pwc.com/industrialmanufacturing

Achieving excellence in production and supply

Industrial Products

Industrial Manufacturing

The third instalment in our Manufacturing Excellence series.

pwc

Contents

Introduction

Welcome to the third in our series of papers on manufacturing excellence. In the first two editions we focused on growth markets and customers. Now we look inside manufacturing and take a look at the threats to and opportunities for achieving excellence in manufacturing production and supply.

Events such as the Japan earthquake have highlighted the importance of supply chain resilience. We live in a world where the connections up and down the supply chain, as well as inside companies and outside to the world around them, are increasingly important. In this context, we highlight five issues that we believe will play an important part in determining the difference between manufacturing excellence, adequacy or mediocrity.

- Identifying and preventing supply chain risk.
- Linking demand planning with the whole value chain.
- Making customer and supplier collaboration real.
- Addressing lifecycle opportunities and demonstrating sustainable value.
- Attracting the people and skills needed for the future.

Common to all five is the importance of companies engaging and connecting better with customers, suppliers and the world around them. Companies that are disconnected or fail to engage appropriately will miss opportunities to achieve excellence or, worse, face the danger of ticking time bombs that could fatally disrupt production and supply. Those that are successful in making the connections have the opportunity to gain ground and move ahead of their peers in distinctive and tangible ways.

Identifying and preventing supply chain risk

Supply chain risk has been on a roller coaster ride. Before the financial crisis supply chains were hit with skyrocketing prices of oil and other commodities. Then they were caught in a perfect storm of rising bankruptcies, high levels of debt, tight credit, and weak demand. Now they face a mix of conditions.

Commodity prices are back to high levels, there has been a renewal of confidence but market conditions are varied. Considerable macro-level and financial market concerns remain. Events in the form of the Arab Spring civil uprisings and the March 2011 Japan earthquake remind us of the risk of abrupt supply chain disruption.

Gaining visibility over critical supplies

The Japan earthquake highlighted not just the interdependencies of the global supply chains that characterise many industries but the challenge for companies of maintaining visibility over the supply chain. The full extent of supply chain disruption following the earthquake remains unclear as the timescales for stock cushions and full visibility play out. Yossi Sheffi, director of the Massachusetts Institute of Technology Center for Transportation and Logistics, observed: "Even the best companies have very good visibility into their Tier One (direct) suppliers, but little or none into their Tier Two and Three suppliers."[1]

It is orthodoxy for companies to focus their supply chain risk management on key suppliers who make the biggest value contribution to the manufacturing process. But the Japan earthquake illustrated that disruption can come in unexpected forms. A supplier that is lower value or not central to the core product platform may nonetheless be critical.

For example, following the Japan earthquake, a shortage of a specialty pigment that gives cars a glittering shine led car manufacturers to temporarily restrict orders on vehicles in certain shades of black, red and other colours. Most major automakers use a pigment, called Xirallic, which is produced at only one factory in the world – the Onahama plant near the Fukushima-Daiichi nuclear power station in Japan.

The Xirallic example (see case study panel) reminds us that confining supply chain risk management to only the largest and most immediate parts of the supply chain is insufficient. Suppliers can be critical for a variety of reasons and risk management strategies need to take these into account. In the Xirallic case, the pigment was impossible to source from elsewhere. These kinds of risks need to be identified and appropriate measures taken, for example by way of inventory cushions, dual sourcing or collaboration with suppliers to develop alternative sources.

Following the Japan earthquake, Boeing was reported to be considering building a new supplier system to minimize the impact of natural disasters on its operations. About 35% of the 787 Dreamliner aircraft is being developed and manufactured by Japanese firms with supplies disrupted by the earthquake. CEO of Boeing Commercial Airplanes, Jim Albaugh, said the company is looking hard at its supplier relationships and the possibility of dual-sourcing critical parts: "We want to make very sure that in the future we have a production system that is not impacted by natural catastrophe that could occur anywhere in the world."[2]

1 Financial Times, US and Europe escape the worst of the quake's aftershock, 19 May 2011.
2 Reuters, Boeing mulling new supplier system in case of natural disaster, 4 July 2011.

Xirallic – when the finishing touch becomes critical

The pearl-lustre effect of Xirallic paint finishes has become popular with car buyers. This evolution in consumer taste has increased the importance of the Xirallic pigment in the auto supply chain. It is manufactured by German chemical company Merck KGaA but production took place at just one plant, 57 km south of the damaged Fukushima Daiichi nuclear power plant in Japan.

The plant had to close following the March 2011 earthquake, causing some car makers to stop or slow their own production. Merck succeeded in completing the recovery and repair work by early May, ahead of schedule. Regular production was recommenced in June 2011. The company has also announced that it intends now to diversify production with the commissioning of a second production line in Germany.[3]

3 Merck press release, Merck Resumes Xirallic Production in Japan, May 10 2011.

Checklist – preventing supply chain risk

- Have you developed a set of leading risk indicators that is forward-looking, based on a continuous monitoring and analysis of conditions?
- Are you recognising all the different types of risk that could affect your supply chain, including factors such as natural disasters, civil and political unrest or strike action?
- Are risks being matched with appropriate remedial measures such as inventory cushions, dual sourcing or dialogue with suppliers on alternative production?
- Do you have effective systems in place across your supply chain to pick up and act on early-warning signs or, in the case of sudden onset risk, to deliver real-time information and enable fast implementation of preventive measures?
- Is the potential ticking time bomb of financial stability risk of suppliers on your radar screen? Do you have the screening systems in place to assess this factor?

Forward and real-time supply chain risk alerts

Many industrial manufacturing companies still don't know who their high risk suppliers are. They haven't expended the time to look hard at where their supply chain risk is and haven't defined this risk comprehensively enough. Nor are they thinking about it ahead of time.

Companies are used to looking ahead for innovative practices to make supply chains more efficient and lean, but their risk mitigation activities often remain backward-looking, based on events they have already experienced. This risk management approach is lagging in nature and almost always ensures that new risks will be spotted only when they become serious issues. A direct link to organisational objectives is one way of making supply chain risk management forward-looking.

