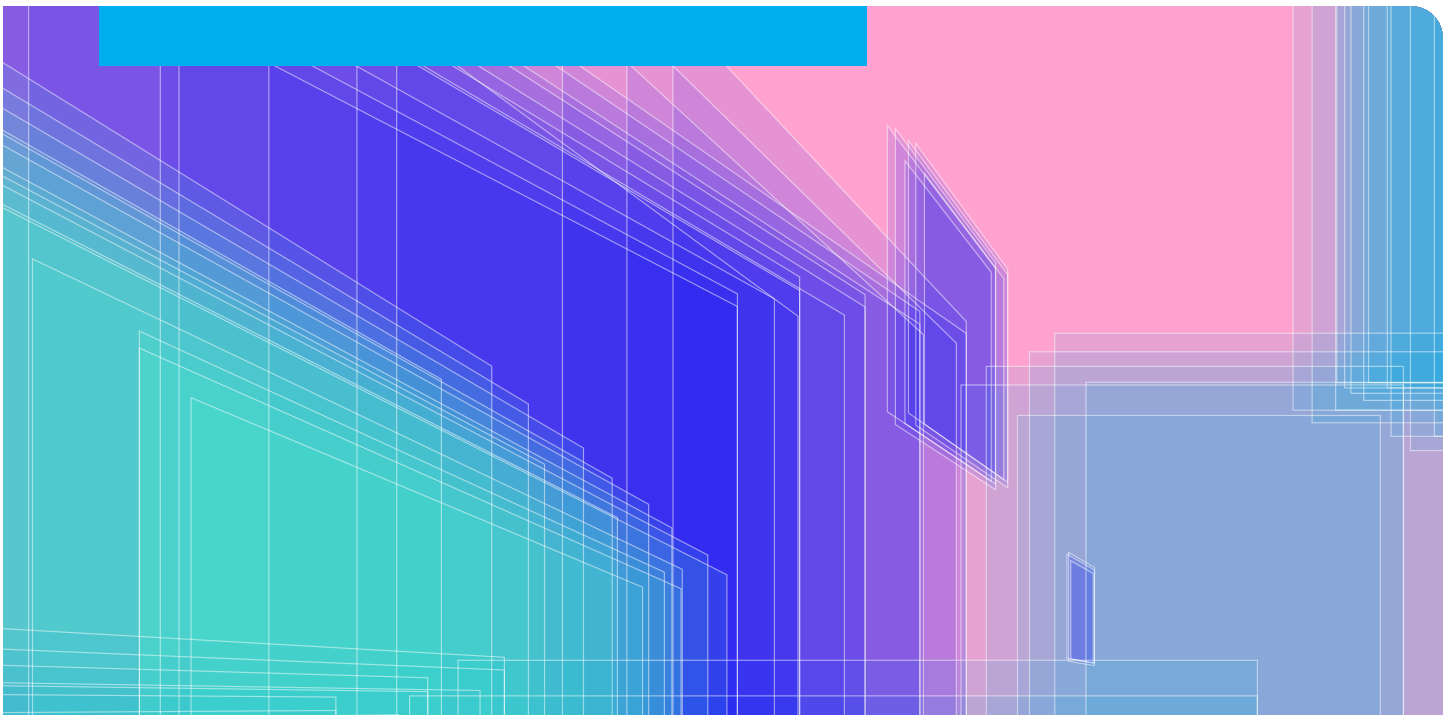

Digital Packaging: Opportunities to Thrive

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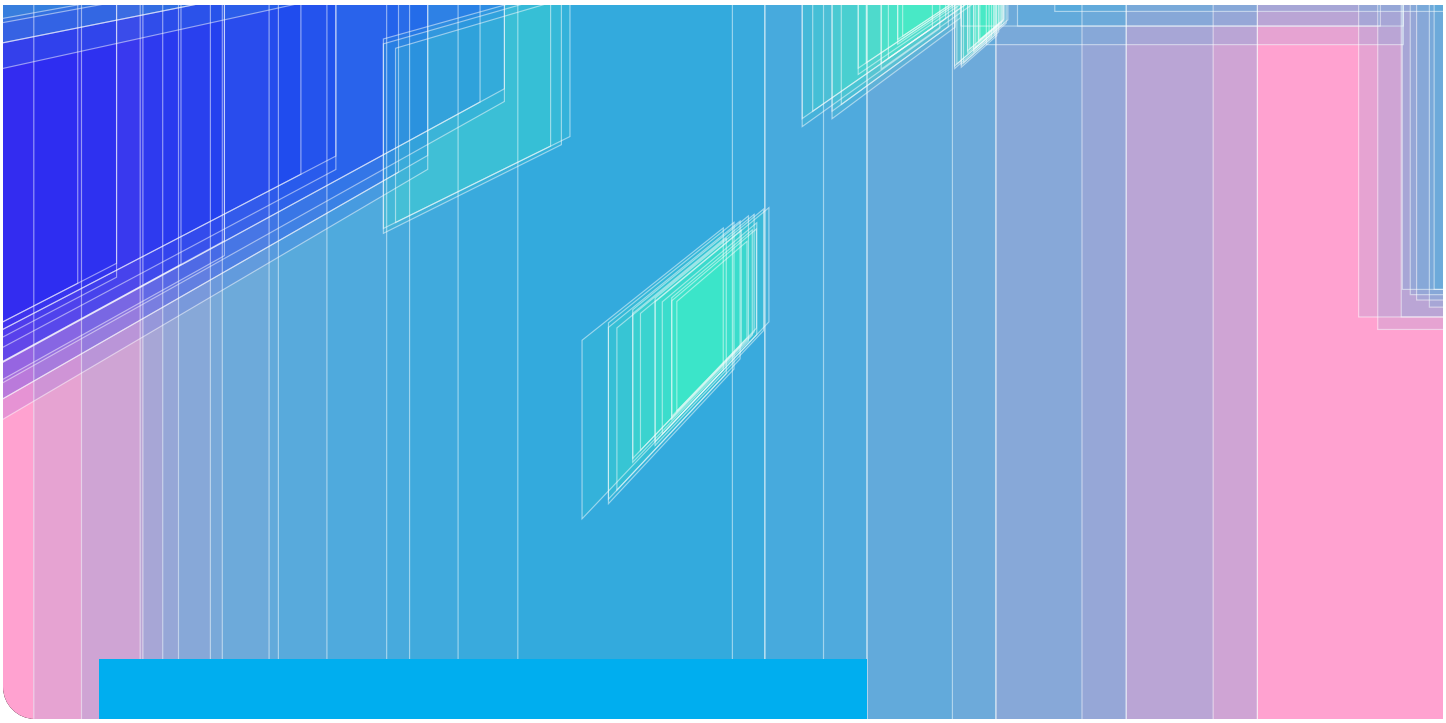

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Digital Packaging: Opportunities to Thrive

EXECUTIVE SUMMARY

When digital printing first emerged in the label and packaging industry, it was met with a combination of optimism for the benefits it would bring to the segment, and skepticism over its ability to compete with the conventional technologies that dominated pressrooms. The question of whether digital technologies will have a lasting impact in packaging has been resoundingly affirmed, and now converters and brands across all segments are utilizing it to its full potential, and exploring ways it can take their output to new heights.

But while those in the industry understand digital's ability to cost-effectively produce the short runs that continue to impact the segment, and provide creative design aspects such as personalization, versioning, and variable data, the technology still accounts for just a small fraction of overall printed label and packaging output. Despite its frequent positioning as a complementary technology to conventional processes, digital printing's advantages are becoming widely acknowledged and brand owners are pushing converters to offer digital as part of their portfolio.

For many years as package printers and converters were adopting, installing, and acclimating to the technology, brand owners were left in the dark about the benefits the technology could provide. Because design aspects like personalization and versioning were not mainstream, many brands were not of the mindset that these were options they could explore, and accepted that static text and graphics were their only avenue.

Now with digital printing firmly established in the label and packaging industries, brand owners are beginning to recognize and understand the power that it provides. In fact, brands are proactively seeking out package printers that offer digital printing, and are coming to the table with ideas in mind for how digital printing can be leveraged to take their businesses to the next level through versioning, seasonal product launches, and even personalization.

One of the most exciting aspects of the state of digital printing in packaging is that it has now become viable at production levels across the four major packaging segments of labels, folding cartons, flexible packaging, and corrugated. In the label and folding carton segments, where digital printing first emerged as a production-level technology, printing platforms suitable for converters of all types have emerged. On the label side, production level electrophotographic and inkjet systems are widespread, along with tabletop solutions for those seeking to enter the market, and robust hybrid inkjet and flexographic presses that provide the best of both worlds.

