INDIVIDUALISED PRODUCTS

THE BURNING PLATFORM FOR FUTURE COMPETITIVENESS
Author

Pierfrancesco Manenti

Vice President, Research, SCM World

Pierfrancesco leads the research practice for manufacturing & production operations and design for supply chain & product lifecycle management at SCM World. He provides insights, consulting and advisory support to leading global manufacturers and specialty IT vendors into the key challenges and trends affecting manufacturing industries including automotive, machinery, aerospace, fashion & apparel, CPG and hi-tech.

Pierfrancesco has over 20 years of industry experience in manufacturing operations and supply chain strategy research, consulting and IT solutions, with a strong focus on the business value of technology in manufacturing. Prior to joining SCM World, he served as Head of EMEA at IDC Manufacturing Insights, where he led the EMEA research practice and was the global lead for the Operations Technology Strategies advisory service.

He also spent 13 years with TXT e-solutions, a Europe-based SCM software vendor, where he held roles and responsibilities including Industry Manager for Automotive, Business Development Director for Manufacturing Industries, and UK Operations Director. Before that, he spent two years at the Italian Ministry of Defence.

Pierfrancesco holds a Bachelor’s degree and a Master’s degree in Computer Science from Pisa University in Italy. He is based in Milan and London.
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EXECUTIVE SUMMARY

The ability to customise products and fulfil very specific, individual customer needs is emerging as the burning platform for future competitiveness. For many organisations this is a fundamental change in current business model and operational processes and, as such, is a daunting task to achieve.

This report discusses the importance of offering individualised products and identifies the key barriers that must be overcome to achieve it. The report analyses the current and future business strategies that companies are actively using today, currently piloting or evaluating in order to be able to make individualised products at an acceptable cost. We also provide recommendations to business leaders willing to embark on an individualised product journey.

Among the key findings:

• **Offering individualised products is the burning platform for competitiveness.** Customers value individualised products and businesses understand that the competitive battle is increasingly focused on customising capabilities.

• **Current focus is on reducing the cost of customisation.** Companies are creating capabilities to make the cost of customisation possible by adopting product platforming strategies, postponement of variability strategies and creating integrated organisations.

• **Digitising the business is the eventual way to win.** The longer-term enabler for offering individualised product is digitising the business through connected products and smart manufacturing facilities. Digitisation will increase the speed of designing, making and servicing individualised products, in line with market demand.

The analysis provided in this report is based on data from a survey conducted by SCM World in 2016. The most relevant data can be summarised as follows:

• The vast majority of organisations (90%) feel their customers value or strongly value individualised products.

• However, 74% of respondents feel it’s hard to gain a clear understanding of what customers really value and are ready to pay for, especially regarding indirect customers.

• Individualised products is the initiative invested in most for competitiveness – and nearly 30% of organisations want to be a first mover.

• Product platforming emerges as the most relevant strategy in place to support individualised products (42% of respondents), along with postponement of variability and integrated organisations.

• Digital supply chain and smart manufacturing are the emerging strategies that 50% and 43% of organisations, respectively, are currently evaluating or piloting.

• 28% of organisations are currently piloting 3D printers as a way to create a digital inventory for individualised products.
INTRODUCTION

“Any customer can have a car painted any colour that he wants so long as it is black”, famously said Henry Ford about his very successful Model T automobile. The sentence mirrors the then innovative principles of mass production. Henry Ford produced millions of identical Model T cars for a growing mass market, eager to consume convenient products. Back then, colours didn’t really matter.

More than 100 years later, BMW is the recognised leader in build-to-order (BTO), the approach that enables customers to configure their own car and get it delivered in two to six weeks. Customers can pick from a total of 11 models, 36 body types, just as many engine types and nearly unlimited options. Going beyond BTO, BMW recently launched BMW Individual to let its customers go even further and design their very own individualised car.

Whether it concerns the exterior or interior or the materials selection – with BMW Individual Collection service, customers become the designers and engineers of the vehicle, while specialists at BMW Individual Manufaktur employ craftsmanship to turn customer needs into reality.

WHAT HAS CHANGED?

Today’s customers are far savvier than they were a decade ago, and they have higher expectations of good service and product innovation. Spoiled by the opportunities given by the likes of Amazon, Uber or Instacart, customers have the freedom to buy any product they want with just a tap on their smartphone and have it delivered when they want it and where. Customers are growing picky and impatient, expecting unlimited choice that perfectly fits their specific needs and at no higher price than a comparable standard, mass-produced item.

It is today’s pervasive technology that’s driving the deep and fast transformation in customer purchasing behaviour. In our private lives, technology is everywhere, and it’s so easy to use that it really does help to make our lives better and enables us to do things faster. This extensive richness of information and choice is dramatically changing consumer purchasing expectation, which is driving a need for more personalised products delivered through multiple channels, at maximum speed.

Today’s companies feel the pressure from customers demanding more personalised products. 90% of organisations responding to SCM World’s Value Chain 2020 survey feel their customers value or strongly value individualised products. And, as discussed in the SCM World report Customer-Centric Supply Chain: Omni-channel Leaders Plan to Widen the Gap, “the race is on for customer-centric, omnichannel supply chain innovation”. 

1 | Customers value individualised products

Do your customers value individualised products?

<table>
<thead>
<tr>
<th>Response</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do strongly value</td>
<td>53</td>
</tr>
<tr>
<td>Do value</td>
<td>37</td>
</tr>
<tr>
<td>Do not value</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: SCM World Value Chain 2020 survey, February 2016  

n=154
WHAT ARE COMPANIES DOING?

In the fashion world, shoppers can design their own Nike trainers, Brooks Brothers suits, Burberry trench coats and Longchamp bags. Nike is tapping into this opportunity through its NIKEiD initiative, which enables an individual to customise their trainers’ performance and style, and then purchase them online. Burberry allows customers to create their own individualised trench coat through the Burberry Bespoke online service, where customers can choose the style, fabric, colour and accessories.

Technology is helping companies go even further with individualisation. Coca-Cola’s Freestyle machines, for example – which allow consumers to create their own beverages, mixing branded soda products with a number of additional flavours – are connected to the internet of things and provide the company with real-time information about product consumption (see company spotlight on page 21). Tennis racquet manufacturer Babolat embeds sensors in its racquets that monitor a player’s swing and advise them on how to improve their performance. Similarly, Under Armour has created a sensor-equipped compression shirt that measures an athlete’s performance, including heart rate, metabolism, body position and lung capacity. The data gathered not only helps trainers to customise the athletes’ workouts without risking strain or injury, it can also be broadcast on a stadium display to engage spectators, providing a whole new level of customer experience.

