

Industry 4.0: Building the digital enterprise

Forest, paper and packaging key findings



73

*forest, paper
and packaging
company
executives
interviewed in 26
countries*

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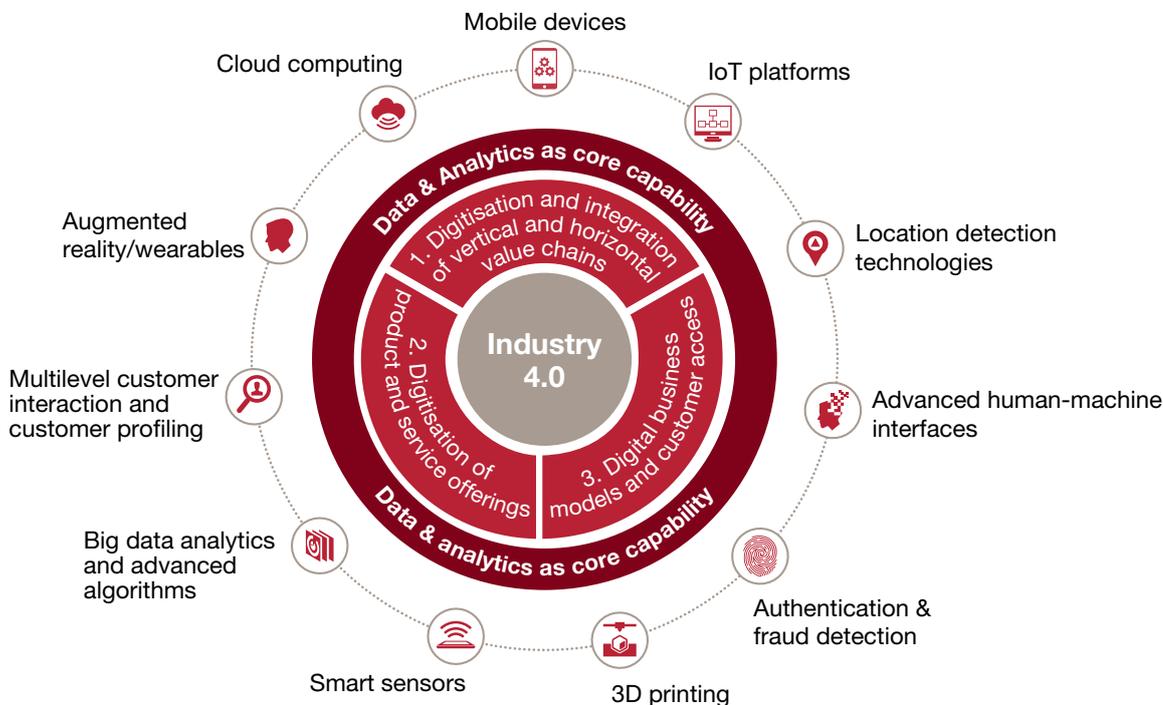
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PwC's 2016 Global Industry 4.0 Survey is the biggest worldwide survey of its kind, with over 2,000 participants from nine¹ major industrial sectors and 26 countries. It goes to the heart of company thinking on the progress of Industry 4.0. The study explores the benefits of digitising your company's horizontal and vertical value chain, as well as building your digital product & service portfolio.

Industry 4.0 at a glance

We include a detailed description and definition of Industry 4.0 in the main global report on the survey. In summary, Industry 4.0 is being driven by digitisation and integration of vertical and horizontal value chains, digitisation of product and service offerings and the development of new digital business models and customer access platforms.

Industry 4.0 framework and contributing digital technologies



1 Aerospace, defence and security; automotive; chemicals; electronics; engineering and construction; forest, paper and packaging; metals; industrial manufacturing; transportation and logistics.

Overview

Behind the scenes of the world's leading industrial and manufacturing companies, a profound digital transformation is now underway. The forest, paper and packaging sector is no exception. Companies are digitising essential functions within their internal vertical value chain, as well as with their horizontal partners along the supply chain. In addition, they are enhancing their product portfolio with digital functionalities and introducing innovative, data-based services.

