

Driving new levels of consumer engagement through intelligent packaging



intelliPACK
BUSINESS NETWORK

intelliFLEX
intelliFLEX.org 613.505.4775
pac.ca 416.490.7860



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Contributors

intelliFLEX

intelliFLEX, a not-for-profit industry alliance, is a vital partner for accelerating the growth of the printable, flexible, hybrid and related electronics sector in Canada. Our technologies add intelligence and connect ordinary objects to enable the Internet of Everything. We unite our 100 members+ to build an effective ecosystem of supply chains for flexible, 3D printable electronics, 2D large area printable electronics, wearable electronics, smart textiles and hybrid electronics including related semiconductors, integrated circuits and software. Our programs accelerate the adoption of these innovations for Smart Packaging, Intelligent Buildings and Connected Homes, Aerospace and Defence, Automotive and Industrial Applications, Health and Wellness, Intelligent Documents, and Consumer Electronics.

intelliPACK

intelliPACK is a smart packaging innovation accelerator co-founded by intelliFLEX Innovation Alliance, PAC, Packaging Consortium and their Members. intelliPACK collaborates with supply chain stakeholders to create awareness, educate and facilitate the broad adoption of solutions for smart packaging – an active or intelligent interactive packaging system that delivers benefits and added functionality to the value chain. intelliPACK unites leading organizations across the packaging value chain, to collaboratively explore, evaluate and mobilize innovative smart packaging solutions. intelliPACK serves North America while sharing solutions globally.

PAC

PAC, Packaging Consortium is a not-for-profit corporation, founded in 1950. PAC is North American centric with global access. We advocate for all materials and for package neutrality through an all-inclusive, transparent and collaborative process. Our 2,200 members come from all sectors of the packaging value chain, from start of life to next life. Our networking process includes PAC webinars, seminars, conferences, competitions, facility tours, education programs, trade shows, technical work groups and social activities. From PAC NEXT, our initiative to eliminate packaging waste, to PAC FOOD WASTE and now with this interest in Blue Events Inc., our industry is on a deliberate path to sustainability.

Executive Summary

In October 2015, 65 industry leaders from across the packaging value chain, including brand owners, packaging companies, creative marketing agencies and technology providers, gathered at Xerox Research Centre of Canada's HQ in Mississauga, ON for IntelliPACK's first Printed Electronics Intelligent Packaging Workshop.

The workshop featured five presentations that covered various aspects of the value chain, in terms of technology, applications, markets and implementation approaches, from:

- National Research Council of Canada, the leading Canadian research and technology organization
- Molson Coors, a global beverage company
- IDTechEx, a global market research consultancy, headquartered in the U.K.
- Navy Agency, a Toronto-based consumer marketing agency
- NetPack Packaging, a printing company already implementing intelligent packaging

The workshop include insightful audience polling that yielded a unique analysis never before carried out in the North American packaging industry. Engaging the consumer at the point of sale emerged as a priority need for major brands, that could be served by solutions based on printable electronics (PE).

This whitepaper distills the key survey results and chief takeaways from the industry presenters at the workshop.

Main points:

- Consumers are empowered and informed like never before when they make purchase decisions.
- Brand owners need new and compelling ways to engage consumers at the most critical point, the point of sale, to influence the purchase decision and drive consumer loyalty.
- The key is to turn product packaging into an interactive engagement platform with the addition of low-cost/low-power electronics that, as a first step, allows brands to interact with consumers through their mobile devices.

- 50% of attendees consider achieving differentiation at the point of sale to be a key reason to adopt this kind of intelligent packaging technology.
- On a separate question, roughly 68% per cent of respondents chose direct marketing, over anti-counterfeiting or traceability, as a reason to invest in intelligent packaging.
- The cost, manufacturing complexity and environmentally sound disposal of intelligent packaging are chief adoption hurdles when considering solutions that rely on conventional silicon electronics.
- PE is the ideal technology to overcome these adoption hurdles.
- The IDTechEx presentation highlighted many examples that already exist in the market.
- The development and adoption of more advanced and functional intelligent packaging solutions enabled with PE requires technologists, marketers, creative agencies and senior executives to collaborate from the outset of any effort to create new solutions and related marketing campaigns.
- This kind of multidisciplinary approach isn't taken 40 per cent of the time, despite the fact that almost 86% of the audience agreed that a brand's marketing/packaging/creative agency should be engaged in new technology development before it is to be applied to packaging.
- More industry collaboration, along with standardized development platforms, is needed to drive intelligent packaging forward with PE.
- Brand owners also need integration partners, since they do not want to serve as integrators themselves.

