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Countdown to the tipping point for Industry 4.0

Practical steps for manufacturers to
gain competitive advantage from
Industry 4.0 investment

Management summary

Contents

1. Industry 4.0 deployment – the position today	4
2. Not ‘whether’ but ‘when’	5
3. The size of the prize	5
4. Urgency gains competitive advantage	6
5. The pace of Industry 4.0 adoption – overview	8
6. Industry 4.0 adoption – pilots	10
7. The window of opportunity – countdown to the tipping point	12
8. Overcoming Industry 4.0 challenges with finance	14
9. Finance 4.0 – identifying the key qualities	16
10. Industry 4.0, secure cloud, technology and finance	19
11. Focus on Sweden – maturing into Industry 4.0	20

- Manufacturers across the world are in a race against time to gain competitive advantage from Industry 4.0 investment before the “tipping point” of majority adoption
- Early movers toward Industry 4.0 adoption can expect to gain a competitive advantage from digital transformation, in contrast to the later followers that will simply be playing catch-up
- Most leading manufacturers, large and small, are currently looking for practical steps and sustainable ways to invest in digital transformation so that they can gain the competitive benefits of being in that first cohort
- The research reveals that around eight in every 10 larger manufacturers have already piloted a significant Industry 4.0 project (compared with around half of SME manufacturers)
- Respondents estimate the “tipping point” for Industry 4.0 adoption (when 50% of the global manufacturing community will have substantially converted to Industry 4.0 production platforms) will be reached within the next five to seven years for larger manufacturers (nine to 11 years for SME manufacturers)
- This report attempts to show that manufacturers urgently need to find sustainable ways of accelerating their Industry 4.0 investment to be among the leading first half of the manufacturing community to achieve digital transformation and gain an early competitive advantage over the “laggard” second half
- Accordingly, specialist financing techniques are being developed to help companies urgently invest in Industry 4.0 today
- This paper outlines a key set of qualities that helps identify the ideal Industry 4.0 financing partner for manufacturers and Industry 4.0 OEMs



Industry 4.0 deployment – the position today

Industry 4.0 machines, technology and equipment are revolutionizing manufacturing by digitalizing production processes, quality assurance, maintenance, planning, forecasting, innovation and discovery, time to market, supply chain efficiency, and many other aspects of the manufacturing ecosystem. Digital data capture and data flow are enabling a degree of flexibility and efficiency that will dramatically lower production costs while increasing scale, agility and profitability.

Momentum for Industry 4.0 transformation is well under way across the globe. Industry 4.0 initiatives are expected to generate \$21.7 billion annually in technology investment by 2023, having grown at a compound annual growth rate (CAGR) of 23.1% since 2017.¹ In terms of specific technology types, cyber-physical systems are expected to achieve the highest CAGR of 26.7%, reaching a total market value of \$4.8 billion in 2023.²

At its core, Industry 4.0 is based on a set of design principles that link people, systems, places and equipment/ technology – interoperability, information transparency, technical assistance and decentralized decisions. It is essentially a practical means of seamlessly integrating physical machinery, robotics, information technology and the internet in “smart” factories. Leading investors in Industry 4.0 can be found in all global industry sectors, and several research commentators predict that the Asia-Pacific region, especially China, will retain the greatest market share through the early 2020s.³

Not ‘whether’ but ‘when’

The question hanging over digital transformation in manufacturing is no longer “whether” to invest in it but rather “when” to do so. In most marketplaces, the early mover will invest in new technologies or business models to gain a competitive advantage – at the expense of competitors that have not adopted. For the “laggard” half of the market, investment in the new technologies or models is still required, but the possibility to gain competitive advantage has disappeared, upgrading as a “follower” simply entails aligning with the new market norm.

Smart CEOs and CFOs in manufacturing are therefore recognizing the importance of being in the earlier swathe of adopters to get ahead of the competition. The market is fast approaching the tipping point, when the majority of the market will have adopted the new technology and business model. This deadline is made even more urgent by the realization that these “laggard” adopters likely won’t erode the gains made by earlier adopters for some period of time, if at all.

The size of the prize

There is little question that the “size of the prize” from digital transformation is likely to be considerable. Each manufacturing sector, even down to the individual manufacturer, needs to carefully analyze their particular situation to identify a clearly articulated and evidence-based business case for return on investment. While estimated returns are based on models or forecasts, smart manufacturing CFOs manage risk by introducing sensitive monitoring processes and methods to closely track progress toward projected goals and gains.⁴

Nevertheless, return on investment is predicted to be very substantial. One major analyst, for instance, predicts that by 2020 manufacturers worldwide will be saving \$421 billion annually as a result of Industry 4.0 investments and will gain \$423 billion per year in revenues each year as a result of digital transformation.⁵ In addition, previous research papers from Siemens Financial Services (SFS)⁶ have presented evidence-based estimates of the financial benefit that manufacturers stand to gain from upgrading their production environment to Industry 4.0 (see Figure 1 – the Productivity Bonus). Moreover, several case examples⁷ demonstrate the financial advantages being gained by early movers in the manufacturing sector’s digital transformation.

