Navigating Flexible Packaging's Digital Printing Journey

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EXECUTIVE SUMMARY

Boasting numerous benefits spanning portability, convenience, and product security, flexible packaging is among the packaging industry's most dynamic segments. Consumers and brand owners largely report an appreciation, and in many cases, a preference for all that flexible packaging offers. As a result, the segment has seen sizable growth rates in recent years.

While flexible packaging continues its rise to prominence, digital printing and production technologies are taking hold across the packaging landscape. For converters and their customers, digital printing offers viable cost-effective short runs, accommodates and enables SKU expansion, and enhances versioning and personalization options. However, compared to its industry counterparts, the flexible packaging segment has been slightly slower in adopting digital printing, with high-volume wide-web flexographic and rotogravure equipment producing the vast majority of output.

That's not to say that digital printing and converting options haven't already made a noticeable impact on the segment. The solutions that have gained market acceptance are more than proving their worth, as brand owners push for faster speed to market, a proliferation of SKUs, and new creative ways to connect with consumers. Flexible packaging printers that have adopted digital printing are reaping the benefits.

This report is derived from a broader study conducted by Alliance Insights, through the sponsorship of the Flexible Packaging Association (FPA). It explores the expanding opportunities for digital printing for flexible packaging. The analysis draws on survey data from Alliance Insights' report *Digital Packaging: Maximizing Innovation and Impact*. While the overall research included package printers and converters across all segments, this report focuses specifically on findings from respondents identifying as flexible packaging printers. Additionally, brand owners across several market segments were surveyed to gain insights from converters' customer base.

KEY FINDINGS

- **Top challenges** for flexible packaging printers include managing customers' speed to market demands (39% report this is a significant challenge), followed by increased competition in the flexible packaging segment (34%), and staffing shortages, increasing sales, and workforce development (all at 32%).
- **Fewer than half (46%) of flexible packaging respondents report utilizing digital printing** for flexible packaging applications.
- Among flexible packaging printers that **have not adopted digital**, the primary reasons are high equipment costs (60%), lack of a viable return on investment (50%), and print speeds being too slow (50%). Meanwhile, only 10% state it is because customers do not want digital, indicating a demand for the technology's benefits.
- Those that currently offer digital printing expect **sales growth in their digital offerings** over the next 24 months, reporting an expected 3.6% average increase.
- Flexible packaging printers are eyeing wider offerings. Of the respondents expecting to invest in digital printing in the next 24 months, **45% state they plan to add equipment 21˝ or wider.**

INTRODUCTION

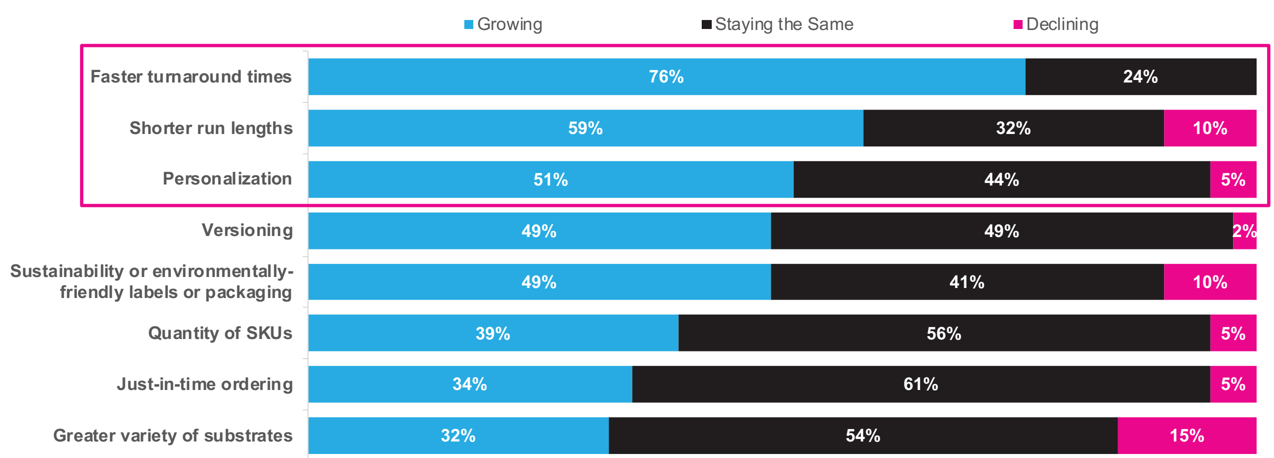
Digital printing has emerged as a mainstream technology across the label and packaging segments, successfully shedding the "novelty" tag many bestowed upon it when it first hit the market. However, largely due to the application's print widths and process complexities, the technology has been slower to catch on in the flexible packaging segment versus the label and folding carton segments, for example.

