

The right impression

Manufacturing & Logistics IT spoke with a number of experts from the vendor and analyst communities about recent developments in the world of printing & labelling technologies.

This report will consider a host of current key discussion points and recent and ongoing areas of innovation and development with the printing & labelling space; one of the most vibrant and fast-changing technology areas actively deployed within the manufacturing, logistics and retail fields. Michael Dizdar, project manager, Panorama Consulting, opens the debate by observing that labels are moving away from being a display mechanism for static, dated data. "Gone are the days where a label was printed two days' ago when a pallet was received (and may or not be correct at the current time) to a vessel that can give updated and changeable information based on transactional events and environmental factors," he said. "New labelling advances from companies like Thinfilm allow real-time temperature data to be produced accurately and timely based on the needs of the current user, not what was produced in the past based on stale information."

In terms of drivers for change, Dizdar makes the point that the pervasiveness of technology into

the day-to-day lives of consumers has significantly impacted the changes in the labelling and printing environments. An end-user of a label mostly likely has a 'smartphone', has played a new video game, and/or interacted with a kiosk at the grocery store – maybe all within the last day," he said. "This ease of technology understanding and adoption has driven advances to end user labelling and printing requirements."

Viroop Narla, mobility research analyst, Frost & Sullivan, considers 3D printing and the technology's impact on the automotive industry. This, he states, has primarily been in research and development (R&D), but OEMs are turning the corner into commercially printed parts for mainstream production. Frost & Sullivan research indicates that in 2014, 90% of 3D printing applications in the automotive industry were for prototyping and 10% for production, enabling OEMs and suppliers to:

- Create proof of concepts with localised manufacturing.
- Fabricate complex and unique production

tools such as jigs, fixtures, and moulds.

- Prototype parts, such as Ford's 4-cylinder EcoBoost engine and F-150 exhaust manifold.

By 2025, new US OEMs such as Local Motors are expected to increase adoption of microfactory business models to:

- Print parts at authorised representative locations, reducing supply chain complexities and cost.
- Expand crowdsourcing and collaborative design to capitalise on a diverse talent pool.
- Enable convenient and quick vehicle servicing to maximise customer satisfaction.

Expansion of 3D printing in the value chain is expected to face multiple challenges, such as:

- The high cost of 3D printing machinery and materials.
- Conventional component manufacturers lobbying governments against 3D printing.
- Customer patent infringement implications for OEMs and suppliers.

A shift from 3D prototyping to production is expected by 2030 due to:

- An expected 40% reduction in raw material prices for 3D printing.
- Price similarity: A conventionally manufactured part now is 78% cheaper than one that is 3D printed; the gap is expected to shrink to as low as 11%.

Gartner analysts, Michael Shanler and Pete Basiliere, comment that the 3D printing (3DP) industry continues to see growth, innovation and many new players. "While several of the seven 3DP technologies have existed for nearly 30 years, those early tools had limitations to speed, quality, resolution and performance," they said. "They provided limited value to enterprises beyond prototyping in manufacturing. Over the last five years, the 'maker movement' catalysed numerous 3DP activities and inspired 3DP solution vendors and end users alike to begin leveraging 3DP in ways to create brand new values and societal impacts. Many industries have moved beyond leveraging 3DP in experiments and will be approaching an inflection point within the next five years, where executing on 3DP is industrialised into the value chain."

Shanler and Basiliere added that, recently, major aerospace and automotive companies have leveraged 3DP to create new products and assemblies that were previously impossible to build or to shorten delivery times on orders. "New materials have been 3D-printed in the retail industry to create new aesthetic and performance characteristics, as well as to satisfy consumers' growing appetite for personalised products," they remarked.



Pete Basiliere, analyst,
Gartner

Shanler and Basiliere also make the point that the medical device and healthcare community has moved toward improved patient outcomes and reduced cycle times by delivering 3D-printed personalised dental devices,

hearing aids, implants and surgical tools. However, they comment that while there are a lot of 3DP technologies that have promise and have moved beyond the proof of concept phase at companies, not every organisation is ready to adopt. Further, merely adopting 3DP in a vacuum can be a recipe for disaster, they said, adding: "The majority of organisations still need to adapt or create new internal processes for handling 3DP workflows, data, hardware, supply chain management and products. The mainstream media, vendor capitalists (VCs) and vendors are still creating a very 'hyped' environment where 3DP can solve everything – from 3D-printed food to end world hunger to creating body parts so people can live forever."