Peter Kallai, CEO of intelliFLEX (formerly the CPEIA) and moderator, concluded at the close of the workshop that the packaging industry needs agnostic PE technology solutions that can serve as a common platform to deliver product differentiation to any brand owner. Real differentiation will happen at the brand level while technology is an enabler.

Introduction

A growing majority of consumers no longer take what they find on a product label or on the signage of a store shelf at face value. More and more, they are turning to their smartphones for on-the-spot product research.

This has left consumers empowered at the point of sale like never before. They can quickly find out what other people are saying about a product through social media or online reviews, and how that product stacks up against the competition.

This new pattern of behaviour has left retailers and brand owners on the sidelines. In the conventional retail setting, they have no way to engage the consumer at the point of sale, to influence the purchase decision, to address questions or concerns, or to collect vital consumer data that can be used to drive new product development and revenue.

But this is changing. New technologies are already turning product packaging and shelf labelling into intelligent platforms for interactive communication. Printable electronics is an emerging technology area that can enable widespread adoption of such intelligent packaging and labelling.

In this paper, we explore the value of engaging consumers at the point of sale with intelligent packaging, the need for widespread cooperation across the packaging value chain, and the technology considerations involved in making everyday packaging interactive.

We draw on the perspectives and research materials shared by the presenters at the Printed Electronics Intelligent Packaging workshop and networking event that took place October 22, 2015 at Xerox Research Centre of Canada's HQ in Mississauga. The event was co-hosted by the Canadian Printable Electronics Industry Association and PAC, Packaging Consortium, as part of their joint IntelliPACK program.

Some examples are taken from a past presentation by Peter Kallai, CEO, intelliFLEX (formerly the CPEIA), at the PAC Innovation Summit in June 2015.

We also draw on insightful audience polling that took place during the workshop, to provide a unique analysis that has never before been carried out in North America.

The workshop drew 65 participants, including brand owners, packaging companies, brand managers and technology providers. This provided a statistically significant sample size, with each poll question yielding 50+ responses.

Part I: What consumers want

Let's talk about Sarah

Sarah could be a teen, or someone in her 20s. She is part of that cohort of consumers born during and after the 1990s. Call them what you will – millennials, Gen Y and Gen Z – this group is tech-savvy, mobile and anxious to discover and experience new things before anyone else. They are heavily information, Internet and social network driven.

Sarah is quite conscious of what she puts in and on her body. When she buys skin care products and cosmetics, she is careful to select only quality products that are non-toxic. Sarah is also aware that many brands don't readily disclose potentially harmful ingredients or products that do not match her skin. She comes to the store after doing her research on various products, where she meets with a beauty consultant for hands-on advice. If and when considering buying a product based on the consultant's recommendation or a brand she hasn't used before, out comes her smart phone for some quick, on-the-spot research.

Some cosmetic products, such as mascaras and moisturizers, also have expiry dates. After she takes her purchases home, Sarah must of course be mindful of how long she can use a product before it may be due for replacement.

How many points of contact?

Through her purchasing journey, and then at home, there are many points at which a brand owner could be interacting with Sarah, to provide personalized and valued information and assistance.

The challenge is having the means to communicate at the point of sale when the critical decision to purchase is being made and then afterward through the period of use. But the opportunity is there. Consumers already hunger for information. They are ready for and receptive to personalized service that enhances their purchasing journey and demonstrates that a brand fits with their values.

As Islem Yezza, Director of Sales and Marketing for Netpack, emphasized in his workshop presentation, "consumers have become hunters rather than surfers."

A recent research report from Deloitte Consulting supports this.

The report found that 84% of retail store visitors use their smart phones before or during the visit to the store. Consumers who use their phones at the store for product information convert from shoppers to buyers at a 40% higher rate. About 22% of these shoppers spend more on the purchases than initially planned. In addition, 75% of those who receive recommendations through social media or experts said that this influenced their purchase decision and then later their brand loyalty.