In flexible packaging and corrugated, the two segments where digital was slower to take hold, converters and brands are now implementing the advantages the technology brings to the table. In the high-demand flexible packaging segment, smaller brands that once may have sought out other packaging formats due to their low-volume needs, can now leverage digital to access the benefits that flexible packaging provides at prices they can afford. In corrugated, a segment that has skyrocketed with the rise of e-commerce, digital is providing a variety of new opportunities, including full-color graphics, personalization, and customization – expanding on what can be done with long-run conventional production.

NAPCO Research, a unit of NAPCO Media and PRINTING United Alliance, conducted a research study to examine the current state of digital printing in labels and packaging. This study, which updates NAPCO Research's 2018 report "Digital Package Printing: The Time is Now!," focused on trends, demands, challenges, and requirements of both converters and brand owners, to ensure a full understanding of the impact digital printing and production is having on this industry.

KEY FINDINGS

Digital's Presence Across Packaging

- In digital printing's early stages in packaging, it was primarily used by label and folding carton printers. The complexity of production in flexible packaging and corrugated resulted in these segments being slower to adopt digital.
- In the years since, digital adoption has expanded to all segments, though it remains more prevalent in label and folding carton.
- More than 40% of respondents from both the flexible packaging and corrugated segments report using digital technologies to at least some extent to print these applications. As technological advancements continue, the expectation is that adoption rates will continue to rise.

Brand Owners Push for Digital Adoption

- While converters have been cognizant of digital printing's advantages for many years, brand owners are now catching on to the ways they can benefit from the technology, and in many cases, are actively seeking it out.
- All brand owner respondents stated they are at least somewhat familiar with the printing technologies used to produce their labels and/or packaging.
- 79% of brand owners say they at least prefer for their package printers to offer digital printing, with 35% stating it is essential.

Maximizing Production Efficiency

- While digital printing offers a variety of creative and cost-saving measures, its ability to optimize workflow efficiency has emerged as a top benefit of the technology.
- Converters cite short-run production capabilities (36% of respondents) and faster turnarounds (34%) as the top benefits digital provides – higher than both versioning and personalization (31% each)

Preparing for Expanded SKU Proliferation

- SKU proliferation is hardly a new phenomenon in labels and packaging, but data reveals that it is an ongoing trend, with 47% of converter respondents stating their brand owner customers have increased their SKUs.
- Meanwhile, 60% of brand owner respondents expect to see an increase in their SKU quantity over the next two years.

Opportunities Across Applications

- Though the various packaging segments are at different stages of their digital adoption, each provides distinct opportunities for converters and brands.
- The technology continues to expand in labels and folding cartons, with electrophotographic and inkjet systems emerging and offering their distinct benefits. Inkjet appears to be on the rise in these segments, as 27% of prime label printers and 30% of folding carton printers state they utilize the technology.
- The high-growth formats of flexible packaging and corrugated are benefiting from technological advancements in digital platforms. In flexible packaging, digital printing is bringing the distinct benefits of this application to smaller brands in need of short runs. Meanwhile, in corrugated, digital is expanding on personalization opportunities in e-commerce and increasing accessibility to high-graphic packaging.

INTRODUCTION

The early rumblings about digital printing in labels and packaging were felt across the entire industry as production-level digital presses began to hit the market in the major packaging segments. While there was some early question as to whether the technology would be utilized primarily for novel purposes such as for personalized packaging or one-off customizations, it is now clear that digital printing for labels and packaging is not only a mainstream technology, but its ongoing evolution is also poised to result in continued adoption throughout the industry.

As the technology began its ascent into the mainstream, brand owners gradually became aware of the benefits it provides. In addition to its ability to provide personalized and versioned packaging, digital printing made cost-effective short runs a reality, leveraging its lack of plates to offer fast changeovers and allow brands to achieve more design flexibility, rather than being locked into static images and text. Additionally, industrial, durable, and warehousing labels with variable data and text have offered a variety of logistical and security benefits.

Since digital's initial adoption among package printers and converters, the types of applications being produced with the technology have expanded. Though it was primarily a technology utilized by label and folding carton printers at first, digital technology has expanded into both flexible packaging and corrugated, making those segments, which were already viewed as high-growth and high-demand areas, even more exciting for converters and their customers. Though digital is still in its early stages in those segments, it is now evident that all packaging applications can reap the rewards of digital printing.

NAPCO Research conducted this study with the support of sponsors, BOBST, CloudLab, Durst, EFI, Elitron, Landa Digital Printing, and Screen Americas, to reveal the trends and market factors that have made digital printing such a key component of the label and package printing industry's future. To gather this data, NAPCO Research surveyed both package printers and converters representing all four major packaging segments, along with brand owners, thus providing a full-scope view of how those in the industry and their customers view the role digital printing will play in their businesses going forward.

DIGITAL PRINTING BECOMES OMNIPRESENT

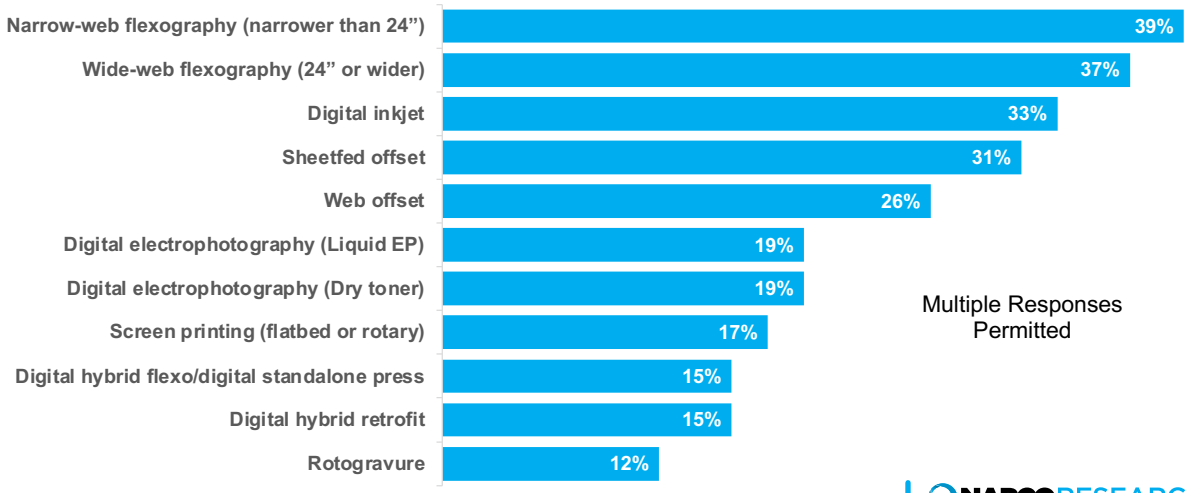
When assessing the package printing industry by overall volume, digitally printed output across all applications is typically reported as being in the single-digit percentages. Unsurprisingly, survey respondents largely reported their use of conventional printing technologies, with an emphasis on flexography in both narrow- and wide-web formats. Specifically, 39% of respondents stated they currently use narrow-web flexography (narrower than 24˝) to produce label and packaging applications.

Meanwhile, just below that, 37% stated their businesses use wide-web flexo (24˝ or wider). Sheetfed offset, another common conventional technology, and the one most widely used in folding carton production, was reported to be in use by 31% of respondents.

While conventional technologies are still predominant in label and package printing, the study reveals that digital adoption rates are keeping pace. For example, 33% cited their use of inkjet printing, while dry toner and liquid electrophotographic equipment were both utilized by 19% of respondents. Meanwhile 15% stated they have invested in a digital hybrid standalone press that combines flexographic and digital technologies, and 15% stated they have retrofit a conventional press with a digital unit.

Figure 1: **Label and Packaging Print Technologies Currently in Use**

Q. Which of the following printing technologies does your company use in house to print labels and/or packaging? Select all that apply



n = 104 package printers

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While adoption rates of digital production print technologies are keeping pace with conventional, digital adoption across the multiple applications varies. For example, the label segment was among the earliest adopters of digital printing technologies and is typically viewed as the segment with the highest

adoption rates. For example, of the respondents that produce prime labels, 32% use liquid EP, 27% have implemented inkjet, 14% cite their use of dry toner, and 9% have added a hybrid standalone press.

Following not far behind labels, folding cartons were also among the early adoption areas of digital printing in packaging. Though adoption of digital in folding carton production is not quite as widespread as label, this is a segment that has shown a willingness to invest in and incorporate the technology. Additionally, digital production of folding cartons by commercial printers, many of which have sheetfed digital presses already installed, is an accessible entry point for printers outside of packaging to make their way into the segment. Of the respondents that produce folding cartons, 30% are utilizing inkjet, 15% state they use liquid EP, and 15% cite their use of dry toner.