As far as possible, companies need to also look at connecting the supply chain and using real-time data. Hand-held mobile communications and IT systems make electronic connectivity with partners and suppliers much easier. Having sensors in place throughout the supply chain enables manufacturers to know instantly what is going on at that moment in time and for alerts to be triggered in the event of any unforeseen developments. Events such as the Japan earthquake highlight the importance of being able to rearrange sourcing and orders in real-time rather than face the time-lag of periodic reports.

The scope of the risk canvas also needs to match the nature of the supply chain. Risk parameters should fully pick up factors such as a concentration on one product, supplier or site that can heighten the vulnerability of that part of the supply chain. Similarly, if a supply chain includes locations that are susceptible to natural disasters, civil and political unrest or factors such as strike action, then these risks should be as much a part of risk management as factors such as currency risk.

Financial stability risk – the potential ticking time bomb

One risk that should be central to supply chain risk management is the financial stability of suppliers. We believe current financial and macro-economic conditions in 2011 are such that manufacturers should elevate their scrutiny of this risk factor.

The banking crisis has made the recent economic downturn and the subsequent recovery different from previous economic cycles. Lenders and banks are under great scrutiny and have held on to very large portfolios of marginal businesses that they would have normally tried to take earlier action on. If interest rates rise, it is going to be more difficult for these businesses to service loans and the banks will have to pay more attention to them. Alternatively, any renewed downturn will put pressures on marginal companies and also on banks.

Either of the above scenarios make it important for manufacturers to identify if such companies are in their supply chains and take steps to derisk. The scale of the potential risk, in the UK for example, is illustrated by data in a mid 2011 Bank of England Financial Stability report which shows around 30% of companies have interest rates greater than profits.[4] The threat to supply chains as bank interest rates rise could be a ticking time bomb for manufacturers. Default rates on loans are continuing to rise among smaller companies according to a survey of credit conditions used by the Bank of England.[5]

There are similar risks in other parts of the world, particularly in North America where the banking system and smaller companies are facing similar conditions. Ahead of the August 2011 financial market turmoil, the risk of global interest rate rises had been viewed as significant. The European Central Bank, for example, pointed to "the prospect of an unexpected and sudden, market-driven rise in long-term interest rates" as a key risk.[6] Although the creditworthiness of larger companies in most advanced economies had improved as profitability increased, default rates have continued to rise for smaller companies. Now, the latest economic concerns in the US and the risk of sovereign debt contagion in Europe have brought fears of a double-dip recession back on the global agenda, heightening the risk of company failure.

30%

Companies with interest rates greater than profits. Mid 2011 Bank of England Financial Stability report

4 Bank of England, Financial Stability Report, June 2011.
5 Credit Conditions Survey, Q1 2011.
6 European Central Bank, Financial Stability Review, 15 June 2011.

Linking demand planning with the whole value chain

High commodity prices have brought renewed focus on the importance of production efficiencies and a resilient supply chain. The traditional mantra is on the importance of companies driving down costs and exploring opportunities to gain ever leaner production and supply chains. But, while this may be an important strategy for some situations, it may not always be the best and most sustainable approach for the long term.

Concepts like 'lean' and 'just in time' have gained a lot of traction in the past decade or so. They have a huge part to play for many companies but their value is only as good as their fit with what specific companies and, most important, their customers actually need. 'Just in time', for example, may not be the best fit for a component or product that is vital but which could be prone to scarcity. As we have seen with the example of Xirallic in the previous section, there can be a fine line between 'just in time' and 'just not there'.

Demand planning – looking at the full picture

Demand planning is a step before 'just in time' or 'on demand' manufacturing. 'On demand' might be an outcome that a company decides on after going through a full demand planning process but it is just one possible outcome. With demand planning, companies start with demand and their customers' requirements and link that to the whole of their operational planning. Whether the product is then produced on demand, in a regular flow, in a large-scale batch or some mix of these is determined by the whole context of the customer's needs, the production logistics and the supply chain circumstances.

Demand planning can be particularly productive when customers and manufacturers look not just at what is being demanded but why it is needed in that way. All the way along the supply chain, suppliers and their customers are good at specifying what they want but don't necessarily share why and how they want it. Overlooking this wider context means that opportunities may be missed to engineer solutions that would help both the supplier and the customer, for example by understanding the context of customer promotions or point of use requirements.

Similarly, while most companies tie future customer needs and expectations into product development, the interface with manufacturing and supply chain planning is often overlooked or left too late. This can be a particular stumbling block for the manufacture of parts that require special arrangement for their production. But it might also lead to opportunities missed for the smooth and quick scale-up and sourcing of more straightforward components.

Smurfit Kappa Ireland – protecting margins and improving demand planning

In an industry with ever increasing competition, paper-based packaging company Smurfit Kappa Ireland's (SKI) success is based on reliable and timely product supply. It has placed a high priority on working with customers on their demand planning.

Effective demand planning has been boosted by significant investment in new machinery at strategic plants and an overhaul of supply chain and business software systems. It has replaced a variety of dated and difficult to maintain legacy systems with new enterprise level corrugated business software which integrates with the company's scheduling software. It now has a centralised database model that runs across all plants, enabling it to manage work from plant to plant, have a consolidated view of all orders and route new sales orders to any of the SKI plants for manufacturing.

The company has much greater historic and real-time visibility on demand and supply. Accurate costing information, based on actual real time data from the factory floor, enables it to quickly identify and remedy margin issues. It can then take immediate action through, for example, redesign or price discussions with customers. Management now have accurate information on 'make ready' times. They can guarantee service levels to customers on specific lead times and deliver with certainty.

With this lead time and costing information, SKI is able to accurately assess the most efficient minimum order quantities and build these into service level agreements with customers. It also has unit-based tracking and visibility of stocks at all times, allowing it to significantly reduce buffer stocks. Customers are confident that they can benefit from and rely on the short lead times and that they can forecast with sufficient accuracy to allow them to operate a 'just in time' type system. In turn, SKI has been able to protect its margins by maintaining prices while delivering added value. For example, SKI is moving towards the idea of 'solutions plants' which are geared to identifying solutions for particular customer needs such as point of sale displays for promotion campaigns, design and logistics.

