THE DIGITAL TRANSFORMATION DIRECTIVE

PRACTICAL APPROACHES TO TACKLING DISRUPTIVE TECHNOLOGIES AT THE C-SUITE
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EXECUTIVE SUMMARY

Digitisation is a disruption that promises to bring massive change, yet is also littered with hype that can cause confusion. Supply chain digitisation is a process of using technology advancements linked with physical and digital assets to redefine and reimagine current business practices to improve customer experience and create a significant competitive advantage.

Pragmatic leadership is needed in the near term to enable the transition. SCM World data demonstrates that supply chain executives have a sharpening focus on how digital technologies can be used to fill gaps in their current capabilities and also drive continued innovation. A holistic approach will provide direction to some fundamental supply chain questions such as:

- What capabilities will I need to meet constantly changing customer demand expectations?
- Where in my supply network do these capabilities need to exist in order to meet speed, visibility, economic and/or regulatory demands?
- How do I shrink the gaps between demand and supply, sense and respond? How can improved planning make this happen?
- How do I leverage cognitive learning and predictive analytics to proactively mitigate risk and capture market opportunities?

SCM World has tracked nine key information and operational technologies since 2014. In nearly all cases, the percentages deeming these technologies ‘disruptive and important’ have grown year on year, with the entire community rating big data analytics, digital supply chain, internet of things and cloud computing among the most important. The implications for supply chain can be viewed in two essential buckets:

- Sensing opportunity – Shrinking lead times and rising customer expectations for late stage product differentiation mean planning faces new challenges. Digitisation is exploding the amount of data available to understand both customer demand and supply availability which means planning must evolve to sense more deeply, more quickly and more subtly than ever before. Predictive analytics and self-learning supply chain algorithms could evolve rapidly here.
- Seizing opportunity – Digitisation also brings huge changes to execution. Operational precision means less batch work and more customised work, which means supply chain execution demands an entirely new level of agility. Cognitive learning should help remove noise from the routine work of execution while supporting personalised delivery.

Organisations seeking to harness digitisation for better supply chain and business performance must
recognise that practical steps depend on starting with a realistic ‘as is’ assessment. This differs by industry since value chains vary. The characteristics of each industry require individualised approaches:

- **Consumer and retail sectors** need better demand sensing and demand response capabilities. Last mile logistics are critical to response capabilities and data analytics dominates thinking about demand sense capabilities. Addressing risks including data security and shipping disruptions is essential.

- **Industrial and hi-tech sectors** are concerned about risks upstream and therefore need better supply sensing. This should help reduce risk of supplier shortage or failure. They are also driven by manufacturing agility concerns and see operational technologies in supply response, both in the plant and at supplier facilities.

- **Healthcare, pharmaceuticals and medical devices** are highly risk averse and need stronger sensing capabilities both up and downstream. Digital should help by adding visibility to data for better planning, tracking and preparedness.

The path forward on digitisation begins with a clear roadmap that shows how your current technology suite works and where your capabilities need improvement – aka, the ‘as is’. The next step involves iteratively debating where improvements are needed and in what order – aka, the ‘to be’. With this roadmap, a set of practical decisions can be isolated to unify strategy across all levels of the business.

This report will provide C-level supply chain executives and their key transformation leaders with tools and frameworks to develop the roadmap and establish a directive for digital transformation.

Leading organisations are using digitisation as a unifying platform to marry legacy systems with new digital disruptors to bring concurrency into reality. The change to corresponding business processes and organisational constructs will be massive.

The concluding section of this report presents a six-point action plan. We share the insights from several leaders to demonstrate how a set of practical actions taken in the near term coupled with the right, few big bets will bring the era of several outdated supply chain paradigms.
In June 2016, SCM World hosted a group of fifteen, cross-industry CSCOs, COOs and CPOs to discuss digitisation. The conversation kicked off with all questioning whether ‘digital’ was just another buzzword with hyped promises that would soon fade. As the conversation continued, however, a common issue emerged. The scope of what digital could mean was so big that it was nearly impossible to pin down and choose a clear starting point. They all shared a common question: “How do I map my current technology suite across the functional areas to understand where I have gaps and how new digital technologies will add, replace and/or augment what I currently have?” It’s a huge undertaking, but absolutely essential in a world where new digital signals are coming so thick and fast that by the time you sense something it may be too late to react.

The dialogue resulted in a capability-centric framework that allows any form of digital technology to be considered in terms of how it affects demand and supply on dimensions of both sense and respond. As a platform for continuous business learning, and in supply chain terms predictive or even ‘cognitive’ operations, this framework offers a way forward.

An interesting insight from this dialogue is that digitisation shouldn’t be a new challenge. Rather, digitisation has presented the opportunity for supply chain executives to design a holistic strategy for end-to-end technology. As the emerging digital capabilities are better understood, they must be mapped and evaluated against current systems.

1 | Digitisation impacts five essential capabilities

Source: SCM World
The example of Stanley Black & Decker is instructive. Its CEO-led approach to innovation offered an appropriate framework for dealing with digitisation in a business-driven manner. The company’s culture driving innovation starts with executive support and specified project teams. Their ‘innovation continuum’ (Figure 2) represents how the company segments ideas and then analyses the balance of risk and opportunity before deciding on what to take to market.

This approach has carried over to supply chain innovation where the entire organisation is encouraged to experiment with new tools and methods to produce and distribute products. This experimentation allowed them to explore and evaluate many options before ultimately implementing technology. A prime example of this process is its connected manufacturing centre. The system synchronises insights from the IoT- and Wi-Fi-enabled site with supply chain planning technologies to create a comprehensive view of production efficiency and operational success.

As a case in point, Stanley Black & Decker uses what many C-level executives call a ‘test and learn’ approach. This has already allowed them to make strides in the use of digital technologies for better planning and therefore performance.