- Forest, paper and packaging companies in our survey plan to invest 4% of annual revenue in digital operations solutions in the next five years.
- They are also setting themselves ambitious targets for the level of digitisation and integration that can be achieved. Nearly two fifths (38%) report they have already reached an advanced level of digitisation and integration and just under three quarters (72%) expect to be at such a level in five years' time.
- Digitisation is moving from being a 'nice to have' or augmenting capability to something that is becoming very important to the challenges of capital intensity, sales pressure and tight margins faced by much of the forest, paper and packaging industry. The industry is embracing technologies that will enable its machines to operate more flexibly, with higher capacity utilisation and with faster reaction times so as to increase profitability and reduce working capital.
- Industry 4.0 is a differentiating and potentially disruptive force. It is delivering production and supply chain efficiency, enhanced communication with customers, reduced wastage and significant raw materials efficiency. Companies are planning for a future where much greater horizontal supply chain integration with customers and suppliers is possible across the whole product life cycle.

We are seeing digitisation having an impact all the way from real-time information and monitoring of forestry and tree conditions through to highly customisable, on-demand manufacturing, with customers having real-time access to design, supply and demand systems.

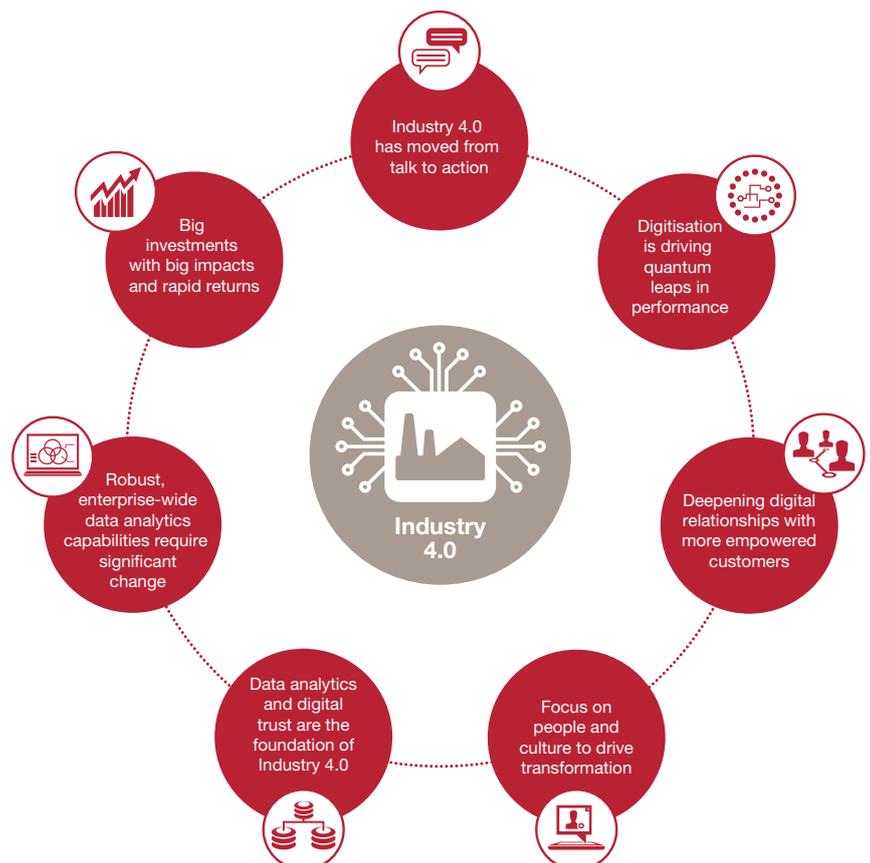
Direct interfaces between mill management systems and customers' own ordering and demand planning systems are shortening lead times and improving machine capacity utilisation planning. In time, this will be extended with the aid of predictive analytics to include future demand management covering longer planning periods. System improvements to mill control

software are being implemented to make mills more flexible, while big data and predictive analytics are being used in areas such as advance warning of potential machine breakdown, threatened paper breakage and optimal maintenance timing.