Global Digitalization Productivity Bonus: reduced production costs resulting from conversion to digitalized technology

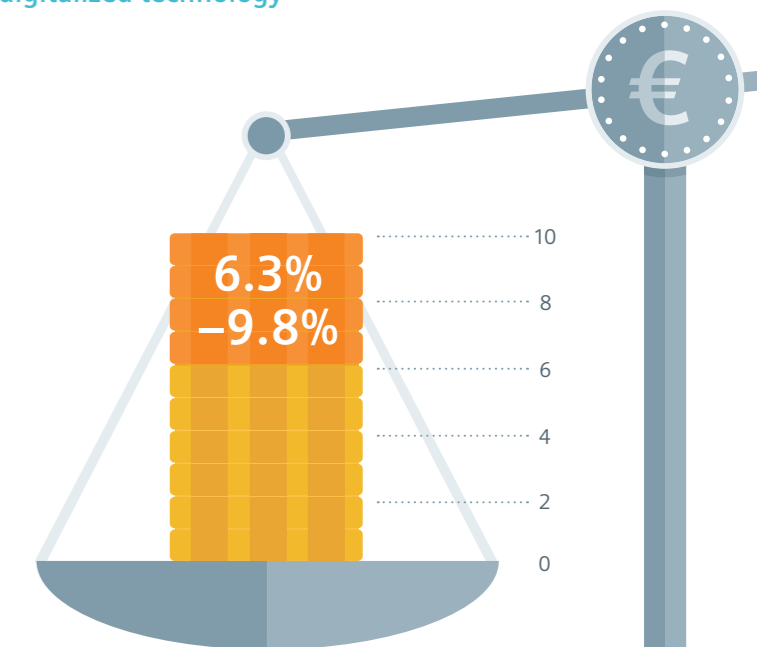


Figure 1
Bonus (production cost reduction expressed as % of total revenues)

Urgency gains competitive advantage

Today's debate is therefore now centered around how quickly digital transformation can be sustainably achieved. As this discussion unfolds, manufacturers large and small are trying to ascertain how they can transition to Industry 4.0 and grasp its competitive advantages *as soon as possible*, without incurring unsustainable debt or cash-flow pressures. This paper presents new research that takes a barometer reading of the time taken for the majority of manufacturers to transition to Industry 4.0 operating platforms.

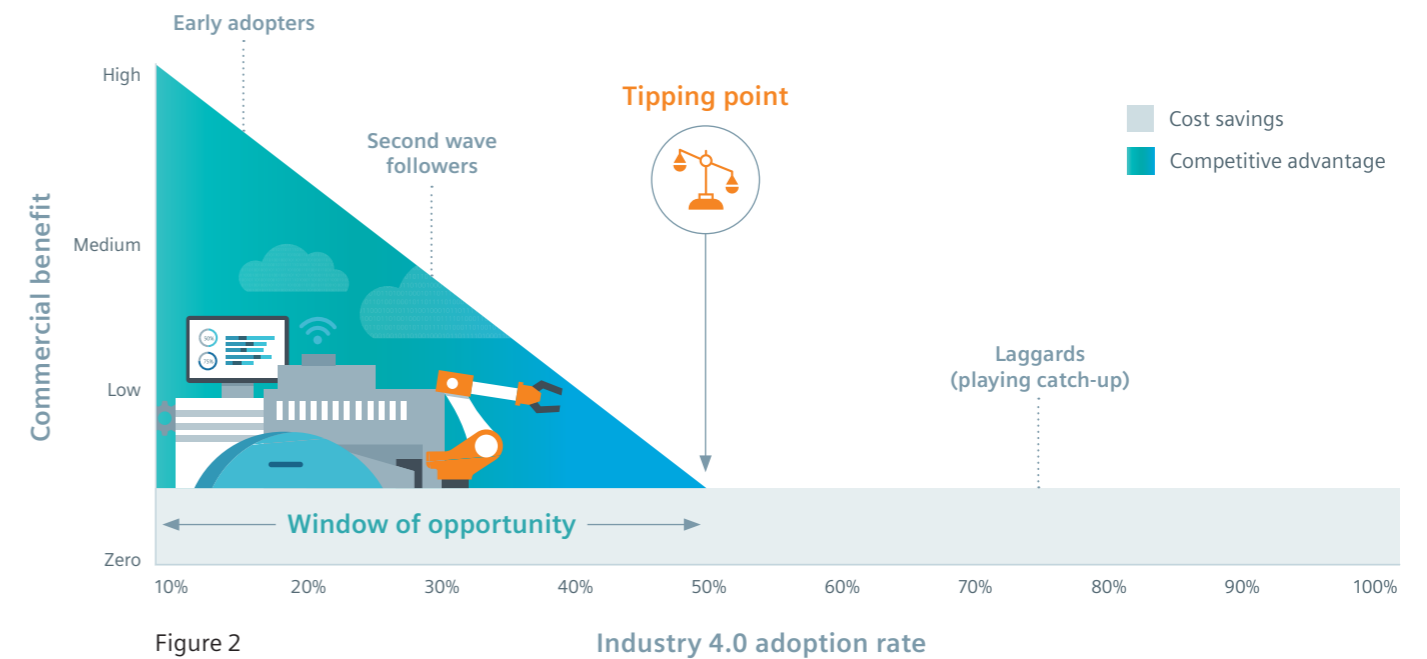
Early adopter advantage

As we have already noted, both true early adopters and the second wave of followers want to be in the first 50% of manufacturers to convert to Industry 4.0 – namely, the cohort for whom transformation offers competitive differentiation and return on investment. One industry player interviewed for this study notes that early movers in the Industry 4.0 transition can expect to make a 25 percent gain on return on capital employed (ROCE) by 2035⁸ – quantifiable gains that have been backed up by other studies.⁹ The second 50% of manufacturers adopting Industry 4.0 technologies are known as the “laggard” adopters, who find themselves simply playing catch-up. It is therefore critical to know how long the window of opportunity will last for manufacturers to be a “first half” investor in digital transformation. Even within that window of opportunity, the pressure to transform remains high – after all, the competitive advantage from conversion reduces as more and more manufacturers adopt Industry 4.0 platforms. Even so, it must be acknowledged that later adopters will still benefit from the cost savings, and economies from digital transformation are expected to add to the bottom line, even if they have lost the benefit of competitive advantage.

Hurdles to Industry 4.0 implementation

Of course, there are hurdles to implementing Industry 4.0. One recent study¹⁰ found that manufacturing leaders across the world are increasingly aware of the challenges before them and are viewing the actions needed to succeed with greater objectivity. The study notes that although many of the businesses that have made investments in technology are seeing payoffs, others are finding it difficult to take the step toward investing. Even as digital technologies generate more global connections and new opportunities within new markets and localized economies, they still face such challenges as too much focus on short-term results as well as a lack of understanding, business cases and leadership vision. The greatest challenge lies in investing in Industry 4.0 transformation in a financially sustainable manner.