Personalisation is also happening in industrial B2B environments, led by companies such as eMachineShop, Local Motors and Fast Radius, which seem a lot more like e-commerce businesses than traditional manufacturing suppliers. The latter, for example, offers direct digital manufacturing services for on-demand parts manufacturing. Its fully-automated facility runs 24 hours a day, seven days a week, and requires just three employees in total (one per eight-hour shift). With a staggering range of 100 3D plastic and metal printing technologies, CNC machining and rapid injection moulding capabilities, this isn’t any old manufacturing facility; it’s a flexible facility that can be used to manufacture one-off parts, or mass manufacture thousands of identical parts. Customers can simply go on their website to create new print jobs, upload the part’s CAD drawing, select materials, colours, number of parts required, production priority and place an order off to be printed. Through a tie-in with UPS (see company spotlight on page 16), any order placed through Fast Radius can be delivered the next day.
UNLEASHING THE OPPORTUNITY FOR INDIVIDUALISED PRODUCTS

In order to be successful, over the next few years companies must meet the demand for speed and personalisation at the right price point. Responding to speed with speed will help organisations meet fickle, fast-changing demand, while creating individualised products profitably will enable them to tap opportunities from niche markets and diverse customer groups.

Businesses along the entire value chain need to learn how to fulfil individualised customer needs faster – before their competitors do. They need to understand demand trends more deeply, introduce new products more rapidly and make products in a lot size of one profitably. This is really about creating a brand new business model. The traditional approach to manufacturing – attached to the stronghold of efficient production plants and mass-production – is, in fact, no longer adequate as a response to these market changes that companies are beginning to face.

Manufacturers have to link customer requirements for personalised products directly to production capabilities. They will have to become more agile organisations and their factories must be more flexible to accommodate shorter lead times. These changes are heading towards a future fulfilment approach where customers are served with a single, specifically tailored, customised and innovative product, made on demand.

Organisations are taking these challenges very seriously. They not only recognise the value that customised products have for their customers, but they also understand that the competitive battle is going to be played around having this capability in the near future. And they are ready to do something about it.

In comparing their supply chain capabilities to their competitive peers’, organisations responding to our Value Chain 2020 survey describe product customisation and individualised products as the key strategy they are planning to invest in. Nearly 30% of respondents are investing because they want to be a first mover in offering individualised products, much more so than any other strategy. They believe this is the burning platform for competitiveness and they don’t want to compromise on this.

2 | The burning platform for competitiveness
   In comparing your supply chain to your competitive peers’, how would you describe your strategy for the following investments?

<table>
<thead>
<tr>
<th>Product customisation/individualised product</th>
<th>14</th>
<th>27</th>
<th>30</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing resource scarcity</td>
<td>9</td>
<td>26</td>
<td>44</td>
<td>21</td>
</tr>
<tr>
<td>Customer segmentation</td>
<td>15</td>
<td>23</td>
<td>41</td>
<td>21</td>
</tr>
<tr>
<td>Customer profitability analysis</td>
<td>26</td>
<td>20</td>
<td>39</td>
<td>15</td>
</tr>
<tr>
<td>Monetising the sharing economy</td>
<td>27</td>
<td>42</td>
<td>23</td>
<td>8</td>
</tr>
</tbody>
</table>

- Not a supply chain responsibility
- Late adopter
- Fast follower
- First mover

Source: SCM World Value Chain 2020 survey, February 2016

% of respondents n=155

BARRIERS TO INDIVIDUALISED PRODUCTS

Jack Daniel’s produces its high-end, highly individualised Single Barrel whiskey in a small workshop at its historical distillery in Lynchburg, Tennessee. This whiskey is a product designed to create a highly customised consumer experience: each bottle has a neckband indicating the barrel number, bottling date and rack location. But more than that, each bottle varies in style according to the cask they are bottled from and they are also individually filled, sealed and labelled. This product required Jack Daniel’s to set up a specific
and fully manual bottling line – well worth the extra cost for such a unique, high-end product. There was no way of making this in its mass production factories, where millions of bottles of standard and perfectly uniformly flavoured OLD NO. 7 mainstream whiskey are made with high-speed bottling lines.

This dichotomy between highly expensive, high-end customised products vs inexpensive, mass-market ones is very common and exemplary of the challenges companies have creating individualised products. The biggest obstacle to offering individualised products is simply the fact that most businesses’ supply chains cannot handle it efficiently today. That’s why Jack Daniel’s had to set up a different and fully manual bottling line to be able to make its individualised Single Barrel whiskey.

The survey results reveal a short and clear set of barriers that are hampering companies’ abilities to offer individualised products (Figure 3): the ability to make products in a lot size of one, along with the associated costs of customising the product.

With a business model intended to fulfill mass markets, many companies across different industries find themselves unable to respond profitably to growing demand for personalised items.

- Most of today’s supply chains are still largely based on a push model, whereas the ones associated with individualised products must be fully based on a pull model.

- The majority of manufacturing facilities are designed for mass production and are only considered profitable if they can fulfil 100% of their production capacity, rather than whether they can fulfil customer demand for individual products.

- This becomes even more difficult when dealing with suppliers that are contracted for producing pre-arranged amounts of products rather than catering to unforeseen demand.

Jack Daniel’s, therefore, isn’t a good example of individualised products as they shouldn’t only be positioned as exclusive, high-end or luxury products. It must be an economically feasible option for most businesses and product types. Launching individualised products is not just about implementing a sales and marketing programme; it’s about a thorough change in business model, with an end-to-end transformation of the company’s operational processes, from product design, to supplier management, logistics, manufacturing and delivery models.

### Table: Barriers to offering individualised products

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Major barrier</th>
<th>Minor barrier</th>
<th>Not a barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to make products in a lot size of one</td>
<td>54</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>The cost of customisation</td>
<td>50</td>
<td>38</td>
<td>12</td>
</tr>
<tr>
<td>Supporting technology does not exist or is too expensive</td>
<td>36</td>
<td>43</td>
<td>21</td>
</tr>
<tr>
<td>Collaboration across supply chain functions</td>
<td>36</td>
<td>49</td>
<td>15</td>
</tr>
<tr>
<td>Ability to design for customisation</td>
<td>32</td>
<td>46</td>
<td>22</td>
</tr>
<tr>
<td>Customers do not value individualised products</td>
<td>10</td>
<td>37</td>
<td>53</td>
</tr>
</tbody>
</table>

Source: SCM World Value Chain 2020 survey

February 2016

% of respondents

n=174
KEY STRATEGIES FOR INDIVIDUALISED PRODUCTS

Offering individualised products requires a thorough transformational change in business model and operational processes: a transformation able to overcome the major barriers to individualised products, including the ability to make products in a lot size of one and bear the cost of customisation profitably. This is not a change that can happen in one day; organisations have to follow a number of steps to activate this capability.