In flexible packaging, adoption rates are not quite as high as other segments, but digital usage is on the rise, particularly in liquid EP, which is cited by 14% of flexible packaging respondents. Dry toner, which is in its early days of usage for flexible packaging, saw 8% of flexible packaging respondents using the technology. Meanwhile, 14% also stated they are using inkjet printing in flexible packaging. Though there are aqueous inkjet solutions coming online for production-length flexible packaging printing, it is important to note that inkjet marking systems are also utilized in this space and could account for respondents selecting inkjet as a technology they use to produce flexible packaging.

Corrugated meanwhile, is an application that when being printed digitally, relies on inkjet, as the heat and pressure of toner-based systems could damage the substrate. Still, production level inkjet systems for both preprint and postprint corrugated are new to the industry and are not as highly represented in the segment as conventional litho or flexo systems. However, as more digital corrugated printing platforms emerge, the more potential arises for printers getting into the space, particularly with the opportunities presented by e-commerce. Of the corrugated respondents, 25% of preprint corrugated printers and 18% of postprint corrugated printers state they are using inkjet technology. Figure 2 below shows the percentage of respondents that use any digital technology to print each application.

Figure 2: **Digital Print Usage Across Packaging Applications**

Q. Which of the following printing technologies does your company use in house to print labels and/or packaging? Select all that apply. (Percentages shown combine all digital technologies selected.)

Application	Printed using digital technology
Flexible packaging (n=50 converters)	42%
Folding Cartons (n=40 converters)	60%
Non-prime labels (n=36 converters)	72%
Postprint corrugated (n=22 converters)	41%
Preprint corrugated (n=20 converters)	50%
Prime labels (n=44 converters)	64%
Rigid boxes (n=23 converters)	48%
Shrink sleeves (n=20 converters)	45%
Tags (n=29 converters)	59%

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BRAND OWNER VALUES DRIVE THE RISE OF DIGITAL

When digital printing first emerged in the label and packaging industry, there were questions as to how the technology would best suit brand owners. With labels and packaging relying on long runs produced by conventional technologies, the benefits that digital provided were not immediately applicable across the board. However, as brand owners began to explore versioning opportunities, reduced run lengths, and expanded SKU quantities, digital printing's advantages became evident.

Though those trends have continued as digital printing has gained adoption, brand owner priorities have evolved, while still aligning with digital printing's advantages. For example, when asked to share their top five packaging challenges, the top response from brand owners was designing packaging that influences purchasing, with 38% of respondents. Digital can assist with this challenge by providing customized, versioned packaging with designs that can change more frequently, therefore catching consumers' eyes on shelf.

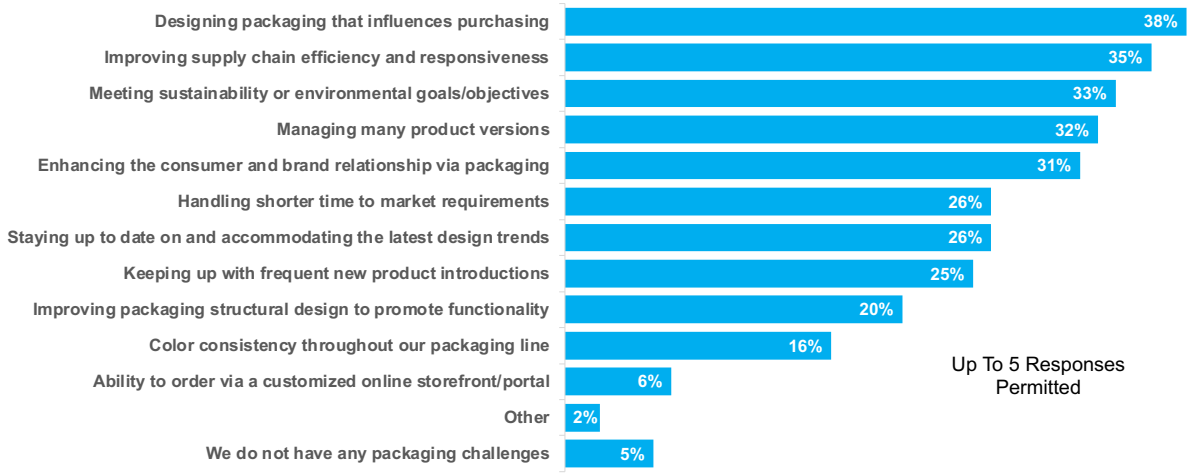
But just below designing packaging that influences purchasing is improving supply chain efficiency and responsiveness, with 35% of respondents citing it as a top challenge. Efficiency in the supply chain has become an increasingly prevalent concern among brand owners, particularly as the fallout from the COVID-19 pandemic continues to impact national and global logistics. With digital printing's fast turnaround times and condensed lead times, brands can benefit by receiving digitally printed runs faster, as they do not need to wait for plates to be made and files can get on press with more efficiency.

In today's increasingly eco-conscious environment, it should be no surprise that meeting sustainability or environmental goals/objectives was a top brand owner challenge, with 33% of respondents stating that was among their top 5. While sustainability objectives from brands and retailers often focus on the recyclability of the end product, digital printing can provide sustainability advantages in packaging. Specifically, makeready on digital presses is typically a minimal process and printers do not need to waste material getting their presses up to color. Educating brands on how digital printing can reduce production waste can be beneficial for converters, as it can help refocus a brand's attention on achieving sustainability in production and compel them to think about the environmental impact of the entire package's lifecycle, beyond just recyclability.

Rounding out the top packaging challenges cited by brand owners are managing many product versions (32%) and enhancing the consumer and brand relationship via packaging (31%). These challenges have some correlation, and both can be directly addressed with digital printing. The influx of versioning that package printers have had to contend with has led to converters needing to manage more jobs flowing through their facilities and conducting increased changeovers. In fact, according to a 2022 NAPCO Research study "Trends and Expectations in Label Printing and Production," which focused specifically on the label segment, 84% of label converter respondents stated they had seen an increase in versions in their facilities over the prior two years.

Figure 3: **Brand Owners' Top Packaging Challenges**

Q. What are your company's top packaging challenges? Select up to 5



n = 93 brand owners

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While the versioning influx curtailed a bit in this year's study with 64% of converter respondents indicating they saw a rise in versioning in the past two years, the solution to an increase in label and package versions is clear. When asked what strategies they have taken to accommodate the increase, investment in digital printing rose to the top, with 58% of respondents that cited an increase stating they have invested in digital printing as a solution.

Digital is also a solution for enhancing the connection between consumers and brands. Versioning is a component of this, as brands seek to keep up with consumer demand for an increased product portfolio. Introducing new flavors, varieties, and seasonal products all provides more intrigue for consumers as they seek to explore more offerings from brand owners. However, it is incumbent on packaging service providers to help brand owners understand the benefits they can achieve from versioning. Education is key in helping brand owners understand how they can take advantage of advanced versioning capabilities of digital printing equipment.

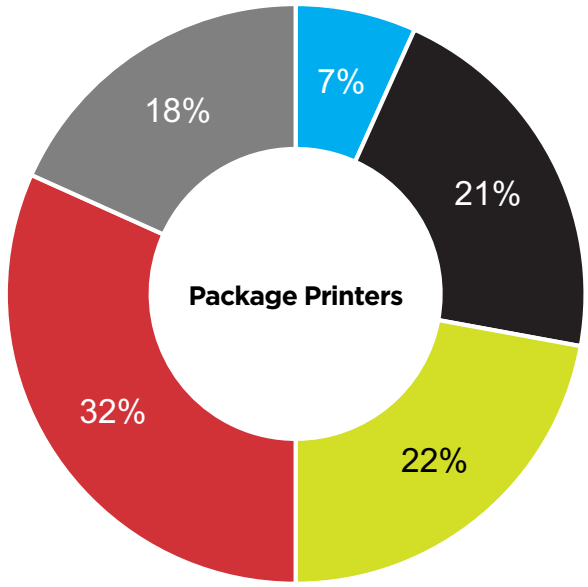
EXPLORING ENHANCED PRODUCTION EFFICIENCY

In NAPCO Research's initial digital packaging study in 2018, it was clear that on average, brand owners wanted to receive their printed labels and packaging faster than their converter partners were producing them. In this year's study, a similar trend emerged, albeit with different timeframes. In 2018, brand owners reported that their average turnaround time requirement for printed labels and packaging was six days, while converters stated they typically provide eight-day turnarounds on their work.

