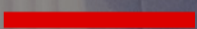


# Nordic Manufacturing

At the Forefront of the Green  
and Digital Revolution



**Key  
Highlights**

A time for  
disruption and  
opportunities

Agenda for  
growth: The  
company  
level view

Strategic  
intent

Capability  
building

Enablers to  
execute

# Introduction Statement

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The manufacturing of tomorrow. Industry 4.0. Making needed things. Helping established SMEs on the next stage of their growth and transformation. Offering not only capital but also expertise, an ecosystem of support. Value creation. A way through the disruptive challenges of uncertain times. These themes describe Oak Universe as an investment firm, and as Founder and Managing Director, I'm delighted to be involved in actualizing such an exciting proposition.

The Nordic region, comprising of Sweden, Denmark, Norway and Finland for the purpose of this paper, is currently leading the way in the European manufacturing sector in terms of both digital-innovation and green-innovation. The region hosts an impressive number of firms, big and small, that are forging the way in innovation, and leading by example in the global market. To continue with this push, the uptake of cutting-edge technologies is key to ensure that all firms in this region can keep the pace with the increasing demand for smart solutions, to pressing and increasingly growing environmental problems and to maintain the push for competitiveness in Nordic manufacturing.

This is where Oak Universe comes in. Oak Universe is an investment firm dedicated to the future of manufacturing in Europe. We focus on helping privately-owned, small- and medium-sized manufacturing businesses achieve the next stage of their growth through the adoption of advanced technologies. We do this by providing not only the capital to finance that growth, but also a close partnership which brings access to know-how, strategic insight, and consulting support when undertaking

projects that drive new value and growth. We recognise that current investment needs not only require a focus on the tangible assets that drive the manufacturing industry, but also on the intangible assets that drive industrial change and innovation and allow for a wide outreach of benefits- for firm, for sector, for society.

In this article we explore some of these challenges and dive deeper into the Oak Universe approach to engaging with and investing in manufacturing SMEs. If this is of relevance to your firm, please reach out to me and let's explore further.

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# A time of Disruption and Opportunity

This paper presents a positive overview of the prospects for manufacturing within the Nordic region, which (for the purpose of this paper) comprises Sweden, Norway, Finland and Denmark. We highlight both the opportunities evident for Nordic manufacturing firms, whilst accounting for the challenges faced by small- and medium-sized manufacturing firms. With increased growth, resilience and operational efficiency as the penultimate aim, we map out how manufacturing firms can reach these goals whilst faced with economic, environmental and societal shifts, as well as the sweeping impact of digital technologies. We aim to demonstrate just how relevant the hands-on approach towards value creation adopted by Oak Universe is for SMEs in the Nordic region, allowing for the chasm between the growth potential of firms and realisation of ambition to be closed.

## Snapshot

Over the past three decades, the total employment in the Nordic manufacturing industry has fallen by approximately 500,000 persons. Deindustrialisation in the region is attributed to production offshoring, outsourcing of non-core activities, productivity gains reducing the need for workers and a loss of competitiveness to newly industrialised countries. While employment in the manufacturing sector has decreased, production has increased. The manufacturing industry of the Nordic region has a superior productivity performance, with manufacturing activity generally growing more than 3% annually across the countries in the region, in comparison to a growth rate of less than 1% in the total economy. Over 50% of exports in the Nordic region stem from the manufacturing sector, meaning that within the region, manufacturing is an important sector for the trade balance and foreign exchange earnings.

Within the Nordic region, most manufacturing companies are small companies, although larger companies are important actors, particularly in Finland and Sweden, where multinational companies play an important role in manufacturing value-added. The region is currently home to major global manufacturing, technology and retail companies, including Ericsson, Alfa Laval, Nokia, Scania, Volvo Group and Maersk. Spearheaded by leaders in 5G, Ericsson and Nokia, the region has a world-leading digital industry ecosystem. Moreover, the region is characterised by collective expertise in mining and associated equipment and is home to three of the largest Mining equipment, technology, and service providers in the world (Metso Outotec, Epiroc and Sandvik). Sweden is an

important producer of metal and ore within the EU, and several rare earth and critical mineral projects in Sweden, Norway and Finland are currently under development. Due to this, the Nordic region is cited as having the potential to become a vertically integrated hub for battery manufacturing for the electric vehicle industry of Europe.