The change consumer is smart enabled



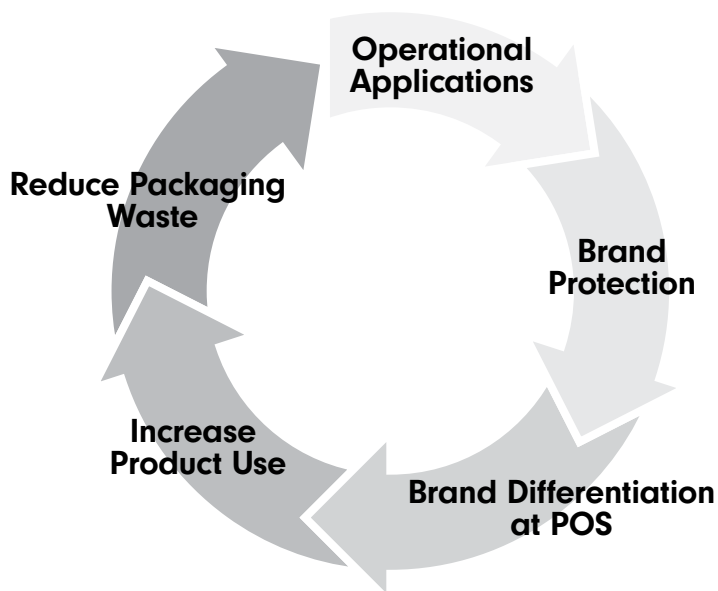
Yeza referenced a recent statement from Nestlé that said technology is fundamentally changing the way consumers buy its products and engage with its brands. This would of course be valid for every consumer packaged goods company (CPGS) in the world.

“As technology is fundamentally changing the way consumers buy products and engage with brands, there is a need to create highly engaging and meaningful experiences online,” Nestlé said.

Part II: Point of sale is the key battleground

New technologies have a role to play through all five phases of the consumer packaging lifecycle:

Smart packaging product life cycle enabled by printable electronics



The simplest and more readily implemented technology solutions today are at the **Operational Applications** level, for purposes such as monitoring for product freshness, spoilage, temperature and contamination, tracking origin and location.

Food packaging: freshness indicators



Printed Intelligent sensor, display operated with printed battery

Consumers expect more:

- Indicate freshness
- Provide product info
- Provide product origin
- Best uses



Next is **Brand Protection**, for product identification and authentication of premium items such as alcohol to nip counterfeiting, and for anti-theft and anti-tampering measures.

Smart labels for drinks: Oculito Beer, Anheuser-Busch



Tequila flavored to target younger consumers who are increasingly choosing spirits such as rum and vodka and Mexican beers. Label uses special ink that reacts when beer gets cold:



- Reveals hidden messages
- Reveals hidden images of skulls
- Empty eyes glow green
- The logo turns fluorescent

Brand Differentiation at the Point of Sale comes third, which is closely aligned with subsequent **Product Use**.

Smart Bottle for Spirits: Johnnie Walker Blue, Diageo



Printed Intelligent Labels

Consumers expect more:

- Authenticate the brand
- Secure product by open/unopened status indicator
- Engage them when passing by the product
- Offer promotions to entice to buy
- Provide cocktail suggestions once purchased/opened

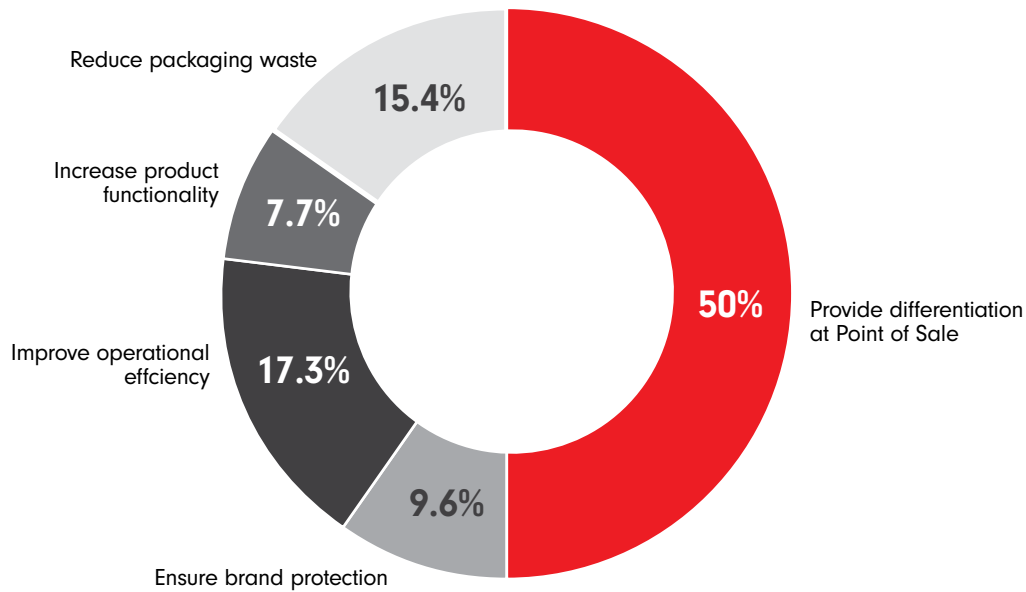
The final stage is the widespread industry goal to **Reduce Packaging Waste**, by reducing the amount of materials used and ensuring those materials that are used can be recycled or otherwise diverted from landfill.