Technologies such as 3D printing in product packaging, predictive and connected maintenance, and the integration of RFID chips in packaging products are just a few examples of new technologies coming into use. At the same time, new innovations offer future integration and productivity opportunities. The use of drones in forestry is expanding and flying robots have the potential for safer remote working at height in forests. Autonomous vehicles offer the prospect of driverless transportation of materials between sites and on site.

Some of these developments are happening now. Others remain for the future. Some see the forest, paper and packaging sector as possible laggards in the adoption of Industry 4.0, but the companies we spoke to are adopting it at an increasing rate. The digitisation, integration and automation opportunities offered enable companies to collaborate both internally and across their value chains in ways that can provide a step change in productivity. And they are opportunities that are increasingly important as companies seek to stay relevant as the era of digitally-connected smart infrastructure develops.

Key findings from our survey research



01 Industry 4.0 has moved from talk to action

The buzz around Industry 4.0 has moved from what some had earlier seen as PR hype to investment and real results today. The forest, paper and packaging participants in our survey plan to invest 4% of revenue in digital operations solutions over the next five years, just short of the 5% level of investment reported across all the industries that we surveyed. When set against the average annual capital expenditure in the industry, around 7% in the years since the global financial crisis², this represents a truly significant commitment.

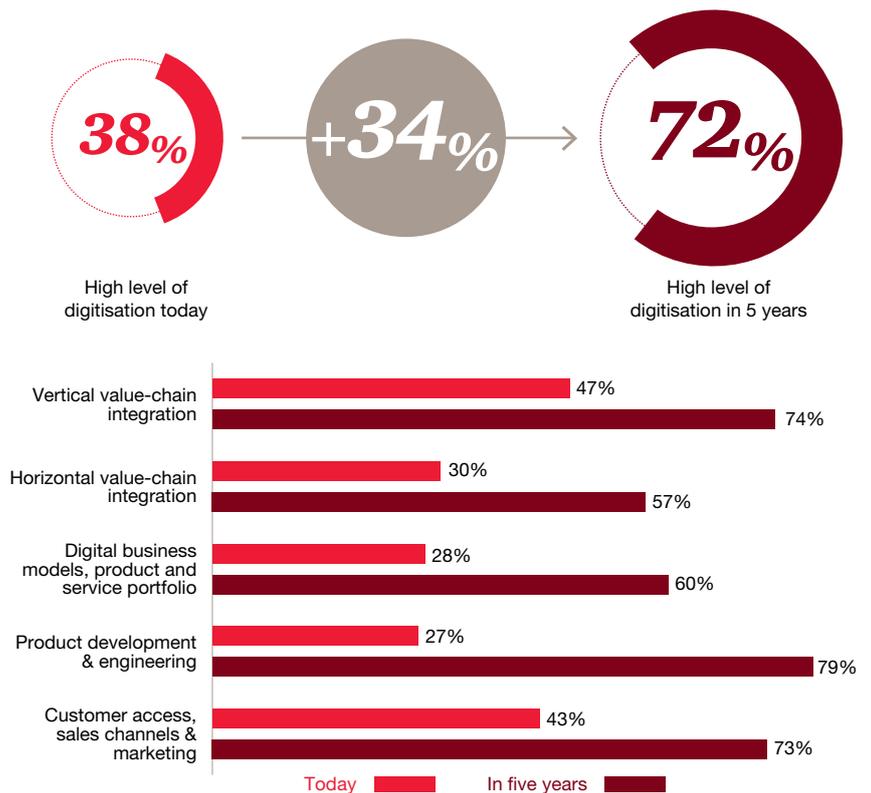
This investment is translating into increasingly advanced levels of digitisation and integration. Nearly two fifths (38%) of forest, paper and packaging companies report that they have already reached an advanced level of digitisation and integration and just under three quarters (72%) expect to be at such a level in five years' time (figure 1).