Commercial benefit of Industry 4.0 adoption



Take, for instance, the results of a global study¹¹ that examined the main challenges to implementing Industry 4.0 at scale. Among the top four challenges are “difficulty to justify ROI” and “lack of financial resources.” Both of these top hurdles can be tackled using smart finance, allowing manufacturers to invest immediately to secure a competitive advantage from Industry 4.0 before the tipping point is reached after which the early-mover advantage will have largely diminished. For the first of these challenges, the business case for return on investment is enabled through financing arrangements that can be flexed to match the projected commercial advantage rate of return from Industry 4.0 transformation. For the second, access to smart finance makes Industry 4.0 investments viable where they might otherwise have been thought unaffordable.

Main challenges to implement factory of the future

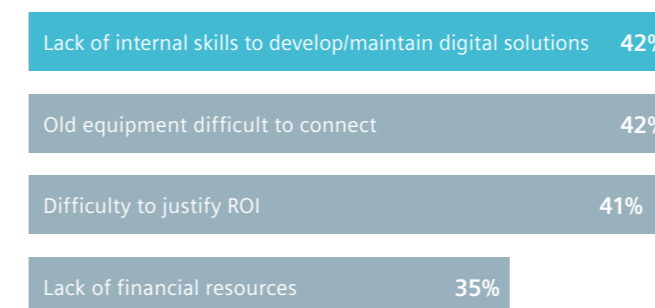


Figure 3

Source: Oliver Wyman 2017

Attitudinal challenges

The experience, outlook, attitude and vision among individual manufacturing companies can fall anywhere between enthusiastic investment in Industry 4.0 and a wait-and-see mentality. This is reflected in the anecdotal responses from manufacturing players interviewed for this paper. Some respondents had not yet begun the journey, such as the U.S. machine tools maker who said, “I can’t say that digitalization is very visible yet in our industry,” and the Finnish metal products manufacturer who shared this view: “I don’t think digitalization and Industry 4.0 affects us that much.” Some were more focusing on systems rather than cyber-physical equipment enablement, including the French automotive technologies supplier who said, “We’re focusing digital transformation on the supply chain and all documentation processes [...] we’re aiming to digitalize as much as possible.” At the other end of the scale, we have the Russian steel and metal products company who claimed that, “Industry 4.0 is the only way to compete with foreign companies,” and the Indian valves manufacturer who said, “digital transformation is a priority for us as we are growing internationally, so the better our competitive positioning the more we attract investors to fuel that growth.” At the forefront of adoption are organizations like the German automotive technologies company who is “deploying Industry 4.0 everywhere, but particularly in the areas of energy management and management of production processes, where we watch data closely and trigger optimization initiatives based on data analysis.”

The pace of Industry 4.0 adoption – overview

With all this in mind, the debate has now switched to examine the pace of Industry 4.0 adoption – a debate this paper seeks to address with new research. How slowly or how quickly is digital transformation being achieved – or expected to be achieved – in the manufacturing industry? Among recent authoritative papers on the subject, one commentator¹² notes that the Fourth Industrial Revolution (Industry 4.0) requires transformational change at a pace the majority of manufacturers are not yet matching. If manufacturers continue on the current trajectory, this commentator warns, they are likely to be disrupted by competitors and new market entrants. The advice, therefore, is that manufacturing CEOs should form a top-down strategy and implement change now in order to meet the realities of manufacturing both now and in the future.

Corroborating this view, the World Economic Forum has analyzed¹³ today's level of connectivity and automation and reports a slower than optimal adoption of technology across countries and sectors. As a result, the organization has made some recommendations for companies and country leaders to accelerate the digital revolution.

With a more positive perspective for the world's very largest companies, another major market research organization¹⁴ has made a number of predictions about digital transformation that sets out a more optimistic picture of adoption rates. This commentator forecasts that by 2020, 30% of the world's top 2000 companies will have implemented advanced digital twins of their production processes. By 2020, the expectation is that they will also have allocated capital budget equal to at least 10% of their revenue to digital strategy development and implementation. Then, by 2023, 95% of these companies will allegedly have implemented new KPIs based on digitalized operations.

“Digital transformation in China is gathering pace. Customers now demand improved quality and efficiency, so the market is becoming more competitive. With big data, we can collect and analyze real-time production statistics and adapt our processes accordingly. In this way, Industry 4.0 is helping us to reduce production failures and increase output.

But manufacturers must continue to adapt - by being aware of new technologies being developed, monitoring top competitors, understanding customer demands and needs, and planning the technology upgrades that are needed to react.

Industry 4.0 requires significant investments. Integrated finance options help us to plan our investments more effectively and reduce the financial burden of acquiring new technology and equipment.”

Catherine Shen, Finance Manager, Selcom Electronics (Shanghai) Co., Ltd. China

An emerging C-level role – that of the Chief Digital Officer (CDO) – and the pace at which companies are appointing candidates to this position, also illustrates the pace of digital transformation. A related study from the European Union¹⁵ looks at overall rates of digital transformation and confirms the rise in CDO appointments from 12% to 20% over the last two years. In addition, 79% of respondents in that study included the adoption of digital technologies in their innovation strategies. Interestingly, another authoritative study conducted back in 2016 tracked levels of digitalization across different manufacturing segments and found that investment levels in Industry 4.0 transformation through 2020 were running at between 4% and 7% of annual turnover.¹⁶ This investment is expected to produce a significantly higher rate of financial return, according to the Siemens Financial Services studies cited earlier in this paper.¹⁷

“We are a leader in industrial data monitoring and integration services. Without special financing from SFS we would have been forced to decline more than \$1,000,000 in orders from our client – a leading electric car manufacturer. The long build cycles coupled with the client's extended payment terms would have meant missing payments to our vendors. SFS created a credit facility in just a few days, allowing us to accept the orders and satisfy our existing commitments to other vendors. Knowledgeable people acted quickly to produce a win-win.”