Flexible packaging is an industry segment experiencing rapid growth. The FPA's annual *State of the U.S. Flexible Packaging Industry Report, 2024*, reveals that sales increased more than 3% between 2022 and 2023, resulting in a nearly $43 billion market. This is primarily driven by flexible packaging applications featuring value add components, such as printing, laminating, and coating, which the FPA reports to be about $34.1 billion as of 2024.

While this exceptional growth has made for prosperous times for flexible packaging printers, converters, and suppliers, this segment is not immune to the challenges faced across the entire packaging industry. In particular, flexible packaging printers report increased demand for faster turnaround times, shorter run lengths, personalization, and versioning, all of which are driving the need for digital printing in the packaging segment **(Figure 1)**.

Figure 1: **Brand Owner Demands Support Digital Advantages**

Q. Please indicate if demand from your label and packaging customers for the following requirements is growing, staying the same, or declining.



n = 41 flexible packaging printers

An increase in demand for versioning and sustainability is also at the forefront for flexible packaging printers, and both can be addressed via digital printing technology. As brand owners continue to expand their product lines, it will create a need for flexibility in production, requiring converters to handle shorter runs and more changeovers. In the flexible packaging segment, this can be challenging for the high-volume conventional printing assets that converters are accustomed to operating, making digital printing an attractive complement to these presses.

BRAND OWNER DEMANDS DRIVING FLEXIBILITY

With any emerging technology in a manufacturing industry, it is essential to understand how it ultimately impacts the customer. For package printers and converters, staying on top of brand owner demands and trends can help inform them on how they can successfully deploy a digital printing initiative. Among brand owners surveyed in this study, their top packaging challenges outline a variety of needs including:

- Increased supply chain efficiency and responsiveness **(47%)**
- Designing packaging that influences purchasing **(47%)**
- Meeting sustainability or environmental goals/objectives **(38%)**

Breaking down these challenges further reveals opportunities for printers and converters. Starting with increasing efficiency, it is evident that flexible packaging companies are feeling the impact of these pressures, as more than three-quarters of respondents report increased demand for faster turnaround times.

At Printpack, an Atlanta-based flexible packaging printer and converter with 17 manufacturing sites in the United States and Mexico, helping its customer base achieve faster speed to market was a key factor in its decision to add digital printing via two HP Indigo 20000 digital presses. Bill Barlow, senior market development manager for Printpack, explains that the company primarily serves larger brands with digital printing. Many of these brands are seeking to diversify their offerings while launching and testing new packaging formats, concepts, and products into the market.

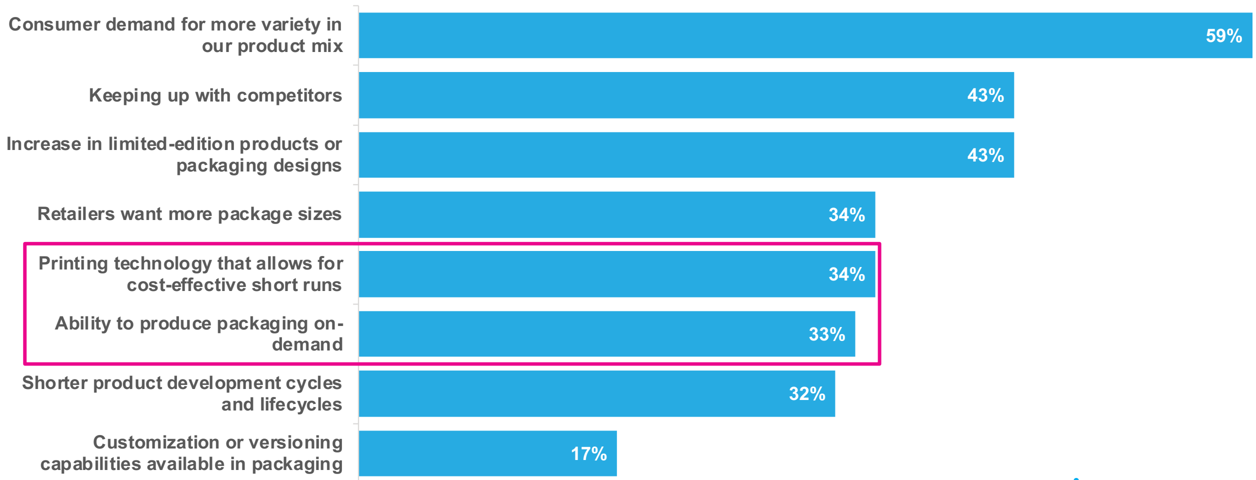
“There’s a lot of pressure from some of these smaller brands, or nimble newcomers in the market, that they’re putting on the major consumer packaged goods brands because they have so many offerings and they’re able to do it quickly with small launches in the market,” Barlow says. “Our big brand customers need to figure out a way that they can also do that, and that’s really the driver for them coming to us and saying, ‘Hey Printpack, we need some help.’ That’s when we offer up the digital printing option.”