Cultural change has also been necessary to make the changes effective. With accurate timely data and increased efficiencies, management has had to change its modus operandi. Without agile, proactive and flexible management and staff, the information and systems alone would not have transformed the business. The company's management was very open and honest in communication with staff with regular and forthright discussions throughout the process. Staff responded by taking on new roles and becoming more flexible and innovative.

Checklist – linking demand planning with the whole value chain

- Do you have demand-led business planning systems and practices in place to enable you to link customers' requirements to the whole of your operational planning?
- Are you looking all the way along the supply chain to share and communicate not just 'what' is wanted but 'why' and 'how', identifying opportunities to improve production and supply?
- Do you have historic and real-time visibility on demand and supply and are you managing it in ways that enable you to optimise pricing and production?
- Have you weighed up the appropriateness of developing collaborative relationships and networks up and down the supply chain?
- Is procurement and contracting risk-based and does it take account of factors such as the total cost of ownership rather than price alone?
- Are you measuring the contribution of suppliers to value generating improvements and solutions? Have you planned for this thoroughly, setting targets based on real data and monitoring progress daily and weekly to validate the benefits?

Collaborative networks

A crucial question for manufacturers to consider is the extent to which they might want to create or participate in collaborative supply chain networks. Being more open and inviting participation not just in the 'what' but in the 'why' and the 'how' a product is required can be a path towards greater productivity and supply chain optimisation. It is also a strategy that is likely to benefit companies that are seeking to build their growth on strategies of innovation and service rather than price alone.

The creation of collaborative networks is most evident in the closed type of supply chains developed by some companies, typically in the technology sector. In a recent discussion of open vs. closed supply chains, Financial Times writer Peter Marsh cites Apple as the most heralded example of a company using a closed supply chain and observes: "A closed supply chain is a highly integrated set of networks in which many of the technologies being applied are developed at least partially by the company orchestrating the system. A large proportion of the components made by key suppliers are unique to the final product."[7]

Marsh contrasts closed supply chains with "open supply chains – common in industries such as automotive, aerospace and many areas of consumer electronics – (where) the emphasis is on standardised components that fit together in a modular fashion. In these systems, suppliers are generally encouraged to be the main innovators and sell the same components to a range of customers."[8] Of course, it is possible for industries and supply chains to have a mix of open and closed networks. The decision whether to develop a closed supply chain, and the collaborative relationships that typically accompany it, might be equally relevant for an industrial products supplier as a manufacturer serving end customers.

Getting knowledge and value from suppliers

Whether manufacturers decide to go down the collaborative network route or not, all manufacturers can benefit from a re-examination of their procurement and sourcing strategies. Procurement is often price-led and fails to take account of wider considerations of value. The result can be a situation where a company's procurement or sourcing department is doing eye catching deals on price but then components that seemed good value become related to severe and frequent cases of downtime and, ultimately, much higher operating and maintenance costs. Often, suppliers and the procurement function are oblivious to these facts because the financial impact lands in operations and not in procurement.

Procurement and operations need to be linked and agree approaches to critical supplier needs that take account of the value and total cost of ownership rather than price alone. Where appropriate, the procurement process itself also needs to be conducted in ways that can gain from the knowledge of suppliers. A relationship which is purely transaction-based and focused on driving down the price is unlikely to utilise the value and the insight that component suppliers might be able to offer. Such insight can be instrumental in preventing inefficiencies or other problems arising later.

Such considerations become even more important when companies are moving beyond component and equipment purchasing and are setting up contract manufacturing arrangements. It often surprises many in the procurement function to find that their potential suppliers have been running process improvement techniques such as 'lean' and 'six sigma' methods across their operations for many years as a way of offsetting the contract pricing demands of their customers. By changing the procurement process to one of price, agility, quality and value the advantages of working with these types of value-driven suppliers becomes apparent.

Recently, for example, a global cereals producer commenced a three year continuous improvement programme. It focused first on their operations but, shortly after, was extended to the procurement function. It was difficult at first to find functional improvements and savings but, once the company engaged with their contract suppliers and manufacturers, they found huge benefits. These came in the form of operational uptime, reduced packaging consumption, better power usage and lower shipment and storage costs to the tune of millions of euros. Even better, relationships are far stronger and the pipeline of new improvements is full for the next 12-18 months with more suppliers and producers entering the programme each month.

7 Financial Times, Closed encounters with suppliers, July 6 2011.
8 Ibid.

Making customer and supplier collaboration real

In the same way that collaborative networks are increasingly important up the supply chain, as discussed in the previous section, they are also highly pertinent for the customer relationship. Business models in the manufacturing sector are changing. In the past most revenues came from the production of components or end products. Now many companies also earn a significant amount from offering services and solutions – and the trend is upwards. But this involves understanding customer needs and involving them in the development of product and service offerings.

In the second paper in our manufacturing performance series, we talked about the importance of collaborating with customers to build relationships and revenue. We believe this type of approach will be fundamental to innovating smarter and developing a sustainable manufacturing business for the future. We looked at how industrial manufacturing companies can use a variety of techniques to understand customers better, both individually and in groups.

Developing a collaborative mindset and protocols

Making collaboration real, whether it is with customers or with other companies along the supply chain, entails major mindset and cultural change, particularly among manufacturing companies. In our experience, many manufacturing companies do not have the outward-facing skillset that is needed to foster collaboration. Indeed, when it comes to some companies' attitudes to their customers, it is not too strong to say that they are anti-customer, seeing them as a nuisance, getting in the way and making life difficult. 'The customer is always right' is not an adage that sits easily with the engineering culture that still dominates in some parts of the manufacturing sector.

The same challenges also apply to collaboration with suppliers. In some respects, they are perhaps even greater. It is not just natural reticence or culture that inhibits openness, it is well-established practice and procedure. The default setting for companies is, understandably, one of confidentiality rather than openness.

Successful collaboration needs to be built on a clear and compelling case of why collaboration makes good business sense, what it covers and does not cover, and what it means for changes to established custom and practice. Even companies that have the skills and mindset will founder without a well-articulated strategy for changing the basic default settings on what can be shared and what is confidential.