The level of expected future progress is in line with that reported across all the sectors we surveyed and, indeed, optimism about current progress is actually slightly ahead of other sectors. In part, this may reflect our survey's focus on larger firms in the sector, which are more likely to have invested in this area. Product development and engineering is the area where forest, paper and packaging companies rate themselves as advancing furthest down the digitisation and integration road in five years' time. In a highly resource-intensive industry where downtime can be expensive, the gains from the use of smarter, sensor-enabled equipment and processes in terms of higher productivity and better raw materials and energy usage can be substantial.

In common with other sectors, advanced digitisation and integration of the horizontal value chain, with suppliers, customers and other value chain partners, is progressing slower than with the vertical value chain. Advances are expected in five years' time but these are areas that companies believe will be more challenging than those closer to their core production activities.

72%
of forest, paper and packaging respondents say they expect to reach advanced levels of digitisation in their vertical value chains in five years' time.

Figure 1: Industry 4.0 is beyond the hype – it has arrived at the strategic and operational core of many forest, paper and packaging companies



Shown: Percentage of companies reporting advanced levels of digitisation and integration

Q: How would you classify the current level of digitisation and integration in the following areas in your company? What levels of digitisation and integration are you expecting in the next five years?

² PwC, Global Forest, Paper & Packaging Industry Survey, 2015.

02 Digitisation is driving quantum leaps in performance

Our survey respondents anticipate significant gains over the next five years from the implementation of Industry 4.0 initiatives. On average, companies across all sectors that we surveyed expect to reduce costs by 3.6% per annum. Forest, packaging and paper companies are also optimistic and, indeed, they have slightly higher expectations of cost savings (4.2%).

Survey participants also expect additional significant revenue growth to flow from their digitisation and integration initiatives. Again, the expectations of the forest, paper and packaging companies we spoke to are slightly higher than those of companies in all the sectors covered in the survey. They anticipate a revenue gain of 3.1% per annum compared to 2.9% in the survey as a whole.

A report from the Confederation of European Paper Industries and others highlights a number of examples of how pulp and paper companies can use Industry 4.0 to reduce costs and to gain revenue.³ It highlights, for example, how networking and connectivity are enabling a company to connect customers directly into the order book, allowing them full transparency, and also to deliver connected maintenance with remote monitoring enabling proactive maintenance practices. It estimates compound aggregate revenue growth of over 11% per annum.

There are substantial simultaneous revenue-adding and cost-saving gains that can be captured. Efficiency gains and revenue growth even of the lower levels reported in our survey have the potential to change the competitive landscape within a very short space of time. If even half of the expectations are realised, some companies may find it difficult to compete. In an increasingly cost-competitive market, no forest, paper and packaging company can afford to lose out in operational efficiency against their market peers. The next two to three years will be crucial for companies looking to catch up.

Forest, paper and packaging companies expect significant additional revenue growth to flow from their digitisation and integration initiatives.

Figure 2: High expectations of cost savings, increased revenue and efficiency gains (forest, paper and packaging)

Expected benefits from digitisation over the next five years



Q: What benefits from digitisation do you expect in the next five years?

³ Paper Industry 4.0: what digital can do for the paper industry, CEPI in cooperation with SITRA and StepChange, November 2015.

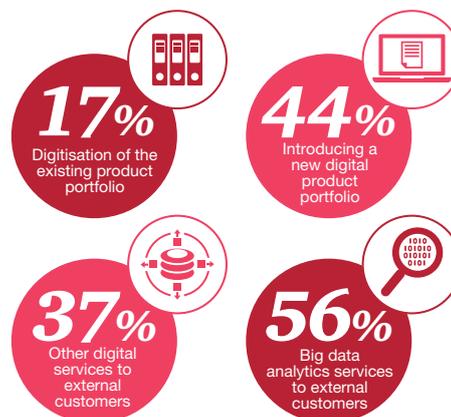
03 Deepening digital relationships with more empowered customers

As Industry 4.0 develops, it will greatly enrich the opportunities to retain and grow the client relationship, but it will also make the fight for the customer more intense. Clients and customers will be at the centre of the changes to value chains, products and services. They will be able to be increasingly customised to customer needs, and many of our survey respondents say they plan to use data analytics to understand and meet them. This is of major importance in the packaging and print industries - the more a product stands out on a shelf, the more likely it will be chosen by the end consumer.