Traditional sectors such as metal products, food products, machinery and electronics are dominant in almost all countries, with Nordic manufacturing sectors dominated by B2B suppliers. In the Norwegian manufacturing sector, oil technology represents the most important cluster (including suppliers in the metal and machinery sector). The Icelandic manufacturing sector is dominated by aluminium, whilst Finland's manufacturing sector is led by electronics and ICT clusters. Swedish manufacturing sectors are dominated by consumer electronics, automotive and steel clusters, whilst Denmark has a more diverse sector in comparison to the other Nordic countries. Production is largely characterised by customised, smaller and more knowledge intensive production of batches across the various manufacturing intensive sectors of the region.

With strengthening competition, the region is faced with the continuous challenge of cost-reduction and heightened efficiency. Since the beginning of the COVID-19 pandemic, the Nordic region has emphasised the importance of maintaining open trade and combating protectionist sentiment but has still faced uncertainty over Brexit and global-trade tensions over recent years. In Sweden, interest rates and high inflation are resulting in slow household consumption, with Russia's invasion of Ukraine being one reason why exports slowed in the first quarter of 2022. As a result of weaker demand and uncertainty, manufacturing investments are predicted to decelerate. Similarly, Finland is faced with a negative economic impact due to the geopolitical crisis in Ukraine<sup>2</sup>. With slow growth predicted across the region as a result of the current uncertainties and COVID-19 recovery, strengthening such an important sector in the region as manufacturing is an important goal for the Nordic countries. Thus far, the Nordic countries have been able to forge a clear path in the manufacturing sector by focusing on digitisation and sustainability considerations. Nonetheless, there are several barriers to automation and digitisation which are common to all Nordic countries, depending on the business model of manufacturers.

Business Model	Barriers to further automation and digitisation in Manufacturing
<p>Innovators: Advanced companies involved in the development of digital technologies</p>	<ul style="list-style-type: none"> <li>• ICT-specialist shortage</li> <li>• Access to funding for applied research</li> <li>• Diverse standards hindering communication between different technologies and products</li> <li>• Design and collaboration of joint research and development projects</li> </ul>
<p>Early adopters: First mover companies applying digital technologies and developing new, digital business models</p>	<ul style="list-style-type: none"> <li>• Access to risk capital</li> <li>• Access to design expertise</li> <li>• Creation of convincing business cases to attract investment in digital technologies</li> <li>• Access to testing facilities</li> <li>• Access to data security and data</li> </ul>
<p>Followers: Companies investing in and applying mature digital technology</p>	<ul style="list-style-type: none"> <li>• ICT-skill shortage</li> <li>• Lack of risk capital</li> <li>• Difficulties identifying customised and appropriate solutions</li> <li>• Limited management resources to reorganise production and develop new business models</li> </ul>



The Nordic countries are characterised by a high share of renewable energy, a high proportion of electric vehicles (in Norway alone, electric vehicles comprise 50% of the market share) and a low average amount of 0.2t CO<sub>2</sub> per capita in comparison to an average of 0.8t for Europe. Nonetheless, although a strong awareness and drive for sustainability exists in the region, there is still room for further digitalization and the provision of increased opportunities in the region. With the Global Cleantech Innovation Index ranking Denmark, Sweden and Finland in the top three places for countries with the greatest potential to produce and commercialise green technology innovations over the next 10 years manufacturing firms in the region would be well placed to capitalise on this to focus on expanding current green and digital strategies.