Beyond an increase in speed, a key component of how brand owners are pushing their package printing partners towards digital is through an increase in SKUs and versioning. This has been an ongoing trend for several years, and Alliance Insights data reveals it continues to be a factor in brand owners’ strategies. Among the brand owners surveyed in this study, 75% indicate they anticipate their overall SKU quantity to grow over the next 24 months. Of those respondents, the average anticipated SKU growth is sizable as well, at 29%.

The drivers of brand owners’ SKU proliferation are also telling. In addition to satisfying consumer demand for more variety (59%), keeping up with competitors (43%), and increasing their limited-edition products and designs (43%), brand owners recognize that printing and production technology is readily available to help them more easily create these new packaging versions. In fact, 34% report that printing technology that allows for cost-effective short runs is driving their SKU proliferation, while 33% cited the ability to produce packaging on demand, both of which are primary attributes of digital printing **(Figure 2)**.

Figure 2: **SKU Proliferation Drivers Include Technology Advancements**

Q. What are the main drivers behind your expected increase in SKUs? Select all that apply



n = 76 brand owners who expect an increase in their company's quantity of SKUs over the next 24 months

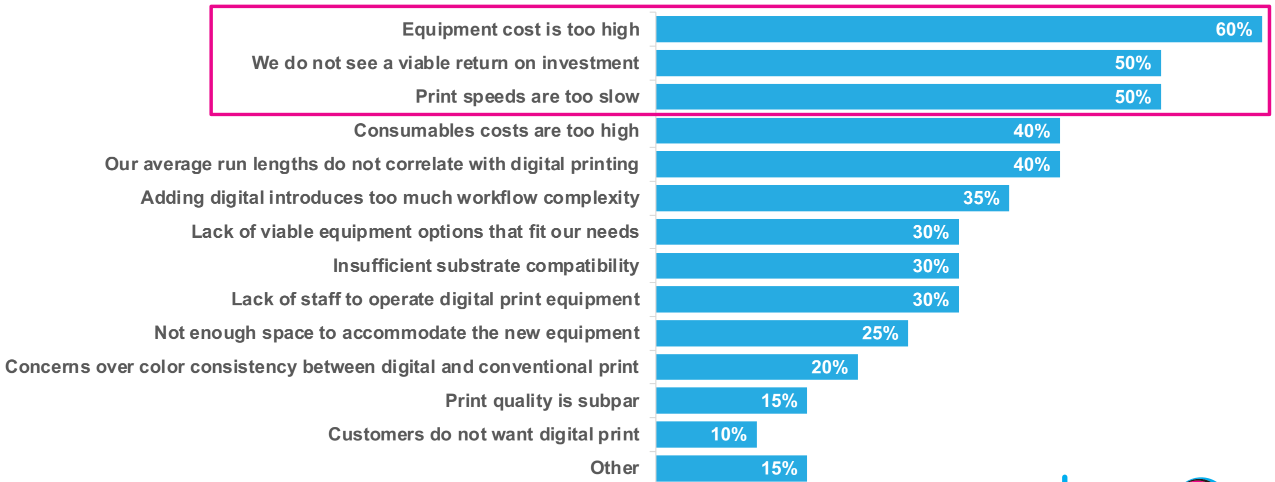
CONVERTERS' DIGITAL PRINTING DECISION DRIVERS

For flexible packaging companies, moving into digital printing is a major decision that requires careful consideration. The digital workflow and the types of jobs it best serves are very different than what converters may be used to on their conventional printing equipment. This means finding trained staff to operate the digital equipment, filling it with appropriate jobs, and ensuring sales staff understand how to pitch the digital advantage.

With digital printing still very much in its infancy in flexible packaging, converters in this segment vary in their readiness to adopt it. Among those that have not yet brought digital printing on board, much of the hesitancy is cost related **(Figure 3)**. Specifically, 60% indicate that the equipment cost has held them back from making the move, while half of respondents report not seeing a clear return on investment. Meanwhile, 50% also report equipment speeds being too slow. As mentioned previously, only 10% of respondents who have not brought digital on board report a lack of interest from their customers, while just 15% express concerns over print quality, which was a common trepidation in digital printing's early days. Similarly, 20% are hesitant due to concerns over color consistency between digital and conventional printing, indicating that quality output is not a primary obstacle in converters making a purchase.

Figure 3: **Converters Cite Costs and Speeds in their Digital Hesitancy**

Q. Why has your organization not invested in in-house digital printing for labels and/or packaging? Select all that apply.