Among supply chain executives surveyed by SCM World, opinions on disruptive digital technologies are still rising between 2015 and 2016. A significant majority of respondents find big data analytics, cloud, IoT and digital supply chain to be disruptive and important. Further, the respondents finding those technologies irrelevant has continued to decrease.
However, the more senior levels of the supply chain organisation are still somewhat unclear on the usefulness of several new forms of digitisation. As Figure 4 shows, SVP/EVP respondents much more frequently say that advanced robotics, machine learning, 3D printing, drones and the sharing economy are of ‘interesting, but unclear usefulness’ than do other levels of the organisation.

### 3 | Executive opinions of primary digital technologies, 2015-2016

<table>
<thead>
<tr>
<th>Technology</th>
<th>2015</th>
<th>2016</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big data analytics</td>
<td>77</td>
<td>81</td>
<td>4</td>
</tr>
<tr>
<td>Digital supply chain</td>
<td>66</td>
<td>66</td>
<td>0</td>
</tr>
<tr>
<td>Internet of things</td>
<td>70</td>
<td>63</td>
<td>-7</td>
</tr>
<tr>
<td>Cloud computing</td>
<td>64</td>
<td>63</td>
<td>-1</td>
</tr>
</tbody>
</table>

- **Disruptive and important**
- **Interesting, but unclear usefulness**
- **Irrelevant**

Source: SCM World Future of Supply Chain surveys 2015 and 2016

% of respondents 2015 n=1,018

% of respondents 2016 n=1,415
This data confirms what many already know: justification for investments in digital transformation must be solid and tied to a wider strategic view of the business. A clear roadmap that layers new technologies onto the legacy suite is therefore critical to engaging the C-level in a digital strategy. For one such approach, please see the SCM World report, What Is the Matrix? A Roadmap for Chief Supply Chain Officers Coping with Digitisation.

4 | Executives are the most uncertain about secondary digital technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>SVP/EVP/Board level</th>
<th>All other levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced robotics</td>
<td>47</td>
<td>54</td>
</tr>
<tr>
<td>Machine learning</td>
<td>40</td>
<td>47</td>
</tr>
<tr>
<td>3D printing</td>
<td>38</td>
<td>41</td>
</tr>
<tr>
<td>Drones/self guided vehicles</td>
<td>25</td>
<td>36</td>
</tr>
<tr>
<td>Sharing economy (e.g., Uber, Airbnb, Instacart)</td>
<td>29</td>
<td>26</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016

% of respondents, n=1,415
Senior supply chain executives are defining digital as not just new technologies like drones, robotics, machine learning and the internet of things, but also enhancement of legacy systems like ERP, SCP, WMS and TMS to incorporate digital signals and machine learning. The full suite of these technologies, working in concert as one, end-to-end set of supply chain solutions will finally help to answer some age-old supply chain questions like what does the customer really want and need and how can I meet their demand expectations? How will my supply network meet speed, visibility and/or legal demands? Which strategic capabilities do we want to control and own, or where can we use partners? And how can improved planning shrink the gaps between demand and supply sense and respond?

Digitisation builds on an existing IT infrastructure

Source: SCM World
SENSING OPPORTUNITY: THE PLANNING CHALLENGE

Digital disruption is happening at all levels of the business. Existing process applications are increasingly accessible via the cloud and able to use data from a wide range of sources. The data itself is exploding because sensor-enabled machinery, vehicles, buildings, pallets and packages, plus of course digitally connected products all collect information on use, movement and condition. Meanwhile, the core of business thinking where decisions and commitments are being made is increasingly using heavy analytics and self-learning algorithms to inform people as they make promises to customers, suppliers and internal colleagues in other functions.

In terms of SCM World’s framework for road-mapping digital transformations, these ideas can be seen in the chart below as Core, Process Applications and Edge. From a planning perspective, the end game involves digesting the right information from the Edge, where things like social media analysis, third-party risk information data services and machine data from production equipment and delivery vehicles are generated. Planning, which starts at the Core and represents the most business-centric view of supply-demand balancing, must select and analyse data from these Edge applications, while maintaining reliable ongoing feedback cycles with Process Applications that run the business.

The planning challenge is to make good use of all this newly available information without dropping the ball on day-to-day operations. Most supply chains employ some form of sales & operations planning to manage this challenge today. Going forward, increasing use of predictive analytics, rich scenario simulation and even artificial intelligence or self-learning algorithms promise to beef up the decision-making speed, precision and subtlety of planning.

6 | The planning challenge

Source: SCM World
Planning also works across multiple time horizons including the most macro-level planning process of supply network design all the way down to daily production sequencing and even order level available-to-promise. Each of these levels of planning requires a different degree of granularity in the data used to make decisions; and yet, the datasets must not be fragmented or disconnects will arise. Data governance, therefore, is an essential process enabling a full digital transformation.

In terms of the kind of Edge-sourced data that may be valuable to meet the planning challenge, consider the fast-growing potential of social media. The data is created by personal users and as such provides insight into granular demand or supply. In fact, not only are many consumer companies using this data to inform product innovation, some industrial companies (such as BMW) are using it to sense supply chain risk. It is unstructured data, of course, but given its timeliness and abundance many are starting to look at its use for planning purposes.

Perhaps most challenging of all, however, is the transition from planning ‘as is’, which is so often accomplished with spreadsheets and manual workarounds, to a ‘to be’ state that fully exploits the rise of digital technologies in everything. The key here is to maintain continuous connection with existing process applications. Regular planning cycles must continue to serve ongoing customer commitments while incrementally learning to add precision and nuance with data from the Edge, including everything from Facebook to machine sensors.

It is a learning journey that must include not only technology toolsets, but also people and organisational process designs. This challenge offers huge potential reward, however, as deeper insight creates potential for savings on inventory, returns, excess and obsolete and all other kinds of process waste. It also promises an increasingly customer-centric view of demand which matches availability, price and service levels to customers’ unique needs.