In revisiting this question five years later, brand owners stated they typically require a seven-day turnaround on average, and converters reported an 11-day average turnaround. The reasons behind the increased turnaround times could be due to lingering pandemic impacts, as shortages of labor and material led to production bottlenecks. Regardless, brand owners still expect to see their printed labels and packaging faster than converters produce it. With digital printing's fast turnaround capabilities, converters can bridge this gap.

Figure 4: **Assessing Packaging Turnaround Times**

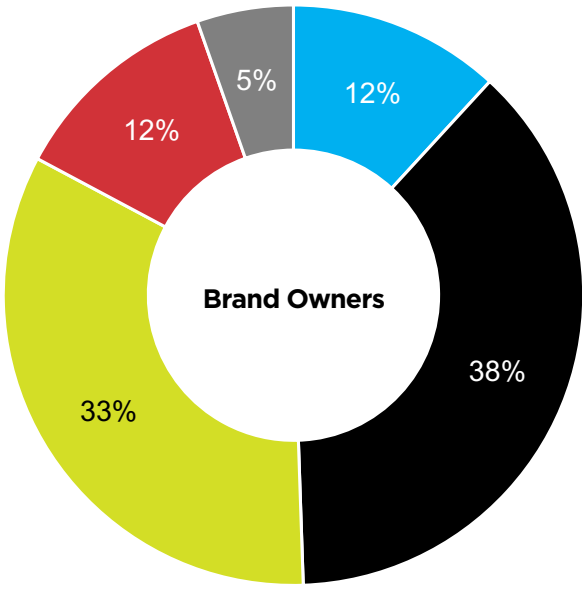
Q. What is your typical turnaround time for producing labels and packaging?



Mean: 11 Days

n = 104 package printers

Q. What is your typical turnaround time requirement for labels and packaging after file submission to your package or label print provider?



Mean: 7 Days

n = 93 brand owners

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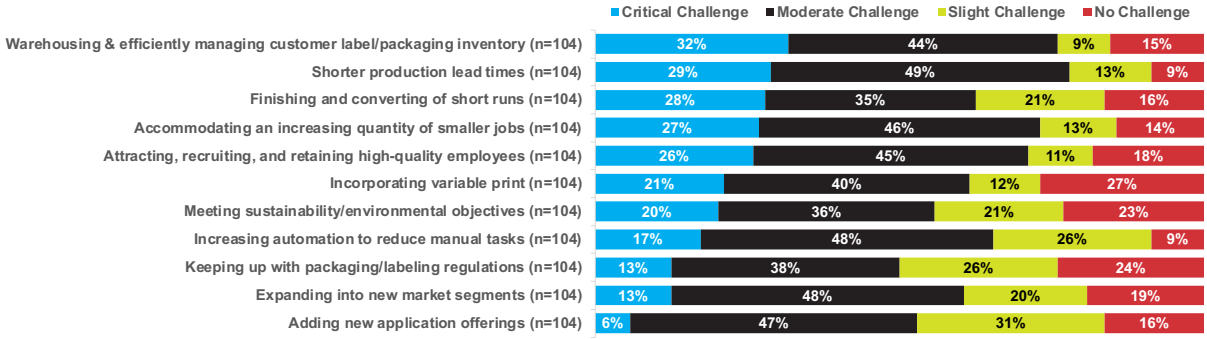
When asked to indicate their top packaging challenges, converters indicated that shorter production lead time demands from their customers were among the most challenging trends impacting their business. In fact, more than three quarters (78%) of respondents stated that this was at least a moderate challenge, while 29% indicated that it was a critical challenge. Additionally, converters indicated that the influx of short runs being presented to them by brand owners were among the top challenges they faced.

More than one quarter of respondents (27%) stated accommodating increasing short runs was a critical challenge, while another 46% stated this was a moderate challenge. The short-run difficulties clearly extend beyond printing as well, as 28% stated finishing and converting short runs was a critical challenge and 35% stated it was a moderate challenge.

Digital printing technology is well positioned to help print service providers address these challenges: decreased setup times over analog technology and the ability to seamlessly handle short-run print jobs allow print service providers to respond to the changing print landscape.

Figure 5: **Top Challenges Among Label and Package Printers and Converters**

Q. Please rate the level of challenge that each of the following present to your company's package printing and converting workflow.



n = 104 package printers

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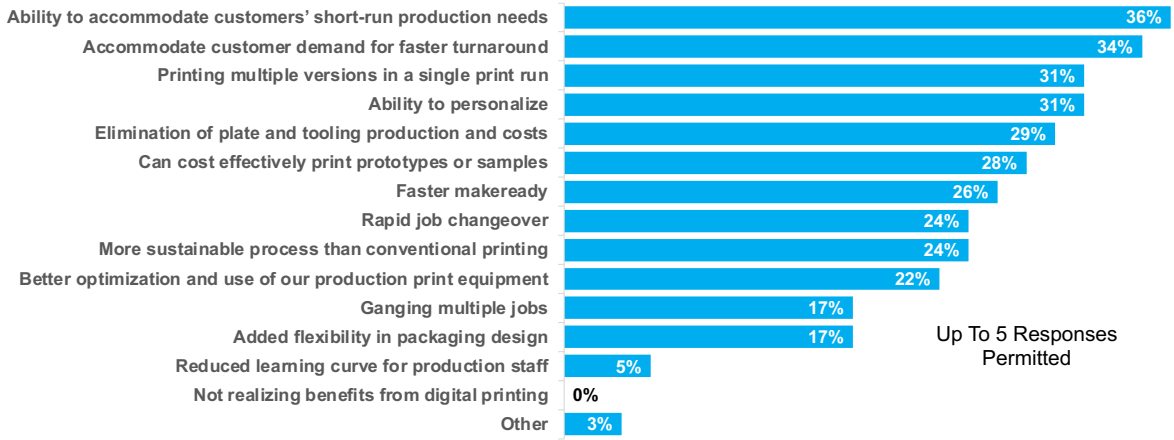
While these trends of shorter runs and faster turnaround times have emerged as top challenges for package printers and converters, actions and strategies are being implemented to ease these pains. Specifically, digital printing has become recognized industry-wide as a solution to these challenges, as is evident in converters' reported top benefits of digital.

Of those respondents that utilize digital printing technologies, 36% stated that accommodating short run production needs was among their top five benefits of digital, while just behind that was 34% of respondents stating that the ability to accommodate customer demand for faster turnaround was among their top five. Versioning and personalization were also toward the top of respondents' perceived benefits of digital printing, with 31% of respondents each indicating that these attributes were in their top five. This indicates that while printers and converters largely view these aspects of digital as beneficial, production efficiency is generally the top priority.

Figure 6: **Productivity, Versioning, and Personalization are Digital's Top Benefits**

Q. What are the most important benefits digital printing provides to your business? Select up to 5



n = 58 Package printers that use digital printing in house to print labels and/or packaging

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ADDRESSING THE CHALLENGES OF DIGITAL PRINTING INTEGRATION

Though digital printing technology has made a clear case for its ability to solve pressing packaging problems, there are challenges in implementing and integrating the technology. At the top of the list of difficulties converters reported when transitioning label and packaging work from conventional technologies to digital were matching colors between various press technologies (47%) and concerns over print quality (45%).

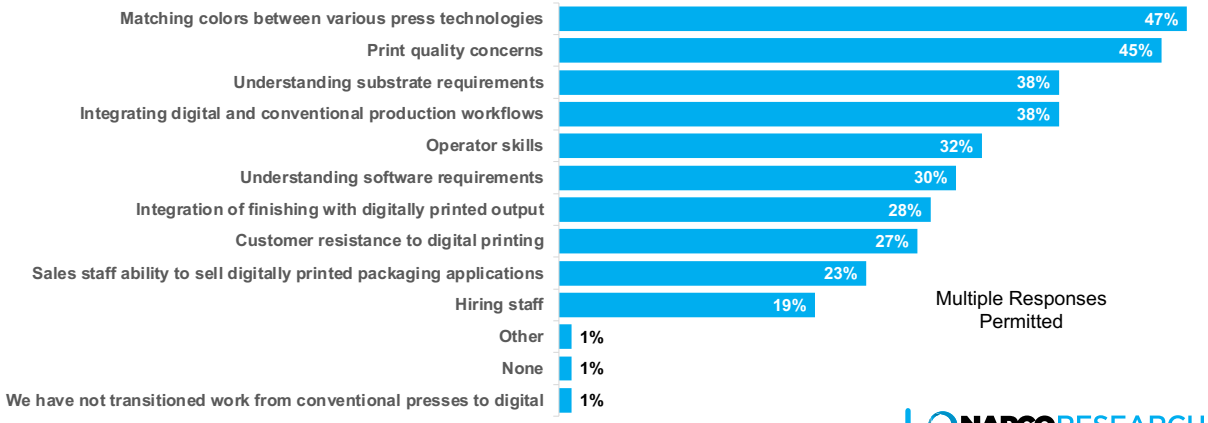
Color consistency in labels and packaging is paramount, as brand owners rely on their colors as a key component of their overall identity. If a converter is utilizing multiple print technologies to produce a line of a brand's products, such as flexography for a high-volume run of a year-round product, and digital printing for a seasonal launch, it is likely that despite the differences in the label's or package's design, there will be common brand colors. Those colors should not appear different to the consumer's eye, as any discrepancy in packaging within a brand's product line may cause quality concerns, or simply just appear "off" to a consumer. When investing in digital printing equipment, it is important for converters to know how they will utilize that device in concert with their conventional equipment and if it will have to match brand colors. If that is the case, it can be worth exploring expanded gamut options, as well as the ability to obtain spot colors when needed.