# Positive Tailwinds in the Nordic Region

In the short-term, recent attention on the challenges faced in the Nordic manufacturing industry often focus on the effects of the COVID-19 pandemic and geopolitical disruptions to the supply and price of commodities. Considering a more long-term view of challenges, the manufacturing sector in the region places an increased focus on the ability of manufacturers to keep pace with technological advances and ever-changing environmental considerations. Although the region generally boasts a healthy environment for technological innovation, SMEs particularly face considerable obstacles during digital transformations, where a lack of strategy and vision, high investment costs and uncertainty surrounding

## Policy and Governmental Focus on Increased Competitiveness

Across the Nordic countries, different factors currently support the competitiveness of the respective manufacturing industries. There is a trend in that the Nordic countries are particularly focusing on policies that aim to attract both investment and talent, including professional mobility and business promotion. For example, the Swedish Government's strategy for industrialisation seeks to increase the capacity for change and competitiveness in manufacturing businesses, focusing particularly on:

1

The implementation of Industry 4.0 to make the industrial sector a leader of the digital transformation

2

Contributing to the competitiveness, value creation and job creation of industrial sectors through increased resource efficiency and sustainable production

3

Boosting industrial skills to meet the sector's needs and promote long-term development; and

4

Leading research in areas that contribute to the strengthening of the production of goods and services in Sweden.



# Positive Tailwinds in the Nordic Region



## Strong country- level capabilities in managing climate

Climate change and the societal efforts to minimise carbon emissions will influence the manufacturing sector profoundly. Should efforts to curb the effects of climate change fail, then the ensuing environmental effects are predicted to cause the mass destruction of jobs and livelihoods across the globe, prompting waves of migration from the most affected areas. The transition towards renewable energy, as well as low-emission production and transportation, will require huge investments in production, propelling industrial restructuring and changes in the volume of skills and work required within manufacturing processes. As a result of their northern location, the Nordic countries are predicted to be one of the regions affected most by climate change (i.e., deglaciation in Iceland is likely to present a significant challenge in the upcoming decades). Fortunately, the countries of the region are widely proactive in terms of preparation for the future and are subsequently leading the way in terms of solutions to counter the climate crisis.

Denmark, for example, is a leader of the current global efforts to reduce greenhouse gas emissions, directing 60% of the country's allocated Covid-19 recovery spending towards environmental goals, and demonstrating in the thirty-years prior to the Covid-19 that a significant reduction in emissions is possible without negatively effecting jobs, growth or living standards. With strong capabilities for managing climate change existent in the region and increasing support towards green-firms and the development of associated technologies, Nordic manufacturers have an opportunity to join the first movers in the region and bolster environmental efforts. The wider changes associated with the shift towards green mechanisms of production and the recent Covid-19 pandemic have further provided the Nordic region with the motivation to digitalise and restructure manufacturing production, with policies to support workforces to adapt to the need for reskilling and job mobility predicted to intensify in the coming years.