7 | The growth of social media as a planning input

<table>
<thead>
<tr>
<th>Source of real-time customer feedback</th>
<th>Potential supply disruptions</th>
<th>Inform product enhancement/innovation priorities</th>
<th>Shed light on social/environmental/labour practices (country and company level)</th>
<th>Help forecast demand for “hot” products</th>
<th>Other, please specify</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of respondents, 2012 n=1,285, 2016 n=1,385</td>
<td>56</td>
<td>73</td>
<td>41</td>
<td>59</td>
<td>46</td>
</tr>
</tbody>
</table>
Sense and respond have a natural need to be coordinated. Digitisation brings new possibilities to both sense and respond, but for many the first point of painful failure will be a breakdown in execution – the customer’s point of contact with a supply chain’s response capability. For decades this has been muted by channels (retail or industrial resellers) who carry inventory to buffer demand uncertainty and who add a personal face to delivery. Digitisation is changing this and in the process, raising the possibility that sense and respond become disconnected resulting in bad experiences for customers.

The digital transformation in supply chain started for many with the arrival of Amazon and the whole new world of e-commerce. In terms of its impact on retail supply chains, this retail revolution forced a rethink about inventory visibility, warehouse and fulfilment strategies and even store operations. Each was forced to get more granular and personalised to satisfy the multi-modal needs of consumers looking to buy and receive goods according to their schedule, not the store’s.

Scroll forward a few years and execution-oriented digital technologies are advancing rapidly. Drones, for instance, have been pioneered by Amazon and, according to SCM World’s 2016 Future of Supply Chain survey⁴, while a majority overall (65%) think of drones as either ‘interesting but of unclear usefulness’ or even ‘irrelevant’, the level of interest has risen very quickly. More tellingly, the share of respondents from logistics roles who consider drones ‘disruptive and important’ has risen to nearly half (49%) in 2016.

Other disruptive technologies that directly impact execution include Uberisation and 3D printing. In both of these cases, the overall percentage of supply chain professionals who consider them disruptive and important is much lower than for key information technologies like big data analytics or cloud, but both have grown very quickly. 3D printing, for instance, which allows production to happen anywhere an additive manufacturing machine is installed, makes fulfilment possible from any number of different locations including the plant, the distribution centre or even on a customer’s premises.

Uber too changes the game for execution by leveraging idle assets like cars and trucks as well as non-employee staff to make deliveries. Companies like UberRUSH and Cargomatic make execution a task that need not rely...
exclusively on owned resources or even contracted 3PLs. Plus, the use of GPS and navigation in Uber-style delivery options delegates the route planning to third parties.

From a supply chain execution standpoint these ideas increasingly demand attention. The challenge, however, is how to use them only where appropriate and only when they can be managed without losing visibility and connectivity to the legacy systems that run ongoing customer service. In terms of our framework for tackling digital transformation, execution must learn how to work around the Edges without compromising process integrity and reliability in the Process Applications.

The logic of Edge applications of digital technology does not only include demand response in terms of delivery to customers, but also supply response in terms of customised production in manufacturing. Extreme build-to-order supply chains like Dell’s pioneering approach in the 1990s is increasingly common in manufacturing strategies. Digital promises huge change here as advanced robotics, 3D printing and IoT-enabled smart manufacturing reduce supply response to a possible lot size of one.

In the transition from traditional mass manufacturing approaches and associated full-truckload logistics networks, many supply chain execution professionals will find incremental steps essential. In fact, the first step for many will be the use of collaborative planning and execution, which allows teams to work together learning how to add capabilities to their existing supply chain. This is something being done now by a large California-based wine producer. Their experience confirms the value of continuous learning in supply chain planning and execution.

The ultimate execution challenge is to know where and how to do the work of production or delivery profitably. This means linking individual shipping orders or work orders to the business logic represented by the principle of profitable to promise. In terms of change management, this challenge means bringing business thinking out from the Core and to the point of work in a DC or plant, but maintaining data and process integrity across Process Applications that govern the whole at scale.

Source: SCM World
When product arrives at the door of a factory or a distribution centre, that location is not intended to be its final stop in the chain of supply from origin to customer. At each step, it is expected that some form of work is being done to add value for the customer, and then the product moves forward in the process. Optimising each function drives improvement at a given link in the chain such that the work creates benefits for the producer, but the opportunity to create value across the extended supply chain is often unclear.

Many progressive approaches are finding that through better alignment of people, process and technology, the value created by the integrated whole is greater than the sum of functionally optimised parts. Organisations seeking to find what approach best suits them must consider a number of factors, especially the role of the supply chain in their business, what risks are of most concern and what technology has the potential to be disruptive and important.

Furthermore, the unique characteristics of each industry require individualised reflections as to what is truly impactful, and what practical applications already in place.

This report includes an appendix on the following industries:

- The consumer value chain
- Hi-tech and industrial value chains
- Healthcare and medical device value chains

Within each section we consider the industry-specific considerations for digital, looking at the role of supply chain within businesses in these sectors, key industry risks and perceptions of disruptive and important technologies.
DIGITAL DIRECTIVES: A PRACTICAL PATH FORWARD

Executives seeking to create a path to increased digitisation in their supply chains must start with an understanding of their current capabilities, then compare that against their desired ‘to be’ capabilities. In addition to understanding the important trends within their own industries, that assessment must also consider commonalities across different value chains.

In particular:

- **Big data is the most disruptive and important technology.** The volume, variety and velocity of big data is creating opportunities to gain a deeper understanding of your customers (who they are, how they buy) and suppliers (when they pay, how they ship), from which you can align the end-to-end supply chain to serve strategic customer segments more effectively. Supply chain segmentation strategies and essential enabling capabilities like cost-to-serve stand to benefit from predictive and even self-learning algorithms applied here.

- **The inability of suppliers to fulfil targets is less concerning than supply shortages for raw materials and components.** Demand-driven supply chains depend on reliable forecasts to plan the flow of products from raw materials to finished goods, but supply shortages make demand forecasts unachievable. To combat this, a digitised supply chain can use digital collaboration and real-time scenario planning to assess and manage shortages.

- **The perception of supply chain as equal partner is increasing, but executing on the fundamentals is still most important.** Even where respondents value supply chain as equal partners with sales and product development, practitioners are most concerned about shipping and distribution disruptions. Technology will enable advancing capabilities but if core processes aren’t sustainable, then supply chain’s reputation is at risk.