Regarding print quality, when digital printing first entered the label and packaging space decades ago, it was often not on par with conventional technologies. However, the latest advancements in both EP and inkjet have made print quality across most applications indiscernible from conventional technologies. When transitioning work from conventional presses to earlier model digital equipment, it is not surprising that there may have been some print quality discrepancies. However, with inkjet and toner equipment now reaching 1200x1200 dpi resolution, and in some cases even higher, matching the quality of conventional technologies, including offset and flexo, is now a reality.

Beyond color and quality however, converters have also expressed obstacles in integrating digital workflows with conventional, as 38% of respondents cited this as a challenge in transitioning conventional work to digital. Similarly, 28% of respondents stated integrating finishing with digitally printed output has been a top obstacle in their experience with bringing digital on board. When investing in digital production technologies, it is important for converters to recognize that workflow will be different from conventional and to prepare accordingly.

Figure 7: **Top Challenges of Transitioning Conventional Jobs to Digital**

Q. What are the top obstacles, if any, your organization experienced in transitioning label and packaging work from conventional presses to digital printing devices? Select all that apply



n=104 package printers

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For example, the conventional workflow can be more complex in its prepress and makeready processes, given that plates need to be made and mounted, followed by implementing the various inks needed in the job and getting the press up to color. While the digital makeready process is often viewed as being as simple as turning the press on, loading the file, and pressing the start button, that is an oversimplification. Operators must ensure the file type is correct and the colors implemented in the file will correlate to a digital print job. Though digital printing can simplify the production process, converters transitioning work from conventional to digital production do need to ensure they are making all the adjustments needed to the file to make the change successful.

On the finishing side, it's imperative that label and package printers and converters bringing digital printing on board emphasize their finishing processes to make sure they maintain the benefits of digital printing. A common misstep among package printers transitioning into digital is that they utilize conventional finishing processes for their digitally printed output. Because conventional finishing typically aligns with conventional printing as a technology best suited for high-volumes and long runs, package printers that try to send short-run, digitally printed work through their conventional finishing processes end up contending with bottlenecks, as the digital finishing devices need to be changed over more frequently. Additionally, converters could end up with capacity issues, as they attempt to use their existing conventional finishing equipment for both conventionally printed and digitally printed output.

Digital finishing technologies have emerged in labels, folding cartons, and flexible packaging. For converters that want to ensure they maximize the benefits of digital throughout the entirety of their print runs, exploring the finishing needs of their customers' packaging first, can then help determine the best way to print the jobs at hand.

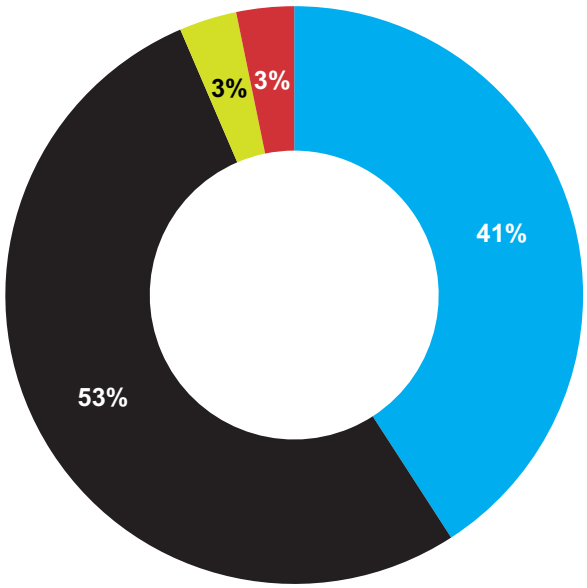
SKU PROLIFERATION: FOLLOWING THE TRENDS

As digital printing has expanded its presence in the packaging industry, brand owners have benefited by being able to grow their product lines with an increased quantity of SKUs. While this desire among brands was occurring even before digital printing's rise into the mainstream, the increasing adoption of the technology has made it easier and more cost effective for these product line expansions to be produced.

While the SKU proliferation trend has been ongoing in the packaging segment for years, it appears that it is poised to continue its impact. When asked about their SKU quantity trends over the past two years, 41% of brand owner respondents stated their SKUs have increased. When asked for their expectations for their SKU quantity for the two years ahead, that number jumps to more than half of respondents, with 60% predicting they would have an increased quantity of SKUs.

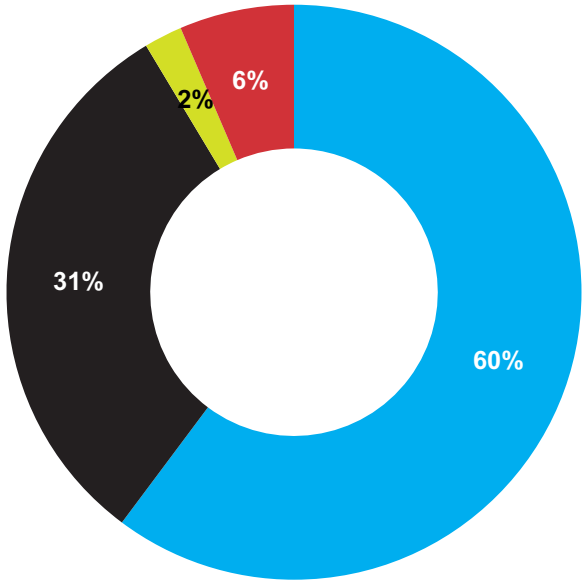
Figure 8: **Brand SKUs Expected to Rise**

Q. Which of the following best describes the quantity of your packaging stock-keeping units (SKUs) over the past 24 months?



n=93 brand owners

Q. How do you expect the quantity of your packaging stock-keeping units (SKUs) to change in the next two years?



n=93 brand owners

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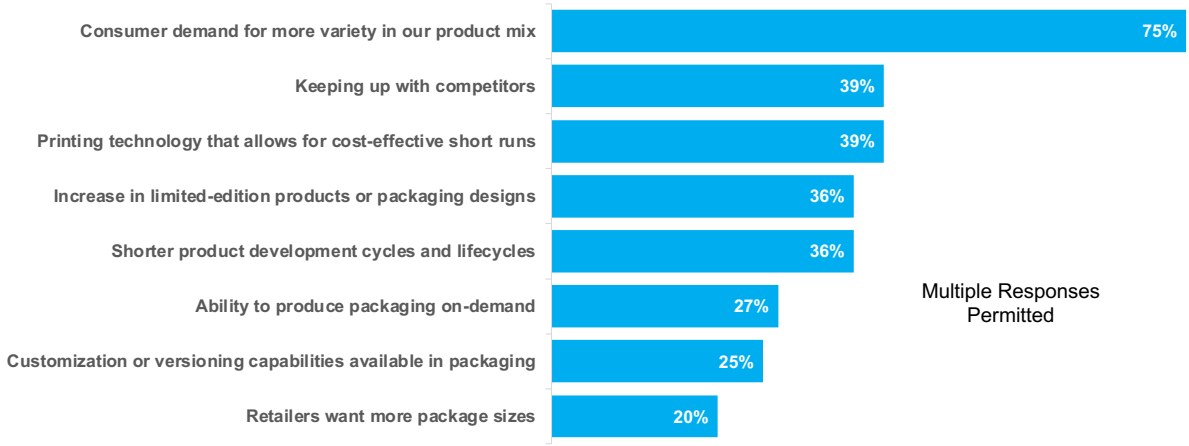
The likely result of this influx of SKUs is the continued adoption of digital printing solutions across the packaging industry. As brand owners have grown their product lines, the overall volume of printed labels and packaging has remained relatively static, with just an increased quantity of label and package versions. Because the rise of SKU proliferation is resulting in more short-run work, investment in digital printing has made sense for printers and converters looking to keep up with demand.