A majority (56%) of the forest, paper and packaging executives we interviewed expect to introduce big data analytics services for external customers and anticipate these to be generating more than 10% of revenue over the next five years. Big data analytics services were identified as an important area by more forest, paper and packaging survey participants than any other sector that we surveyed.

Many companies we spoke to are also expecting to strengthen their digital offering to customers, either by digitising existing products or by developing new digital products. The opportunity is there not only to greatly increase the ability to respond flexibly and more rapidly to customer demands but also to anticipate demands, helping customers get ahead of themselves in a range of predictive ways.

Figure 3: Revenues from digitising the product and service portfolio will grow significantly in the future (forest, paper and packaging)



Note: Companies achieving 10% or more additional revenue in the following areas over the next 5 years. Multiple answers possible

Q: Which of the following new digital products or services do you plan to introduce and expect will generate more than 10% of your future revenue over the next 5 years?

The scope for digital collaboration with customers at many different levels is considerable.

04 Focus on people and culture to drive transformation

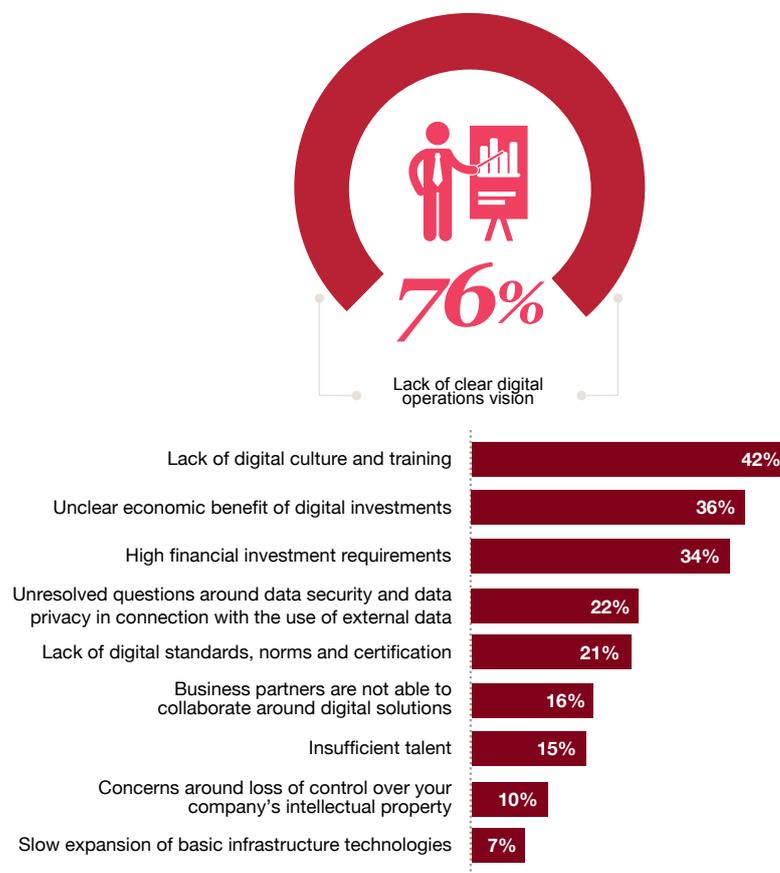
Industry 4.0 has significant implications for how a company chooses to organise itself and its delivery model. Companies will need to make sure staff understand how the company is changing and how they can be a part of it. From our interviews with forest, paper and packaging companies, the biggest challenges centre around internal issues such as culture, organisation, leadership and skills rather than external issues such as whether the right standards, infrastructure and intellectual property protection are in place or whether concerns about data security or privacy concerns can be overcome.