Our work with first movers highlights four sensible approaches to evaluating, piloting and implementing digital initiatives:

1. Create the digital mindset.
3. Raise the digital IQ.
4. Design a simplified digital programme.

The remainder of this report will take you through a more extended view of conclusions and recommendations on each of these four tactics.

**1. CREATE THE MINDSET**

Digitisation in supply chain must firstly build on existing capabilities and secondly, align with broader business strategies. As described in our report, What is the Matrix? A Roadmap for Chief Supply Chain Officers Coping with Digitisation, an organisation begins the creation of a digitisation mindset by making an assessment on the strength of ‘as is’ capabilities and the value or importance of needed improvements. Companies with clear functional deficiencies may find the need to implement technology alongside process improvements, while those with already strong functional capabilities will evaluate how technology can enable rapid cycles of improvement.

TE Connectivity (TE) is one example of a company whose assessment of ‘as is’ capabilities led to a realignment of strategy, process and technology. The catalyst for the realignment was repeated business disruptions caused by disconnects in divisional approaches. It was clear to TE’s leadership that a common digital platform was needed to facilitate decision-making, but in order to make the change truly impactful, process changes were also necessary. Behind an executive strategy focused on scalability and agility, TE Connectivity reengineered many of its processes and implemented new technology solutions that successfully changed the mindset of the business.
Lenovo’s supply chain processes were already an integral part of the personal technology company’s success. However, despite meeting internal performance targets they were not meeting customer expectations fully. Motivated to improve customer experience scores and enhance visibility to quality, the company sought to drive change in a three step process:

1. Make the strategic shift: transition from an internal to an external view focused on customer expectations that further improves supply chain response capability.
2. Implement perfect order fulfilment KPI: enhance technology capabilities and ensure solid change management processes.
3. Drive performance to higher levels: strengthen capabilities and adjust targets as the environment changes.

Among the keys to the implementation of their new mindset were a consolidated technology platform, cross-functional collaboration and top executive support to drive change.

2. ACQUIRE - FILTER - ANALYSE - ACT

Digitally-enabled supply chains create a new opportunity to leapfrog existing frameworks to predictive/cognitive models that mitigate risk and reduce variability. Whether it be through experimentation with new technologies, or finding ways to use new data sources, successfully progressing digitisation is dependent on the ability to make decisions and/or drive actions. With solidified process fundamentals and an aligned mindset as the foundation for exploration, companies can begin the process to acquire, filter, analyse and then act.

Each step of the process systematically reduces the information and any accompanying anxiety, leading eventually to the point at which a decision can be made confidently or an action can be taken. This process is easily represented in a big data context, as with new data sources available, there is a significant amount of information that is now acquirable. However, at least initially, the usefulness of much of that data is unclear, so the broader data set must be filtered. Analytics are then applied to the filtered data, and that becomes the basis for the company to act.

Within the consumer value chain, the growth of one the world’s largest, privately-held, California-based winery was enabled by such a methodology. Its supply chain was built upon process excellence and initially used internal tools to manage information flow. However, the company’s supply chain leadership soon determined that the internal tools were not sufficient to scale the business and set out to integrate process, systems and strategy.

That integration followed a flow that:

- Set a vision for the future of the company.
- Identified the key constraints/obstacles to achieving the vision.
- Selected configurable technology to connect and collaborate across the value chain.
- Tested technology in a controlled environment.
- Expanded upon successful tests.

Alongside its consumer-centric value chain peers, the company sought out to enable big data analytics, digital supply chain capability, and cloud connectivity. Its test on digital collaboration began with a single market area, then expanded to two, and is now expanding more broadly to connect collaborative intelligence across their entire US market.

Companies within other value chains are also finding that connecting functional optimisations is too complex for humans to manage and that digitisation is the connective tissue across functions that shapes insight into the overall direction/health of the business.

Berry Plastics is a leading provider of packaging and protective solutions to other businesses. Since 1998, its growth via acquisitions has created complexity in
serving its extensive network of customers. The first step in its integrated supply chain transformation was the development of a steering committee to drive alignment across divisions and solidify the vision.

The roadmap developed by that senior leadership team included business process and tool integration to avoid inefficiencies and create an end-to-end solution. Its process led to an understanding of what solutions are currently in place, as well as an exploration of what integration options exist. Of particular concern during the filtering was the ability to connect with its customers and create an outside-in perspective of the business; this is consistent with those in industrial value chains that are especially concerned about customer’s ability to reliably meet demand forecasts. Upon acting, the resulting advanced planning system allowed for synchronisation of:

- demand planning as close to the source, as possible;
- inventory planning that balances customer service and inventory management;
- replenishment planning that models the entire network.

The healthcare value chain is seeing the influence of operational digitisation, as evidenced by Teva Pharmaceuticals’ extensive investments. Teva combined the information gathered from its acquisitions with an abundance of technological developments to “build an information highway by building global systems that standardize the company’s business processes”\(^5\). The process filtered and analysed the needs of the business to support the entire value chain with big data, digital, and cloud capabilities.

Teva’s actions included an extensive look at how to best safeguard and track its supply; recall that the healthcare value chain showed particular concern about supply incidents and logistics disruptions. The resulting action was the creation of premier logistics centre that combined many operational digital technologies with informational capabilities to connect the value chain, drive efficiency and manage regulatory requirements.

11 | The process needed to successfully progress digitisation

12 | Finding, hiring, and developing talent is more challenging for those who find technology enablement and change management to be essential skills

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Finding talent
\[\begin{array}{c|ll}
Finding talent & Extremely challenging & Somewhat challenging \\
\hline
Finding talent & 23 & 64 \\
\end{array}\]

Hiring talent
\[\begin{array}{c|ll}
Hiring talent & Extremely challenging & Somewhat challenging \\
\hline
Hiring talent & 20 & 62 \\
\end{array}\]

Developing skills among existing staff
\[\begin{array}{c|ll}
Developing skills & Extremely challenging & Somewhat challenging \\
\hline
Developing skills & 13 & 60 \\
\end{array}\]

Source: SCM World Future of Supply Chain survey 2016

Source: SCM World % of respondents, n=714
3. RAISE THE DIGITAL IQ

In addition to integrating strategy, process and technology, companies must enable tomorrow’s talent to become ecosystem engineers capable of managing a digital enterprise. That future workforce will rely on a blend of specialists and generalists to be able to dive deeply in data, while also translating information across functions and vertically throughout the hierarchy.