When it comes to the application of intelligent packaging, the October 20 workshop found that the third stage, Brand Differentiation at the Point of Sale, is a top priority for brand owners.

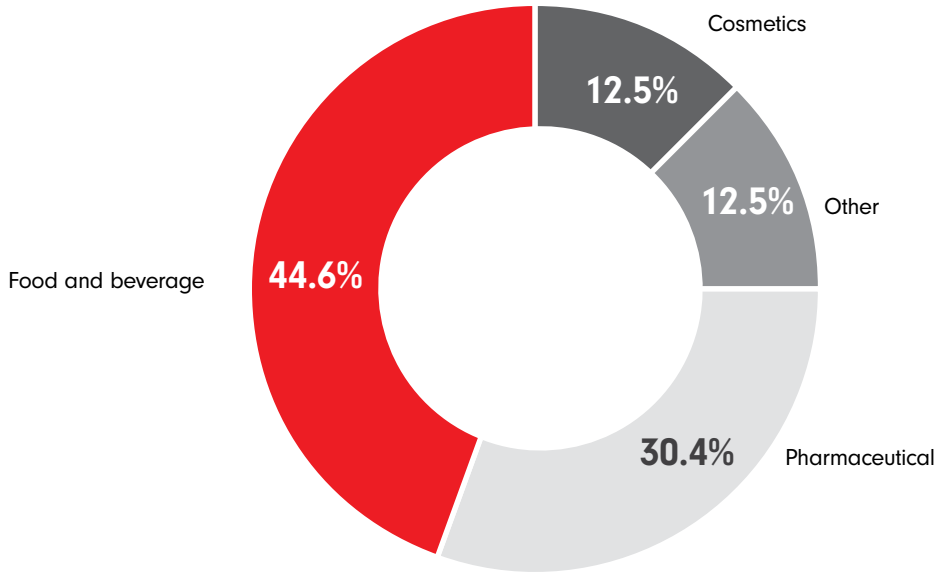
Why? Because brand owners are faced with greater competition than ever, as well as empowered consumers who are on the hunt for products that align with their personal health, social and environmental values. This has left forward-thinking brand owners eager to find new ways to stand out and proactively engage consumers on a personal level.

What the poll results tell us

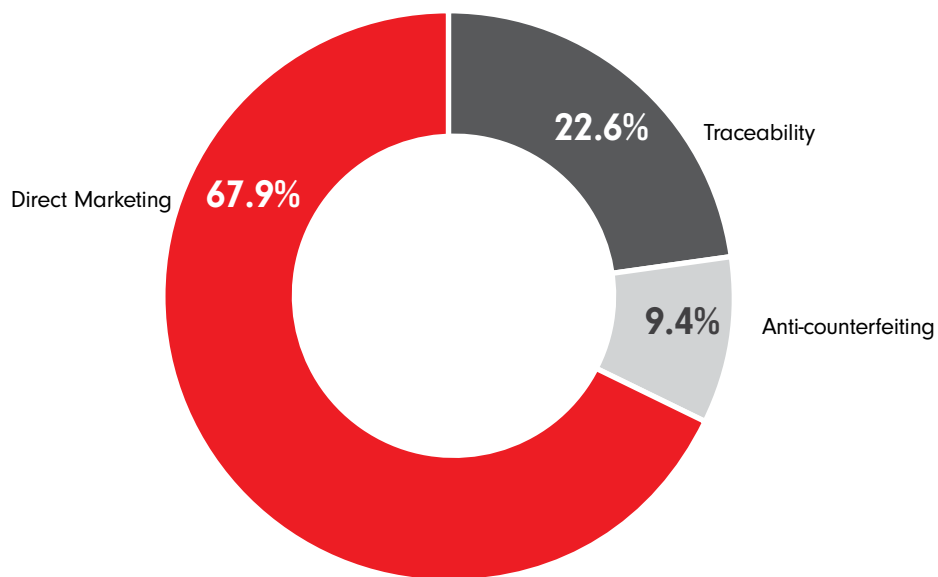
Audience polling during the October 20 workshop yielded the following insights about how important brand owners, brand managers and creative agencies view greater consumer engagement at the point of sale as a motivation to invest in new technologies:



Three market verticals also emerged as key targets for intelligent packaging solutions capable of wireless communication, specifically, near field communications (NFC). These were pharmaceutical, food and beverage (including premium alcohol), and cosmetics. These could be considered high-value point-of-entry markets where intelligent packaging can prove its worth and then spread throughout the rest of the consumer goods supply chain.