Respondents to our Value Chain 2020 survey shared where they are in regards to a number of strategies their company has invested in or will invest in to better support individualised products (Figure 4):

- **Product platforming** emerges as the most relevant strategy currently in place to support individualised products, with the largest chunk of respondents (42%) actively using it today. Another 29% of organisations is currently evaluating or piloting product platforming, making this strategy one of the most relevant today and in the future.

- **Postponement strategies** – either in the form of packaging or manufacturing postponement – and integrated organisations are both in place today at more than a quarter of respondents. Going forward, a relevant share of organisations – ranging from 37% to 43% – are planning to implement these strategies, making them both very relevant to supporting individualised products.

- **Digital supply chain and smart manufacturing** are two tightly connected strategies that refer to creating connected product and intelligent factories. They are in place across a minority of organisations today, however, showing a massive share of interest across 50% and 43% of organisations respectively that are currently evaluating or piloting them.

- Creating **digital inventory through 3D printing** is a strategy that’s still in its infancy as far as current adoption is concerned. However, companies are taking this option into consideration very carefully, as 28% are busy evaluating or piloting it right now.

A closer look at the survey results also suggests a clear path forward by adopting a two-step strategy approach. Companies first have to have the foundational capabilities of individualised products in place – eg platforming, postponement and integrated organisations – and then, on top of the foundation, they must develop a set of differentiating capabilities – eg digital supply chain, smart manufacturing and 3D printing – that will help them win the competitive battle.

- **Foundational capabilities** – Platforming and postponement provide the “physical” ability for companies to create individualised products, while integrated organisations represent the necessary structural change to support it. Platform-based products with interchangeable modules can be finalised through postponement of variability and late-stage configuration to fulfil very specific customer orders. Breaking organisational silos and having an integrated organisation – with product development,
sales and supply chain organisations working as one – is the only way companies have to be able to streamline and make the design-make-service process for individualised product profitable.

- **Differentiating capabilities** – Digital supply chain and smart manufacturing are the digitally-enabled strategies to create a fully digitised environment that will make individualised products flexible, fast and profitable. Digital supply chain means connected products and an ability to remotely monitor and customise products, while tying in customer visibility that is key to get the true picture of demand. Smart manufacturing means factories and supply chains that are agile and intelligent, and that are technology-enabled through the internet of things and big data analytics.

In the following section we will dive deeper into each of the key strategies organisations are working on today and those that are being evaluated.

**PRODUCT PLATFORMING**

Product platforming is the ability to design and develop products that are based on standard modules and common components. This strategy supports reduced product complexity and enables individualised products to be made by combining a platform with interchangeable modules that meet specific customer needs (Figure 5).

Different industries have different definitions of what a platform is. In the automotive industry, for example, a typical platform is the chassis, while exterior colours, internal trims and a range of other options are components that are considered features of the final product. In chemicals, a platform can be the recipe for a bulk product, while additives that create the final speciality chemical are the components. In mass-produced consumer products, platforms may relate to different types of packaging that serve different customer groups and sales channels.

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**5 | Product platforming explained**

<table>
<thead>
<tr>
<th>Customer group A</th>
<th>Customer group B</th>
<th>Customer group C</th>
<th>Customer group N</th>
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<tbody>
<tr>
<td>Create a much higher number of finished products by combining one platform with a number of modules</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Develops an even smaller number of standard platforms</td>
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<td></td>
<td></td>
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<tr>
<td>Uses the smallest number of standard components to create the smallest number of modules</td>
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<td>Source: SCM World</td>
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Product platforming is quite common in the automotive sector, where vehicle customisation on a mass scale has been in place, especially in Europe, for more than a decade. Volkswagen probably has the most complete platforming approach in the industry, which enables the company to flex product features and meet specific customer needs. With the MQB (Modularer Querbaukasten) platform introduced in 2012, the engine is also an interchangeable module and the platform enables the customer to create a fully customised car, including selecting the most appropriate engine, from internal combustion engines to electric engines.

Besides automotive, the concept has been successful in industries ranging from consumer packaged goods to hi-tech, and in companies such as Lego, Unilever, Samsung, HP and Haier. Lego figurines, for example, are a combination of interchangeable modules – body, legs, arms, hands, head and hair, plus decorations. The company designs, plans and produces each module independently and they come together only at the final assembly stage. This way, Lego can take the latest retail orders into consideration when planning, say, how many heads to decorate with a smiley face. Product platforming enables Lego to decouple product development and manufacturing from customer fulfilment, dramatically reducing R&D and manufacturing costs and increasing flexibility in fulfilling customer needs.

Platforming has a significant impact on the supply chain: modularity in products enables modularity in production processes and segmentation of supply chain steps so that companies can choose where and when to take each step. Platforming, therefore, enables more effective manufacturing footprint strategies, where factories can be specialised and diversified in making different platforms and modules. Companies can use large, efficient but less flexible plants to satisfy the higher-volume demand for standard platforms and modules, and smaller, potentially higher cost but more flexible and closer to demand plants to make the final assembly of platform and modules on-demand.

China-based Haier – one of the world’s largest home appliance manufacturers – is undergoing a radical business model transformation driven by its ambition to deliver customised home appliances. This strategy is based on product platforming and the ability to seamlessly link product design and manufacturing. If product platforming is the foundational product design technique for ensuring product customisation, smart manufacturing is its realisation (see company spotlight).
COMPANY SPOTLIGHT

Haier business model change through product platforming

Haier Group is a Chinese multinational consumer electronics and home appliances company. With global revenues reaching $32.1 billion in 2014, the company is considered the world’s major appliance brand, with a global market share of more than 10%.

Given its global footprint, Haier needed to develop the ability to fulfil global demand for market-specific products in an efficient way and without causing an excess of product complexity. Learning from other industries, such as aerospace & defence and automotive, the company started exploring product platforming in 2009, achieving full implementation in 2014.