A digitally-enabled supply chain should be seen as an elite organisation within a company; empowering it is a skillset that is increasingly qualitative with communication skills and business strategy joining functional skills among the top three characteristics. Among the other skills listed, change management and technology enablement will be especially important in developing digitised supply chains. Those that find both skills to be essential for the future executive and are already finding it challenging to find, hire, and develop talent (Figure 12).

13 | A path to strategic workforce planning

Create a more transparent rationale for all learning and talent management decisions

Source: SCM World webinar, Opportunities from challenges: attracting, developing & retaining top talent, presented by Vivek Kamath, Raytheon
To combat those challenges, companies must set a path to strategically plan their workforce (Figure 13). Much the same as creating a digitisation mindset, strategic workforce planning must begin at the C-suite, as this is where the overall direction for the company is envisioned. The digitally inclined executive knows that technology will significantly shape that future state, but they must also consider how it works in tandem with a company’s workforce.

Certainly technology has the potential to automate and simplify work, but as futurist Gerd Leonhard has stated, “anything that cannot be automated will be more valuable”. An executive intent on increasing digital IQ must then develop a workforce strategy that addresses what will be automated, and what will not. In addition, decisions must also be made about whether to develop the skills needed for the future organisation in-house (‘make’) or externally (‘buy’), as well as how to map a chain of succession.

At the centre of the path to strategic workforce planning is talent management and human capital readiness. Here, the strengths and weaknesses of an organisation’s talent are evaluated and paths are developed to a digitally intelligent workforce.

Global shipping leader DHL leveraged technology and innovation in increasing its digital IQ. Within its eStory®, DHL layered together technology, infrastructure and communication to identify and understand innovation opportunities. This project began with a vision that was aspirational, but required extensive partnerships in developing the capabilities that would turn vision to reality. The resulting intelligent path was created on shared passions for innovation, a commitment to excellence and an ambitious mindset.
4. DESIGN A SIMPLIFIED DIGITAL PROGRAMME

Digital transformation adds complexity to the technology roadmap but simultaneously meets the need for business simplification. Primary, informational technologies are already commonplace in today’s business, but supply chain digitisation value will be maximised when the insights from tools like big data and cloud computing are actionable and integrated into planning and execution processes.

In addition to the integration of tools and processes, a digitisation roadmap must be developed in accordance with business strategy and workforce planning. When these programmes are built as one interdependent ecosystem, connectivity creates alignment across the functional breadth of the company, as well as the depth of the hierarchy. C-suite support plays an essential role in change management and technology enablement.

To begin the process of building your digitisation strategy:

1. Assess current capabilities against the competitive challenges specific to your industry and business situation:
   a. Evaluate the strengths and weaknesses of your current people, processes, and technology.
      i. In the consumer value chain many find that a key challenge in current processes is bridging demand insight and supply response. Technology advances are now making truly predictive demand sense capabilities available to supply chains. This means using digital technologies to better understand consumer behaviour is for many the likeliest point of current weakness in supply chain.
      ii. In the hi-tech and industrial value chains a key challenge in current processes is often in upstream supply assurance. Supply sense, in this context means more than just visibility to problems, but an analytically robust means of predicting trouble and preparing ahead of time. Risk management in these industries is heavily dependent on supply planning techniques that anticipate problems.
      iii. In healthcare value chains many are finding that existing processes and technologies are weakest in terms of connecting operational technology and information technology. The need for risk containment and flexible execution means many are finding that existing manufacturing methods are out of date and that new technologies offer a chance to deliver ‘precision medicines’. Here again, predictive, as opposed to reactive planning approaches offer a step up on current processes.
   b. Consider points of differentiation and commonality across functions, organisational hierarchy and industries.

2. Set a vision for the future:
   a. Define measurable objectives and timelines.
      i. In consumer value chains this is likely to be focused on balancing personalisation, service levels and cost. The planning challenge in this environment is all about enabling predictive decision-making on multiple time horizons. The execution challenge depends on building flexibility in fulfilment to keep up with multiple levels of customer expectations.
      ii. In hi-tech and industrial value chains this is likely to be focused on speed and agility in supplier delivery. Predictive planning and flexible execution combine to de-risk upstream supply sources. Look to supplier quality as balanced against cost to target objectives and timelines.
iii. Healthcare supply chains need better flexibility, personalisation and cost-effectiveness in delivery. This means planning challenges should target improved demand forecast accuracy in both the long term and medium term. Execution should target higher item variety without destroying cost models.

- Find the gaps between ‘as is’ and ‘to be’.

i. Consumer value chains will find many of their biggest ‘as is, to be’ gaps in the demand sense quadrant. This implies looking here first for potential technology solutions.

ii. Industrial and hi-tech value chains are likely to find their biggest gaps in the supply sense quadrant. Technology solutions here should offer improvements not only in visibility, but in prediction of supply failures upstream.

iii. Healthcare value chains will often find the biggest gaps in some combination of supply response and demand response, where historical risk aversion and regulatory oversight have forced wasteful material practices. Technology solutions here should offer greater agility and inventory traceability at reasonable cost.

iv. Across all three value chains, many will find significant gaps in the ‘decide and commit’ centre of the Matrix. This will be the case where ‘as is’ planning capabilities have failed to keep up with expanding sources of data and/or evolving analytical toolsets to apply to the data. Here, the gap to be closed should enable deeper, more complete scenario planning as an input to traditional processes like S&OP or mature integrated business planning (IBP).

3. Start on the path. Across industries, the following principles apply to any digital transformation:

- Create a mindset that builds upon process excellence and seeks out leading-edge enabling technologies, such as cognitive learning.
- Experiment in measurable and controllable environments.
- Expand successful experiments and connect the digitised value chain.