In fact, when asked to indicate the main drivers behind their expected increase in SKUs, 39% of brand owner respondents that indicated an expected increase stated that printing technology that allows for cost-effective short runs was a key factor. This indicates that brands are becoming increasingly aware of digital printing and its benefits and are recognizing the advantages it can bring to them in the form of shorter runs of increased SKU quantities.

The top response to this question was consumer demand for more variety in their product mix, with 75% of brand owners stating this was a main driver of their increased SKUs. This indicates that as long as brand owners' consumer customers are expressing a desire for more product options to choose from, brands will seek to expand on these options to satisfy their customers' demands.

Figure 9: **Consumer Demand Drives SKU Proliferation**

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



n = 56 Brand owners who expect the quantity of their packaging stock-keeping units (SKUs) to increase in the next two years.

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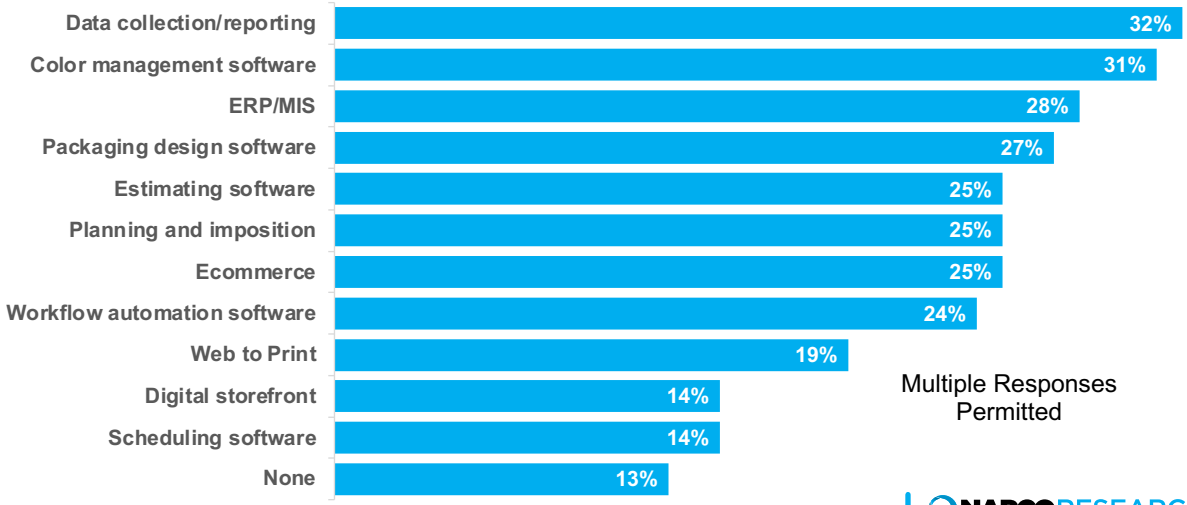
Meanwhile, converters from all segments report being tasked with producing an influx of SKUs. In this study, when asked if they had experienced increased customer demand for more SKUs, nearly half (47%) of converter respondents stated SKUs are on the rise. In addition to the challenges presented by the influx of individual jobs in terms of optimizing the use of printing equipment, printers and converters must also be cognizant of the software solutions they are implementing to help manage the rise of SKUs.

When asked which software solutions they are considering investing in within the next two years, the top response from converter respondents was data collection and reporting, with 32% of respondents indicating a desire to invest in this software. While not necessarily entirely correlated to managing an influx of SKUs, data collection and reporting software can help converters understand how each of their printing assets is performing, which are operating at their peak efficiency, and which types of runs are best suited for each press on the floor. Having this data at their fingertips, production managers can help assign jobs to the right equipment and ensure they are optimizing their end-to-end workflow by sending multi-SKU jobs, or short runs with many changeovers, to digital presses.

Similarly, 28% of respondents stated they are exploring an investment in Enterprise Resource Planning (ERP) or Management Information Software (MIS) systems in the next two years. These platforms are designed to help businesses maximize their resources and connectivity between multiple departments. As more SKUs and individual package versions are sent to converters, having these software systems in place can help manage the complexity of more jobs flowing through a shop.

Figure 10: **Converters Seek a Variety of Software Solutions**

Q. Which, if any, of the following software solutions are you considering investing in within the next 2 years to support your label and/or packaging production? Select all that apply



n = 104 package printers

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EXPLORING OPPORTUNITIES ACROSS APPLICATIONS

Though the label segment has historically seen the highest adoption rate of digital printing in the packaging space, opportunities have emerged in all segments with the rise of new digital printing platforms and enhancements to existing technology.

One of the most exciting opportunity areas for digital printing of packaging is in the flexible packaging segment. This is a high-growth segment, which the Flexible Packaging Association[1] cites as the second largest packaging segment in the U.S., at 21% of the total U.S. packaging market and accounting for $42.9 billion in sales in 2022. Flexible packaging applications, such as resealable pouches, stick packs, and sachets have been lauded by brand owners, consumers, and retailers for their convenience, portability, and ability to prolong food freshness compared to other packaging formats.

However, when it comes to printing, flexible packaging has largely been relegated to conventional processes such as wide-web flexography and rotogravure printing, which require expertise, a large physical footprint, and a higher capital expenditure than digital solutions. Additionally, finishing and converting of flexible packaging is a complex process compared to other segments, due to the construction and functional requirements of the end product.

Because flexible packaging has been so reliant on conventional printing, it has been largely relegated to bigger brands that had the high-volume work that conventional technologies thrive on. Therefore, it was also challenging to accommodate the short run desires of brand owners, and provide the increased versioning and SKU demands that have been on the rise. For smaller brands meanwhile, flexible packaging was often not a feasible option for their products, as they did not need the long runs of conventional printing, which may have been cost prohibitive anyway.

Over the past few years however, digital printing technologies have made their way into the flexible packaging space, primarily via the liquid electrophotographic platform from HP Indigo. Additionally, progress is being made with dry toner technologies and with aqueous inkjet, which is typically preferable to UV inkjet in direct food contact packaging — a common use for flexible packaging — due to ink migration concerns. As a result, smaller, startup brands now have the ability to package their products in the same high-demand flexible packaging formats as their larger brand competitors. It has also allowed for personalization opportunities, versioning, and variable data to be printed on flexible packaging, expanding on its potential usage capabilities in a variety of market segments.

Recognizing the opportunities in flexible packaging, converters have expressed a desire to explore digital printing options capable of producing these applications. Of the survey respondents that stated they are actively pursuing an investment in digital printing capabilities over the next 24 months, 58% stated they plan to produce at least some form of flexible packaging with the equipment.

Folding cartons were also among the top applications converters plan to produce on their newly acquired digital assets. Half of respondents that expect to make an investment in digital printing in the next two years state they plan to use the equipment for folding carton production. Technological solutions for folding cartons have emerged across all digital printing technologies spanning both liquid EP and dry toner, along with inkjet platforms designed specifically for these applications. Additionally, this is a segment that many commercial printers have also expressed interest in expanding into, particularly due to their familiarity with the sheetfed production processes often used for folding cartons, and because many commercial printers already have sheetfed digital devices that can handle carton stock.

Folding cartons offer a variety of benefits to brand owners as well, and are often lauded for their recyclability attributes, appeal to luxury brands, and their visual appeal via print enhancements. Unlike many flexible packaging applications, which are typically not curbside recyclable, paperboard-based folding cartons are almost always curbside recyclable, which gives consumers peace of mind that they are making a positive contribution to reducing packaging waste. Paperboard-based packaging is also often utilized by high-end brands, given its sturdiness and tactile appeal, which consumers often connote with luxury items, compared to those that are packaged in plastic.

Another paperboard-based application that is seeing sizable growth opportunities with digital printing is corrugated packaging. The rise of e-commerce has helped make corrugated a high-growth segment, as consumers are now receiving deliveries of goods directly to their home and reducing their reliance on brick-and-mortar retail. Though corrugated shippers are often brown boxes conventionally printed with one or two colors, the rise of both single-pass and scanning head digital corrugated platforms are making high-graphic, personalized corrugated packaging a reality.