William P. Southard, Owner, DST Controls (control systems manufacturer), United States

Industry 4.0 adoption – pilots

One way to gain insights into the current rates of adoption is to identify the proportion of manufacturers that have started on the journey to Industry 4.0 – with some form of significant¹⁸ pilot. The WEF estimates¹⁹ that only 29% of industrial companies have started to roll out Industry 4.0 technological solutions across their production processes, 41% are still piloting solutions, and the remaining 30% have yet to start the journey. This broadly aligns with the findings of the latest research from Siemens Financial services (see Figure 4). SFS interviewed over 40 respondents: manufacturers, trade associations, management consultants, and academics, across the United States, Europe and Asia-Pacific between September 2018 and January 2019. A further 26 manufacturers across the same regions were also interviewed for their views on the role that specialist finance was playing in enabling their digital transformation.

“If you look at our industry, and at many other industries too, the technology we need is changing and developing all the time.”

The changes are so fast-paced when it comes to digital industry. So financing tools and techniques need to match and accommodate that pace of change. The time to invest is getting shorter.”

Electronic components, Germany

The new research from SFS, however, also highlights the significant gap between larger and smaller manufacturers – and the two-tier race to digital transformation. This in itself is interesting and may reveal a misconception over the achievability of digital transformation by smaller players – something noted in a variety of Industry 4.0 studies.²² Larger manufacturers often have more invested in legacy production systems than their smaller competitors. As a result, although larger players have the advantage of scale and market power, their digital transformation may be more complex. Moreover, small nimble players – even start-ups – are benefitting from a concept known as “factory in a box.” These are modular production units built on standardized IT and communications protocols that conform to the open standards many see as essential to the development of Industry 4.0. Finally, various commentators note that there may also be a perception among smaller manufacturers that specialist financing tools are only available to larger organizations,²³ even though this is not necessarily the case.

Of course, establishing a significant pilot does not equate to full rollout of digital transformation. Some organizations have found it difficult to move beyond the pilot phase. Analysts speak of “pilot purgatory” – extended pilot phases combined with production organizations’ inability to move technologies from pilots to company-wide rollout. Pilot phases exceeded one year for 84% of respondents, according to one study²⁴ and lasted more than two years in 28% of the cases. The report considers the pilots’ extended duration to be problematic. Pilots must be short to test a significant number of technology applications, as the experience from pioneering companies shows that at least 20 to 30 applications are needed to transform the production system effectively.²⁵ Given technology’s short development cycles, an extended pilot phase might not keep up with the current pace of technological evolution.

“Over the last two years, more progress has been made with digital transformation and companies are using IoT to monitor the use of their equipment in order reduce idle time, and improve production rates, for example.”

Digital transformation in India has been slow, but it appears to be picking up. In India, the entire environment is more mature and conducive to automation.

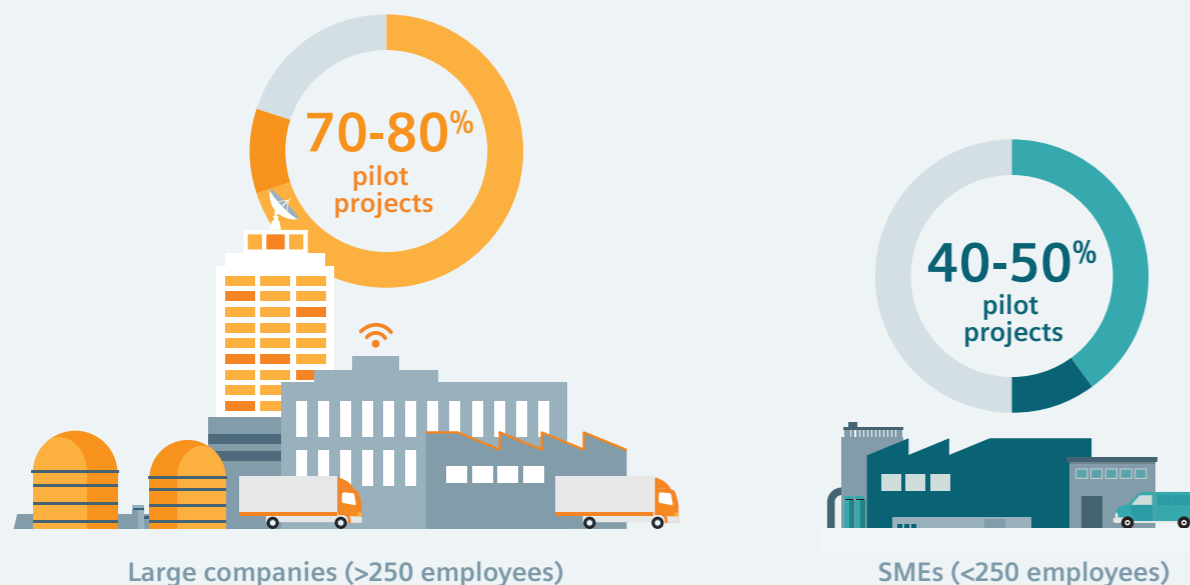
India is a special case for the workability and ROI of Industry 4.0. From a social perspective, pressure of providing jobs is high and the environment remains unstructured.

Nevertheless, for certain manufacturing businesses there will be a clear advantage in converting to Industry 4.0 where there is a strong business case. Those that can convert early – assisted by finance – are likely to get a competitive advantage making it difficult for their rivals to catch up.”

Mr. T K Ramesh, Director & CEO, Micromatic (machine tools manufacturer), India

What proportion of manufacturers in developed economies²⁰ have implemented a significant²¹ pilot project for Industry 4.0 production solutions?