Breaking down silos

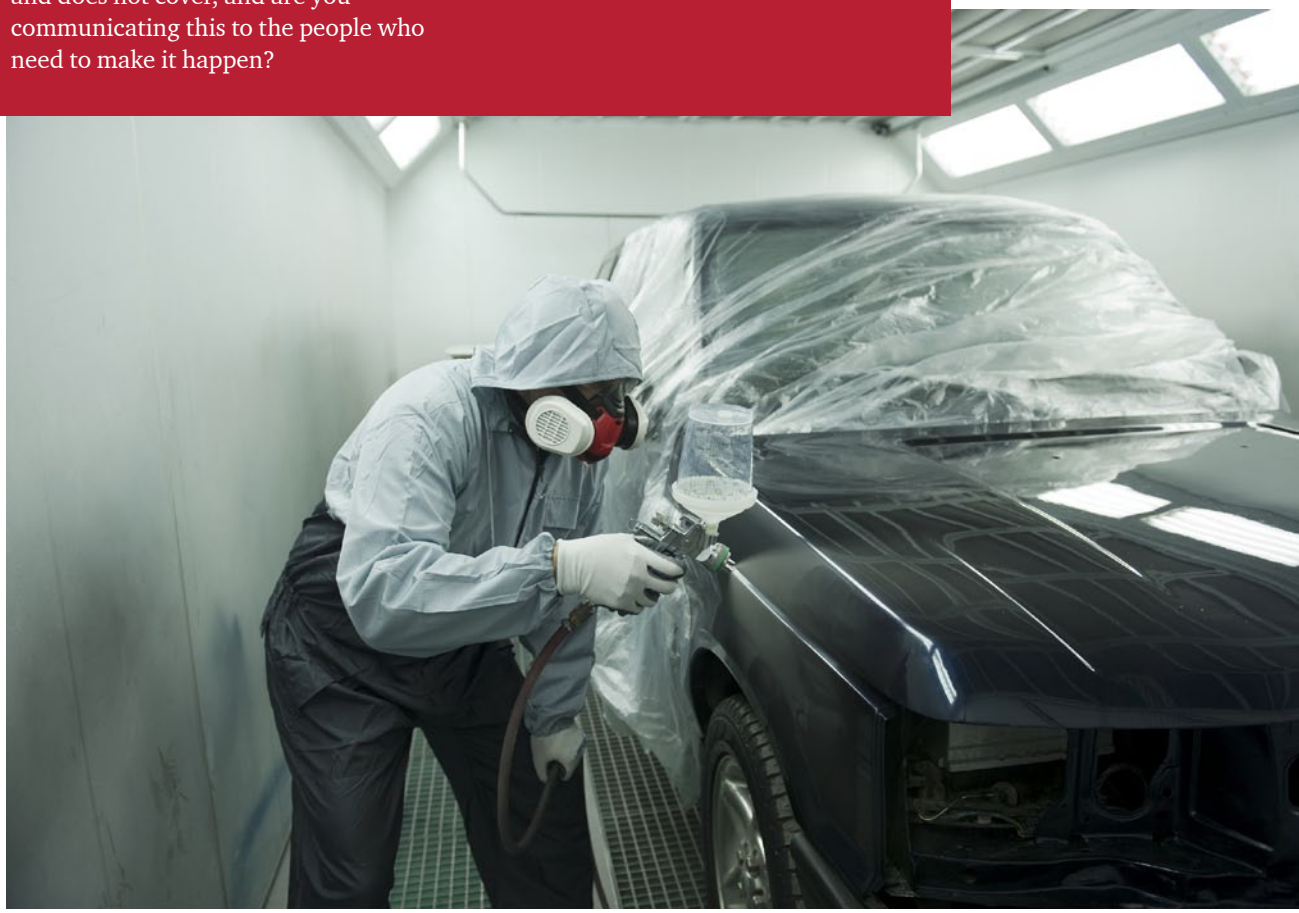
Developing a collaborative approach with customers and suppliers externally also needs to be matched with greater collaboration inside companies. Greater external connectedness is difficult to achieve if there are internal disconnections. Silo working with demarcations between marketers, product designers and production engineers characterises many manufacturing companies with consequent challenges for developing the right interfaces with customers and the supply chain.

The challenge here is that most companies operate budgets and savings targets functionally. The best companies build a business-wide operating or management system that takes the overall challenge and breaks it down into operational imperatives. In this way, the focus is more on key business processes that transverse the functions. They allow everyone to contribute to the challenge and strategic decisions to be taken that will often be counter intuitive to individual functions.

Capital expenditure projects, such as operations, IT or service solutions, provide an example of this. Often decisions on these are taken within individual functions as they benefit their budget, either through savings or revenue growth. But a broader business-wide management system perspective might conclude and decide that a particular project is not the best project and more can be gained from a different investment project with far bigger benefits and impact for the business.

Checklist – making customer supplier and collaboration real

- Are you sitting down with your suppliers and customers to look at the potential for shared systems, protocols and ways of working?
- Are you confident your company has the outward-facing mindset and culture needed to identify and develop the potential gains of collaboration up and down the supply chain?
- Do you have a clear understanding of why collaboration makes good business sense, what it covers and does not cover, and are you communicating this to the people who need to make it happen?
- Are you identifying and acting on internal barriers to change such as silo-based working or established rules, customs and practices? Do you have effective business-wide operating or management systems in place to cross-over functional boundaries?
- Do you have effective business planning and shared information systems in place to support collaboration?



Addressing lifecycle opportunities and demonstrating sustainable value

One of the most important ways that industrial manufacturers can secure growth is by demonstrating the sustainable value inherent in their products and exploring the opportunities that come from considering the whole product lifecycle. Increasingly, companies are realising that such an approach can be a differentiator in the marketplace that can directly enhance revenues rather than being a bolt-on strategy in response to regulatory imperatives.

Opportunities to maximise sustainable value arise at the product design, product support and product end of life stages. In the first of these stages, sustainability can be designed-in to the product. Once a product is in use, support and maintenance packages can be tailored to extend product life or increase its output or efficiency. Always the relationship with the customer is of central importance. Some customers are mature and are looking for a 'through life' total cost approach. Others are less sophisticated and, in such cases, suppliers need to think carefully about their cost/value equation and how they communicate this.