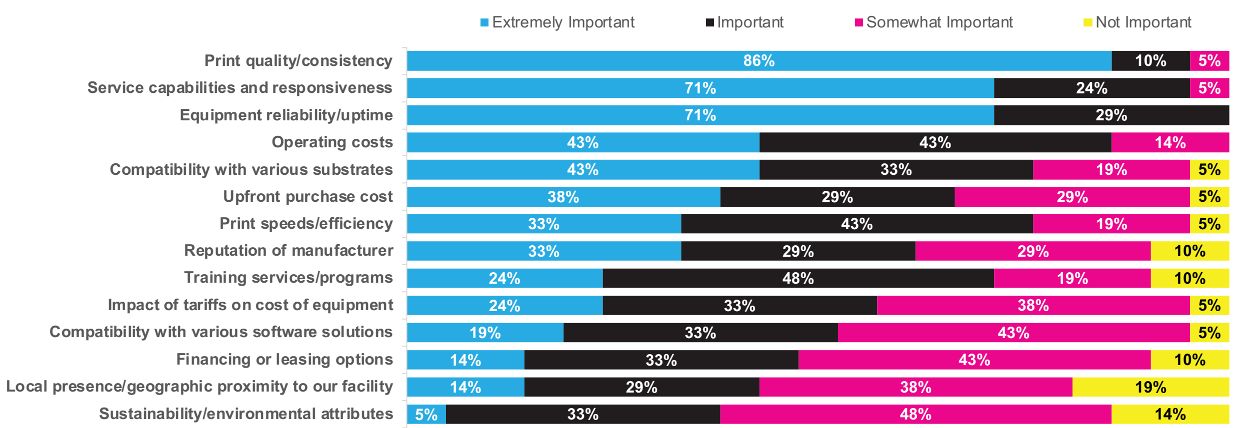


n = 20 flexible packaging printers whose companies do not currently offer in-house digital printing

Interestingly, among flexible packaging printers that have invested in digital printing, cost is a secondary factor when assessing digital printing. In fact, when asked to rank attributes of digital equipment vendors, flexible packaging printers that have invested in digital ranked upfront equipment cost sixth overall, with 38% deeming it to be extremely important. The most important factors, however, are based on quality and consistency (86%), service (71%), and equipment reliability (71%) **(Figure 4)**.

Figure 4: **Quality, Service, and Reliability are Primary Digital Decision Drivers**

Q. When assessing a digital printer manufacturer, please rank the importance of the following attributes:



n = 21 flexible packaging printers that provide in-house digital printing

While digital print quality has largely caught up with conventional print quality, there are other visual factors that are driving printers and converters toward the technology. For example, at Nosco, a Pleasant Prairie, Wisconsin-based label and packaging printer, leveraging digital's benefits beyond its variability has made for an attractive advantage. Jacob Resnick, product manager at Nosco, shares that the company had deep experience in digital in its label and folding carton business segments before bringing its first HP Indigo 20000 digital press on board for flexible packaging, which will soon be joined by an HP Indigo 200K.

"When we look at digital, we look at a few value propositions that are really key," Resnick says. "One being variable data print. Being able to print multiple pieces of information across each impression is a really big add-on. This allows us to have to integrate programs such as Amazon Transparency for product authentication. Also, the ability to do things like security inks and other covert security features that you can't do necessarily with a traditional offset or conventional press."

A DEEPER DIVE INTO RUN LENGTHS

The emergence of digital printing in the packaging industry has coincided well with brand owners' desires to reduce inventory, increase versioning, and alter designs more frequently. These ongoing trends have all contributed to the reductions in run lengths that printers and converters across all segments are experiencing. The flexible packaging segment has not been immune to these brand owner demands, as 59% of flexible packaging printers report an increase in short-run demand from their customers.

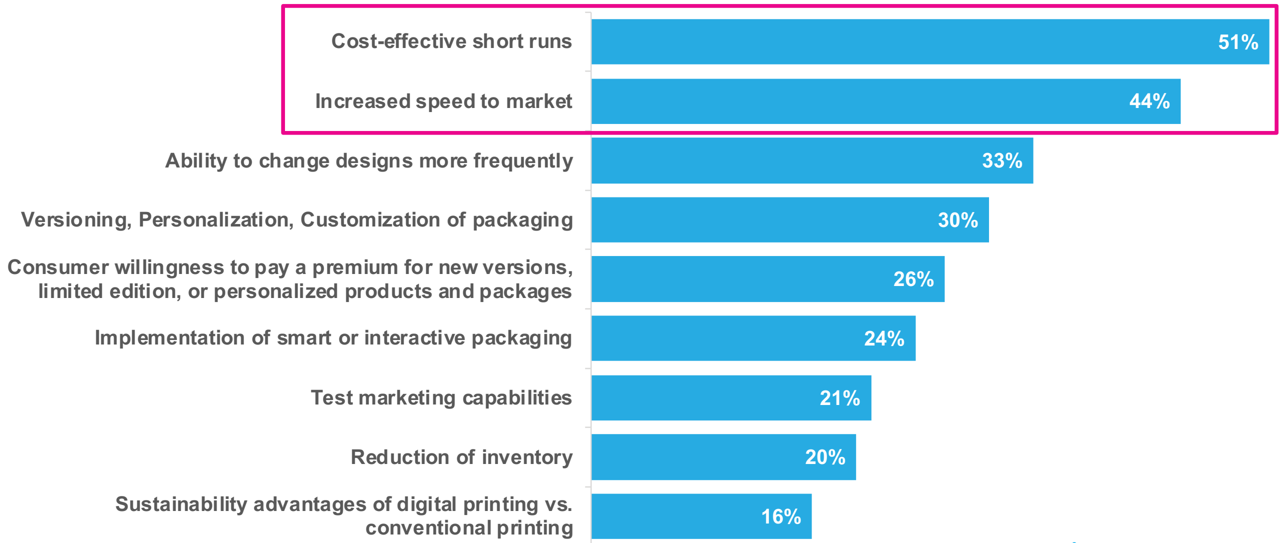
For an industry segment that has largely relied on conventional printing technologies, this influx of short runs can lead to added workflow complexities. For example, with more short runs comes more press changeovers, which can be time consuming on wide-web flexographic or rotogravure equipment. But the reality in flexible packaging is that a sizable majority of work stems from high-volume production runs, which are best suited for conventional printing. This is evident in the FPA's *State of the U.S. Flexible Packaging Industry Report*, which reveals that in 2024, among participating FPA members, flexography accounted for three-quarters of sales, gravure was 11%, and digital printing was 1%.