With the help of product platforming, Haier has been able to reorganise its product ranges and reduce complexity. It now manages a much smaller number of components to make an even smaller number of standard modules. Nevertheless, by combining interchangeable modules, the company is able to create a much wider range of finished products than before.

Platforming is particularly useful to manage product types that vary significantly from market to market, such as fridges. In North America, fridges are generally bigger than in Asia, while in Northern Europe they are typically taller. With platforming, Haier has been able to design a standard fridge platform for all markets, while employing a combination of standard modules to configure it for specific market needs.

With the adoption of product platforming, Haier improved profitability, increased revenue and reduced costs. Product platforming is not simply a more effective way of developing products, it is a principle that brings benefits across multiple functions:

- **Research & development** – Product platforming helps engineers to focus on a smaller number of components, modules and platforms, which concentrates innovation efforts and speeds up development time.

- **Supply chain & manufacturing** – The reduced number of standardised modules supports operational excellence by simplifying sourcing, increasing production volumes and optimising supply chain structure.

- **Sales & marketing** – Creating differentiated products as a combination of standard modules satisfies different customer groups and markets at an affordable price, driving sales, increasing revenue and improving customer loyalty.

What started as a cost reduction exercise is now moving towards a complete business model change programme, which has given Haier the ability to deliver customised home appliances.

Haier’s success in this programme is not only dependent on its product platforming strategy, but also on its ability to seamlessly link product design and manufacturing. If product platforming is the foundational product design technique for ensuring product customisation, smart manufacturing is its realisation. Haier’s assembly lines are able to produce customised appliances efficiently because they are modular and mirror product platforms’ structure. Using flexible automation and robotics, Haier can switch final assembly from one module to another in just 20 seconds.
**POSTPONEMENT OF VARIABILITY**

Product platforming enables companies to implement postponement of variability – i.e. delaying the commitment of a finished product, until the moment when demand for the product is known or customer orders are in. With postponement, manufacturers can respond faster to individual orders because products are built on demand by combining a modular platform with a number of standard components that qualify the features of the products, according to the specific requests of customers.

With an ability to postpone final configuration, manufacturers greatly increase their agility to respond to specific customer needs without building up a risky inventory of fully finished products. At the same time, they can cut order to delivery times because platforms and common components have been produced or procured already and are available for final configuration. With this model, production or sourcing lead times for the platform and common components are not included in the order-to-delivery time. Customers get the benefits of rapid delivery, while manufacturers reduce both the risk of obsolescence for finished products and the costs of on-hand inventory.

Through postponement, organisations can adopt a “push-pull” strategy (Figure 6) to produce individualised products. They can focus on producing platforms and critical modules in-house, while final configuration can be made on demand by a network of third-party factories or retailers closer to customers. The combination of postponement and proximity to demand enables manufacturers to bring customisation closer to the customer.

Using postponement strategies, companies such as GoPro, Coca-Cola and Zara have been able to meet customer fulfilment needs more accurately while cutting inventory carrying costs, avoiding rebates on finished products that aren’t selling, and reducing the risks of scrap and obsolescence.

GoPro – a manufacturer of a range of wearable cameras that allow consumers to capture live images taken during activities like surfing, driving or parachuting – has moved from a footprint strategy based on centralised manufacturing in China to a decentralised model with postponement centres in California, the Netherlands and Singapore. Bulk cameras, accessories and packaging are

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**Push-pull strategy through postponement**

![Image of push-pull strategy through postponement]

*Source: SCM World*
independently planned, manufactured in China and shipped to the postponement centres. Product “mix” decisions are taken in the regions closer to demand to better meet customer fulfilment needs with the postponement centres making the final configuration and packaging.

The key enabler of Zara’s fast-fashion capability is its postponement strategy. Zara is able to track fashion trends continually and produce “skeleton” designs for new items that are not final, but are specified enough to allow purchases of long-lead-time materials such as fabric and trim packages. These basic designs are then finalised with input from stores that reflect current demand trends, but are constrained within the bounds of whatever materials are on hand.

Probably the most sophisticated example of postponement of variability is the one made possible by 3D printing of final products. UPS recently announced a partnership with 3D printing manufacturing service provider Fast Radius to offer on-demand direct digital manufacturing capability combined with its global logistic capability (see company spotlight).

INTEGRATED ORGANISATIONS

Traditional organisations tend to work in silos. This is especially true when it comes to the new product development and launch (NPDL) process. In the SCM World report *The Innovation Success Rate: Why Leaders in Design for Profitability Do Better*, we found that less than a third of businesses are fully integrated organisations, while nearly 70% are still somehow siloed with manufacturing, sourcing and logistics partially or minimally connected to R&D or engineering – not to mention sales.

That report demonstrated how new product failure is primarily a consequence of poor collaboration and siloes. Today, more than 70% of companies still do not consider supply chain as an equal partner in the new product development and launch (NPDL) process. When this is the case, issues with new products being launched often include poor manufacturability and the inability to easily find adequate supplier capabilities – issues that significantly impact time-to-market and the customer experience. With the pressing need to offer personalised products, these issues are amplified exponentially with much higher product variability, shorter time to market and lower volumes.

The bottom line is this: traditional companies that are not fully integrated cannot support individualised products well. To harness this opportunity, companies must become “integrated organisations”, where the three key functions of sales & marketing, supply chain & manufacturing and research & development work together as equal partners in an orchestrated NPDL process. Designing, making and servicing individualised products requires a NPDL process driven by continuous assessment and optimisation of product lifecycle targets that address changes in the marketplace, customer needs, product technology, supply chain and production capabilities. The necessary NPDL process for individualised products must, therefore, be highly collaborative, where each function has adequate visibility and comprehension of the implications that their decisions may have on other functions, both inside and outside the enterprise.

As with many CPG organisations, Procter & Gamble is experiencing a dramatic increase in the number of SKUs, with a proliferation of individualised packaging that must fulfil specific customer groups as well as retailer promotional launches. To make sure it’s able to fulfil these individualised requirements, while meeting manufacturability constraints, P&G implemented a tight and collaborative process with its suppliers to create artwork and packaging shapes that better address specific demand, while vetting their manufacturability ahead of production. Setting up an integrated process between P&G designers and their suppliers’ manufacturing engineers was conducive to a greater level of collaboration at a very early stage in packaging design, allowing P&G to identify and eliminate design mistakes well before manufacturing took place.
COMPANY SPOTLIGHT

On-demand 3D printing network for individualised products

With highly variable market demand for individualised products and customers expecting agility and speed in delivery, on-demand production is becoming a trending topic in boardrooms around the world. The ability to make individualised products on demand is the most sophisticated example of postponement, something previously impossible to achieve with traditional manufacturing and supply chain capabilities.