Internet of Things

David Stain, senior vertical marketing manager EMEA manufacturing, field mobility & healthcare, Zebra Technologies, comments that developments we see taking prominence are the need to bring the Internet of Things (IoT) to life in the printing/auto ID world. This, he explains, is about making the print devices visible across the user estate where there may be several hundred or thousand devices, flagging their status, use rate and being able to manage them from a central location.

Configurability

Another development of note, according to Stain, is the appreciation that the labels themselves have become much more configurable by use case; for example, new RFID tags designed specifically to work better on metal components, shelf-edge labels that peel away more easily when being replaced and wrist bands for medical applications. Stain considers that the drivers for change can be characterised as follows:

- Customisation. "Both end user and enterprises want products and components that are right for them. Hence we are seeing mass customisation or product variants being produced to fulfil this need."
- Visibility. "In a connected world, all devices need to be connected and indeed the outputs of a printer – the tag or label – enable the connectivity by giving a digital

voice to the item it is placed on.

More and more we are seeing, however, the need to connect the printer to the network so status can be observed. Also, the ability to connect quickly to other peripherals such as scanners or mobile computers is key to efficiency and intelligence."

- Availability. People will wait for goods and merchandise if they get accurate and convenient delivery commitments. Those that won't will shop around, so inventory visibility is key and getting the stock to a convenient location for the customer just as key. Track & trace is vital to both."



Michael Dizdar,
project manager,
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Centralisation and standardisation

Ken Moir, VP marketing, NiceLabel, comments that, first, there is more centralisation and standardisation taking place because companies want to increase the agility of their business. "These types of process optimisation benefits can mean companies are able to ship product faster, sell more product, have less downtime, have less product returns, reduce inventory, mitigate the risk of mislabelling etc. – these are the key drivers for change," he said. Also, Moir points out that web technology now allows companies to do client-side web printing. "This is now fully usable," he said. "The latest web technology doesn't require Silverlight or Flash plugins, and doesn't require administration rights for users to install software locally. So web-based technology can now be deployed anywhere across the extended supply chain for any authorised user. It can be deployed across your own business, your stores, your franchises, your suppliers, your contract manufacturers or your 3PLs etc., and all be controlled centrally."

Moir adds that the latest integration systems and service buses also allow companies to take advantage of universal templates and

print from any device on any operating system. "So a big part of the story here is mobility; it's not just PCs that you can print from, it's also tablets and android devices," he remarked. "Most retail stores and warehouses use mobile devices and it's now easy to actually print from these devices. You no longer need to hard code or generate and embed printer command templates in your applications. This is what NiceLabel calls next-generation mobile printing."

Previously, explains Moir, some vendors would offer template printing solutions whereby users could design a label, print it to file, take the printer command language and embed it within their application. "However, what users now want are universal templates," he said. "Integration systems now make it easy for iOS, Android etc. to print universal intelligent labels; they don't need to store separate templates for different mobile devices. It's now easy to integrate mobile computers into label management systems (LMS) so that users can print to any printer, whether mobile or fixed. It doesn't matter what printer you use. The point is that mobile, desktop or tablet computers can be easily integrated into LMS."

In terms of the key drivers for change, Moir comments that, in addition to reduced product returns, reduced inventory, reduction in labelling errors, etc., there are drivers concerning legal compliance. "In life sciences, the FDA UDI deadline recently passed in the US," he pointed out. "The next thing regarding medical device manufacture is going to be the



David Stain, senior vertical marketing manager EMEA manufacturing, field mobility & healthcare,



EU medical device directive. In pharmaceutical, there will be further changes regarding serialisation and track and trace over the next couple of years. This is all naturally driving the need for a more centralised, standardised labelling methodology."

Greater business efficiency

Ioana Nitu, product manager at ICT services provider Brother UK, states that the main function of mobile and label printers in the manufacturing and logistics industry is to increase business efficiency by allowing employees to print simply, quickly and easily while on the move, and this hasn't changed. However, what has changed in her view is the capabilities of the technology in facilitating this, and that is what is steering the biggest trends at the minute. "As businesses across all sectors, including this one, broaden the devices they're using, connectivity has become more important," said Nitu. "Manufacturing businesses are investing resource into innovative new technology to help employees work more efficiently while reducing costs, and any print systems need to be compatible with these."