For what purpose? Direct marketing ranked first by a clear majority as the key driver for applying this intelligence. This of course links directly to consumer engagement at the point of sale.



Part III: How to power engagement at the point of sale

The game changing potential of new tech like NFC

The industry focus is clear – brands want and need the means for greater differentiation and consumer engagement at the point of sale.

NFC technology could be a game changer that will bridge the physical retail world with the interactive engagement of the digital world. NFC is a set of protocols that enable electronic devices to establish radio communication by bringing them within 10 cm or so of each other.

In the bricks-and-mortar retail setting, one of those devices would be a consumer's smartphone or tablet, while the other would be the product on the store shelf.

NFC has the advantage of being cheap, flexible and not requiring an app. NFC chips and tags can easily be incorporated into a mobile device.

Kraft Foods tried a pilot a few years ago, in which silicon chips that could be read by NFC-enabled smartphones were placed in signage on the shelves right in front of Kraft cheese and Nabisco cookie brands. These "shelftalkers" invited consumers to tap their smartphones to access recipe content, download a nutrition app or share on Facebook.

Kraft found that the time consumers spent engaged with the brand rose to 48 seconds, on average, versus five to 10 seconds without the shelftalkers. Thirty-six per cent of shoppers who engaged converted into action, such as saving a recipe, downloading the Kraft app, or sharing with friends.

Compared to the QR codes that were also available on the shelves, engagement with the NFC system was 12 times higher.

But how can this wireless interaction be enabled on a product's packaging, at a reasonable price point?

Don't get hung up on cost

Cost is a major concern. In the ongoing battle to remain cost competitive, no consumer packaged goods company wants to add to the cost of a product because packaging has become more expensive and difficult to manufacture with the addition of electronic components.

Radio Frequency Identification (RFID), another wireless communication protocol intended for greater distances, faces the same cost challenge.

Many see consumer packaging as, frankly, a cheap commodity item, without considering the value of the consumer insight that can be gained from turning it into an interactive marketing platform.

Brand owners should beware of getting hung up on the cost of adding intelligence. This investment must be weighed against the potential return. Intelligent packaging can be a new revenue driver.

Printable electronics is the answer

But that doesn't mean cost considerations should be ignored. It's a question of finding the right technology.

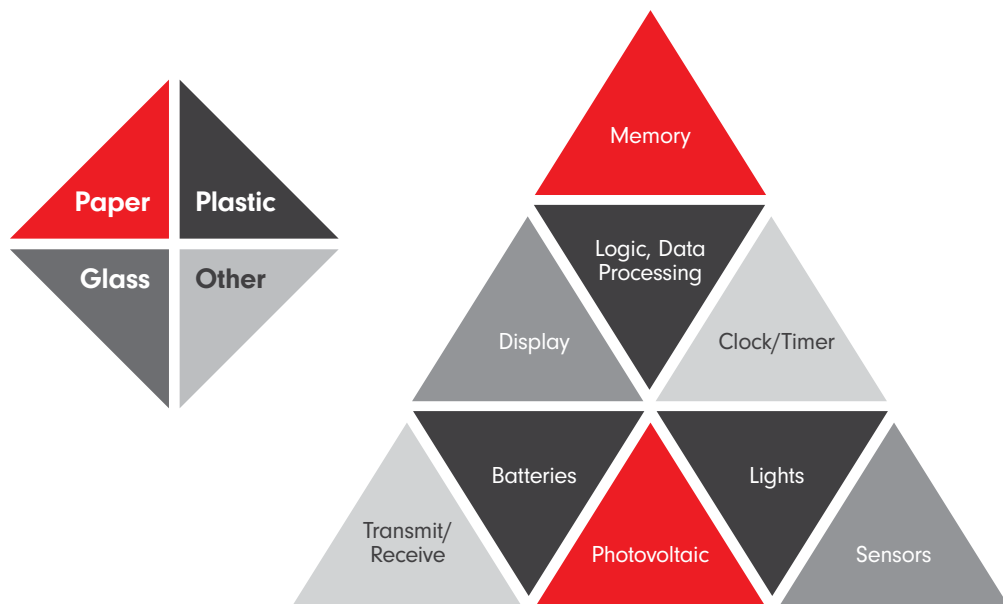
That technology is printable electronics (PE).