With this trend in mind, in 2013 UPS – one of the world’s largest parcel delivery companies and a provider of supply chain management services – decided to launch a pilot programme in six locations around the United States, offering 3D printing as a service through its UPS network of stores. The initiative was successful, and a year later, the company extended the pilot, rolling out 3D printing capabilities in more than 60 of its stores throughout the United States.

Offering distributed, light-manufacturing capabilities combined with its extensive global logistics network worked so well that UPS is now taking the next step, by further extending its current capabilities and adding industrial-grade 3D printers through a partnership with Fast Radius – an on-demand direct digital 3D printing service provider.

Through this partnership, UPS will create a distributed, on-demand manufacturing network that links its global logistics network with mid-level 3D printers available in more than 60 UPS stores around the United States and Fast Radius’ industrial-grade 3D printing factory in Louisville, KY.

The partnership is aimed at the manufacture and distribution of custom parts, and the service will be flexible enough to accommodate both one-off parts production and/or the mass manufacture of thousands of identical parts.

Customers will visit the Fast Radius website to place their 3D printing orders, which will be directed – based on speed, geography, and the product quality the customer requires – to either the network of mid-level 3D printing capabilities or Fast Radius’ industrial-grade 3D printing facility. Orders can be shipped as early as same day.

The on-demand network will benefit many different types of customers:

- Manufacturers wanting to reduce inventory for slow-moving parts;
- Manufacturers with short production runs where the cost to create the mould or tooling could make these orders too expensive for their own manufacturing facilities;
- Manufacturers and retailers of custom/semi-custom goods;
- Industrial designers and engineers who want rapid prototypes delivered;
- Entrepreneurs, start-ups and manufacturers who don’t currently have access to 3D printers or have limited capital.

To make this network work efficiently and support customers managing on-demand manufacturing parts, UPS has also partnered with SAP to integrate its supply chain software. The SAP software will also be used to seamlessly route on-demand manufacturing orders from production to delivery. It will also be used to help customers with an automatic quantification of the financial viability of 3D printing vs traditional procurement or manufacturing options, which will support real-time decisions on the optimal supply chain path for every parts order.
The NPDL process for individualised products is, therefore, not simply linear but is collaborative and can be represented as a circle (as shown in Figure 7), where each step informs and integrates into the next one. Product service, for example, is not only the last step in the lifecycle, it is also the first. It informs marketers and engineers about how to improve product performance and how to create the next individual product. The NPDL process for individualised products has three key steps:

1. **Design** – To develop an ability to offer individualised products, this step must be about designing product platforms that can be easily individualised through interchangeable modules. The business case for individualised products requires that supply chain and manufacturing functions are involved in new product design since an early stage, so that they can contribute and vet any possible manufacturing, supply chain and service issue.

2. **Make** – Both manufacturing and supplier management processes must be highly flexible to accommodate and fulfil demand for highly individualised products. Suppliers need to be contracted because of their flexibility and speed rather than their production capacity. Factories must be flexible and agile to fulfill specific customer needs in a profitable way.

3. **Service** – This process – including after-market services, warranty management, customer support and end-of-life disposal – must be set out so that it’s profitable for individualised products. This has a lot to do with how products have been designed and made, while design for serviceability strategies – which take into consideration types and costs of aftermarket services during early product development – will be essential to drive profitability.
DIGITISING YOUR BUSINESS WILL BE ESSENTIAL

In addition to the barriers we looked at earlier in this report, one of the reasons why companies feel challenged by the opportunity to create individualised products is because they aren’t sure what their customers really want. 90% of organisations responding to our Value Chain 2020 survey believe that gaining a “clear understanding of what customers value and will pay for” is highly valuable. However, the vast majority of them (74%) feel that it’s hard to get access to this information (Figure 8).

This is particularly true in regard to indirect customers, where companies have no direct contact. Looking more closely into the details offered by our survey, it emerges that more than 62% of organisations responding to the survey think they have no such data from indirect customers. This is much more than when compared to data from direct customers, on which 21% believe they have no data (Figure 9).

The issue is that many manufacturing organisations do not serve their end clients directly but rely on third parties. For example, CPG organisations serve retailers, which in turn serve consumers. Automotive organisations serve dealerships, which in turn serve end customers. How will these organisations be able to serve their end customers with individualised products if they haven’t got any clue about what they really value and what they’re willing to pay for?

Figure 10 gives us a hint about what companies are planning to do to gain more information from their end customers. The overall picture is one of a more digital environment, where connected products inform businesses about their consumption and use, and supply chains and factories are digitised too, thus enabling them to respond faster and with more agility to any customer needs for individualised products or services.

8 | It’s hard to get a clear understanding of what customers value and will pay for

| Clear understanding of what customers value and will pay for | 55 |
| Access to demand data from consumers/end-users | 14 |
| Access to demand data from B2B customers | 8 |
| The cost to serve of customisation options | 13 |
| The cost to serve of last mile delivery | 14 |

9 | No data available or not valuable from indirect customers

How accessible and useful is the data you get from your direct and indirect customers?

<table>
<thead>
<tr>
<th>Tier 3+ suppliers</th>
<th>Tier 2 suppliers</th>
<th>Tier 1 suppliers</th>
<th>My internal operations</th>
<th>Direct customers</th>
<th>Indirect customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>65</td>
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<td>13</td>
<td>21</td>
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<td>6</td>
<td>7</td>
<td>24</td>
<td>44</td>
<td>34</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: SCM World Value Chain 2020 survey, February 2016

% of respondents n=155

Source: SCM World Value Chain 2020 survey, February 2016

% of respondents n=153
More specifically, our survey findings show the following:

- **Digital supply chain** – 50% of organisations want to tap into the opportunity of creating connected products so that they can be remotely controlled, updated and serviced. Connected products can inform manufacturers about their clients’ needs very effectively, especially the indirect ones, as they can help bypass retailers, dealerships and wholesalers. Coca-Cola’s Freestyle vending machine is connected to the internet of things and provides the company with real-time information about the consumption of different kinds of liquid, as consumers pour and mix their drinks. This case is exemplary of an organisation succeeding in offering individualised products, thanks to technologies that connect them directly with their end consumers, letting them gain a better understanding of what end customers really want (see company spotlight).