## Increasing technological competencies

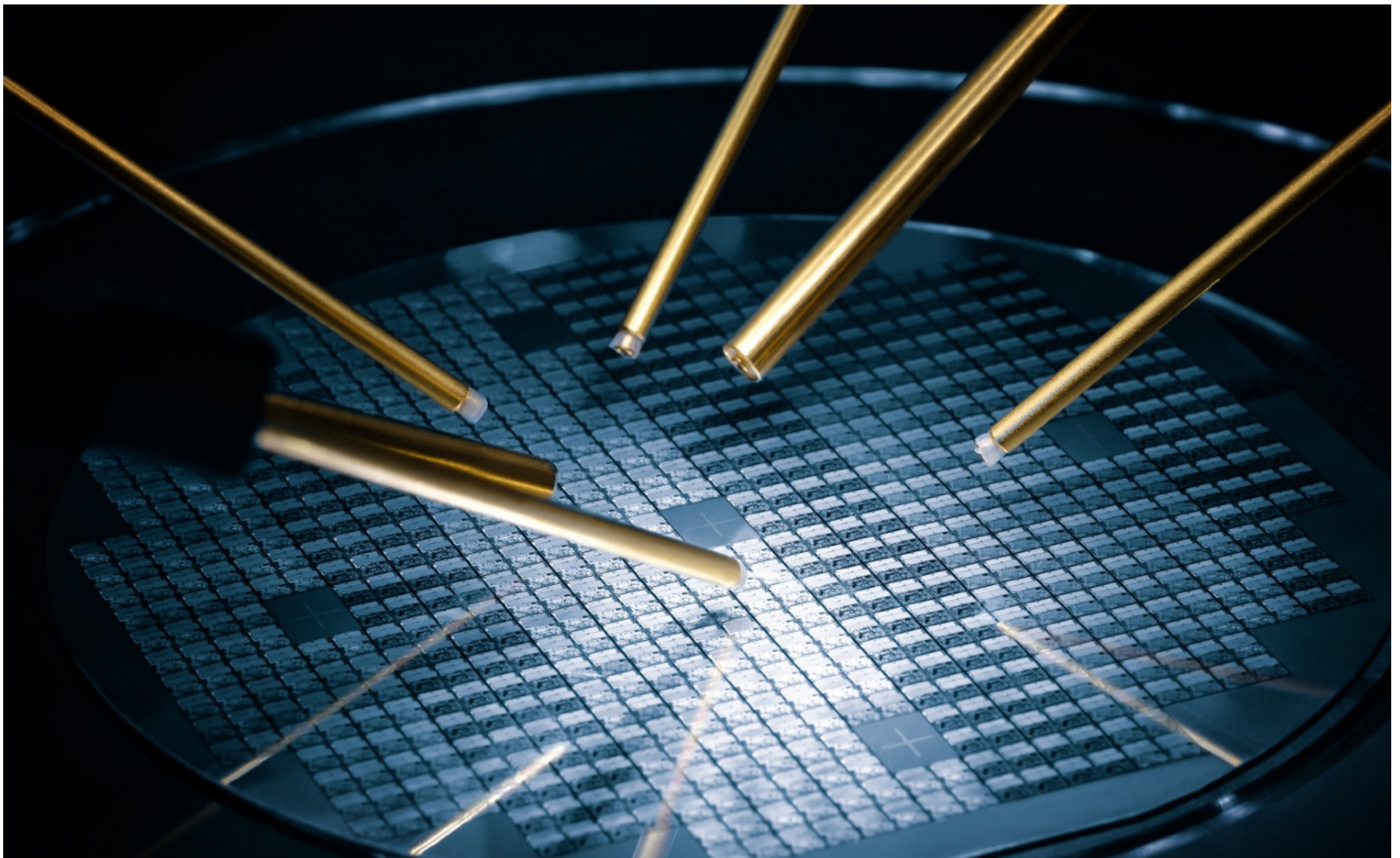
Within the Nordic manufacturing industry, over half of producers have adopted Internet of Things technologies, which provide the foundation for the majority of digitisation initiatives, suggesting that already over half of manufacturers possess the necessary base to kickstart technological innovation. One in five firms use AI, one in ten Blockchain, a third of firms use robotics (i.e., for assembly and welding), and a third use 3D-printing. While this level

of adoption remains relatively low, figures indicate that an increasing number of manufacturers in the region are aiming to adopt these technologies. Within industry clusters, increasing technological competencies will lead to positive knowledge spill overs and sharing, supporting the growth of the digitisation of manufacturing in the region

# Agenda for Growth: The Company Level View

Against the background of both geo-economic and geo-political shifts, rapid technological innovation, increasing sustainability needs, and changing demographics, workforce dynamics and skill requirements, manufacturing SMEs in the Nordic region can forge the way towards competitiveness, growth and efficiency. The digital revolution- the increasing capacity of digital technologies to transform processes and generate and process large volumes of data- creates fundamentally new possibilities for production and supply chain organisation. SMEs, often overwhelmed by the complexity of competing visions and technologies and awed by the scale of investment implied, can easily recoil from the task and content themselves with low ambitions and modest increments of change.