This underscores the widely held belief across the packaging industry that digital printing should be viewed as a complementary tool to support conventional printing. With each technology boasting its distinct benefits, digital printing has emerged as an ideal solution to take on short run work, while conventional presses can be freed up to handle the high-volume static runs that dominate flexible packaging output.

Though bigger brands may account for much of the long-run work in the segment, the short-run benefits of digital printing can be attractive to these customers. Among brand owners surveyed who currently use digital printing for their labels and packaging, 51% report that cost-effective short runs are the primary benefit of the technology **(Figure 5)**.

Figure 5: **Short Runs and Speed to Market are Brands' Top Digital Benefits**

Q. What do you view as the top benefits digital printing of labels and packaging can provide to your company? Select up to three



n = 91 brand owners whose companies currently purchase labels or packaging that have been digitally printed

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Barlow says that Printpack has put this advantage into play with many of its large enterprise brand customers. These customers may be interested in taking on a new packaging initiative, with more sustainable materials, for example, but would prefer to test it out in a smaller volume before scaling up to a conventional press run.

"We're able to do something quickly with sustainable materials and commercial graphics that has relatively low commitment and risk for both Printpack and our customer," he says. "That speed to market element and the ability to have the flexibility to transition those customers to the large-scale processing in the future is an advantage and a benefit for Printpack."

Some flexible packaging printers see additional opportunity for digital printing in meeting customer demand for medium-length runs. In flexible packaging, finding an ideal printing platform has been challenging because many press runs are too long to justify printing with existing digital equipment, but may be too short for economical conventional production.

This has led to the development of digital flexible packaging printing equipment that offers wider print widths than what is currently available. For example, multiple flexographic press manufacturers, including Paper Converting Machine Company (PCMC), have revealed plans to launch hybrid platforms that feature aqueous inkjet and flexographic technologies. Windell McGill, the launch manager for PCMC's ION digital press, explains that this equipment is an ideal option to fill this market gap.

"There's plenty of that business in that 30,000 to 50,000 linear foot run, in which you would get efficiencies, and your customers could change graphics every time without any kind of penalties," McGill says. "You could have quicker turnarounds and a lot of the value proposition that digital has always brought into play, but now in bigger run lengths."

MORE THAN JUST PRINTING

One of the common pitfalls among packaging printers and converters when investing in digital equipment is that finishing is often overlooked. In flexible packaging, processes such as laminating and pouching are key to the construction of the final product. Because digital printing is often done in lower volumes and with different consumables than conventional processes, converters should ensure they have the finishing equipment that maintains the efficient short-run advantages of digital printing and functions well with digitally printed output.

Among flexible packaging printers that have adopted digital printing, nearly all (95%) report laminating their printed output, while 79% use slitting equipment, and 63% have implemented pouch making.