The resulting digital customer insights will define and refine supply chain segmentation strategies and create unique opportunities across value chains, such as creating a consumer experience that extends beyond the point of purchase, extending hi-tech and industrial visibility beyond the enterprise and personalising healthcare for patients locally and globally.
Consumer-centric supply chains are tasked with putting product as close to the point of sale as possible, but also, being responsive enough to both never run out of product and minimise waste. As such, the perspective on supply chain’s role in consumer-centric businesses varies greatly according to who is asked. For example, a retail merchant’s perspective is sales focused, but they disavow accountability if the supply chain cannot put product on the shelf.

That mindset is reflected in Figure 1, where 60% of respondents felt that supply chain is either only an enabler of product or sales driven business strategies, or a cost centre that affects margins. A similar percentage of CPG respondents also view supply chain as an enabler, but more importantly, half see supply chain as an equally important part of business success. Food and beverage respondents are of the same mind, and fabric and apparel companies are even more geared toward supply chain as an equal partner.

Yet, even as consumer-centric businesses begin to accept supply chain as an equal partner, their biggest concern is focused on basic supply chain functionality. Across these industries, three out of four responded that shipping and logistics disruptions are very, or at least, somewhat concerning (Figure 2). For retail, this aligns with the fundamental need to put products on shelf to drive sales, but by narrowing the concern so drastically, it discounts the need to manage risk across the entire value chain. The broader perspective of other industries acknowledges that risk can come from both upstream and downstream, and can manifest itself physically or as information.

APPENDIX 1: THE CONSUMER VALUE CHAIN

1 | The role of supply chain in consumer-centric businesses

<table>
<thead>
<tr>
<th>Industry</th>
<th>Absolutely</th>
<th>Yes</th>
<th>No</th>
<th>Not really</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPG</td>
<td>50</td>
<td>45</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Fabric &amp; apparel</td>
<td>55</td>
<td>29</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Food &amp; beverage</td>
<td>49</td>
<td>49</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Retail</td>
<td>38</td>
<td>46</td>
<td>13</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016

% of respondents, n=367
Data security and/or IT incidents is another consistent area of concern, with retail having been particularly vulnerable to data breaches that have directly impacted consumers. Despite that, these industries still find big data analytics to be the most disruptive and important technology (Figure 3), especially in the context of understanding consumer behaviour. The other technologies that are important varies by industries. For fabric and apparel, digital supply chain enables the sharing of designs and patterns, which can then be combined with 3D printing to produce items that are trending locally, at short notice. Retail’s relative focus on drones and the sharing economy again reflects the importance of last mile delivery, while CPG is using internet of things (IoT) devices like Amazon Dash to create a direct connection with consumers.

2 | Risks about which consumer-centric businesses are somewhat or very concerned

Ensuring long-term environmental sustainability

<table>
<thead>
<tr>
<th></th>
<th>CPG</th>
<th>Fabric &amp; apparel</th>
<th>Food &amp; beverage</th>
<th>Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data security/IT incidents</td>
<td>69</td>
<td>71</td>
<td>64</td>
<td>67</td>
</tr>
<tr>
<td>Financial failure of critical customer</td>
<td>40</td>
<td>61</td>
<td>44</td>
<td>35</td>
</tr>
<tr>
<td>Financial failure of critical supplier</td>
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<td>61</td>
<td>48</td>
<td>45</td>
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<tr>
<td>Inability of customer to fulfil production/sales targets</td>
<td>53</td>
<td>61</td>
<td>59</td>
<td>47</td>
</tr>
<tr>
<td>Other incident at supplier facilities (eg, fire, strike, technical problems)</td>
<td>63</td>
<td>77</td>
<td>62</td>
<td>43</td>
</tr>
<tr>
<td>Shipping/logistics disruptions</td>
<td>75</td>
<td>74</td>
<td>78</td>
<td>77</td>
</tr>
<tr>
<td>Supply shortage of raw materials/ components</td>
<td>63</td>
<td>61</td>
<td>71</td>
<td>45</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016  % of respondents, n=367
Illustrating how all of this comes together in a digitally-enabled value chain is Intel’s retail sensor platform (Figure 4). Using data from secure RFID technology, the platform follows item movement in an IoT-connected environment that tracks inventory to “near-100 percent accuracy” and provides insight into “what items are touched, tried on, and eventually sold”. Also, the platform can provide replenishment alerts and has the potential to connect to manufacturing and distribution solutions for smarter, more efficient product flow. Furthermore, advanced analytics can use this rich data to develop adaptive decision-making, predictive capabilities and help shape product lifecycles.

<table>
<thead>
<tr>
<th>3 Perceived disruptive and important technologies in consumer-centric businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPG</strong></td>
</tr>
<tr>
<td>Big data analytics</td>
</tr>
<tr>
<td>Digital supply chain</td>
</tr>
<tr>
<td>Internet of things</td>
</tr>
<tr>
<td>Cloud computing</td>
</tr>
<tr>
<td>Advanced robotics</td>
</tr>
<tr>
<td>Machine learning</td>
</tr>
<tr>
<td>3D printing</td>
</tr>
<tr>
<td>Drones/self-guided vehicles</td>
</tr>
<tr>
<td>Sharing economy (eg, Uber, Airbnb, Instacart)</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016

% of respondents
n=367
Connecting retail solutions across the supply chain
APPENDIX 2: HI-TECH AND INDUSTRIAL VALUE CHAINS

In comparison to both consumer and healthcare value chains, hi-tech and industrial value chains show the highest likelihood of valuing supply chain as an equally important part of business success as sales and marketing or product development (Figure 1). Automotive and logistics and distribution lead in the distinction, each with 63% perceiving supply chain as an equal; industrial and aerospace & defence fall into the next tier with 56-58%; and hi-tech trails with 50%.

Given the long-standing collaboration between producers and suppliers, it is not surprising to see the automotive industry’s strong perception of supply chain, but surprisingly, hi-tech surpasses automotive when supply chain as an enabler of strategy is added to the equation. In both cases, digitisation enables multi-tier collaboration and visibility which means both better sense and respond built on leverage of data analytics, cloud and digital supply chains.