Figure 4



The window of opportunity – countdown to the tipping point

The clock is ticking for manufacturers who want to gain substantial competitive advantage from their Industry 4.0 investment. The tipping point – after which competitive advantage is largely lost – is when a majority of manufacturers have deployed digital technologies across their production processes. At this point, cost and efficiency can still be gained from Industry 4.0 investments, but not market advantage.

In simple terms, most manufacturers, wherever they are in the world, understand the benefits of investing in Industry 4.0 technology in order to reap its competitively differentiating benefits before such investment becomes mainstream. It follows, therefore, that the first 50% of manufacturers to deploy Industry 4.0 technologies will stand to gain a competitive advantage over rivals, whereas the second half of the manufacturing community to do so will be playing catch-up.

SFS therefore asked experts in the field for their estimate of how long it would take for this tipping point to be reached. This effectively forecasts the window of opportunity for manufacturers to reap the expected return on investment from their digital transformation initiatives. Larger manufacturers were expected to take between five and seven years to reach this point; whereas SME manufacturers were expected to take much longer – between nine to 11 years. This finding is corroborated by various research organizations' forecasts²⁶ on the growth of the Industry 4.0 technology sector – at its lowest level expected to deliver a 15%+ compound annual growth rate (CAGR) over the next five years. From current Industry 4.0 deployment rates across production processes, the penetration level would reach over 50% in five years' time.

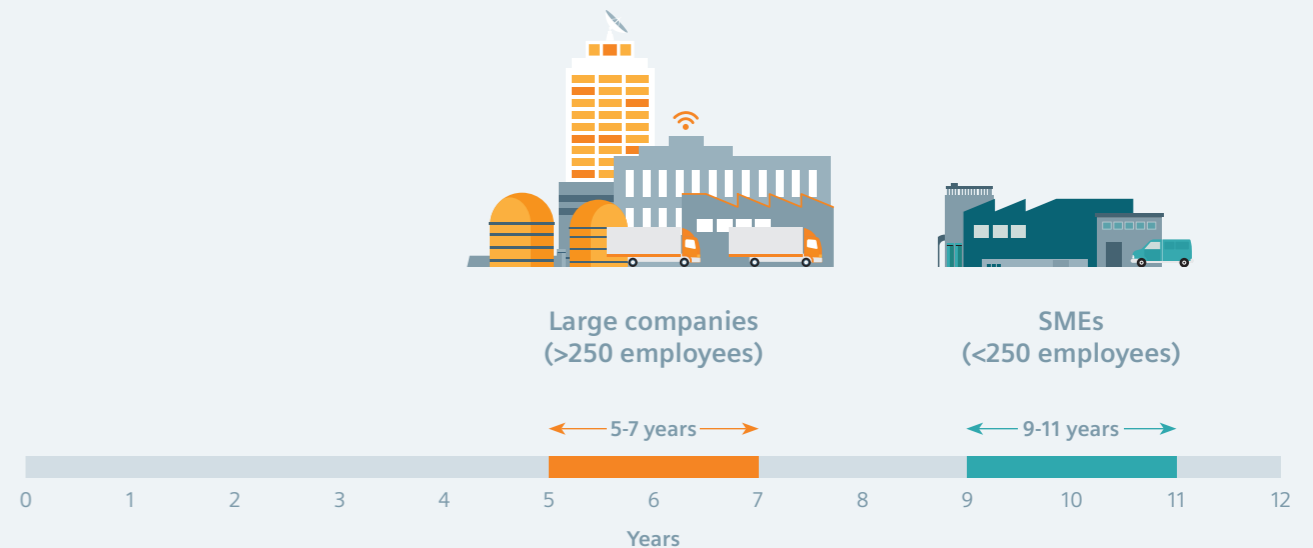
“Industry 4.0 is revolutionary for us. In the field of 3D printing, it enables us to produce very complex parts in small or medium-sized series and allows us to optimize the manufacturing costs of those parts.

In France companies are struggling to finance Industry 4.0. This slows down the Industry 4.0 revolution in France, because it means that some of the technologies that would allow us to create the factories of the future are not being acquired in France. French companies must find a way to overcome this – using smart finance - otherwise we risk falling behind other countries. Smart finance is part of the Industry 4.0 revolution. The management of finance contributes to the technological advancement of Industry 4.0.”

Clement Muhle, President, ADDIDREAM
(additive medical manufacturing), France

How long will it be until over 50% of manufacturers have implemented an Industry 4.0 strategy that has a significant commercial and competitive impact on the company (whether price competitiveness, product quality, agility and time to market, service improvement)?

Figure 5



Economies with less manufacturing investment legacy to deal with may be able to leverage Industry 4.0 transformation faster, leap-frogging ahead of those still needing to see return on legacy investment (especially in automation technologies) from the 2000s. According to one report,²⁷ India and China have long been competing for the major share of global manufacturing. Yet India's manufacturing contribution to GDP still less than half that of China. The report indicates “an opportunity to turn the tide in India's favor as China's shrinking labor arbitrage and strengthening Yuan against the US Dollar has encouraged investors to look toward more cost-effective destinations like Vietnam, Indonesia and India.” It also claims that “India's advantage is its ample supply of skilled technical labor and low cost of manufacturing. Already several large manufacturers have shifted units to India.”

Other factors support the expected accelerating growth of Industry 4.0 in India as well. Regarding two very critical enabling Industry 4.0 technologies – IoT and big data – observers²⁸ note that the country seems to be developing the right platform on which to base its smart factories.

India is expected to command nearly 20 percent of the global IoT market by 2023. At the same time, China is no laggard in digital transformation. One analyst²⁹ predicts that China's IoT investments could add \$196 billion to cumulative GDP in “manufacturing industries alone” over the next 15 years. Taking all this into account, however, both India and China are under pressure to increase their Industry 4.0 adoption rates across the board to match those prevalent in Europe (especially Germany) and the United States.³⁰

This study serves to forecast the point at which both larger and smaller manufacturing companies may find themselves catching up with the mainstream of Industry 4.0 adoption – a point at which investment will not offer early-mover competitive advantage, but instead simply be a must-do strategy to compete in markets at all.