PE can overcome the bottlenecks around the issues of cost, manufacturing complexity, and even environmentally sound disposal and recycling, for intelligent packaging.

With PE, inks that can conduct electricity – made from materials such as graphite, silver and copper – are printed on a substrate at high enough density to form a complete electronic circuit, but thin enough to have negligible impact on footprint. The substrate can be rigid, flexible or even stretchable, such as paper, plastic, fabric or glass. The inks can be applied through traditional printing processes such as flexo, screen, inkjet, gravure and offset, as well as through coatings.

PE can be used to create discreet components such as displays, conductors, transistors, sensors, light emitting diodes, photovoltaic energy capture cells, memory, logic processing, system clocks, antennas, batteries and low-voltage electronic interconnects. These can be integrated into simple systems that, for example, can record, store and then transmit temperature information.

System Components



Fully functional electronic systems can be created in this way, or discreet components and sub-systems can be produced to function as part of a hybrid solution with conventional silicon-based components.

Why printable electronics?



1. Ideally suited for simple systems
2. High-volume low-cost manufacturing
3. Flexible solutions
4. Access to existing R&D facilities to run pilot scale
5. Wide range of functions – sensors, displays, memory, antennas...

This technology has been under development for 10 to 15 years in various parts of the world. Large volume commercial applications are now hitting the market in:

1. the automotive sector through control panels, antennas,
2. consumer products such as organic electronic TVs, monochromic book readers,
3. intelligent packaging through labels that measure food freshness,
4. security documents that embed electronic features and
5. health and fitness applications where it can measure heart rate, body temperature, embedded into wearable devices.

What is practical today

But PE remains an emerging industry. Market ready PE solutions remain relatively basic.

In his workshop presentation, Thomas Ducellier, Executive Director of the National Research Council of Canada's Flagship PE program, assessed the status of today's market ready options.

At this stage, market ready PE solutions for intelligent packaging remain limited to simple one or two layer components. But even simple solutions can enable valuable interactivity.

Take, for example, Touchcode, from Sun Chemical and T+Ink.

Touchcode labels can be printed directly on a product. When that label comes in close contact with a mobile device, it launches through the device a menu of interactive programs and information for the consumer. It also gives the brand owner a means to collect data analytics on consumer purchasing habits.

Jones Packaging of London, Ont., a Member of both the intelliFLEX and PAC, already offers packaging solutions with Touchcode.

More complex examples, but still relatively simple, include smart drug blisterpacks that use two layers of conductive ink. These allow monitoring of temperature to prevent spoilage, real-time monitoring to ensure medication is taken correctly, and detection of tampering and drug fraud, among other uses.

Take NFC. Ducellier cited several examples of consumer products that have been enabled with some kind of NFC technology to provide interactive communication with consumers. These solutions integrate a printed antenna and/or other PE components with a traditional, if tiny, silicon NFC chip.

There have been many high-profile examples of this kind of hybrid intelligent packaging in recent years, often as part of big-budget marketing campaigns involving high-end items like premium liquor.

Part IV: Building the brand story to engage on a deeper level

In her workshop presentation, Jennifer Murtell, Co-founder of the Navy Agency, emphasized that consumer brands must take advantage of intelligent packaging to:

- Deepen the story they are trying to convey to consumers about what they sell and what they stand for.
- Create immediate delight and blow the minds of consumers, by connecting on an experiential and emotional level.
- Make engagement easy for the consumer to interact with the brand.
- Make it personal, so the consumer feels like the product or service was tailored to them.
- Solve a focused problem.
- Remove barriers that may be inhibiting a consumer's use or enjoyment of the product.
- Inspire a new need state, so the product becomes a must have, like the cache that's come to be associated with Apple's products.
- Bridge the gap between technology, technologists and the brand builders/marketers who will lever the capabilities of intelligent packaging to engage with the consumer at the point of sale.

Giving all stakeholders a seat at the table

Packaging intelligence enabled with PE obviously isn't the only game in town to achieve brand objectives.