The absence of a clear digital operations vision and leadership from top management was identified as the single biggest challenge by more forest, paper and packaging companies than any other. Around a third (32%) named it as the top challenge and three quarters (76%) put it in their top three challenges. In this

respect, they were more likely than companies in other sectors to pinpoint lack of leadership as a challenge –only 40% of companies across all the sectors surveyed identified it as a top three challenge.

The second biggest challenge for forest, paper and packaging companies is the lack of a digital culture and the right training. Between a quarter and a third (29%) named it as the top challenge and 42% put it in their top three challenges. The third biggest challenge is that the economic benefits of digital investments still remain unclear. Clearly all these factors go hand in hand and one important way of establishing momentum in changing the culture will be for top management to communicate clearly the benefits that they see ahead and to ensure they are identified and celebrated as they are achieved.

Figure 4: *Lack of a clear digital operations vision and leadership from top management is the biggest challenge facing forest, paper and packaging companies*



Note: Included as one of three possible responses

Q: Where are the biggest challenges or inhibitors for building digital operations capabilities in your company?

05 Data analytics and digital trust are the foundation of Industry 4.0

Data lies at the heart of the fourth industrial revolution, but the massively growing information flow brings little value without the right analytics techniques. The rapidly growing number of sensors, embedded systems and connected devices as well as the increasing horizontal and vertical networking of value chains result in a huge continuous data flow.

Data is coming from multiple sources, in different formats, and there is a need to combine internal data with data from outside sources. Expert and effective data analytics is essential to using data to create value. And with so many points of entry, companies need to take a rigorous, proactive approach to data security and related issues and work to build digital trust.

Our survey data shows that many forest, paper and packaging companies already understand the vital importance of data analytics. Over half view it as important or very important to their companies today, and this rises to 83% when they are asked to look five years ahead (see figure 5).

Only 13% of forest, paper and packaging companies have advanced data analytics capabilities

Figure 5: Forest, paper and packaging companies: in five years from now even greater importance will be placed on data analytics



Q: What significance does the gathering, analysis and utilisation of data for decision making have for your company?

The use of big data analytics offers companies considerable gains in a number of areas right across the value chain. In forestry, the combination of meteorological, environmental, land and crop data can deliver more efficient forest management and be linked into customer demand data to enhance supply chain efficiency. One of the main areas of potential for data analytics is the use of ‘big energy data’ for better optimisation of energy costs. The pulp and paper industry is energy-intensive, with average energy costs around 16% of production costs, and in some cases up to 30%.⁴ Further down the value chain, the collaborative use of data by packaging companies and their customers opens up opportunities to predict customer trends and demands.

There’s still a long way to go before companies reach the level of sophistication needed to really drive Industry 4.0 applications. Only 13% of forest, paper and packaging companies rate the maturity of their data analytics capabilities as advanced – even lower than the 18% result across all the sectors we surveyed.

A key challenge is skills. Half of those we surveyed pinpoint lack of data analytics skills in their own workforce as a particular data analytics challenge. This was in line with the response across all the sectors we surveyed. And over two thirds cite increasing in-house data analytics technology and skill levels as the single biggest improvement route to boost their data analytics capabilities.

⁴ European Commission, Strategic Energy Technologies Information System, Energy Efficiency in the Pulp and Paper Industry.

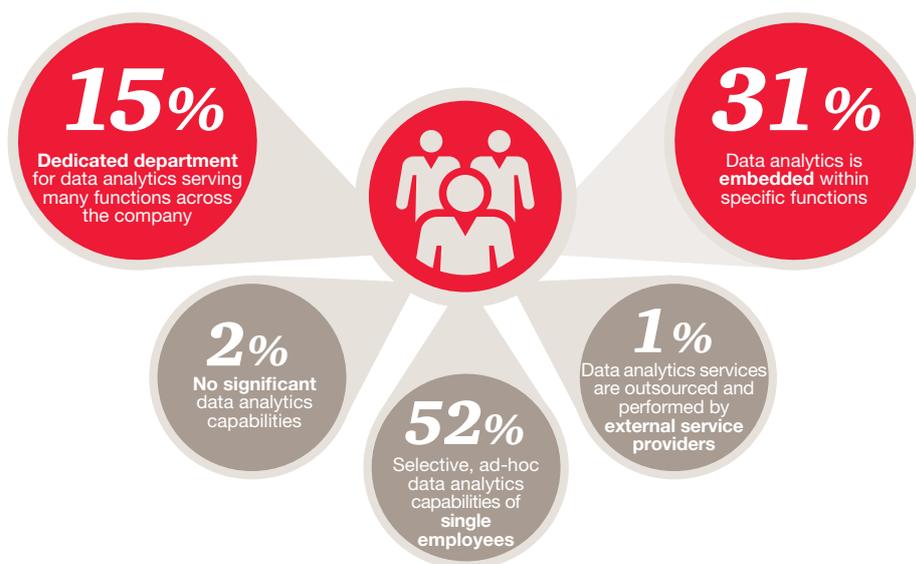
06 Robust, enterprise-wide data analytics capabilities require significant change