- **Smart manufacturing** – 43% of organisations want to develop a smarter way of making products, one that is suitable for individualised products. While they are giving more options to their customers, they also realise that this will all be for nothing if they can’t deliver the individualised product at the same speed as the market. Businesses are planning to use more technology on the plant floor – especially the internet of things and big data analytics – to make their factories more intelligent and agile. Tesla’s factory in Freemont, California is a great example here. It employs cutting-edge robotics as many other vehicle manufacturers do. However, Tesla’s factory looks different from any other assembly line: robots here are flexible enough to do multiple assembly tasks on the vehicles, from putting in seats to attaching windows to sealing the body of the car. As Tesla is less about volume and more about individualised products, their robotics must be more agile to fulfil a more diversified and lower production volume.

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10 | Evaluating a digitised supply chain

What is the most effective strategy your company has invested in, or will invest in, to better support individualised products?

<table>
<thead>
<tr>
<th>Strategy</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital supply chain</td>
<td>50</td>
</tr>
<tr>
<td>Smart manufacturing/Industry 4.0</td>
<td>43</td>
</tr>
<tr>
<td>Integrating product development, sales and supply chain organisations</td>
<td>43</td>
</tr>
<tr>
<td>Postponement of make processes</td>
<td>38</td>
</tr>
<tr>
<td>Postponement of packaging</td>
<td>37</td>
</tr>
<tr>
<td>Product platforming</td>
<td>29</td>
</tr>
<tr>
<td>Digital inventory through 3D printing</td>
<td>28</td>
</tr>
</tbody>
</table>

Source: SCM World Value Chain 2020 survey, February 2016

n=153
THE DIGITAL SUPPLY CHAIN

Just as a physical supply chain is a result of all of the ‘source’, ‘make’ and ‘deliver’ activities from raw materials to product use, so is the digital supply chain a result of the collection of activities focused on getting content, intellectual property (IP), applications or software from the manufacturer to a connected product. Digital supply chain is not a synonym for digital business. New digital business processes capture a broad spectrum of technologies including big data, the internet of things and cloud, among others. While digital supply chain will connect parts of these technologies, it’s specifically defined as the transfer of content, IP or software to a connected product.

Tesla is pioneering the practice of shipping product digitally rather than physically. Tesla owners love how the instrument panel, gigantic navigation screen and even engine control algorithms update over the cloud automatically whenever the company “ships” a new product. Having designed the vehicle from the ground up as a hybrid of mechanical technology and digital technology, Tesla is positioned to perpetually sell new capabilities to individualise their cars to existing customers. These include not only information features like gauges, GPS enhancements or entertainment systems, but also physical add-ons like speed, braking and who knows what else. In some ways, Tesla is really just selling a giant iPhone.

Konecranes – a €2 billion European manufacturer and service provider of heavy-load cranes – not only customises its cranes to meet very specific needs from their business customers in ports, logistics and manufacturing applications. It also makes intelligent cranes that are connected assets aware of their condition. The company senses real-time data about the condition and usage of the installed cranes and uses big data analytics to provide its customers with safety and productivity services, including predictive maintenance and asset lifespan improvement strategies. To deliver this extremely personalised service, Konecranes tightly integrates all its functions along a digital thread where all the real-time data they gather from physical cranes are stored and compared with historical data about the performance of that same crane as well as other cranes.

Similarly, Dell gathers product information from a number of disparate sources – contract manufacturers, repair centres and directly from products themselves – and uses big data analytics to predict possible failures before they occur. This enables Dell to speed up customer support response and increase customer experience, through an extremely individualised customer support service.
COMPANY SPOTLIGHT

Individually created drinks in a demand-driven, real-time supply chain

Driven by the desire to offer a greater number of beverage choices to its consumers, in 2009 Coca-Cola introduced its first Freestyle vending machine. This is a brand new generation of fountain dispensers, which enables end consumers to create their own drinks, picking from a staggering choice of 100 options. Consumers can select basic Coca-Cola branded products and then mix them up with a number of flavours to create their individualised drink combination.

The technology behind the blending capability of the vending machine is innovative and based on micro-dosing, typically used to measure precise amounts of medication. Besides the technology, the machine is fun and exciting for customers, boosting their experience with Coca-Cola while matching the expectations of emerging consumers, the millenial generation. A big touchscreen guides consumers’ selection by tapping icons, reminiscent of mobile touchscreens. What's more, a mobile app lets consumers create and store their own custom drinks on their own smartphone, so that any Freestyle vending machine will know exactly what their own favourite flavour combination is.

The Freestyle machine creates a completely different business model for Coca-Cola, one that moves complexity out of its plant floor and gives virtually unlimited choice to consumers. Whatever the individualised drink blended at any of Coca-Cola’s Freestyle machines is, that won’t affect any bottling lines. In fact, there is no bottling line anymore! Coca-Cola just makes standard cartridges of basic concentrated drinks and flavours. In effect, the new business model for Coca-Cola is similar to a printing business, or the likes of HP, Xerox or Canon.

What is revealing is how the real-time data that’s collected from the vending machines is being leveraged. Freestyle fountains are connected to the internet of things and are not only automatically creating orders for supplies directly into Coca-Cola’s IT systems, but are also constantly reporting sales data – by brand, location, and day part – to both Coca-Cola and the restaurant where it’s located. The machine is therefore enabling a pure demand-driven supply chain, one that’s driven by customers picking their individualised products and real-time demand signals that inform the supply chain of any replenishment, inventory and manufacturing need.

Data gathered not only drives more efficient and effective supply chain replenishment but also provides essential demand-sensing information to help Coca-Cola improve its forecast accuracy and optimise its product portfolio, including the launch of brand new products.
SMART MANUFACTURING

Smart manufacturing is the notion of intelligently optimising supply and demand through the integration of real-time data with process expertise to enable manufacturing and supply chain real-time visibility, speed and proactive decision-making capabilities. Smart manufacturing is therefore about creating an environment where all available information – from within the plant-floor and from along the supply chain – is captured in real time, made visible and turned into actionable insights.

Smart manufacturing requires a healthy dose of technology to ensure that machines collaborate with one another, that material flow is visible in real time, and that teams of knowledge workers orchestrate the entire process. Industry has to become more digitised, and the internet of things represents the technology environment necessary to implement smart manufacturing. The internet of things can create a network linking together a range of assets from production equipment to parts being produced, from sensor-embedded automation controls to energy meters, from trucks and lorries to warehouse smart shelves. Manufacturers will be able to give each of their physical assets a digital identity that enables them to know the exact location and condition of those assets in real time.