In many sectors, sustainability-related initiatives are most evident among first and second tier suppliers who are close to the consumer/retailer interface where, often, regulation applies or customer choice comes into play. But understanding of the value of sustainability and its adoption often fades as you move further along the supply chain. A noteworthy example of impetus to address such issues throughout the entire supply chain and across the whole industry is the nonwoven fibre sector. Here firms in the industry have come together to form EDANA, an initiative that seeks to embed sustainability throughout the entire supply chain (see opposite).

Gaining competitive advantage

Manufacturers and suppliers that are able to demonstrate sustainability in their processes and products are gaining competitive advantage. For example, building and construction companies competing to be part of the supply chain for most major projects are expected to meet certain specifically-defined thresholds. Many projects now expect suppliers to go well beyond these as end customers, whether they are public or private entities, seek to show that their new facility excels in sustainability terms.

For example, the 2012 London Olympics has sought to set new benchmarks in carbon reduction for large scale projects and regeneration projects. As well as climate change, it also has strong themes related to waste, biodiversity, inclusion and healthy living that have been part of contractor and supplier selection. Similarly, in France PwC has been working with Nice City Council on tender proposals for the construction of a new soccer stadium. Each of the four proposals have been graded according to their environmental impact, taking into account factors such as energy and water consumption and the life cycle of building materials.

A whole supply chain approach – measuring economic, social and environmental impact

EDANA is an international association serving the diversified interests of over 220 member companies, representing over 90% of the vertically integrated supply chain in nonwovens.[9] It promotes cooperation on sustainability in the value chain and conducts an annual sustainability report on its efforts to embed sustainability at the core of the industry. Nonwoven fibres have a wide range of uses. Most well known are feminine hygiene products, nappies and wound care dressings but nonwovens are also used in more than 40 automotive parts, such as air and fuel filters, trunk liners and carpets, and they are used in many aspects of building construction.

A key part of EDANA's approach is to identify and communicate the social, economic and environmental benefits and impact of nonwoven fibres. In doing so, it brings together assessments of matters such as the economic and social value-add of the industry. These measures are diverse, ranging from things such as the number of people employed by the sector through to the social and economic benefits of its products. It provides a focus for information on key issues in the industry such as the evaluation of the environmental impact of single use vs. reusable products and the industry's contribution to waste prevention – a big debate surrounding disposable nappies.

EDANA's 2011 sustainability report was informed by an initiative called Vision 2010.[10] It asked the Copenhagen Institute for Futures Studies to carry out a detailed assessment of nonwovens in which they developed a number of scenarios and associated recommendations for EDANA and its member companies over the next ten years. The results show the importance of the sector to health, hygiene and environmental challenges that will become increasingly acute over time. For example, the report highlights the ways in which the sector's products are contributing to the number of people who can remain economically active in an increasingly feminised global workforce and the impact of products such as incontinence pads to help an ageing population remain mobile and independent.

9 www.edana.org
10 EDANA, Sustainability Report 2011.

Lifecycle assessment and 'cradle to cradle®' approaches

The push towards sustainability is being given a strong reinforcement by the impact of rising energy and other input costs, including the cost of carbon arising from tax or trading requirements. This all puts a premium on designing products that have minimal carbon footprints, consume less energy, water and other inputs in their manufacture and end-use, and produce fewer air, water and other pollutants.

Manufacturers are responding in a variety of ways – with products that have prolonged useful lives or modular parts to extend the useful lives of components or that are composed of parts that are recyclable and reusable to the greatest extent possible. Manufacturers can also differentiate themselves and gain competitive advantage by initiating take-back programmes and by assuming extended product responsibility, ensuring that their products' ultimate disposal is environmentally sustainable.

Manufacturers who gain reputation in this space stand to benefit from 'dematerialisation', where they use fewer materials to do more and their products gain a value and resonance over and above their basic functionality. Lifecycle assessment and 'cradle to cradle®' strategies can help industrial manufacturers design out or minimise harmful impacts and maximise benefits for any given production process.

The 'cradle to cradle®' design approach goes a step further than minimising harmful impacts. Its goal is product design and manufacturing that reflects the ability of nature's ecosystem to replenish – namely, by designing products that have value beyond their immediate lifetime and can provide input, or 'nutrients', for the next generation. "Toward this end, product ingredients are evaluated for their human and environmental health attributes and their potential to be safely cycled," argue 'cradle to cradle®' proponents William McDonough and Michael Braungart. They talk about "either 'biological nutrients' that are derived from the biosphere and can biodegrade to build healthy soil, or 'technical nutrients' that are recyclable materials and can be returned to high-valued uses in new products without contaminating the biosphere."[11]

Aliapur is a used tyre recovery company founded by seven leading tyre manufacturers, including companies such as Bridgestone, Dunlop, Goodyear, Michelin and Pirelli. Its aim is to neutralise the environmental hazards brought about by the presence of used tyres in France. PwC has conducted a comparative life cycle assessment of the main tyre recycling methods on behalf of Aliapur. One of these is the use of granules from old tyres in the production of synthetic turf. This enables the substitution of ethylene propylene diene monomer rubber (EPDM) granules. EPDM granule production is very energy consuming and granule lifetime is only half that of granules made from old tyres. Other options for tyre recycling include the construction of retention basins which make it possible to store rainwater or runoff water temporarily. Using whole or shredded tyres for retention basins provides an alternative to quarry gravel. As tyres are less costly both as a raw material and in terms of transportation, they make it possible to fill the basin whilst conserving a very large quantity of water.

Life cycle analysis of a new product range

Europe's number-one producer of household wraps and waste collection packaging, Sphere, asked PwC to perform a life cycle analysis of its new product range, produced with renewable polyethylene made from sugarcane ethanol. It wanted to identify the gains expected in terms of environmental impact compared with waste bags made from plastics of fossil origin. Over their complete life cycle, the 'biosourced' polyethylene bags use three times less non-renewable natural resources than the 'fossil origin' bags. The greenhouse emissions generated at all stages of the new bag's lifecycle – from cultivation, through manufacture and end-use and disposal – are offset by the carbon taken up during the growth of the sugar cane, the main raw material in the bag.