Supply chain risk management is especially important in these value chains, as shown by the similar level of concern amongst automotive and hi-tech companies for disruptions originating upstream (Figure 2). Financial failure and incidents at supplier facilities were more likely to be areas of concern for these two industries due to their reliance on a steady flow of inbound materials for production.

1 | The role of supply chain in hi-tech and industrial businesses

<table>
<thead>
<tr>
<th>Industry</th>
<th>Absolutely</th>
<th>Yes, but only as an enabler of product- or sales-driven business strategies</th>
<th>Not really. Supply chain is understood primarily as cost centre that affects margins</th>
<th>No. Supply chain is strictly seen as a function meant to service the business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace &amp; defence</td>
<td>57</td>
<td>29</td>
<td>10</td>
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<tr>
<td>Automotive</td>
<td>64</td>
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<td>7</td>
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<tr>
<td>Hi-Tech</td>
<td>51</td>
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<td>2</td>
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<tr>
<td>Industrial</td>
<td>59</td>
<td>31</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Logistics &amp; Distribution</td>
<td>63</td>
<td>22</td>
<td>11</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016

% of respondents
n=633
The dissimilar make-to-order nature of industrial companies is reflected in their high level of customer focused concerns; logistics and distribution companies are also more concerned about customer risk, as their business depends on the fulfilment of contracts. Aerospace & defence’s risk concerns are largely consistent across the value chain, although the reliance on government relationships lessens the incidence of customer financial failure.

Across the heat map, data security and IT incidents, and shipping and logistics disruptions are again consistent concerns.

Hi-tech and automotive are yet again associated together in their consideration of advancing technologies (Figure 3). Hi-tech is most likely to value the primary technologies as disruptive and important, while automotive is most likely to feel that way about the operational grouping. Neither should be a surprise as many of the primary technologies originated from hi-tech, and ideas such as drones and the sharing economy are vehicle-related.

Aerospace and defence views most technologies as importance, but 3D printing is a clear area of differentiation for companies like Lockheed Martin.

### 2 | Risks about which hi-tech and industrial businesses are somewhat or very concerned

<table>
<thead>
<tr>
<th>Risk</th>
<th>Aerospace &amp; defence</th>
<th>Automotive</th>
<th>Hi-tech</th>
<th>Industrial</th>
<th>Logistics &amp; distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data security/IT incidents</td>
<td>63</td>
<td>66</td>
<td>80</td>
<td>70</td>
<td>79</td>
</tr>
<tr>
<td>Financial failure of critical customer</td>
<td>44</td>
<td>47</td>
<td>47</td>
<td>58</td>
<td>57</td>
</tr>
<tr>
<td>Financial failure of critical supplier</td>
<td>65</td>
<td>69</td>
<td>70</td>
<td>64</td>
<td>58</td>
</tr>
<tr>
<td>Inability of customer to fulfil production/sales targets</td>
<td>60</td>
<td>53</td>
<td>60</td>
<td>71</td>
<td>61</td>
</tr>
<tr>
<td>Other incident at supplier facilities (eg, fire, strike, technical problems)</td>
<td>66</td>
<td>66</td>
<td>69</td>
<td>66</td>
<td>57</td>
</tr>
<tr>
<td>Shipping/logistics disruptions</td>
<td>70</td>
<td>75</td>
<td>76</td>
<td>74</td>
<td>82</td>
</tr>
<tr>
<td>Supply shortage of raw materials/components</td>
<td>72</td>
<td>66</td>
<td>76</td>
<td>73</td>
<td>51</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016  
% of respondents n=633
and General Dynamics, which are already investing in additive manufacturing capabilities. Industrial companies also maintain a consistent perception of importance across technologies, as does logistics and distribution for non-production related areas.

One example of a company at the forefront of integrating digital capabilities throughout the value chain is Caterpillar. In introducing “The Age of Smart Iron”\(^8\), Caterpillar CEO Doug Oberhelman said, “entire fleets and job sites – every machine, engine, truck, tablet, light tower, smart device and drone – will eventually share data on one common technology platform and speak the same language.” Through concepts such as Cat Connect (Figure 4), the company can connect with customers to gain insight about the use of the products in the field, determine how to best service the products and how to shape the company’s future. Expressing his attitude about the potential across the value chain, Oberhelman exclaimed, “I can’t wait to see what that means for our customers – and for us.”

### Perceived disruptive and important technologies in hi-tech and industrial businesses

<table>
<thead>
<tr>
<th>Technology</th>
<th>Aerospace &amp; defence</th>
<th>Automotive</th>
<th>Hi-tech</th>
<th>Industrial</th>
<th>Logistics &amp; distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big data analytics</td>
<td>75</td>
<td>81</td>
<td>88</td>
<td>76</td>
<td>79</td>
</tr>
<tr>
<td>Digital supply chain</td>
<td>61</td>
<td>66</td>
<td>75</td>
<td>70</td>
<td>76</td>
</tr>
<tr>
<td>Internet of things</td>
<td>54</td>
<td>66</td>
<td>81</td>
<td>74</td>
<td>72</td>
</tr>
<tr>
<td>Cloud computing</td>
<td>47</td>
<td>54</td>
<td>77</td>
<td>57</td>
<td>64</td>
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<tr>
<td>Advanced robotics</td>
<td>62</td>
<td>79</td>
<td>58</td>
<td>61</td>
<td>45</td>
</tr>
<tr>
<td>Machine learning</td>
<td>55</td>
<td>60</td>
<td>63</td>
<td>51</td>
<td>45</td>
</tr>
<tr>
<td>3D printing</td>
<td>74</td>
<td>54</td>
<td>50</td>
<td>46</td>
<td>34</td>
</tr>
<tr>
<td>Drones/self-guided vehicles</td>
<td>51</td>
<td>61</td>
<td>27</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Sharing economy (eg, Uber, Airbnb, Instacart)</td>
<td>13</td>
<td>50</td>
<td>31</td>
<td>18</td>
<td>38</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016

\(^{n=633}\)
Creating success with CAT connect

**EQUIPMENT MANAGEMENT**

- Increase uptime and reduce operating costs.
- Know the location, health and efficiency of equipment.
- Spot problems before they happen with data, inspections and fluid analysis.
- Receive expert recommendations on equipment maintenance and repair.
- Reduce costs through preventive maintenance, fleet optimisation and life cycle planning.