Andrew Frost, Innovation Manager at Molson Coors, discussed at the workshop how the beer giant has some 300 tech ideas on file to better engage consumers and build its brand power in the marketplace.

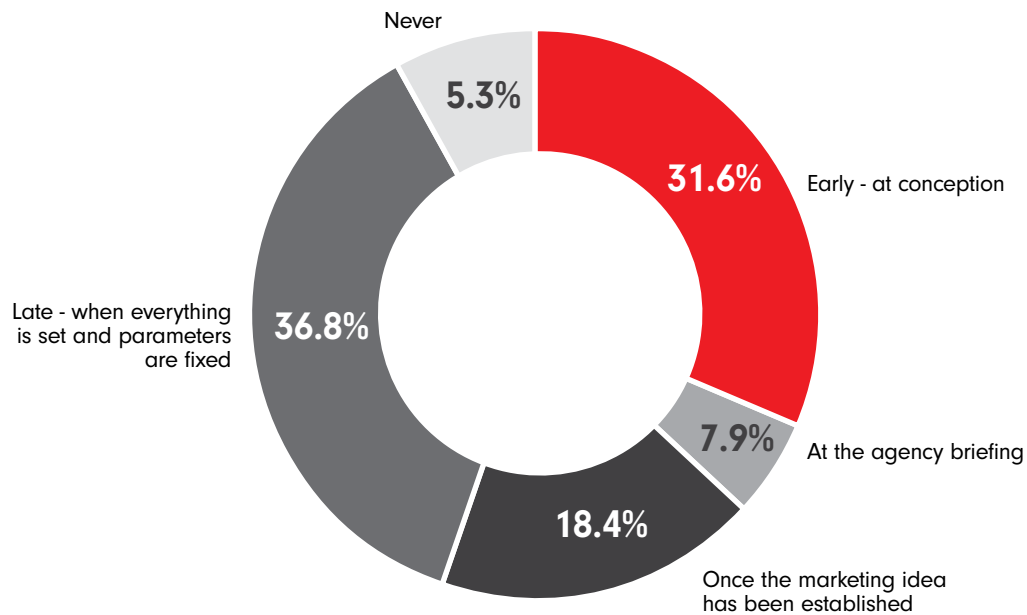
Most of these won't see the light of day. Many that do, like the beer fridge that opens in response to a verbal cue or a Canadian passport, don't require a PE solution. But the important takeaway is that brands do need to embrace new technologies and

marketing strategies that will help them to stand out, maintain and grow market share, and grow revenues.

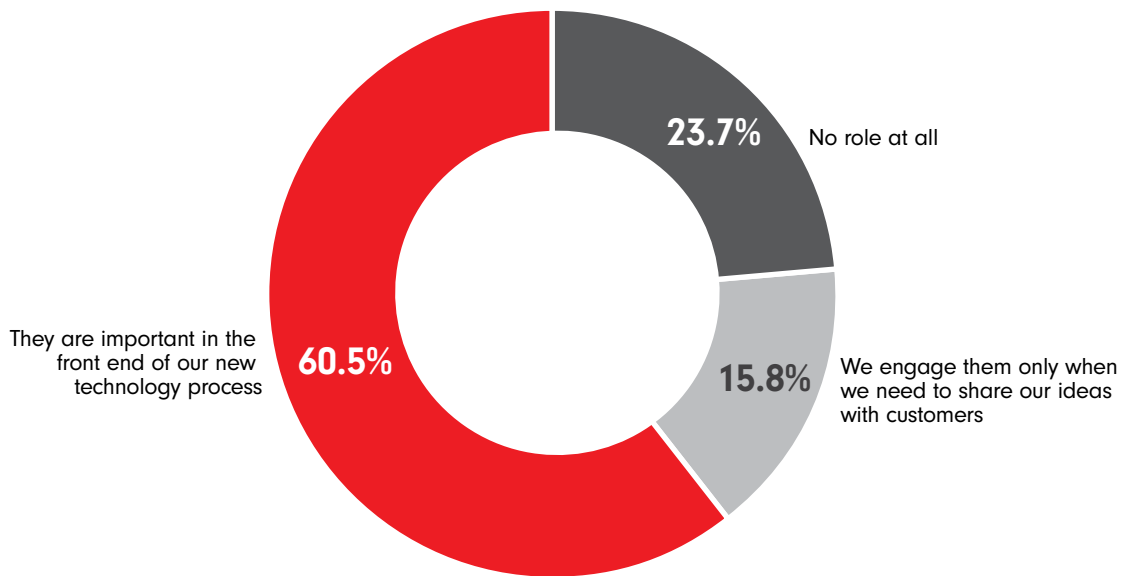
To develop that fresh competitive edge takes more than a technologist, a marketer, a creative agency or the authorization of a senior executive. It takes all these stakeholders sitting down and working together from the earliest stages of any effort to create a new marketing campaign, with all its required packaging and technology components.