Overcoming Industry 4.0 challenges with finance

Ultimately, while there is momentum behind the transition to Industry 4.0, many commentators have remarked that the pace of transformation could stand to accelerate, especially as incumbent players look to compete with rival economies, stay ahead of new entrants, and manage disruptive change. Clearly there are challenges for Industry 4.0 adoption. The World Economic Forum³¹ summarizes these challenges as:

- difficulty in aligning the organization around the potential value and return on investment,
- uncertainty surrounding digital's value to their performance (especially in the short term),
- the cost of resources needed to implement new solutions, and
- the investments required to take them to scale.

These challenges tend to pivot around the issue of finance. The organization needs to understand the commercial benefits of Industry 4.0 and be confident that there will be a reliable return-on-investment. Then, it needs to be able to pay for the corresponding technology at a rate less than or equal to commercial gains in order to make the investment sustainable and cash-flow friendly. In response to these conditions, the term "Finance 4.0" has been coined to describe financing techniques that enable sustainable digital transformation.³²

It was widely recognized among respondents in this study that the main challenge to Industry 4.0 investment is essentially financial. A few examples illustrate that point. To quote a Spanish machine tools manufacturer, "Upgrading our production environment is extremely reliant on the payment method we can obtain. Each phase might cost around €1 million, and we quickly recover those costs, but until that point, there's a real impact on cash flow. Traditional financiers do not provide appropriate mechanisms for this kind of project as they do not understand how our operations function." An Indian hydraulic gears and pumps manufacturer adds, "We supply the aerospace and defense industries, and we have to have affordable, sustainable ways of financing essential digital transformation to meet our clients' needs." Mainstream tech has its own pressures. A Chinese clothing manufacturer remarked, "We're under pressure to improve client service quality while at the same time improve our working capital and cash flow management – so smart financing methods are critical to improving our competitive positioning." This is corroborated by an automation and robotics supplier in Turkey who succinctly says, "Rising competition means we have to upgrade to the latest digitalized technology, and we need affordable ways of achieving this."

The key challenges identified by the World Economic Forum can largely be addressed with specialist financing solutions designed to ease Industry 4.0 transformation. The issue is not simply a matter of easing the impact of Industry 4.0 technology acquisition for the manufacturer at the end of the line. A whole supply chain sits behind each Industry 4.0 manufacturing solution, and finance plays a role in each step of that supply chain. Take the example of a respondent from the United States – making driveline, sealing and thermal management components – who says, "We need to grasp Industry 4.0 to continually improve our manufacturing quality and efficiency, because we're under constant price pressure from OEMs. Financing tools help us adapt to market changes, improve our market share and compete around the world." So, as an Industry 4.0 technology solution is built for the manufacturer, cash flow and working capital management needs to be eased and supported right through the supply chain of component manufacturers whose products go into building that overall solution.

"Industry 4.0 has generated a significant interest in the industrial world and by extension the machine-tool sector. I consider that up until this point, the machine-tool sector has progressed adequately, and as such, I believe that our starting point is good. However, we still have many big challenges ahead."

In order to be at the forefront of Industry 4.0, a company must undertake a significant financial investment and this is a key challenge. Providers of manufacturing technology that offer integrated finance options have a major advantage over those that don't because it helps companies make the investment sustainably."

Igor Vitoria, GMTK-Spain (multi process machining), Spain

"On the whole, digital transformation is a major driver of innovation and creativity in our company. It helps to accelerate production, increase flexibility and enable extensive customization. Finance for Industry 4.0 plays a great role in our overall financial toolkit as state-of-the-art digital equipment is the key to quality as well as reduced manufacturing cost."

Bottling company, Russia

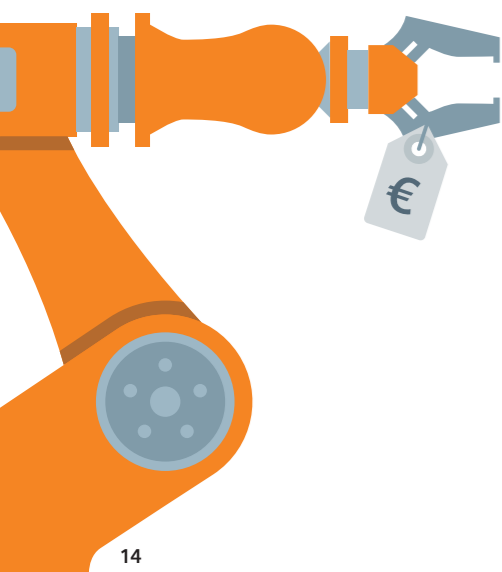
"Digital technology is transforming productivity in the food industry so it is essential that UK companies in the sector embrace digitalization in order to improve productivity and keep up with their international competitors. Digitalization simply cannot be ignored; the food industry needs to embrace Industry 4.0 as fast as it can."

From TrakRap's point of view, digital technology is having a huge impact on our business. For example, thanks to the use of a digital twin, we've been able to significantly reduce the cost and time taken to develop our new packaging platform, but this is just the start."

Although digital equipment is expensive, it's also upgradable and is changing all the time, so traditional depreciation models aren't applicable here, think of it more as an upgradable software platform. Consequently, manufacturers need to look to new financing models (Finance 4.0) in order to accelerate the take up of these digital systems."

Smart, pay per use, financing models are helping companies to undertake digital transformations that would otherwise be unavailable to them. For smaller companies, for example, models that enable them to massively cut operating costs without any up-front capital, make investments in technology affordable to everyone."