11 MBDC/Cradle to Cradle®, Design for a cradle to cradle Future, 2010.

Optimising manufacturing processes

Underpinning everything is the need for manufacturers to be able to monitor and optimise their processes to ensure they are as efficient as possible and are not in any way wasteful. The use of modern process control technology on individual operations and processes, enabling them to be continually monitored and accurately controlled, can significantly reduce or eliminate waste and, in turn, ensure minimal use of energy and other inputs. Such technology can be integrated into overall system architecture, allowing full transparency on quality aspects from unit operation up to manufacturing execution system (MES) or even enterprise resource planning (ERP) level.

Waste heat is a major efficiency and energy production opportunity for manufacturers in some sectors. In glassmaking, for example, large amounts of waste heat with temperatures between 400°C and 800°C are produced. But many companies are still failing to make use of the energy generation potential of such heat. The electrical energy from waste heat could cover up to half a glass manufacturing plant's total electricity needs,[12] saving money and reducing carbon dioxide emissions.

Measuring and reporting progress

Monitoring and control of energy intensity, carbon use and other impacts is increasingly important, not just for regulatory compliance purposes, but also for customers so that they can evaluate environmental and other impacts in their supply chains. In 2011, PwC helped sports lifestyle company PUMA develop an environmental profit and loss account, making them the first global business to put a true value on the natural resources used and the environmental impacts caused by providing products to its customers.

Environmental P&L accounting is an emerging field for reporting. The profit and loss account is intended to give PUMA a detailed understanding of the implications of decisions on the environment, enabling better positive actions to be taken to deliver commercial benefits and safeguard the natural assets businesses depend on. PUMA has taken a significant first step, effectively holding a mirror up to its supply chain, showing its dependencies on natural capital so that they can be tackled from the first design concept to the shop shelf. The supply chain holds the key for many companies' ability to tackle environmental risk and impacts.

Checklist – addressing lifecycle opportunities and demonstrating sustainable value

- Are there opportunities in your sector to take a whole supply chain approach to sustainability?
- Are you identifying and promoting the environmental, economic and social value-add of your products and feeding this back into product development?
- Do you have modern process control systems in place to manage production in ways that reduce or eliminate waste and, in turn, ensure minimal use of energy and other inputs?
- Have you evaluated the potential of initiatives such as take-back programmes and extended product responsibility which have the potential of reinforcing and sustaining customer relationships and revenue streams as well as boosting environmental sustainability?
- Do you have effective mechanisms for monitoring, gathering data and reporting on energy intensity, carbon use and other impacts and have you considered ways of enhancing this, for example through environmental profit and loss accounting?

12 Siemens, Energy efficiency thanks to waste heat recovery, innovative concepts for the glass industry, 2008.

Attracting the people and skills needed for the future

CEOs worldwide are once again citing a lack of key skills as the hottest issue on their agenda. Managing talent has overtaken risk as top of the CEO agenda and two thirds report that lack of the right skills is their biggest talent challenge.[13] Manufacturing is no exception and companies in many different countries report shortages of suitably qualified science, technology, engineering and mathematics (STEM) qualified workers. In the UK, a fifth of manufacturers report skills gaps and, despite high unemployment, 45% report that hard-to-fill vacancies are causing delays in new product or service development.[14]

New types of skills

Gaps seem particularly evident in the type of skills needed to deliver the culture of collaborative working and breaking down silos that is discussed earlier in this report. For example, specific skills gaps in problem solving, team working, oral communications and customer handling skills account for four of the top five positions in a list of 15 skills shortages reported by companies in the UK process and manufacturing sector.[15]

In the US, the Manufacturing Institute reports that "according to US manufacturing executives, a skilled, educated workforce is the single most critical element of innovation success — and the hardest to acquire."[16] Eric Spiegel, US chief executive of German engineering group Siemens, observed: "There's a mismatch between the jobs that are available, at least in our portfolio, and the people that we see out there."[17] Siemens is responding to this environment in the US by investing in education and training to meet its staffing needs, including apprenticeship programmes of the kind it uses in Germany.

Investing in the skills supply chain

Manufacturers are increasingly addressing their skills and talent challenges by stepping up investment in their people development programmes. For example, multi-brand commercial products manufacturer Ingersoll Rand has developed its own 'Ingersoll Rand University' (IRU). It is a training resource which provides strategic education to develop business leaders, enhance strategic competencies and drive the Ingersoll Rand culture. Training programmes are delivered locally across the globe as well as at the company's University Education Centres in Davidson, North Carolina; Prague, the Czech Republic; Shanghai, China; and Bangalore, India. IRU learning programmes are also available on-line, 24 hours a day, at no cost to the employee. During 2010, 23,000 Ingersoll Rand employees used this training resource.[18] The resource is also open to customer, distributors and partners.

Attention is also being focused on ways of stimulating the future supply line of STEM-qualified students. In the UK for example, Tomorrow's Engineers is led by Engineering UK and the Royal Academy of Engineering and reaches more than 35,000 students in over 1,000 schools across the UK each year.[19] It brings engineering into the classroom, enabling young people to experience for themselves the possibilities that engineering has to offer. The broad programme is backed up with regional initiatives including the involvement of Airbus UK in a cross-sector initiative in the West Midlands with power utility company E.ON to link learning in schools to the real world of engineering.

Emerging markets are also placing a high priority on the skills agenda. In India, for example, efforts are underway to enhance the skills level of the labour force, with the National Skills Development Council looking to "skill or upskill" 150 million workers, and new private engineering colleges springing up at a rapid rate.[20]

Checklist – attracting the people and skills needed for the future

- Are your assessment of skillset requirements and your people development and recruitment activities keeping up with the changing needs of your customer and supply chain strategies?
- Are you making the appropriate investment in in-house development packages and future talent programmes? Have you got the metrics in place to assess the return on such investments?
- Are you making the most of ways in which you could reach up the future talent supply chain and collaborate with schools and universities?
- What are the opportunities for shared initiatives across your supply chain or with other companies in your sector?

13 PwC, 14th Annual CEO Survey, 2011.
14 UK Commission for Employment and Skills, National Employer Skills Survey for England 2009, August 2010.
15 Proskills UK, The Sector Skills Assessment 2010 for the Process and Manufacturing Sector, December 2010.
16 http://institute.nam.org/page/edu_workforce.
17 Financial Times, Siemens chief warns on US skills shortage, June 11 2011.
18 Ingersoll Rand, 2010 Sustainability Website Content.
19 http://www.engineeringuk.com/tomorrows_engineers.
20 The Times of India, TN to get 42 new engineering colleges, July 9 2010.