Strategic Intent	Capability Building	Enablers to Execute
<ul style="list-style-type: none"><li>▶ Product Service Design</li><li>▶ Geographic Management</li><li>▶ Customer Centricity</li><li>▶ Partnerships</li><li>▶ Industry Value Chains</li></ul>	<ul style="list-style-type: none"><li>▶ Process Digitalisation</li><li>▶ Industry 4.0 Technologies</li><li>▶ Data Analytics Decision Making</li><li>▶ Sustainability and Climate Impact</li><li>▶ Cybersecurity</li></ul>	<ul style="list-style-type: none"><li>▶ Investment Capital</li><li>▶ Program and Project</li><li>▶ Expertise</li><li>▶ Workforce Culture Upscaling</li><li>▶ Human and Societal Relevance</li></ul>



# Strategic Intent

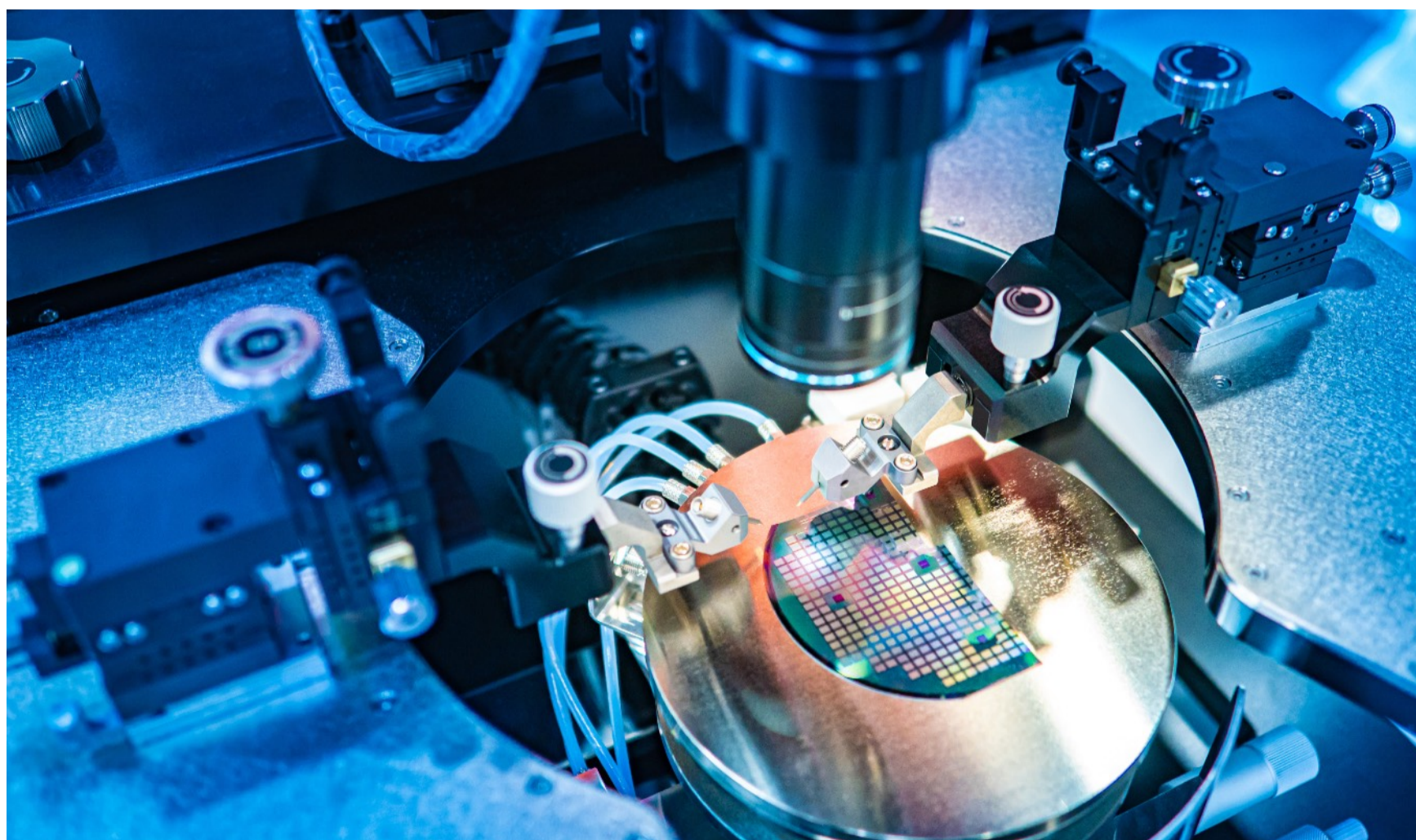


## What to make ?

While the global realignment of markets and supply chains may create windfall opportunities for some firms, others face the risk of rapid decline in demand for their products and the appearance of new competitors with more attractive products. Firms cannot afford to take a static view of demand based on historical sales volumes, market segment growth rates and price points, but need to understand the changing quality of demand from the customer's standpoint. New product development and the R&D to support it has become ever more critical to success. Increasingly, products are hybrid: they come bundled with services and software and the process of developing them involves the use of digital tools to add value in such areas as providing insight into user needs, predicting lab test outcomes, inventing new materials. The business model for these hybrid products and services often involves partnerships between firms, necessitating various degrees of operational integration. This in turn has major implications for the development of new digital skills and creative inputs into product and service design.

## For whom to make it ?

Firms need to take a fresh view of their markets, going beyond the country-by-country market and competitor analysis which has driven such decisions in the past. While thinking globally, they should consider not just the changing patterns of international supply and trade which will redefine opportunity and the relative attractiveness of different markets, but also have a dynamic awareness of changing customer profiles and requirements. "Know your customer" has never been more of an imperative, and this includes the ability to optimise the customer journey and experience. Customers are increasingly partners, integrated into the processes, ecosystems and information systems of their suppliers.