Running almost parallel to this, according to Nitu, is the growth of different technology used across businesses and the impact this has on how easily these different devices integrate. "As technology develops, businesses are continuously trialing new software and hardware, making it more and more challenging to ensure these different systems are compatible with each other," she said. "We're finding that customers, now more than ever, want mobile printers that integrate easily with existing systems and cause minimum disruption."

Additionally, Nitu considers that the evolution of technology over the past decade has raised the bar in terms of customer expectations. "In everyday life people want solutions which have an instant impact with minimal inconvenience, and this is certainly the case in this sector," she said. "Customers are looking for high-speed, compact devices that increase business efficiency and empower employees from any location."

Nitu added that the speed that technology has developed in recent years has led to a continuous need for investment in Brother's products. "All of our solutions are designed with the customers' needs front of mind, and we spend a lot of time understanding the sector and the challenges they're facing to ensure our products can help meet these needs," she said.

"Our mobile print solutions seamlessly integrate with industry-leading software, meaning the set-up and incorporation of the technology into existing systems is straightforward. We've also invested in the range of connectivity options available on our products, helping to ensure they're compatible with both iOS and Android devices. Print speed has always been a key feature for us, coupled with the continued need for reliable, hardwearing and compact solutions."

Mari Waldron, global business development manager, Honeywell printers, points to key areas of development as being simplicity, ease-of-use and connectivity – with command language auto sense, printers automatically analysing incoming data streams. This, she explains, means a user can pull the printer out of the box and immediately start printing, which makes the start-up process quick and simple for the end user. "Customers have come to expect user-friendly design, including a large, multi-colour touch screen with easy-to-use commands," said Waldron. "This is driven by consumerisation trends, which means a familiar interface and compatibility with consumer devices, such as smartphones."

In terms of motivation for change, Waldron believes the Industrial Internet of Things (IIoT) and the need for connectivity is driving retailers, manufacturers and supply chain firms to invest in technology to enhance their business performance. She points out that companies look to connected devices to improve flexibility, efficiency and profitability.

Increased adoption of consumer technology

In addition, Waldron explains that Honeywell customers place a strong emphasis on ease-of-use when it comes to technology for their workers. "This is partly driven by an increased adoption of consumer technology," she said. "Workers on a manufacturing or distribution centre floor expect the devices they use to be familiar and intuitive. This is particularly important when hiring and training new workers. For seasonal workers hired during peak times, a printer must be easy to use in order for the new staff to be productive in a short amount of time."

Jörk Schüßler, marketing director EMEA for Citizen Systems Europe, maintains that omnichannel, mPOS and reverse logistic are some of the most interesting current talking points where printing and labelling is involved. "For example, customers now receive and return goods in a variety of ways, which can be challenging for warehouse and logistics operations," he said. "To ensure this process is efficient and not overly costly for the goods provider, it requires perfect integration. For instance, let's say a customer who ordered something online opts to pick up the merchandise in store but return it via a courier if they decide not to keep it. The customer will receive a receipt from the store, and also a returns label to send back the goods. This places different demands on printers. The way to overcome the challenge is to combine the use of mobile POS and label printers or box printers, and perfectly integrated them – through Wi-Fi or Bluetooth – into the shop's retail system."

Regarding motivation for development, Schüßler explains that these changes are simply driven by the changing world and the different demands of shoppers. "Potential customers are always online nowadays and they expect the same from shops," he said. "They demand the same user experience from the tools they use at home as they do in their professional lives. The line between private and professional IT is blurring more and more, with the user experience becoming a critical factor in the success of implementing different technologies."

Laurent Lassus, general manager marketing & product management, SATO, believes the most current trends in printing and labelling are connectivity, more intelligent printing and mobility of equipment, and that they all relate to the wider Internet of Things (IOT) megatrend. "End users are demanding printers that easily connect to the network and can communicate through a number of

ways; for example, Bluetooth and WiFi," he said.