Unlike traditional industrial automation, the internet of things is ubiquitous and standard, allowing assets to be visible not only within the four walls of production facilities, but also throughout the supply chain. It therefore offers manufacturers the potential for real-time, end-to-end manufacturing and supply chain visibility and remote control of their physical assets, wherever they are around the world. This is exactly what’s needed to make individualised products profitably: faster and agile supply chains and manufacturing facilities that can be rapidly reprogrammed to accommodate urgent customer orders for individualised products, which must be made in a lot size of one profitably.

A number of leading manufacturers – including the likes of Tesla, Coca-Cola Enterprises and Harley-Davidson – are early adopters of smart manufacturing to enable the flexibility necessary to make individualised products profitably.

Much of the turnaround that Harley-Davidson has achieved by rebuilding its production facility in York, Pennsylvania is due to the adoption of smart manufacturing. The company needed a deep change in manufacturing processes and people mind-set to manage a dramatic increase in product customisation. The company shifted away from a traditional mass-production assembly line and embraced a flexible “digital chain” approach, which enabled individualised motorbikes to freely flow throughout the production facility (see company spotlight).

Coca-Cola Enterprises (CCE), the major Western European bottler for The Coca-Cola Company can fill up to 2,000 cans per minute in each of its factories. Over the last couple of decades, however, the number of stock-keeping units (SKUs) has increased tenfold, as retailers want to differentiate their offering to satisfy different consumer groups. What really impacted CCE factories more is the tremendous proliferation of containers, pack sizes and pallet sizes, which called for CCE to invest in order to gain more flexibility in packaging and palletisers areas. CCE implemented a “push-pull” decoupling point between the high-volume bottling lines and a brand new automated repacking line, which is able to automatically unpack standard pallets from the bottling line and repack custom pallets in the right quantity and mix to fulfil individualised customer orders. The bottom line for CCE was an ability to fulfil individualised orders from retailers rapidly and at a cheap operational cost.
COMPANY SPOTLIGHT

A connected factory environment makes Harley-Davidson more agile

As the global economic slump hit in 2008, Harley-Davidson lost 40% of its business and was facing the prospect of having to shut down its major motorcycle manufacturing operation – the York Vehicle Operations facility, which accounts for more than 60% of annual production.

The York factory was designed on Henry Ford’s mass production principles and was highly inefficient and extremely inflexible in meeting customer fulfilment needs. Each motorcycle model was assembled on a dedicated assembly line and the process flow was heavily constrained by the physical space and shape of the buildings. Large batches of make-to-stock bikes often didn’t meet customer needs for individualised models either in terms of volume or model mix.

The company embarked on a profound transformation of its York facility aimed at making it an agile and responsive factory, driven by customer demand. Among the key activities implemented:

- **Single digital chain** – Harley-Davidson got rid of multiple physical assembly lines, where motorcycles rigidly move along a predetermined path, to one single, multiple-model, digital chain where bikes move on AGVs (automated guide vehicles) driven by planning needs, software and automation.

- **Plant-floor visibility** – The factory environment is connected via the use of wireless networks. Every step of production is tracked and incorporated into a real-time performance management system available on digital signage and large screens around the plant, on desktops and on mobile devices. Management has full visibility of plant floor performance and can make informed decisions in real time. Cameras placed around the manufacturing floor also enable managers to monitor production processes remotely wherever they are.

- **Production planning** – Thanks to the digital chain and the greater visibility, the planning cycle has moved from a 21-day fixed plan to a six-hour horizon. This has not only significantly impacted inventory on hand – which is now just three hours compared with 8-10 days in the past – but also added a greater degree of flexibility and real-time rescheduling capabilities to accommodate new customer orders.

- **Fewer people, higher skills** – The new factory has about half the number of employees it had previously, as a result of better visibility, automation, outsourcing and the use of flexible workers during seasonal periods. At the same time, workers are more engaged and highly skilled to manage a digital factory.

The transformation of Harley-Davidson’s York factory is a great example of a company dramatically increasing manufacturing visibility to achieve a higher level of agility and responsiveness in meeting customer needs. This transformation drove down costs by 7%, increased productivity by 2.4% and boosted the net margin by 19%.
3D PRINTING

For a long time and in many industrial sectors, 3D printing has been used as a tool for rapid prototyping. Today, the technology is on the cusp of reaching a new, critical level of innovation, as 3D printers can use a vast range of materials from standard to engineering plastics, to powdered metals and engineering alloys. As such, this technology is generating great interest among a number of manufacturing enterprises, especially outside its traditional industrial manufacturing space.

3D printing can help the industry fulfil customer demand for individualised products, simplifying manufacturing processes, significantly shortening supply chains and resetting inventory levels for finished products forever.

The Hershey Company – the largest producer of quality chocolate in North America and a global leader in chocolate, sweets and refreshments – partnered with 3D printer manufacturer 3DSystems, to develop a 3D printing technology for creating edible foods, including confectionery treats. Today, the company lets its consumers interact with a library of 3D graphics on iPads to get a number of chocolate designs printed in 3D at select retail stores. Hershey sees it as an opportunity to individualise products by creating new forms of candies, develop new ways of production and find new delivery methods.

Similarly, Barilla – an Italian food multinational and the world’s leading pasta maker with 25% market share in the US – is working on a 3D printing technology for rapid production of custom-designed pasta shapes. One of the potential applications of the technology is to enable customers to present restaurants with their desired pasta shape stored on a USB stick. Speed is a big focus of the project: they want to be able to print 15-20 pieces in less than two minutes.

28% of respondents to our Value Chain 2020 survey are evaluating or piloting 3D printing as “digital inventory” for individualised products. This is a remarkable number, although still doesn’t represent the majority of enterprises. The reason behind this is that many organisations do not consider making individualised products in-house an important

11 | 3D printing eases barriers to individualised products
What are the key barriers that are hampering your company’s ability to offer individualised products?

<table>
<thead>
<tr>
<th>Barriers to Individualised Products</th>
<th>Currently evaluating or piloting 3D printing</th>
<th>No plans for 3D printing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to make products in a lot size of one</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>The cost of customisation</td>
<td>44</td>
<td>52</td>
</tr>
<tr>
<td>Supporting technology does not exist or is too expensive</td>
<td>26</td>
<td>40</td>
</tr>
<tr>
<td>Collaboration across supply chain functions (plan, source, make, deliver)</td>
<td>29</td>
<td>37</td>
</tr>
<tr>
<td>Ability to design for customisation</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td>Customers do not value individualised products</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: SCM World Value Chain 2020 survey, February 2016

% of respondents
n=153
capability. Many are, in fact, planning to use contract manufacturers to make low volume/high mix individualised products, at least in their initial venture towards individualised products.