# Capability Building

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## How to make it ?

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Henrik von Scheel, who is credited with coining the term Industry 4.0, offers a list of technologies relevant to the technological transformation of the production chain. Internet of Things (IoT), Cloud computing and Automation/robotics top the list, closely followed by advanced data analytics, cybersecurity and additive manufacturing. But the list is long, and the business value lies in the creative and far from self-evident application of the technologies themselves. Alongside technological considerations, the whole set of sustainable development issues (circular economy, waste minimisation and recycling, environmental care and net zero commitments, social responsibility etc) are also having a major impact on how manufacturers in the Nordic region are thinking about their product and production processes.



## Where to make it ?

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Issues of production localisation and broader supply chain reconfiguration arise from many of the global trends already discussed. Obtaining raw materials and delivering the end-product to the customer most efficiently requires a fresh look at questions of insourcing and outsourcing within an ecosystem of suppliers and partners. An incipient but evident trend in Nordic countries towards reshoring of production, driven by the development in technology and the possibility of automation, as well as social and environmental motivations, is a clear example of this. It may be that this perception of increased efficiency via digitisation and the increasing attractiveness of sustainable processes, will also drive a trend towards greater vertical integration of value chains; but this will likely be balanced by a continuing trend towards companies focusing on specialised capabilities and decoupling these capabilities from their own business functions in order to source best-in-class capabilities externally where this is advantageous, and to market their own internal capabilities on the external market.