Lassus added that printers with intelligence onboard, such as SATO Application Enabled Printing (AEP), mean that separate printers and PCs are no longer required. "An application-enabled printer not only has its own internal processing power – so it can connect to other devices such as weighing scales, a handheld barcode scanner, or a keyboard, and it can print without the need to connect to a PC – but it is designed to be readily reprogrammable," said Lassus. "With increased intelligence, printers can also monitor their status, reporting back to the maintenance team 24/7, and alerting them before any problems occur. This reduces downtime as well as unnecessary regular service costs."

Also, Lassus explains mobile printers that are portable and easy to operate allow users to print on the move, where and when required, regardless of having to be near a power supply or infrastructure. In Lassus's view, drivers for development include the continual need for businesses to work more efficiently, and streamline operations, with the adoption of Cloud-based technologies.

Optimisation

Gartner analyst, Lai-ling Lam, states that providers can no longer rely on the success formulae of print hardware and supplies to thrive in this industry. Printing cost, being one of the nonpriority expenses, was high on the cost-cutting lists of most organisations. To control printing costs, Lam points out that organisations have embarked on projects to optimise their printing fleets, reduce hardware purchases, and control excessive printing and supplies usage. As a result, print volume has shrunk, followed by lower consumables sales. Total end-user spending on printers, copiers and multifunction products (MFPs) has declined for the past five years. In 2015, total end-user spending on printers, copiers and MFPs declined 6.2% while consumables spending for enterprises shrank 13%, and the outlook for the next five years is not expected to improve despite having small pockets of growth, such as production printing. Lam comments that adoption of print management tools to track and monitor printing

patterns also helps organisations to manage printing activities. "As electronic business and communication processes gradually replace paper, organisations are reducing costs by moving pages from printed to digital form and printing only when and where they truly need physical documents," she said.

Print providers, in turn, evaluate, transform and adapt to a maturing technology market and businesses' impending challenges, commented Lam. "The need for organisations to manage printing costs and move content freely back and forth from physical to digital is creating opportunities for providers," she said. "The need to better manage printing costs in organisations led to the growth in managed print services (MPS) over the years. As organisations seek to digitise their work processes and manage their workflow more efficiently and effectively, print providers are investing in expanding their range of solutions, such as data capture and retrieval solutions, document management services and managed content services (MCS), that help companies to this end. Investment in high-volume digital printing technology is increasing as print service providers gradually shift from offset to digital printing."

Lam added that the growing trend toward Cloud delivery, digital transformation and global adoption of mobile devices leads to revenue opportunities for print management solutions and a possibility for managed IT services that extend beyond printing.

Printable electronics and the packaging industry

Mike Hopkins, project manager, CDi Yorkshire (a special interest group of the BPIF), explains that the increase in the use of smartphones and the incorporation of printed electronic solutions and printed logic into consumer products is creating a global billion-dollar industry. "In 2013, over 967





Ken Moir, VP marketing,

NiceLabel®

million smartphones were sold to consumers worldwide and it is projected that by 2019 sales of smartphones will reach over 2 billion," he said. "The capabilities of smartphones and the way in which we use them has changed since the first

smartphones came onto the market in the late 1990s. Today's smartphones include touch-screens, high-speed internet access and NFC (near field communications) which has altered the way we interact with people, and objects, conduct business and make purchases."

As the market opportunities and demand to incorporate NFC into smart products grows, Hopkins points out that so does the demand to produce high-volume printed electronic components at low cost. "This is essential to extend the reach of electronic intelligence into everyday objects, where conventional silicon-based electronics is unsuitable," he said.

The BPIF is involved with project SCOPE, the aim of which is to develop new processes, equipment and applications – in essence building a UK supply chain – in order to meet the growing demand for high volume (billions or even trillions) units incorporating various components, at low cost. It will also provide a technology platform to develop new, innovative and ultimately more complex and novel functionalities and applications, build skills and capabilities and strengthen the UK supply-chain.

Initial concepts have been carried out to develop low-cost, high volume, printed logic for integration into labels, for smart packaging and product branding on fast moving consumable goods for the end user. Initially prototypes were produced using a combination of conventional and printed electronics, including Labels incorporating LEDs, used for promotional purposes by one of the UK's major fast moving consumer goods manufacturers. While the prototypes demonstrated the potential for printed electronics, the concepts have been

predominantly manufactured with conventional electronic components. The project is continuing to work to overcome the challenges of creating a hybrid label which will be manufactured with both conventional and printed electronics that is able to survive the rigorous application process and post labelling electronic quality control.