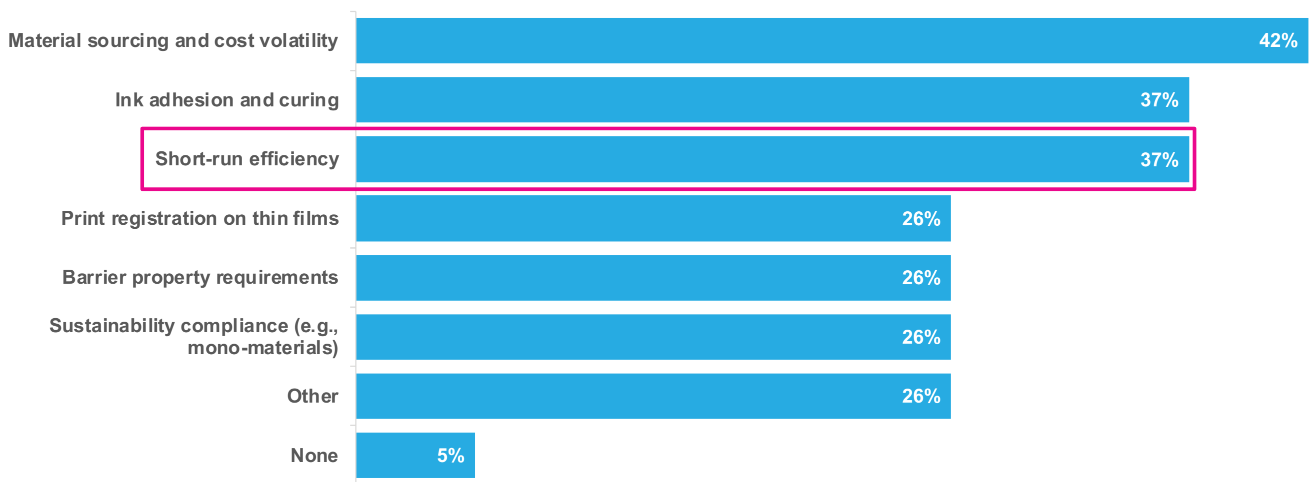
At Nosco, Resnick explains that the company recognized it needed to implement various lamination processes suited to its digitally printed output because it serves customers with a variety of needs. Additionally, he explains that when setting up pouch equipment for digitally printed flexible packaging, it needs to accommodate the way the film is coming off the roll. Further, he adds that Nosco has implemented multiple finishes, including matte, soft touch matte, and traditional gloss that can help customers enhance their packaging's visual and tactile appeal.

"Once you start getting past the printing section, you have to start thinking about what you need downstream for the lamination and finishing processes to meet the customer's needs," Resnick says. "What we've done is we realized we need a variety of different processes and requirements. We have our customers equipped for both thermal and solventless lamination and electron beam technology for specially formulated inks and coatings."

Finishing and converting often create inefficiencies when converters attempt to run digitally printed output through conventional finishing equipment. This challenge is reflected in **Figure 6**, where 37% of flexible packaging printers that have invested in digital printing ranked short-run efficiency among their top three concerns.

Figure 6: **Challenges in Digitally Printing Flexible Packaging**

Q. Which of the following challenges has your company faced when DIGITALLY PRINTING flexible packaging? Select up to three.



n = 19 respondents whose companies digitally print flexible packaging

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TOP PACKAGING TRENDS AND DIGITAL PRINTING'S ROLE

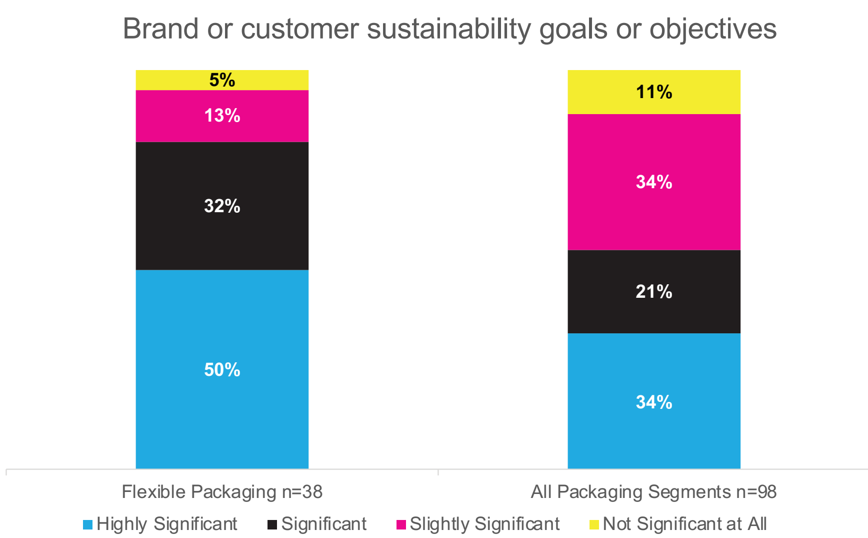
Flexible packaging is being shaped by three powerful forces that are redefining how converters and brand owners approach the market: sustainability, e-commerce, and automation. Digital printing enables providers to respond to each.

Sustainability

Whether at the consumer, retail, or converter level, the sustainability and environmental impact of packaging is being closely scrutinized. This is a pressing factor for flexible packaging printers, as the industry has come under fire due to growing backlash against plastics and the recycling challenges flexible film structures present. Among flexible packaging printers that have taken on corporate sustainability initiatives, their customers' sustainability goals are the primary driver, with half reporting it is highly significant and 32% stating it is significant. This follows the overall trend among package printers surveyed in this study, though flexible packaging printers weigh these brand objectives higher than the full sample size **(Figure 7).**

Figure 7: **Customer Objectives are Primary Packaging Sustainability Driver**

Please rank the following based on how significant an impact each has had in driving your company's sustainability initiatives.