Martin Leeming, CEO, TrakRap Ltd, UK



Finance 4.0 – identifying the key qualities

What, then, does Finance 4.0 – supporting Industry 4.0 transformation – look like? What capabilities are needed to support the various needs of digital transformation, throughout the manufacturing technology supply chain? This paper sets out the potential spectrum of smart financing options available to manufacturers. Additionally, it considers the three key phases of Industry 4.0 transformation:

- getting started with the technology and equipment required to run pilots,
- accelerating implementation with full rollout across production systems, logistics, maintenance, quality assurance, and other areas, and
- maintaining the momentum of digitalization over the long term, using finance to ease cash flow and capturing as much business growth as possible in a cash-flow friendly, sustainable way.

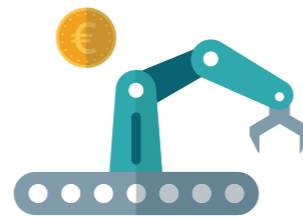


Technology Upgrade and Update

Industry 4.0 developments are unfolding at great speed, while technology innovation and upgrade periods continue to shrink in a digitalized world.³³ For manufacturers already well on the path to becoming a fully digital enterprise, integrated equipment and technology finance options allow them to upgrade during the financing period and offer protection against technological obsolescence. Upgrades might involve replacing with a newer model or retro-fitting enhancements onto the main technology platform. Ultimately, manufacturers can use the additional flexibility to roll out Industry 4.0 and grow at the same fast pace as the accelerating demand for their (improved) products.

Pay to Access/Use Equipment & Technology Finance

Whether starting a pilot or accelerating implementation, most manufacturers are looking for financial tools to help them acquire a piece of technology, machinery or a system from OEMs without the need to use up their own capital – whether accrued profits or bank loans. Early engagement with the right financing partner will enable manufacturers to size and specify the pilot without unnecessary financial constraints and help build the business case with the freedom to access the technology that best fits their needs. Financial solutions will usually be based on a range of options: finance lease, operating lease, rental or hire purchase arrangement. Financiers with a deep knowledge of manufacturing in general and digitalization in particular will adapt the finance arrangement to align with the likely benefits the manufacturer will gain from the technology. This type of financing can also cover associated costs of ownership, such as maintenance, into a “bundled” monthly payment. To enable a series of implementation and adoption decisions over time, financiers can also put in place an enterprise-enablement “master” agreement with a manufacturer. This is an umbrella arrangement that speeds up new technology and gives the manufacturer the confidence that they will be able to acquire new technology from an OEM as soon as they need it.



Software Finance

The journey to digital transformation requires deploying combined hardware and software solutions that can deliver digital data streams of performance data. These data are the key to production optimization, predictive and remote maintenance, and more intelligent manufacturing. This is recognized by specialist financiers that can offer manufacturers integrated arrangements for financing requirements. With knowledge of how the software is implemented and the resulting business outcomes, these financiers understand the associated risk and integrate the software element into a total financing package.



Pay for Outcomes

Financing agreements in which payments are predicated on the expected business benefits, or “outcomes”, that the technology makes possible are being offered with increasing frequency. Savings or gains from access to the technology are used to fund monthly payments, making the technology cost-neutral for the manufacturer. One good example: A piece of energy-efficient equipment delivers cost savings from lower energy consumption, and a financing plan aligns payments to the rate of savings made each month. In some cases, this means that digitalization technology solutions can be adopted at low or zero-net cost, because the energy savings pay for the technology upgrade over the life of the financing plan.



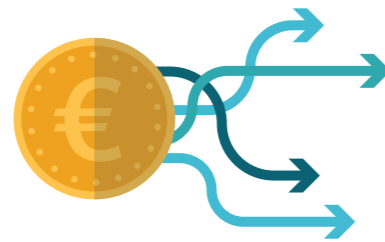
Finance to Assist Transition from Pilot to Mainstream

While the benefits of moving to a digitalized manufacturing environment are clear, the process of transition has to be carefully managed and commercial risk eliminated by rigorously testing new technology in the real-world production environment. This can often act as a barrier to digital transformation because the manufacturer is discouraged by the idea of having to pay for both the old or pilot arrangement and the new or scaled approach during the transition period. Recognizing the challenges of transition, financing arrangements are available that defer payment for a new system or scaled setup until it is reliably up and running. This removes the financial challenge of having to pay for the new system while the old one is still running.



Working Capital Solutions

As the competitive advantage from Industry 4.0 generates growth, manufacturers are under increasing pressure to manage cash flow. Cash flow and working capital challenges arise at moments other than just the initial point of acquiring digitalized technology. Digitalization may increase production capacity and productivity, while improving price competitiveness, to the extent that a manufacturer's order book experiences a sudden, significant upswing. This is good news. Yet the momentum that is built through digitalization brings its own challenges – such as suddenly having to buy raw materials or components in greater quantities. Added-value financing services offered in partnership with a specialist financier – usually based on some form of invoice finance – are available to help manage the cash-flow challenges brought on by success through digitalization.



Finance Solutions to Enable OEM Sales Momentum

OEMs have access to the full range of Industry 4.0 finance techniques, with one important addition. Vendor financing programs can offer OEMs further competitive advantage, as they drive their own businesses or enable their own customers to become digital enterprises. OEMs and systems integrators can partner with digital finance specialists to offer integrated finance to their own prospective and existing customers – be the large, medium or small manufacturers – so that they can acquire new machines and digital solutions.

Vendor finance can help OEMs, systems integrators and other technology vendors to enhance their value proposition and overcome competitive pressures by providing an alternative to outright purchase during the initial scoping and needs-analysis phase. Vendor finance can play an important, complementary role to support the sale of digital technology and machines and can encompass complete finance solutions, including maintenance, servicing, hardware and software. With affordable payment options, this can also help the OEM's customer to consider a more tailored technical specification and overall solution to fit the customers' needs over time.



Industry 4.0, secure cloud, technology and finance

Mario Schenk, Head of Cloud Application Solutions, Siemens AG

Working with, and within, our secure Cloud platform – MindSphere – gives a particular perspective on Industry 4.0, its rate of adoption and the way it is settling into manufacturers' strategies.