Hopkins explains that the printing of electronic functionality will enable designers to embed technology into their designs, creating innovative components that are smarter, lightweight and wireless without the need for expensive and rigid silicon chips. "Typically, the technology has been embedded into RFID (radio frequency identification device) tags used for tagging and tracking purposes," he said. "These electronic tags (circuits) contain data which can then be transmitted back to an antenna using radio frequency signals. But NFC is an emerging technology which goes one step further. An NFC chip, which is embedded into a device, operates as one part of a wireless link. Once it is activated by another chip, data can then be gathered and transferred between the two devices when held a few centimetres apart."

Hopkins adds that printable electronics is moving from niche applications into more lucrative mainstream applications. One such application area is packaging and labelling. "As the unit price for a printed electronic system falls, smart packaging is set to become a reality and may even evolve into what futurists are heralding as an 'Internet of Packaging'," he said. Hopkins observes that brands, packaging companies and retailers are all keen to embrace this technology for applications such as:

- Anti-counterfeiting/brand protection.
- Consumer management.
- Logistics track and trace.
- Monitoring a pack's contents.

"All of these functions can be framed within the umbrella term 'smart packaging' as a set of technologies that allow packaging to contain, evaluate and transmit relevant information," he said.

Back-office relationship

In terms of the relationship between some state-

of-the-art Printing and Labelling systems, what do you feel have been some of the key recent changes? Nitu believes this ties into the growing trend for seamless integration. "Businesses are looking for one solution to help them increase business efficiency and cost savings," she said. "Our customers don't care if it's different companies providing these services, so long as they work together as one solution which is why simple integration is key." Nitu adds that due to the flexibility that technology has offered businesses, customers are also now demanding bespoke end-to-end solutions that serve their specific needs. "No one business and their requirements is identical, so it's important ICT services providers spend time understanding the company and ensuring its mobile print or labelling solution is going to achieve optimum results," she said.

Dizdar considers one revolutionary change to be the increasing incidence of data that originates outside of the 'system' (ERP/CRM/WMS, etc.) and ends up being printed via a label or other 'hard copy' means. "Data collection is no longer restricted to the four walls of a facility," he said. "Instead, information can be obtained via any number of devices – whether a personal phone, an anchored RFID reader, or a camera attached to a traffic light. These different collection mechanisms are driving consistency and openness with the ERP/CRM/WMS vendors in order to allow their customers ease of integration and use."

Waldron considers that, increasingly, users are wanting to print their own shipping label directly from their smartphones to reduce cost and increase speed. "It is important for printers to integrate with smartphones – supporting the major mobile operating systems – in order to seamlessly connect the devices," she said. "For example, a consumer needs to ship a parcel. He or she books the shipment with a smartphone app and takes the parcel to a store to ship. Using the



Jörk Schübler, marketing director EMEA, CITIZEN Micro HumanTech



Lai-ling Lam, analyst,
Gartner

phone's camera, the consumer scans a barcode from the store's printer screen, which pairs the device to the printer and communicates the shipping data. The printer immediately prints the shipping label, thereby saving time and giving the shopper a user-

friendly process. Honeywell's PC43d printer offer a hi-res, colour display to enable this process." Another trend highlighted by Waldron involves the use of smartphone apps and mobile printers in transportation & logistics space. "Delivery drivers are being utilised for other doorstep services, such as collecting parcels, for which a receipt or label would be needed," she said.

Stain believes touch to pair on devices is without a doubt of massive benefit to enterprises that see a huge time saving as configuring printer to scanner or mobile computer, is done in seconds – almost like the speed difference between contactless card payment transactions and the PIN number method. Stain also makes the point that manufacturing is in the midst of Industry 4.0 (the 4th Industrial Revolution). "That means one of the key elements is better visibility of material flow through the line extending right back to the supply chain = AIDC and RFID deployment," he said. "Transport & logistics business are seeing parcel delivery increasing and the need for accurate time slot of delivery. Waiting in all day for a parcel is no longer acceptable for the consumer. 30- and 15-minute delivery windows are here along with a stream of notification capabilities to the customer on status of delivery."