Another challenge lying in the way of companies establishing strong data analytics capabilities is getting robust organisation and governance frameworks in place. We found that many companies still have 'ad hoc' approaches to data analytics. Over half lack a structured approach to data analytics organisation and governance. Many rely on the selective, ad hoc data analytics capabilities of individual employees. The reliance on a few individual employees was the highest we found in any of the sectors we surveyed.

In contrast, just under a third have embedded data analytics into specific functions, giving themselves the flexibility and proximity to business knowledge to fully utilise the potential of data analytics. Another 15% of companies have a dedicated department for data analysis serving many functions across the company.

Across all sectors, our survey found that companies who consider they have advanced data analysis capabilities are much more likely to have pursued these two options – 43% have embedded their data analytics in specific functions and 24% have a dedicated department.

Figure 6: Forest, paper and packaging companies: organisation of data analytics capabilities



Q: How are data analytics capabilities organised in your company?



07 Big investments with big impacts and rapid returns

Big investments are being made in Industry 4.0 initiatives. Over a quarter of the forestry, paper and packaging companies in our survey have invested 10% or more of their revenues in the last two years. And in the next five years nearly as many again plan to make this level of investment. The prize for companies is a very special one – the prospect of achieving significant revenue gains while simultaneously reducing costs.

This golden prize of higher revenues and lower costs is in reach because the advanced connectivity and automation of Industry 4.0 allows companies to gather and analyse data from across a wider range of activities and from partners, suppliers, collaborators, end uses and end customers in ways that enable faster, more flexible processes to produce higher-quality output, sometimes highly customised, at reduced costs. Heightened connectivity and automation give companies the opportunity to add value to products and to develop new kinds of offerings to address their markets.

It simply won't be possible for companies to achieve advanced digitisation without making a step change in investment, given the continued rapid progress anticipated by companies who are already leading

The pace at which forest, paper and packaging companies expect to accrue benefits from Industry 4.0 investment leads more than two thirds of them to estimate a return on investment (ROI) timescale of two years or less (figure 7). A quarter of companies anticipate a longer timescale of three to five years, but relatively few think that it will take any longer than five years for Industry 4.0 investments to pay for themselves.

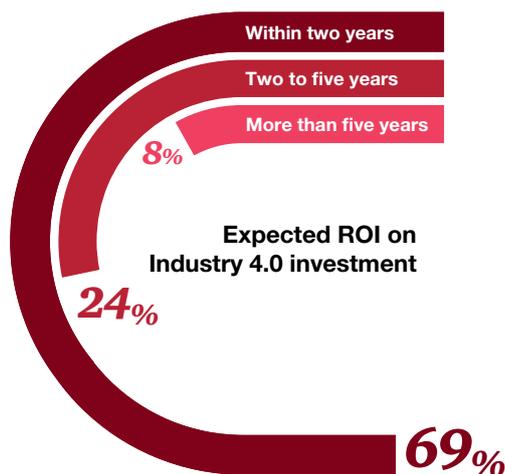
Catching up is getting increasingly difficult

Looking ahead, many of those who haven't invested significantly in the past two years plan to step up investment in the coming five years. That's one way to close the gap. But just over a third of companies still expect to keep their future investment relatively low. Some of these companies may be waiting for the 'perfect' technology. That's short-sighted. As we've already shown, the

biggest challenge companies face isn't buying the right technology, it's transforming their people and culture. These require long-term change programmes.