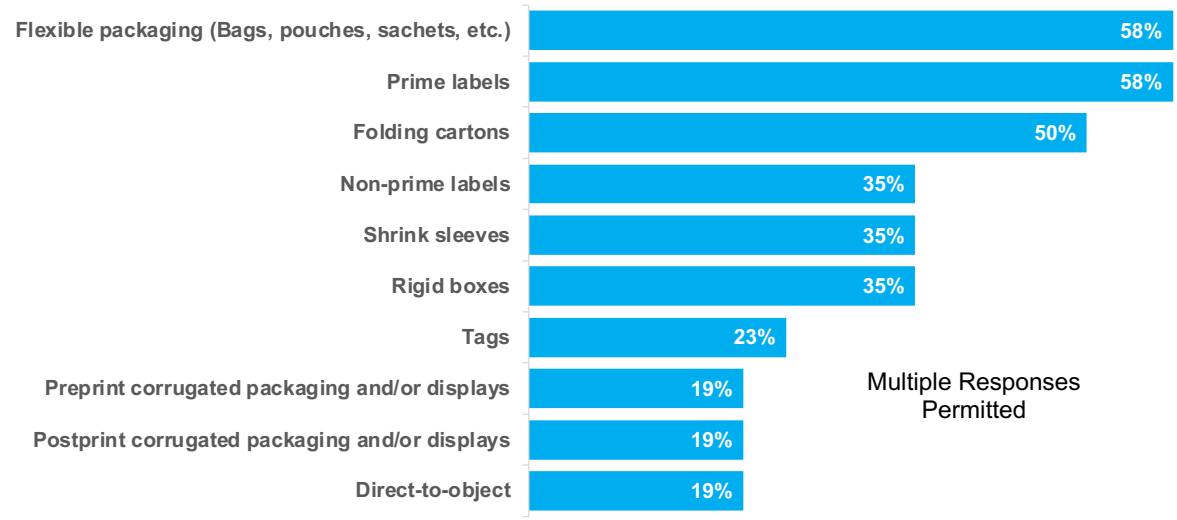
According to research from McKinsey & Co.[2], the rapid growth of e-commerce was occurring before the pandemic, with e-commerce responsible for approximately one quarter of retail sales. However, the pandemic and its subsequent lockdowns and quarantines greatly accelerated the growth of online retail, as consumer intent to buy products online increased by 40% to 60%, McKinsey reports, with the expectation that these consumer behaviors will remain intact in the post-pandemic climate.

As a result, opportunities are emerging for brands, online retailers, and corrugated packaging printers to enhance the shipping containers sent to consumers' homes in a variety of ways. One advantage that corrugated packaging in the e-commerce space has over packaging in brick-and-mortar locations is that the vendor has the consumer's data, and therefore can utilize it to personalize the package with the recipient's name or with targeted messaging.

The digital printing platforms in corrugated include both multi-pass and single-pass technologies and can be utilized for preprint and postprint applications. Each platform has its distinct advantages, so those interested in the segment can assess the speed and volume they require in production and proceed accordingly. Of those respondents eying an investment in digital technology in the next two years, 19% state they are looking into preprint solutions and 19% are exploring postprint.

Figure 11: **Converters Eye Multiple Applications with Digital**

Q. What applications do you plan to print using the newly installed digital device? Select all that apply



n = 26 Respondents that are actively pursuing a purchase of digital label and/or package printing equipment

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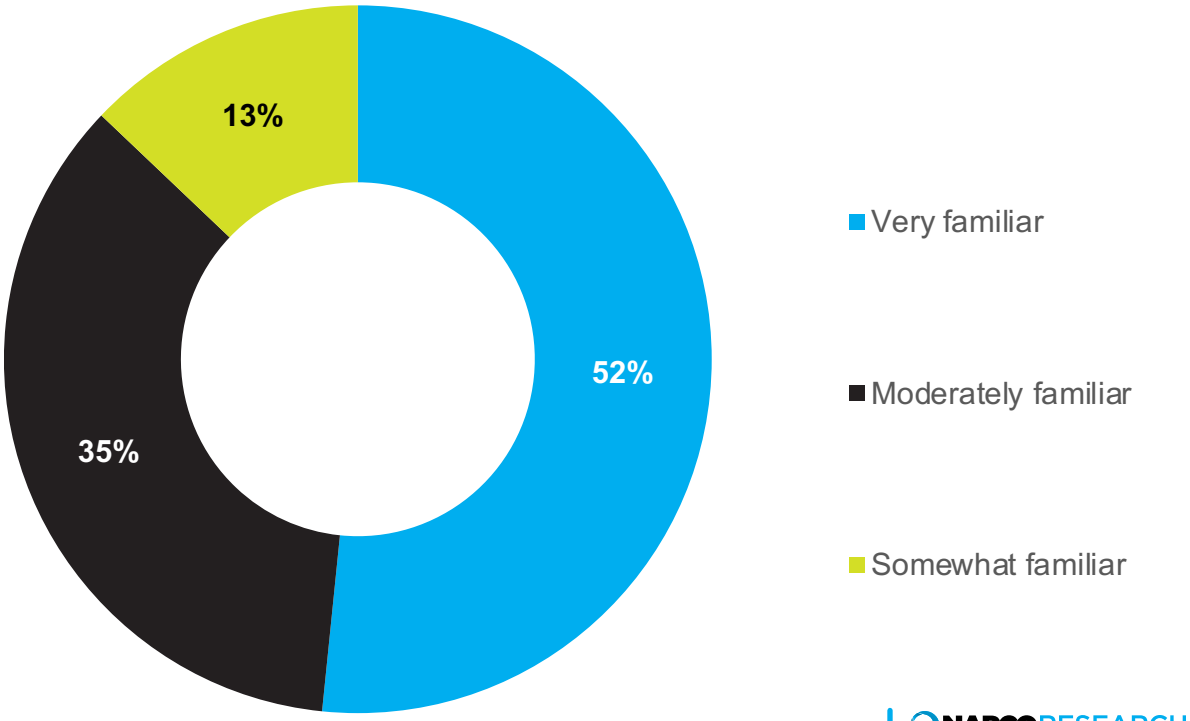
WHAT BRANDS WANT IN A PACKAGING PROVIDER

The days of brand owners having little to no input on the printing processes used in their labels and packaging appear to be at an end. Every brand owner respondent to this survey stated they have at least some familiarity with the printing technologies being used to produce their company's labels and packaging, with more than half (52%) stating they were very familiar. This indicates that brands have developed knowledge of the various printing technologies available and have some oversight of how they are implemented for their packaging.

Figure 12: **Brands on the Pulse of Their Printing Processes**

Q. What is your level of familiarity with the printing technologies used to produce your company's labels and/or packaging?



n = 93 brand owners

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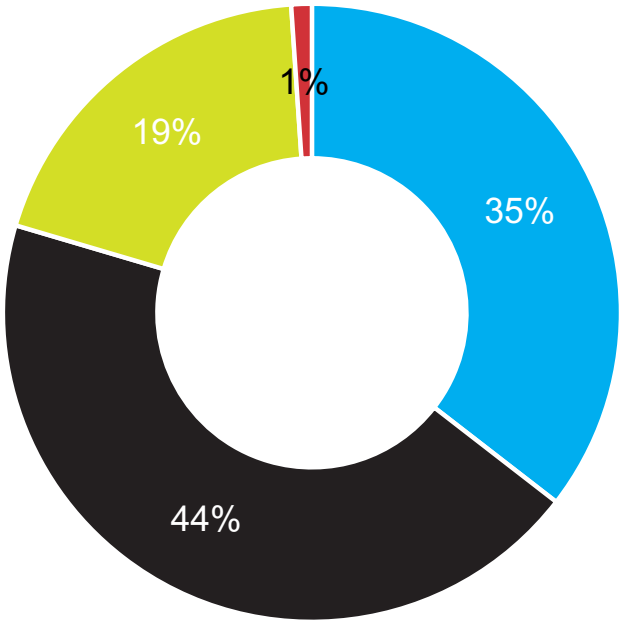
And not only do brand owners have an understanding of the print technologies being used, many are actively seeking out print partners with digital printing capabilities. When asked how important it is for their companies to work with package printers that offer digital printing, 79% of respondents stated that it is at least preferable, with 35% stating it is essential.

This is a positive indication for both brands and converters. In the early days of digital package printing, there appeared to be an education gap as converters began to learn the ins and outs of the burgeoning technology. However, that information was not as widely disseminated to brand owners, who took longer to fully grasp all of the benefits digital could provide. Now, not only are brand owners familiar with the differences among the various print technologies, but many are also making it a requirement.

Figure 13: **Brands Prefer Print Providers With Digital**

Q. How important is it for your company to work with label and/or packaging print providers that offer digital printing?



n = 93 brand owners

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This is evidence that brand owners are cognizant of digital printing's advantages, whether for short runs, creative opportunities with versioning or personalization, and fast turnarounds, among the many other benefits it provides. Printers and converters should leverage this opportunity to collaborate with brands about the potential benefits their digital assets can offer, and work with them to develop packaging campaigns that maximize digital's capabilities.