Earlier, we looked at how UPS is partnering with Fast Radius to offer on-demand 3D printing services. This is an excellent example of where the service business is moving to support manufacturers creating individualised products. And today, this seems to be the route that the majority of organisations are taking to deliver individualised products.

Digging further into the survey, the data reveals interesting differences among those 28% currently evaluating or piloting 3D printers and the rest of respondents – especially in regard to the perceived barriers hampering individualised products strategies (Figure 11). Those currently with no plans for 3D printing represent a much higher share (40% vs 26%) of companies that think supporting technology for individualised products does not exist or is too expensive. This suggests a high level of immaturity among organisations in the way they understand the opportunities that 3D printing can offer them in support of individualised products.

There is also a remarkable difference in how “collaboration across supply chain functions (plan, source, make, deliver)” is perceived as a major barrier among those with no plans for 3D printing (37% vs 29%). At the same time, those that are currently evaluating or piloting 3D printers feel more secure in their ability to make products in a lot size of one (50% vs 55%) and experience lower cost of customisation (44% vs 52%) in respect to the rest of the respondents.

As 3D printing technologies are evolving towards faster speed production times and more sophisticated material surfaces and textures, they are expected to have an increasingly relevant role in supporting organisations delivering individualised products. However, it seems that not all organisations fully understand their potential just yet. When they do understand the potential, many would, however, consider opportunities for outsourcing 3D printing of individualised products to on-demand direct digital manufacturing service providers.
The days of Henry Ford’s mass production principles are long since gone. However, many organisations are still tightly attached to these principles and are struggling with a number of barriers that are hampering their ability to tap into the individualised products opportunity. Nevertheless, organisations across all industries recognise that their market is changing and that their customers increasingly value individualised products. This change is happening so rapidly and so pervasively that manufacturers don’t want to miss out. In fact, they see individualised products as the burning platform for competitiveness and they really want to be a “first mover”.

To achieve these goals, manufacturers are ready to undertake a number of transformative strategies that will end up in a completely new business model for them to be able to profitably offer individualised products. Offering individualised products requires a foundational strategy made up of product platforms, postponement of variability and integrated organisation. These strategies give businesses the physical capability to put together individualised products. To win the competitive battle, though, companies will have to build more capabilities on top of this foundation. They will have to become fully digitised in the way they design, make and service their products. Connected products will be delivered, monitored, updated and serviced digitally. Consumption and usage will also be monitored for a more responsive supply chain. Finally, products will be manufactured in agile and intelligent factories, which might often be outsourced to on-demand direct digital manufacturing service organisations.

For those organisations wanting to be fast movers in individualised products, the following recommendations apply:

- **Realise your market is changing.** Many organisations are feeling the pressure from the market to offer individualised products. However, in most cases, and particularly for industries serving indirect customers, it might not be fully clear what end customers really value and what they are ready to pay for. You will need to embark on a thorough analysis of your indirect customers’ needs and understand the areas where individualisation is more compelling. In doing so, think creatively and don’t be constrained by your current product portfolio.

- **Review your product portfolio.** Once you have a clear understanding of what your customers value and are ready to pay for, start a thorough analysis of your current product portfolio and determine how it matches the market’s requirement for individualised products. Thoroughly examine your current approach to product platforming, postponement of variability and integrated organisation capabilities – this will give you a clear picture of the level of flexibility you already have today to accommodate individualised products requirements. If your company does not have a decent level of adoption of these strategies, you will have to work to expand your current capabilities, by starting to break down silos and integrate processes and functions.
• **Connect your products.** As you identify gaps in your current portfolio, start thinking about new products and rethink existing ones with technology in your mind in the first place. The fastest and cheapest way to individualise your products – as well as the best way to monitor your products’ consumption – is through creating connected products that can inform you and link you with your end customers. When doing this exercise, don’t think just about the individualisation of “physical” products, but also about the individualisation of services around products.

• **Reinvent yourself, don’t lose yourself.** In most cases, launching individualised products will require a brand new business model for your company. As you won’t want to jeopardise your current business, consider creating a brand new company or division to design, manufacture and service individualised products. That will make it easier to implement the necessary changes in your organisation and business model that are essential for a successful implementation of an individualised product strategy.

• **Become a smarter organisation.** Launching an individualised product strategy is much more than simply launching a new sales and marketing initiative. To really tap into the opportunity to offer individualised product with substantial impact on your bottom line, you need to redesign your operational processes, from product design, to supply chain, to manufacturing and supplier management. They will all have to be designed with individualised products in mind and they will have to be connected in an end-to-end collaborative process.
In February 2016, invitations to complete an online survey were sent to members of SCM World and to a wider group of practitioners in supply chain and other functions globally. In total, 155 completed responses were received during the survey period.

Key demographics are as follows (all figures represent % of respondents):

**Industry**
- Industrial: 16
- CPG: 13
- Hi-tech: 12
- Healthcare & pharma: 9
- Food & beverage: 8
- Retail: 6
- Utilities & energy: 5
- Professional services: 5
- Paper & packaging: 3
- Automotive: 3
- Media & telco: 3
- Logistics & distribution: 3
- Chemicals: 3
- Academic: 3
- Software: 2
- Agriculture & mining: 2
- Other: 6

**Job function**
- Supply chain: 49
- General management: 10
- Purchasing/procurement: 9
- Operations: 8
- Logistics/transport & distribution: 7
- Manufacturing/production: 5
- Sales/marketing/business development: 4
- IT/IS/technology: 3
- Other: 5

**Company size**
- Less than $1bn: 30
- $1bn-$5bn: 11
- $5bn-$10bn: 21
- $10bn-$25bn: 12
- $25bn plus: 15
- Undisclosed: 1

**Job level**
- SVP/EVP/Board Level: 15
- VP/Director: 7
- Manager/Head: 34
- Other: 44

**Location**
- Europe, Middle East & Africa: 1
- Asia & Australia: 9
- North & South America: 46
- Rest of the World: 44
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For more information about our research programme, contact:

Beth Morgan
Vice President, Content Operations
beth.morgan@scmworld.com