It simply won't be possible for companies to achieve advanced digitisation without making a step change in investment, given the continued rapid progress anticipated by companies that are already leading. The investment required to catch up is likely to be too costly, and faster-moving companies will have a significant advantage when it comes to positioning their offerings as a "platform of choice" within digital ecosystems. Perhaps most importantly, companies that try to jump in too late will find that their internal cultures have lagged behind and no amount of advanced technology acquired later on will bring them up to speed.

Figure 7: Forest, paper and packaging companies: most companies expect Industry 4.0 investments to pay back within two years



Note: Answers shown are rounded

Q: Which return on investment period (ROI) do you expect from your digital investments?

Blueprint for digital success

To move forward with Industry 4.0, digital capabilities are all-important. These take time and concentration; a step-by-step approach is important. But move with deliberate speed, so that you don't lose the first-mover advantage to competitors.

1) Map out your Industry 4.0 strategy

Evaluate your own digital maturity now and set clear targets for the next five years. Prioritise the measures that will bring the most value to your business and make sure these are aligned with your overall strategy. Make sure company leadership is ready and willing to champion your approach.

2) Create initial pilot projects

Use them to establish proof of concept and demonstrate business value. Target a confined scope, but highlight the end-to-end concept of Industry 4.0. Not every project will succeed, but they will all help you to work in a cross-functional and agile approach with customers and technology partners – the new norm of the future. With evidence from early successes, you can also gain buy-in from the organisation, and secure funding for a larger rollout.

Design pragmatically to compensate for standards or infrastructure that don't yet exist. Collaborate with digital leaders outside your organisation, by working with start-ups, universities, or industry organisations to accelerate your digital innovation.

3) Define the capabilities you need

Building on the lessons learned in your pilots, map out in detail what capabilities you need to achieve your vision. Include how enablers for Industry 4.0, such as an agile IT infrastructure, can fundamentally improve all of your business processes.

Remember to develop strategies for attracting people and improving processes as well as for implementing new technologies. Your success with Industry 4.0 will depend on skills and knowledge. Your biggest constraints may well be your ability to recruit the people needed to put digitisation into place.

4) Become a virtuoso in data analytics

Consider how you can best organise data analytics; cross-functional expert teams are a good first step. Later these capabilities can be fully embedded in your functional organisation.

Learn to get value out of data by building direct links to decision-making and to intelligent systems design. Use the data to improve products and their use in the field to offer and build new service offerings. Think big, but start small, with 'proof of concept' projects.

5) Transform into a digital enterprise

Capturing the full potential of Industry 4.0 often requires company-wide transformation. Look to set "tone from the top", with clear leadership, commitment and vision from the C-suite and financial stakeholders. Foster a digital culture: many of your employees will need to think and act like digital natives, willing to experiment with new technologies and learn new ways of operating.

Remember that change doesn't stop once you've implemented Industry 4.0. Your company will need to re-invent its capabilities at faster rates than in the past to stay ahead of the game.

6) Actively plan an ecosystem approach

Develop complete product and services solutions for your customers. Use partnerships or align with platforms if you cannot develop a complete offering internally. You may find it difficult to share knowledge with other companies, and you may prefer acquisition. But look for ways to bridge this gap – perhaps with technical standards – so that you can profit from being part of platforms that you don't fully control.

Real breakthroughs in performance happen when you actively understand consumer behaviour and can orchestrate your company's role within the future ecosystem of partners, suppliers and customers.

Don't buy the hype. Buy the reality. Industry 4.0 will be a huge boon to companies that fully understand what it means for how they do business.

Blueprint for digital success



Map out your Industry 4.0 strategy

1



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2



Define the capabilities you need

3



Become a virtuoso in data analytics

4



Transform into a digital enterprise

5



Actively plan an ecosystem approach

6

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