Conclusion

Looking ahead, the importance of the themes discussed in this report is likely to intensify rather than diminish. Manufacturers that succeed in strengthening the connections and resilience of links up and down the supply chain and demonstrating the value-add of their strategies for sustainability will be in a stronger position than companies that underestimate these priorities.

Factors such as geopolitical, economic and financial market risk are an ever-present. As the experience from the Japan earthquake has showed, companies need to identify and monitor all the different types of risk that could affect supply chains and match them with appropriate remedial measures such as inventory cushions, dual sourcing or dialogue with suppliers on alternative production.

The banking crisis has made the nature of the recovery from the recent downturn very different from previous economic cycles. Lenders and banks have held on to loans that they would have normally tried to take earlier action on. If interest rates rise or fears of a renewed downturn become real, we believe manufacturers need to be especially vigilant to the potential ticking time bomb of financial stability risk of companies in their supply chains.

High energy and commodity prices will continue to require an emphasis on the need for manufacturers to monitor and optimise their processes to ensure they are as efficient as possible and are not in any way wasteful. Sustainability in the form of minimising harmful footprints and maximising lifecycle utility will be an expectation and will also be an important service-add to build relationships and revenue with customers.

Demand planning, with manufacturers linking the totality of their customers' requirements to the whole of their operational planning, will be an important priority. This requires a greater degree of collaborative working. Being more open and inviting participation not just in the 'what' but in the 'why' and the 'how' a product is required can be a path towards greater productivity and supply chain optimisation. It is also a strategy that is likely to benefit companies that are seeking to build their growth on strategies of innovation and service rather than price alone.

But, as we have seen, greater collaboration and external connectedness is difficult to achieve if there are internal disconnections or if the right skillset is not in place to deliver it. A collaborative approach with customers and suppliers externally needs to be matched with culture change internally. Just as companies are stepping up investment in their people development programmes to address STEM skills shortages, so they also need to be looking at the softer skills, such as problem solving and team working, that are needed for collaborative working up and down the supply chain.

Further reading

Customer Collaboration Designs Excellence

It's a given that a business needs to focus on its customers. But how does this work in practice for industrial sectors, where customers aren't consumers, but businesses? In this paper we take a look at how manufacturing companies are collaborating with customers to build relationships and revenue.

Capturing growth markets

In the 80's and 90's, many companies looked to the emerging markets for low-cost sourcing. Now they are looking to places like China as important markets in their own right. We highlight some examples of manufacturers who are already building plants, working with local partners and governments, conducting research – and most importantly, generating significant sales – in some key emerging markets.

14th PwC CEO survey: Industrial manufacturing sector summary

In 'Growth reimagined: Prospects in emerging markets', we show how CEO confidence is being driven by targeted investments in particular emerging markets – often far from home. Like their peers in other sectors, industrial manufacturing CEOs have renewed confidence in their companies' growth prospects. They honed their cost-cutting skills during the recession, patiently waiting for the time when global growth would return.

Manufacturing barometer

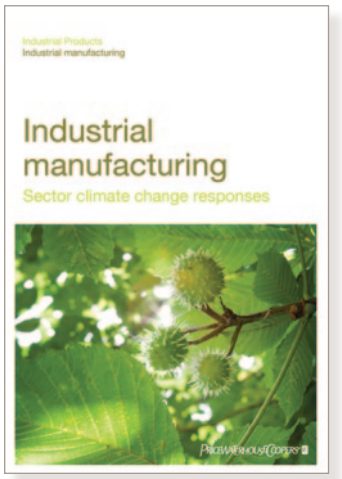
Given today's economic conditions, this window on the views and expectations of other executives will help you to understand what your peers are thinking, and how they are responding to current business issues. Every quarter, the Manufacturing Barometer surveys US-based senior executives from multinational manufacturing companies regarding their view of the US and global industrial manufacturing economies over the past quarter and their outlook for the next 12 months.

Assembling value

Assembling value is the PwC quarterly analysis of mergers and acquisitions in the global industrial manufacturing industry. In addition to a detailed summary of deal activity in each quarter, we supplement each issue of Assembling Value with a special report looking at the impact of wider industry challenges on the strategic deal environment.