Brand owners, while expressing their preference for partners that offer digital printing have also expressed their desire for package printers to weigh in on print technology decisions. When asked to indicate the various stakeholders they rely on to determine the right printing process for their labels and packaging, it became evident that brands view the decision as a collaborative process.

In fact, the top two responses, with 45% of respondents each selecting these options, were the packaging printer and the brand owner packaging team. This indicates that while brands want the opportunity to discuss and ultimately select the print technology used to produce their packaging, they value and welcome the insight of their print partners. With this collaboration in mind, printers and converters can leverage their knowledge of digital's creative potential, while brands can contribute their perspectives on their brand identification and messaging. The result of this collaboration, backed by the power of digital printing technology, is sure to render highly innovative, engaging packaging, that will drive consumers toward purchase and enhance their overall brand experience.

CONCLUSIONS AND RECOMMENDATIONS

Now that digital printing has made noticeable inroads into all packaging segments, package printers and brand owners have moved beyond the introductory phase with the technology and are proactively implementing it to enhance their packaging campaigns. Additionally, digital printing's efficiency attributes are making cost-effective production of in-demand short runs and versioned product lines a reality.

Despite the increasing prevalence of digital printing in labels and packaging, it is also important to understand that it still accounts for a small percentage of overall printed output, and is typically best implemented as a complementary technology to conventional presses, including flexographic, offset, and gravure platforms. Because each technology offers its own distinct benefits, being able to offer brand owners the attributes of both conventional and digital printing will allow converters to serve their customers' diverse needs.

However, while digital printing is gaining adoption in segments where it had previously lagged, such as in flexible packaging and corrugated, it is still in its very early stages, and technologies are not as readily available for these segments compared to labels and folding cartons, which were earlier adopters of digital. In flexible packaging, liquid electrophotographic technology is the most viable digital technology for now, though dry toner and aqueous inkjet platforms are making strides. In corrugated, a variety of inkjet platforms, including scanning head and single pass have emerged and are leading to exciting opportunities, particularly in e-commerce. But before converters invest in any of these technologies, it is imperative they understand the complexities of these segments, including the nuances of the substrates and finishing processes.

Following the trends of the label and packaging industry makes clear that the drivers that led to digital printing's initial rise will continue to push the need for its adoption. Specifically, an increase in SKUs and versioning is expected, and will require converters to lean on their digital assets to accommodate their customers' expanding product lines. Additionally, reduced run lengths remain a reality, and converters will need to leverage their digital print capabilities to cost effectively produce these low-volume requests, while freeing up their conventional presses for long-run work.

Communication with brand owners is going to be paramount moving forward. Brands have made it clear that they want and appreciate the benefits of digital printing, but ultimately put their trust in their package printer partners to weigh in on the print process used for their packaging. Brand owners are becoming increasingly knowledgeable of the benefits that digital provides, and converters that proactively collaborate with their customers will ensure they are maximizing the power of their digital equipment to achieve new heights in label and packaging production.

REFERENCES

[1] State of the U.S. Flexible Packaging Industry Report, 2023, Business & Economic Research Division, Flexible Packaging Association

[2] Jiamei Bai, Frances Fu, Rushan Guan, Steve Hoffman, Peeyush Karnani, Mihir Mysore, and Sarah Touse, Solving the paradox of growth and profitability in e-commerce, McKinsey & Company, Dec. 20, 2021, mckinsey.com/industries/retail/our-insights/solving-the-paradox-of-growth-and-profitability-in-e-commerce

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WHO WE ARE

BOBST

We are one of the world's leading suppliers of substrate processing, printing, and converting equipment and services for the label, flexible packaging, folding carton, and corrugated industries.

Founded in 1890 by Joseph Bobst in Lausanne, Switzerland, BOBST has a presence in more than 50 countries, runs 19 production facilities in 11 countries, and employs more than 6,100 people around the world.

As a leading technology company in the packaging world, we shape the industry, with BOBST holding the No. 1 or 2 position in each segment. All members of the Group are leading – and ensure continuous innovation. We shape the future by developing new business models. We anticipate the transformation of the packaging world by expanding our technology reach. Across labels, flexible packaging, folding carton, and corrugated board, we gain insights to sustainably support our customers to answer the current and future consumer needs – and to respond to the challenges of brand owners, retailers, and e-tailers across a flexible and agile workflow.

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WHO WE ARE

CloudLab

CloudLab develops innovative and flexible online solutions for the graphic arts industry. After the great success of the web to print system printQ, CloudLab revolutionized digital packaging design with packQ as well as improved their functionalities. Everything is modular, expandable, enormously scalable, and comes from a single source.

As a young startup, CloudLab revolutionized the market for online printing solutions in the early 2010s. Since then, the company has been able to acquire many large printing and packaging customers worldwide, including Cimpress, Avery, Lindt, and many more. CloudLab has an international team with offices in Dortmund, Berlin, Iași, and New Haven, CT.

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WHO WE ARE

durst

We are a global manufacturer of advanced digital printing and production technologies. We concentrate on efficient and environmentally friendly production technologies that are facilitated by digital change. Our core business is digital inkjet printing and the associated ecosystem of inks, software, and services. We offer holistic solutions in the following business areas:

- Graphic Business: Large Format Printing, Textile, Corrugated & Folding Carton
- Label & Flexible Packaging: Label Digital, Label Hybrid, Specialty Packaging
- Software Ecosystem

As a third generation, family-owned company, we have independence and financial strength that allows us to take long term views and constantly invest in R&D. A global leader in the development of inkjet systems, we can react quickly to market needs and requirements, and strive for customer success and quality in all of our actions. We gain loyalty and respect from our customers and employees by offering innovation and solutions of the highest quality.

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WHO WE ARE

Let's be brilliant. Together.

EFI™ is a global technology company, leading the worldwide transformation from analog to digital imaging. We understand you want breakthrough technologies to lead you through your digital journey. That's why we're passionate about driving your business growth with a scalable portfolio of products, solutions, services, support, and world-class partnerships for the manufacturing of signage, packaging, textiles, ceramic tiles, building materials, commercial print, and personalized documents with a wide range of printers, inks, digital front ends, and workflow software. Our unwavering commitment is to increase your profits, cut costs, improve productivity, and optimize efficiency — job after job, year after year. We're obsessed with your success. And we definitely believe we have the right people, technology and experience to help your business achieve its goals.

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WHO WE ARE

Elitron
ROBOTIC CUTTING INTELLIGENCE

With three decades of expertise, Elitron excels in producing award-winning digital finishing systems and automation solutions for precise and efficient packaging production.

From compact cutting tables to fully automatic finishing systems, Elitron ensures high productivity, and best-quality results, empowering customers with innovative cutting technology.

Highly qualified engineers and technicians manage the entire production process, from the initial project development to the realization of the final product. Not single products, but integrated systems for a stressless working process.

Each cut is technology, passion, and challenge. Our goals are precision and efficiency, with maximum automation for high productivity where required.

Elitron develops each project by working closely with customers to offer solutions capable of fully satisfying their production requirements today, while always being prepared for the challenges of tomorrow.

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WHO WE ARE

Landa DIGITAL PRINTING

Landa Digital Printing was founded by Benny Landa with the purpose of liberating printers from the barriers inherent to traditional digital and conventional analog printing. Thanks to Landa's unique Nanography® technology, Landa Nanographic Printing® Presses produce stunning images of extensive color range, designed to print at any run length, on coated or uncoated media, and in fast turnaround times.

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WHO WE ARE

SCREEN

SCREEN provides pioneering inkjet solutions across a variety of graphics and print markets including label and packaging as well as direct mail, commercial print, and publishing. Our flagship Truepress Jet L350UV Series label press heads a growing portfolio for the label and packaging markets, including new solutions for flexible packaging, paper pouches, and small folding cartons. SCREEN first introduced high speed continuous feed inkjet printing in 2007 and our combination of robust engineering and simplified cost and service models drives the lowest operating costs and highest uptimes in the industry.

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WHO WE ARE

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NAPCO Research crafts custom data-centric solutions that leverage our highly engaged audiences across the markets in which we operate, our industry subject matter experts and in-house research expertise. We partner with our clients to identify their unique business problem and create solutions that enable deeply informed decision-making.

NAPCO Research can help with:

- Business goal prioritization
- Opportunity discovery
- Market segmentation
- Landscape insight
- User needs and wants
- Product features and functionality
- Content marketing strategy
- Sales strategy and tactics
- Market conditions
- Benchmarking
- Industry trends
- Brand awareness

Contact research@napco.com to talk with our analysts to find out how we can help you with your research needs.

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