SaaS and Cloud

In terms of device integration, Stain points out that Zebra offers Cloud Connect, which allows Link-OS printers to interact with the Cloud. It also drives areas such as SAP or Oracle ERP integration as well as Zebra's Link OS PDF Direct capability that allows the printing of PDF documents without middleware. Stain explains

that integration can, of course, cover everything from document design and device integration through to device management and developer tools. Regarding developer tools, he thinks it is important that users provide an SDK developer kit to their suppliers to allow them to use the app in the way that suits them best. This, he adds, can also enable the devices and the Cloud platform to connect better.

Stain said many of the Cloud challenges that Zebra comes across are around what the company terms terminal emulation, for companies that want their brand on the label, and also want standard format and standard label sizing. "These companies want the format of that printer to be able to be emulated across all the devices on their estate," he explained.

"This is an area where the Cloud can really reap benefits because you can place your template in the Cloud for, as an example, front of store for houseware and this can then be downloaded by each store as a when they are need it."

Convenience

Stain adds that in the retail world 'convenience', is becoming the watchword; hence the click & collect and home delivery markets are developing to fulfil the consumer need, as well as seeing into other store branches' stock levels to check availability. In terms of the healthcare market, Stain points out that Positive Patient ID is the cornerstone of secondary healthcare. He also makes the point that, with the digitalisation of records, administration of the right treatment and medication is now much more accessible. "In hospital, that means giving the patient a digital voice via a wristband," he said.

Lassus believes the methods of communications have seen the most development. "Bluetooth-enabled printing has been available for a number of years, but now printers are being built with SIM cards and 3- and even 4G capabilities," he said. "Near field communication (NFC) is also being introduced into equipment which allows users to simply copy the settings from a printer to an Android phone, so they can send the same settings to other printers while they are switched off. The NFC also allows users' phones to view some of the printer's settings which is an advantage for service."

Moir points out that SAP is the ERP system of choice for many companies, particularly the larger ones. "We realised that more and more companies wanted to deploy LMS and see previews of labels inside SAP before they printed them as finished labels; basically, they wanted to see the label with the master data in the ERP system," he explained. "However, there wasn't an easy way to get a preview into SAP from LMS. Realising that some of our clients had spent a considerable amount of time trying to achieve this, we decided to develop an add-on for SAP, which has proved to be very popular with our customers. We are now looking to develop similar pre-built solutions for other systems so that more companies are able to achieve faster time to value."

In Schüßler's view, one key change that stands out is the relationship between mobile and back-office systems, which is so close that they have to become one system. "This combination helps enterprises to work more efficiently by reducing time and increasing precision," he said.

Convergence

What are the current key discussion points concerning convergence within the printing & labelling technology space? Dizdar comments that convergence is a consequence of technological advancement, thus it is a positive force for the end user and the marketplace. "End users are going to continue to demand increasing functionality from any technological device in the future," he said. "Technology that can only perform a single task is going to be seen as outdated when compared to other multi-function technologies. For example, the ability to take a picture via a smartphone is now commonplace; thus for many purchasing a camera to take pictures is now unthinkable. From a printing/labelling perspective, a movement towards multiple functions (with printing as one of the basket of functions) for a device will be seen as commonplace and



Virop Narla, mobility
research analyst,
Frost & Sullivan

necessary at a minimum.”

Moir believes there will be an increasing level of convergence in terms of, for example, labelling and direct marking solutions. A good case in point is the dairy company he referenced earlier, which has adopted a NiceLabel LMS solution that satisfies both its labelling and marking requirements. Moir is also seeing convergence in the ability to access label master data from ERP and MES on mobile devices such as smartphones and tablets; as well as on desktop PCs. “Again, the requirement for greater standardisation and centralisation is driving conversion,” he said. “We also see that more and more companies want to reduce IT complexity because this also helps to reduce costs and unplanned downtime, as well as save time and increase agility.”