For a start, there is a clear differentiation between larger companies and SMEs. Larger firms have largely defined what digital transformation means to them and has to offer and are looking for a technological partner to help them implement change. Our role here is to support their analytics – using datastreams from their systems, their digitalized production sites, their supply chains, etc – and bridge from those insights through to practical deployment. With SMEs it is quite different. They have catching up to do in regard to digitalization and require consultants. We're there to help them understand digitalization in terms of the art of the possible, turning the hype and the opportunities of Industry 4.0 into real commercial benefits.

Of course, despite the Industry 4.0 zeitgeist, digital transformation tackles issues as old as the companies themselves – higher productivity, improved quality, more flexibility and speed of reaction to market changes. It's just

that in a digitalised, data-rich world, so much can be done, tested, trialled, explored – which isn't possible at a justifiable cost in currently existing structures. With the modelling that we can now do in our secure cloud environment, companies have seemingly endless possibilities, from the optimization of existing processes all the way to new business models that safeguard competitiveness and increase business success.

In fact, we find ourselves talking to manufacturers not so much about Industry 4.0 (which tends to focus on technology) but more about Business 4.0. These conversations cover the interplay between client technology, the MindSphere Ecosystem and finance solutions. It is the combination and integration of these three 'enablers' that allow new ways of doing business, new business models, to be created.

It is quite evident that intelligent finance, including the ability to track and analyse technology usage and performance, is not just helping to accelerate Industry 4.0 adoption - it is a fundamental component of Business 4.0 transformation. The technology platform MindSphere and finance solutions come together to free manufacturing of its historical constraints, and create new ways of working, new value, and new ideas of what sustainably successful business looks like.

Focus on Sweden – maturing into Industry 4.0

Mikael Kraft, Head of Factory Automation and Digitalization, Siemens AB

“Industry 4.0 is evolving fast here in Sweden. There is a very high awareness of digital transformation, its benefits, and the necessity of moving ahead with Industry 4.0 initiatives. Nevertheless, there is a strong contrast between firms in terms of the ability to implement technology, carry out the preliminary analysis, and make the required investments. The starkest contrast that we see today is between larger companies (typically in machine building, food, automotive, steel, etc), which are well positioned for digital transformation, and the community of SME manufacturers, who are more at the start of their journey.

Nevertheless, Sweden is definitely a country of early adopters, with a handful of Swedish companies in the Industry sector who are ahead of the curve in terms of their ability to implement Industry 4.0 projects. Just look at a few articles in the press about Industry 4.0 and one sees that many of the examples quoted are from the Nordics. That speaks for itself.

“What we have learnt from the Swedish experience is to apply the same strategic business disciplines to Industry 4.0 transformation as you would in any other aspect of your business. It is a real mistake to be dazzled by technology for its own sake. The starting point has to be identifying a clear and achievable target. What aspects of digital transformation will really give a manufacturer competitive advantage? What will put them ahead of rivals both at home and abroad? What technology, equipment, systems and people/skills are required? And how can you make the investment affordable and sustainable, without having to make technological compromises?”

“That last point is probably the biggest hurdle that manufacturers face. Certainly, we have a feeling that SMEs are sometimes being put off by the idea of a major up-front investment cost. That’s why we have been working hard in Sweden to offer SMEs (indeed, all customers) sustainable ways of spreading costs over time, so that payments are aligned with the benefits that the Industry 4.0 transformation delivers. We’re also finding that it is important for the manufacturer that the technology and financing come from a single source. Such integrated finance is absolutely tailored to the technology and equipment solutions, making everything easier to negotiate and easier to administrate. In some cases, master agreements are set up so that we can make the financing grow with the manufacturers Industry 4.0 development without having to structure a new contract every time. This fits in better with the customer’s strategic path – in fact, it can sometimes encourage more strategic thinking from a manufacturer, inspired by the need to think further ahead about the financing aspect.

“In short, we are seeing the Industry 4.0 label becoming commonplace – a sure sign of a maturing market. In fact, I would almost say that the label is becoming less used as manufacturers focus on the particular specialist requirements for themselves and their sector. We’re getting past the generic and much more into the specific with digital transformation.”

“In Sweden, many companies are starting to move toward Industry 4.0. For Swedish suppliers to the automotive industry it’s important to make sure they keep up with their European counterparts and are able to remain competitive, and they have to accelerate their Industry 4.0 investment.

I believe one of the biggest roadblocks to digitalization for European companies is how to manage the investment, particularly if you’re a SME. Without financing, you may not see the payback for many months. But with smart finance where the monthly fee is linked to the benefits of the technology – you’ve got the ideal solution.”

Clas Tengström, CEO, Bror Tonsjö AB (precision metal components manufacturer), Sweden



“Since the aim of the sector we work in (machine tools) is to produce machines that are integrated with Industry 4.0, it’s important we embrace digital transformation to remain competitive. By using Industry 4.0 technology, we are able to collect data about production at our CNC machining center production facilities to maximize our efficiency. The need for digital transformation extends down the supply chain, so businesses at all levels will need to invest in Industry 4.0 and need to prepare themselves for this investment now. Firms can improve their production rates through digital transformation. Production costs are reduced and sales figures are increased, so there are great rewards. But the difficulty comes in making the initial investment. This is where smart finance can help.”

CNC and machine tools, Turkey

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Research methodology

41 respondents were interviewed about their views on current Industry 4.0 pilot project implementation. The same respondents were also asked to estimate the period (in years) by which a majority (more than 50%) of manufacturers would have deployed digital transformation (Industry 4.0) across their production processes. Respondents included global top 2,000 manufacturers, trade associations, expert management consultants, and academics, covering the United States, Europe, and Asia-Pacific. They were interviewed between September 2018 and January 2019. The study also interviewed 26 manufacturers across these regions to get their views on the role specialist finance was playing to enable in Industry 4.0 transformation.

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