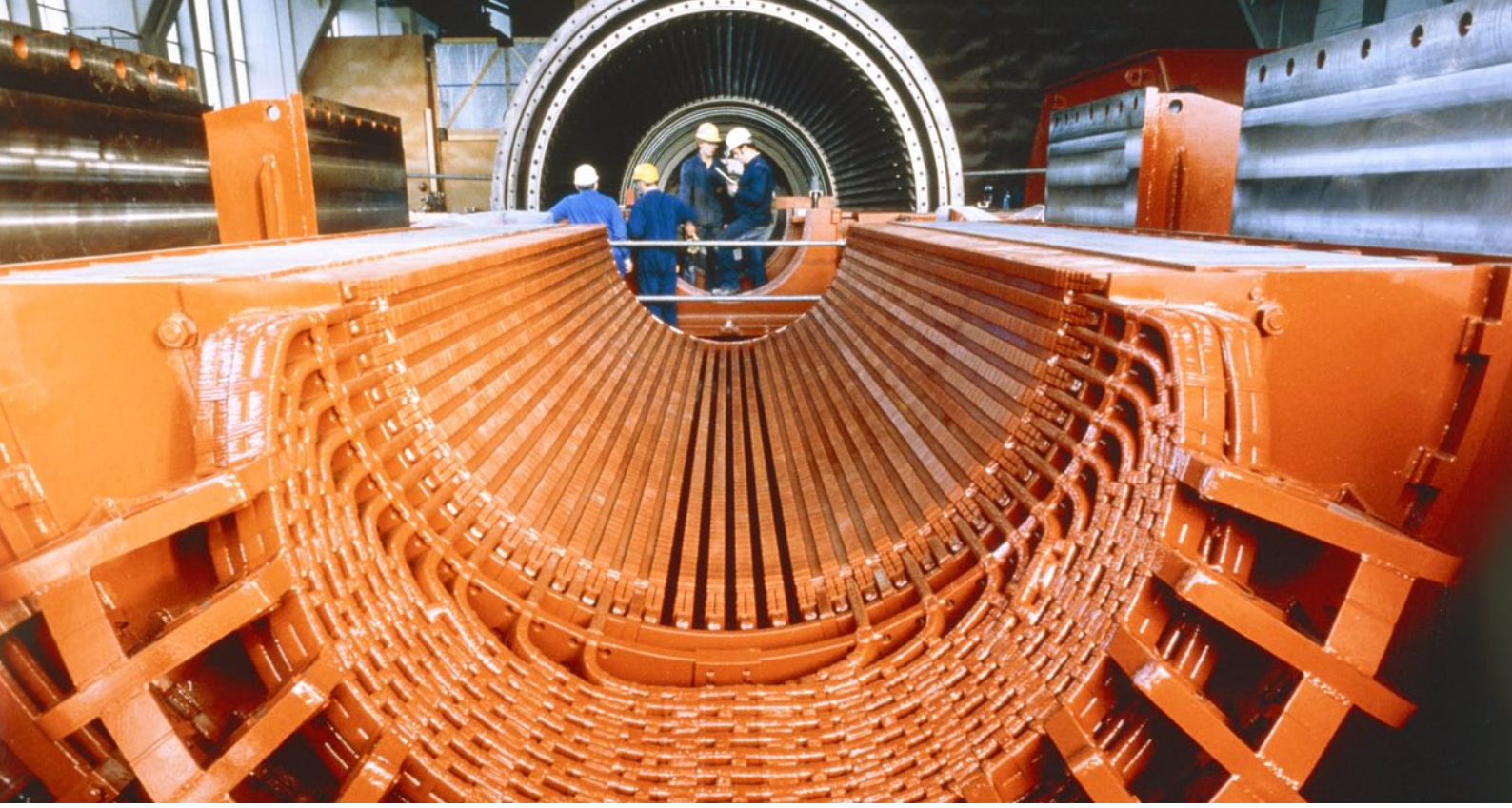
Never waste a good crisis

Business leaders have taken their companies through unprecedented times recently and now face new challenges in embedding the lessons learned and driving for growth in a rapidly changing environment. In this report we show how some leading players in the Industrial Manufacturing sector have used the period to adapt and strengthen their businesses providing lessons for those tackling their own particular stage of the cycle.



Different shades of green

In this short paper we look at the state of the climate change agenda post Copenhagen and the business implications for Industrial companies. The accompanying manufacturing sector supplement gives some background on the current state of the sector followed by an analysis of top sector companies and their responses to climate change issues based on publicly available information.



Global Industrial
Manufacturing team

Barry Misthal
Global Industrial Manufacturing Leader
barry.misthal@us.pwc.com
Tel: +1 267 330 2146

Erica McEvoy
Global Industrial Manufacturing Marketing & Knowledge Management
erica.mcevoy@au.pwc.com
Tel: +61 3 8603 4827

Global Industrial Manufacturing Industry Group

The Global Industrial Manufacturing Industry Group at PwC includes over 9,300 professionals who are committed to serving the Industrial Manufacturing industry. It is part of an Industrial Products group consisting of over 32,000 professionals, including over 17,000 providing Assurance services, 8,300 providing Tax services, and 7,000 providing Advisory services.

Our group is dedicated to delivering effective solutions to the complex business challenges faced by industrial manufacturing companies. As a global leader in serving the industry PwC has extensive experience working with companies on industry-specific strategic, operational, and financial issues.

Our expertise includes assurance, tax and advisory services, as well as specialised capabilities in regulatory compliance, risk management, performance improvement and transaction support. In helping our clients, we draw on the full knowledge and skills of PwC's professionals.

Territory Industrial Manufacturing contacts

Australia
Graeme Billings
graeme.billings@au.pwc.com

Canada
Calum Semple
calum.k.semple@ca.pwc.com

Central and Eastern Europe
Matt Pottle
matthew.pottle@cz.pwc.com

China
Malcolm MacDonald
malcolm.macdonald@cn.pwc.com

Finland
Urmas Rania
urmas.rania@fi.pwc.com

France
Edouard Sattler
edouard.sattler@fr.pwc.com

Germany
Martin Bork
martin.bork@de.pwc.com

India
N.V. Sivakumar
n.v.sivakumar@in.pwc.com

Ireland
Alisa Hayden
alisa.hayden@ie.pwc.com

Italy
Gianluca Sacchi
gianluca.s.sacchi@it.pwc.com

Japan
Shigeru Shiina
shigeru.shiina@jp.pwc.com

Korea
Jae-Eun Lee
jae-eun.lee@kr.pwc.com

Luxembourg
Mervyn Martins
mervyn.martins@lu.pwc.com

Malaysia
Thaya Sangara Pillai
thaya.sangara.pillai@my.pwc.com

Mexico
Hector Rabago
hector.rabago@mx.pwc.com

Middle East
Alistair Kett
a.kett@ae.pwc.com

Netherlands
Alexander Staal
alexander.staal@nl.pwc.com

Russia
John Campbell
john.c.campbell@ru.pwc.com

South Africa
Diederik Fouche
diederik.fouche@za.pwc.com

South and Central America
Marcos Panassol
marcos.panassol@br.pwc.com

Spain
Julio Balaguer Abadia
julio.balaguer@es.pwc.com

Sweden
Olof Enerbäck
olof.enerback@se.pwc.com

Switzerland
Stefan Raebsamen
stefan.raebsamen@ch.pwc.com

Taiwan
Gary Chih
gary.chih@tw.pwc.com

United Kingdom
Chris Baker
chris.baker@uk.pwc.com

United States
Barry Misthal
barry.misthal@us.pwc.com

pwc.com/industrialmanufacturing

We thank a number of partners and staff at PwC for their contributions to the research, writing and management of this publication.

This document is printed on heaven 42. heaven 42 is an environmentally responsible paper manufactured using Elemental Chlorine Free (ECF) pulp sourced from certified, well managed forests.
heaven 42 is Forest Stewardship Council (FSC) Chain of Custody (CoC) certified (mixed sources).