Schübler sees the convergence trend as very positive. “The acceptance is much higher and it offers the chance to choose best of breed solutions,” he said. “Besides that, IT isn’t any longer a secret or bad things. Most people fully understand that it is making their work life and private life much easier.” Lassus also believes the convergence of technology is a good thing for manufacturers. “With printers using the same common languages to communicate, installation and operation will become much easier, so users can ensure their workplace runs more efficiently,” he remarked.

In general, Waldron considers technology convergence to be a positive trend. “Today, businesses face constant pressure to do more with less,” she said. “More often, enterprises are looking at Smart Printing, in which the printer runs apps and doesn’t require a computer, to support convergence. This can help reduce

costs as a company does not need to invest in additional computers to support their printers. Smart Printing also leads to decreased energy consumption, a smaller environmental footprint and efficient use of valuable space. We also see this in the field for



Michael Shanler, analyst, Gartner

connecting mobile workers and enhancing productivity. Logistics and direct-store-delivery firms are implementing PrintPads which combine a mobile computer and a printer, vehicle-mount printers and wearable printers.”

Stain explains that Zebra is putting labels on hot ingots of steel for Tata Steel. “If you have this type of convergence capability regarding adhesives and labelling within the business it starts to open up many more avenues of application,” he said. “I think part of the challenge for many print companies is they don’t have a print supply business, whereas Zebra does. In terms of marking, from etching through to direct part marking, our scanners can read both.” Stain added that tap to pair is another convergence where NFC enables printer and scanner to be paired swiftly.

Stain considers that technology will continue to advance, but believes we need to remember that many enterprises want scalability. “So even though sensing technology could be seen as a threat to the printed barcode, having a portfolio that embraces both positions the supplier in a more strategic light with customers as it gives them choices as to which technology to deploy based on use case and density of visibility needed.”

The future

What might be the next key innovations/developments to look out for over the next year or two within the printing & labelling technology space? Dizdar anticipates continued development of the ability for a printed document or label to give ‘real-time’ information in a proactive instead of a reactive manner. “Instead of a label ‘waiting’ to be accessed by a user, the label will utilise rules and data to determine when to inform due to changes in the entity that is labelled,” he said. Another development, states Dizdar, is to continue to allow for a user outside of a closed system to access data via a label or printed document. “This will allow organisations to market better transparency between themselves and the end customer due to the end user’s ability to access data via labels or printed material,” he explained.

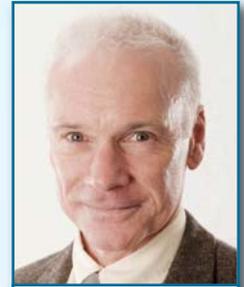
Schübler reflects that labelling & printing are commodity solutions nowadays.

“They might be enhanced in a way that they are APP like and web-based systems, so for the next year or two I think usability might be the main focus,” he said. Waldron

believes linerless media presents interesting, environmentally friendly opportunities in printing and labelling in industrial applications. “When printing linerless labels, backing paper, which may end up in land-fill, is eliminated,” she explained. “In addition, there is no risk of workers slipping or tripping over any backing paper hanging off a printer in linerless printing.”

Waldron added that the future of the printing & labelling marketplace will be dynamic as companies look for ways to reduce costs and increase productivity. “Consumers and retailers are increasingly moving away from printed receipts and instead receiving their confirmations and invoices by email,” she said. “Printer manufacturers need to continue to find new ways to deliver solutions that still provide Return on Investment where demand is reduced.”

Stain believes we will see the 2D barcode get a lot smaller; to micro label size. “This can be very valuable from a security and authenticity (fake product) standpoint, for example,” he said. “Zebra has already supplied micro labelling to a number of electronic manufacturing businesses. This means the companies are able to identify small parts very easily and readily using 2D barcodes with scan capabilities on the other machines. Therefore, I believe marking, and certainly 2D printing, will increasingly become not just about ID; we will also start to see more security features too.” Stain also maintains that interoperability between devices will grow, and that will yield unprecedented ease of use, configuration and manageability. Also, he believes the ability to embed identity into a small form factor will help lead to an age of total transparency.



Mike Hopkins, project manager, CDI Yorkshire – a special interest group of the BPIf

Hopkins observes that developments in smart and connected electronics applications are opening up significant new market opportunities in areas such as e-health, intelligent packaging and wearable technology (IoT technology). Hopkins reminds us that the Internet of Things describes a world in which every day physical objects or 'things' are embedded with electronics, sensors and connectivity which enable them to exchange data with the manufacturer, operator and/or other connected devices.