Flexible packaging printers have a strong sustainability story to tell, despite the environmental headwinds the industry has faced. These distinct advantages the segment can boast are its food preservation benefits and its lightweight attributes. For smaller, startup food brands, flexible packaging has often been out of reach due to the lack of short-run, low-volume production options. With digital printing, however, these brands can now benefit from the extended shelf life and reduced food waste concerns that flexible packaging offers, without having to commit to a conventionally printed run of packaging. Additionally, for flexible packaging printers, production waste can be reduced via digital printing due to its minimal makereadies.

E-Commerce

While consumers have been purchasing products online for decades, the rise in e-commerce has accelerated in recent years, prompting brands to adjust their packaging to accommodate this new retail landscape. Among brand owners surveyed, 87% offer their products via e-commerce channels, underscoring just how important online shopping and at-home delivery have become.

Of those brand owners that offer their products via e-commerce, 94% have taken on at least one packaging initiative to best serve this channel, the top three being:

- Increasing packaging durability due to more touchpoints in shipping: **51%**
- Packaging design that factors in the consumer's "unboxing" experience: **44%**
- Personalized packaging enabled by obtaining consumer data: **43%**

For the flexible packaging segment, the rise of e-commerce presents distinct opportunities. Beyond flexible packaging's light weight and product preservation capabilities, digital printing allows brand owners to implement consumer engagement and personalization opportunities. Unlike in a brick-and-mortar retail setting, e-commerce allows the brand to access the names and other personal information of consumers buying the product and use that information to customize the package.

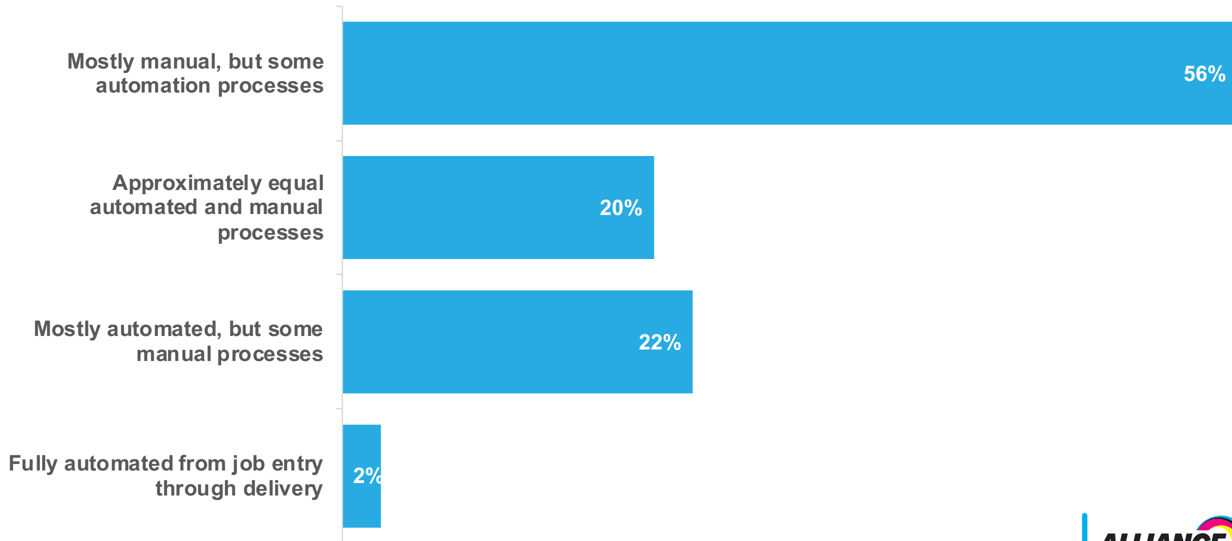
Pet food and treats, for example, is a market segment on the rise, relying heavily on flexible packaging and showing an increasing trend of premiumization and humanization among its product lines. For pet owners, having the ability to order customized food designed for their pets, and then personalizing that packaging with their pet's name, is a great opportunity for brands to connect on a one-to-one level with this passionate consumer segment. Barlow shares that at Printpack, the company's digital printing capability allows them to provide unique QR codes or alphanumeric coding for interactive gaming and to connect or direct consumers to more information about the package or product.

Automation and Artificial Intelligence

In addition to the digitization of their printing and production processes, packaging printers have also been increasingly exploring automation and artificial intelligence opportunities. Among flexible packaging printers, all respondents have implemented at least some level of automation. However, most are in the early stages, as 56% report their production processes are mostly manual with just some automation. Meanwhile, 20% report approximately equal amounts of automated and manual processes, while 22% report their production is mostly automated, with some lingering manual processes **(Figure 8)**. Though many package printers still have room to implement additional automation, it is encouraging that so many have started automating operations. With increasing speed to market pressure and ongoing labor challenges, automating processes to free up existing staff from monotonous, repetitive tasks will be crucial for printers and converters to remain competitive.

