while some brands are reluctant to activate their packaging until a majority of retailers have scanning devices to detect smart packaging.

It's a classic conundrum that is usually overcome at first by a minority of enterprising, forward-thinking and disruptive innovators, as is the case in many different markets.

You see such innovation-thinking with our initial adoption by **Wegmans**, which was also the first retailer to broadly deploy the now-standard UPC codes. We think the retail sector, where the separation between bricks-and-mortar and the digital shelf has all but vanished, is at that stage now, and we are happy to play a role to support this sea change.

At Digimarc, we believe that packaging is an analog solution in a digital world, and we are the bridge between them.