He adds that, although embedded computers have been able to communicate wirelessly for years, the majority of these have been closed systems that are only able to communicate with a central computer. "With the Internet of Things, devices are able to communicate with other devices," he points out. "They have the ability to communicate through wireless technologies (such as RFID and NFC), are able to report on activities worldwide through sensors, and they can be controlled or accessed from anywhere in the world. The Cloud provides the power to store and exchange information, irrespective of location." Hopkins explains that we are able to:

- Connect to things simply by scanning them with our smartphone.
- Monitor things remotely.
- Manage things better, from traffic flows to use of energy within the home.
- Control things, such as smart thermostats.

Project SCOPE

Project SCOPE, in which the BPIF's role is to connect the technology and technology providers to the packaging industry, began in late 2014 and will conclude in the middle of next year. Towards the end of the project the BPIF will devise awareness and training programmes to inform the industry of the new opportunities that the technology will open up. Hopkins points out that of particular importance will be the brainstorming with the technology experts to understand the potential applications of the technology both now and in the future and how the label industry in particular can integrate into their production runs.

Narla considers that the future price of 3D

printing is expected to stagnate if speed, machinery technical capabilities, software usage, and material specifications do not change significantly; conventional manufacturing techniques are still expected to dominate.

He added that the cost of difference between conventional manufacturing and 3D printing is expected to shrink to only 11% by 2030 based on close parity to raw material prices. A summary of some of the key future indicators regarding 3D printing from Frost & Sullivan's perspective is as follows:

- Large-scale commercialisation of 3D printing is expected to bring about faster and localised production, but only by achieving economies of scale.
- Current high cost of materials and machinery, and low printing speeds, prohibit large-scale manufacturing.
- Only very-low-volume production can be undertaken when tooling investment is necessary.
- Prices decline exponentially as quantities increase since cost is spread over quantities.
- In the future, low prices for materials and machinery are expected to lower production costs.
- Printing time and material availability challenges still expected to prohibit wide adoption and stagnate prices.

Lassus believes the next generation of printers will have look and feel of tablets and smartphones, becoming PCs that print, rather than simply printers. "Users will come to expect a similar user experience throughout their industrial applications as they find in their typical day-to-day personal lives," he said.

Lam comments that weak demand for print hardware and consumables will remain the main challenges for print vendors as demand for printed pages stagnates or declines, and content moves from paper to digital. She adds that consumables spending will fall at a faster pace than hardware spending within the forecast period. Lam also maintains that print services and solutions will become growth drivers that place print vendors in front of enterprises;

however, their revenue contribution would remain a small part of the overall print industry. Lam adds that total enterprise print spending will still shrink throughout the forecast period. However, "the shift to Cloud, increased workforce mobility and digital business transformation are opening up opportunities for print providers to sell related MCS solutions", she said.



Ioana Nitu, product manager,
brother
at your side

Shanler comments that while there are myriad options for 3D printing of concept 'non-functional' prototypes to assist with iterative design and feedback, users could consider driving 3DP for creation of 'functional prototypes'. "This could mean leveraging more advanced 3DP technologies, such as powder bed fusion and directed energy deposition, that may deliver more exotic materials than traditional acrylonitrile, butadiene and styrene (acrylonitrile butadiene styrene) plastics," he said. Shanler added that using 3DP for prototyping can assist with reducing new product development schedules via faster, frequent and more insightful feedback when in the concept/ideation, research, development and beta-testing phases.

Moir considers that IoT will increasingly empower managed print services (MPS) and predictive maintenance etc. He anticipates that further Cloud and Software as a Service (SaaS) development will also continue to change things. "In the near future, LMS could move to a model that's something similar to Office 365, and a lot of this will be multi-tenancy in the Cloud," he said. "I think when people become more confident about having business-critical manufacturing applications in the Cloud this will become more prevalent. It is possible that smaller users will move to this type of solution before some of the large businesses, then more and more companies of all sizes will adopt it. The main point is the Cloud and SaaS will change LMS in the future. Indeed, I think we will start to see SaaS LMS in the Cloud within the next few years." ●