Figure 8: **Automation is Taking Hold in Flexible Packaging**

Q. Which of the following best describes your company's level of automation in its production processes?

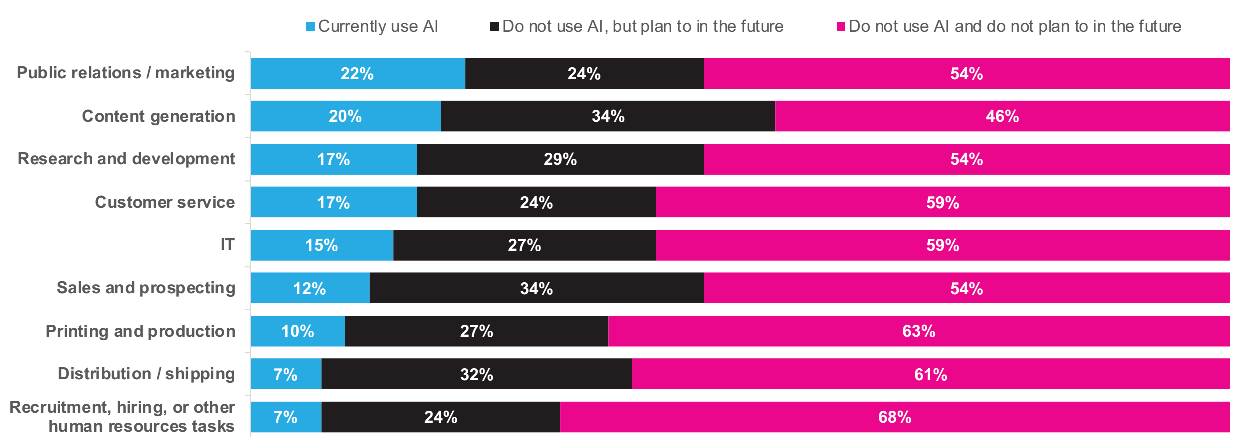


n = 41 flexible packaging printers

Extending the promise of automation, artificial intelligence has rapidly gained traction in the package printing industry. While few respondents report using AI in printing and production (10% among flexible packaging printers), several respondents have taken on AI initiatives in public relations and marketing (22%) and content generation (20%). These areas represent good starting points for AI, as it has demonstrated its strengths in copywriting and in locating potential sales prospects. The production floor appears to be among the next targets for flexible packaging printers to add AI, as 27% report plans to implement the technology in these business functions **(Figure 9)**.

Figure 9: **Package Printers Beginning Their AI Journeys**

Q. Please indicate your company's usage status of artificial intelligence in the following business areas.



n = 41 flexible packaging printers

CONCLUSIONS AND RECOMMENDATIONS

The flexible packaging segment is in the midst of an exciting upward trajectory, marked by continued growth and emerging opportunities. Digital printing and production technologies, while still in their early stages in flexible packaging, are poised to be a key tool to enhance converters' offerings. Although technological advancements in digital printing are continuing at a rapid rate, these platforms are best viewed for most flexible packaging printers as complementary to their conventional printing assets.

Brand owners are driving a need for digital printing across the label and packaging landscape, as they seek to increase their short runs and expand their number of SKUs. Consumers continue to push for more variety in the products they are being offered, and brand owners are leaning on their packaging providers to meet this demand. As run lengths decrease and SKUs increase, the importance of digital printing and production technologies to meet these demands will become prominent, while wide-web flexographic and gravure presses continue to produce the high-volume runs they excel at.

The creative side of digital printing also opens opportunities for flexible packaging printers. Specifically, with personalization and customization, brand owners who were accustomed to committing to high-volume static packaging can now experiment with new designs and initiatives. Consumer engagement becomes a prime opportunity here, as each package can contain a unique code, for example, that provides the consumer with targeted information about the package or the product inside. E-commerce presents another personalization opportunity, as brands now gain access to personal consumer information, including names and geographic details, that they can leverage to personalize packaging.

Although digital printing currently represents a small share of flexible packaging volume and sales, converters that have invested in the technology expect sales growth, while brand owners continue to push for the advantages it provides. As technology advances, flexible packaging is likely to follow the path of labels and other packaging segments, which have already experienced a steady growth in digital printing adoption.

WHO WE ARE

The **Flexible Packaging Association** is the voice of the U.S. manufacturers of flexible packaging and their suppliers. The association's mission is connecting, advancing, and leading the flexible packaging industry. Flexible packaging represents $151.4 billion in direct economic impact in the U.S. and is the second largest and one of the fastest growing segments of the packaging industry. Flexible packaging is produced from paper, plastic, film, aluminum foil, or any combination of those materials, and includes bags, pouches, labels, liners, wraps, rollstock, and other flexible products. Learn more at FlexPack.Org.

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