At present, this multi-disciplined approach from across a brand's organizational chart often doesn't happen, judging by the polling results from the October 20 workshop.

When asked how early they and their teams were invited into the idea creation process, the audience response was either late or never about 42% of the time:



With regard to the role of marketing and creative agencies, or the packaging companies that must produce the final product, they were only engaged from the start 60 per cent of the time:



This despite the fact that, on a separate question, almost 86% of the audience agreed that a brand's marketing/packaging/creative agency should be engaged in new technology development before it is to be applied to packaging.

Part V: What must happen next?

The value of PE as a key technology enabler for intelligent packaging isn't with one-offs or limited-run marketing campaigns. Its true benefit lies in enhancing day-to-day consumer product use and engagement.

But how do we go beyond simple one and two layer PE components to add truly interactive and engaging intelligence to packaging that is either cheap, or that yields a satisfactory return on the investment in terms of greater brand loyalty and revenue?

As Ducellier recounted, functional and useful solutions are available in the market today. They are simple and represent the early stages of the technology and its full potential to revolutionize the relationship between consumer, product and brand owner.

The next stage is to further develop underlying PE technologies that will progress the market toward more ambitious solutions and applications, like packaging that can play audio and video solely from PE components, or even respond to verbal questions from shoppers.

A need for standardized development platforms & integrators

To drive the market forward, Ducellier cited the need for standardized development platforms.

But this requires some level of cooperation between major brands and CPGs.

In his workshop presentation, Dr. Harry Zervos, Principal Analyst with IDTechEx, observed that the need for competitive differentiation through intelligent packaging among forward-thinking consumer brands may in fact present a hurdle to this manner of industry cooperation.

By his measure, many consumer brands are exploring PE internally with custom-made prototypes. But progress is at a research/innovation level, while marketing is waiting for a solution that can be produced at low cost in high volume. This work is often secretive because companies seek differentiation.

There is also a lack of integrators. Consumer brands often complain about a lack of integrators in the market since they don't want to become integrators themselves. They want quick turn around and don't care about discreet components, only functional prototypes and complete solutions.

A need to engage with the packaging industry

All of which leaves the packaging industry in need of agnostic PE technology solutions that can serve as a common platform for product differentiation. Stakeholders must work together through industry associations such as PAC and intelliFLEX to advance the base PE technologies and create a common development platform.

They can then use this platform to differentiate themselves with consumers as savvy brands always have – through sound marketing principles.

Brand owners, technologists and creative agencies/marketers must also work with the packaging companies that have the task of incorporating intelligence on the manufacturing line, to develop solutions that are cost-effective and meet the industry's focus on packaging waste reduction.

Technology, be it PE or something else, is simply the enabler. Brands and their intimate consumer relationships are the differentiators that will be created on top of such technologies, said Peter Kallai, President and CEO of intelliFLEX and the workshop facilitator.

Conclusion

Turning packaging, in whatever form, into an intelligent technology platform for interactive communication is the future of modern retail at the point of sale.

Brand owners, brand managers and creative agencies agree that the immediate need is for intelligent packaging that can serve as a direct marketing tool. This will drive greater consumer engagement at the point of sale and enhance the buying experience through value-added content that delivers the personalization which discerning consumers want.

Consumers have evolved from surfers to hunters. They are more concerned than ever before about the impact of what they buy and use on their personal health, as well as on the environment and society at large.

Offering them new and interactive ways to make more informed buying decisions at the point of sale promises to become a key differentiator for forward-thinking brands on an increasingly crowded store shelf.

But to usher in this new era of day-to-day consumer engagement, brand owners, marketers, technologists and packaging companies must work together to lever the full potential of an emerging technology that will enable this connectivity at a price point that makes sense. That technology is printable electronics.

For more information, please contact IntelliFLEX President and CEO Peter Kallai at pkallai@intelliFLEX.org or 613.795.8181.



intelli**PACK**

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intelli**FLEX**

intelliFLEX.org 613.505.4775
pac.ca 416.490.7860