**PRODUCTIVITY**

- Monitor production and manage jobsite efficiency.
- Get accurate information on daily loads and volumes.
- Hit payload targets more consistently.
- Boost production with faster cycle times.
- Improve grading and compaction efficiency.
- Use production data to enhance project performance.

**SAFETY**

- Enhance jobsite awareness to keep people and equipment safe.
- Improve processes and jobsite practices to promote a positive culture.
- Increase operator visibility.
- Reduce the risk of injuries every day.
- Precisely track equipment location, speed and avoidance zones.
- Apply remote control in harsh or challenging environments.

**SUSTAINABILITY**

- Reduce environmental impact and simplify compliance.
- Reduce emissions by burning less fuel.
- Get the right equipment to minimise owning and operating costs.
- Recover more value at the end of equipment life.
- Make compliance reporting easier with better emissions.

Source: Caterpillar
APPENDIX 3: HEALTHCARE AND MEDICAL DEVICE VALUE CHAINS

Healthcare & pharmaceuticals and medical device value chains are designed to positively impact patients’ lives. The value of the supply chain in delivering that impact is evident to 85% of respondents in these industries. However, the product-based nature of medical devices decidedly sees that role as an enabler, as opposed to an equal partner. Healthcare and pharmaceuticals are more balanced, especially as the need to distribute products to remote areas of the world continues to grow (Figure 1).

Any business involved with the health and well-being of its customers faces considerable risk throughout their value chains. The risk concerns between these two industries are largely similar, although the healthcare & pharmaceuticals industry is more concerned with financial failure and incidents at suppliers, while the medical device sector shows greater concern towards customer purchases (Figure 2). The need for tight control of information is also more apparent in healthcare & pharmaceuticals, where regulatory restrictions – such as those concerned with material sourcing – illustrate the need for track and trace visibility.

<table>
<thead>
<tr>
<th>The role of supply chain in healthcare and medical device businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare &amp; pharmaceuticals</td>
</tr>
<tr>
<td>Absolutely. Supply chain is understood as an equally important part of business success as sales &amp; marketing or R&amp;D/product development.</td>
</tr>
<tr>
<td>Yes, but only as an enabler of product- or sales-driven business strategies.</td>
</tr>
<tr>
<td>Not really. Supply chain is understood primarily as a cost centre that affects margins.</td>
</tr>
<tr>
<td>No. Supply chain is strictly seen as a function meant to service the business.</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risks about which healthcare and medical devices businesses are somewhat or very concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data security/IT incidents</strong></td>
</tr>
<tr>
<td>75</td>
</tr>
<tr>
<td><strong>Financial failure of critical customer</strong></td>
</tr>
<tr>
<td><strong>Financial failure of critical supplier</strong></td>
</tr>
<tr>
<td><strong>Inability of customer to fulfil production/sales targets</strong></td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>Shipping/logistics disruptions</strong></td>
</tr>
<tr>
<td><strong>Supply shortage of raw materials/components</strong></td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016

% of respondents n=154
The two industries have similar perceptions to the broader supply community about the disruption and importance of the primary technologies (Figure 3). The need for advancing manufacturing processes in developing healthcare, especially medical devices, lends itself to a higher level of importance for operational technologies especially in the areas of advanced robotics, machine learning and 3D printing.

These industries are also far more sensitive to regulatory risk than most others which raises the stakes for their use of digital strategies for better supply sensing as well as visibility into production operations and distribution including the use of digital to enhance track and trace as well as predictive risk analysis.

### 3 | Perceived disruptive and important technologies in healthcare and medical device businesses

<table>
<thead>
<tr>
<th>Technologies</th>
<th>Healthcare &amp; pharma</th>
<th>Medical equipment &amp; devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big data analytics</td>
<td>83</td>
<td>82</td>
</tr>
<tr>
<td>Digital supply chain</td>
<td>62</td>
<td>68</td>
</tr>
<tr>
<td>Internet of things</td>
<td>58</td>
<td>54</td>
</tr>
<tr>
<td>Cloud computing</td>
<td>50</td>
<td>54</td>
</tr>
<tr>
<td>Advanced robotics</td>
<td>44</td>
<td>68</td>
</tr>
<tr>
<td>Machine learning</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>3D printing</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>Drones/self-guided vehicles</td>
<td>20</td>
<td>39</td>
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<tr>
<td>Sharing economy (e.g., Uber, Airbnb, instacart)</td>
<td>16</td>
<td>29</td>
</tr>
</tbody>
</table>

Source: SCM World Future of Supply Chain survey 2016  
% of respondents, n=633
Pfizer is one prominent bio-pharmaceutical company leveraging the power of the value chain to deliver precision medicine\(^9\) (Figure 4). With a focus on “discovering and developing medicines and vaccines that deliver superior outcomes for patients”, Pfizer is using data and technology to integrate the process from an understanding of the basis of disease to optimised patient care. The approach combines traditional clinical trials with innovative technologies to gain a deeper understanding about its patients and their needs. Furthermore, the programme utilises centres of excellence and extensive collaboration to connect patients to precision treatments.

### Precision Medicine Approach

**Discovery**
- Identification of Mechanisms Linked to Human Disease

**Development**
- Improved Therapeutic Index in Selected Patient Subpopulations

**Regulatory**
- Superior Safety & Efficacy Profile in Pre-determined Patients

**Clinical practice**
- Optimisation of Patient Care

Application of knowledge From Extensive Patient Experience – to every stage, within a dynamic R&D environment

Source: Pfizer
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9 http://www.pfizer.com/partnering/areas_of_interest/precision_medicine
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