# Enablers to Execute

The above strategic questions are complex enough in themselves, but effecting the required transformation poses another set of tough challenges, particularly to resource-constrained private firms:

## Investment Capital

For SMEs, investment in digitisation may be difficult to achieve from the retained profits or operational cashflow of the organisation, due to the significant level of capital often required. The Nordic region boasts a vibrant private equity market, with close to 3000 Swedish firms receiving private equity capital between 2010 and 2020, contributing to an addition of SEK 230bn to the GDP level of the country due to the cumulative effect of private equity capital investments since 2007 (which is equivalent to almost 5% GDP). Nonetheless, private equity funds normally acquire large shares of the companies they invest in and adopting this path often connotes a significant loss of control over the business, with traditional owners reaping only a partial share of the value that the business is capable of realising.

## Transformation Management

Covers the range of disciplines needed to reach a clear strategic determination, plan the transformation and orchestrate the initiatives needed to see the programme through to full realisation of the investment case. Adoption of these disciplines often involves significant culture change as well as injection of specialist experience which many SMEs lack. Relevant aspects include:

- Choice and establishment of the right program management and digital transformation structures
- Application of test-and-learn and other typical agile development principles in place of linear, slow, risk-averse and in-house development processes
- Use of crowdsourcing and hackathons to add intensity to problem-solving and find solutions faster
- Agile digital platforms which collect large volumes of unstructured data from a plethora of internal and external sources and process them into actionable insights, as well as allowing information sharing with external partners
- Adoption of advanced simulation techniques such as digital mock-ups and digital twins, allowing for flawless construction of real-world factories and machinery and their continuous updating
- The decision-making processes needed to mediate between physical and digital processes.

## Expertise

**While the Nordic countries are leading the way in both digital and green innovation, skills shortages in certain areas present a challenge to growth of the manufacturing industry. In Norway, around 30% of companies cite a shortage of IT expertise as a prime obstacle to growth, with network security, robotics, digitisation and product innovation all particularly lacking. In Sweden, a software developer shortage is cited due to growing wage pressure, difficulties in matching the available skills with existing jobs, and the inability of the education system to adapt to market needs.**

In 2022, this shortage is expected to reach around 4% of the total European skills shortage, with IT developers, testers, process engineers, laboratory engineers and project leaders causing the biggest deficit. Denmark and Finland both report significant skills shortages also due to a competitive labour market, lack of specialization in required areas, and the increase of large firms expanding their R&D facilities in the countries. The market lack of ICT specialist skills in the region may constrain the adoption of new technologies in manufacturing SMEs and higher productivity. Thus, the roll out of expertise and skills, across a wider sample of manufacturing SMEs is essential to allow for the assimilation of new technologies and disciplines and build the capabilities described above.

## Human relevance

Growth strategies and digital transformations will not succeed unless they create conditions for individuals to develop and flourish. Of primary importance is job creation, resulting from growing businesses, ecosystems and industries. Equally, workplace culture and conditions must make manufacturing in the Nordic countries an attractive career choice, and for this people need to be equipped with the skills to add value in this digital and sustainability-driven world. The Fourth Industrial Revolution, for all that it is about digitisation, must bring new significance to the human dimension of work and create meaningful and enriching jobs. Increased focus on filling the skills gaps evident is required, in order to attract the right talent to the right role.

## What it will take to succeed

**Does the ambition level of Nordic SME's correspond to the size of the opportunity associated with embracing the growth and transformation agenda outlined above?** Even if in some cases it does, many companies will clearly struggle to overcome the threefold challenge of defining strategies and building essential new capabilities while harnessing the key enablers of execution: investment capital, expert know-how, human capital and transformation management. With whom should these companies partner for help in orchestrating this process? What would such a partnership look like?

The investment firm Oak Universe is dedicated to scaling the manufacturing champions of tomorrow. It helps privately-owned, mid-sized manufacturing businesses achieve the next stage of their growth through the adoption of advanced technologies. It does this by providing not only capital, but also a close partnership bringing access to strategic insight and consulting

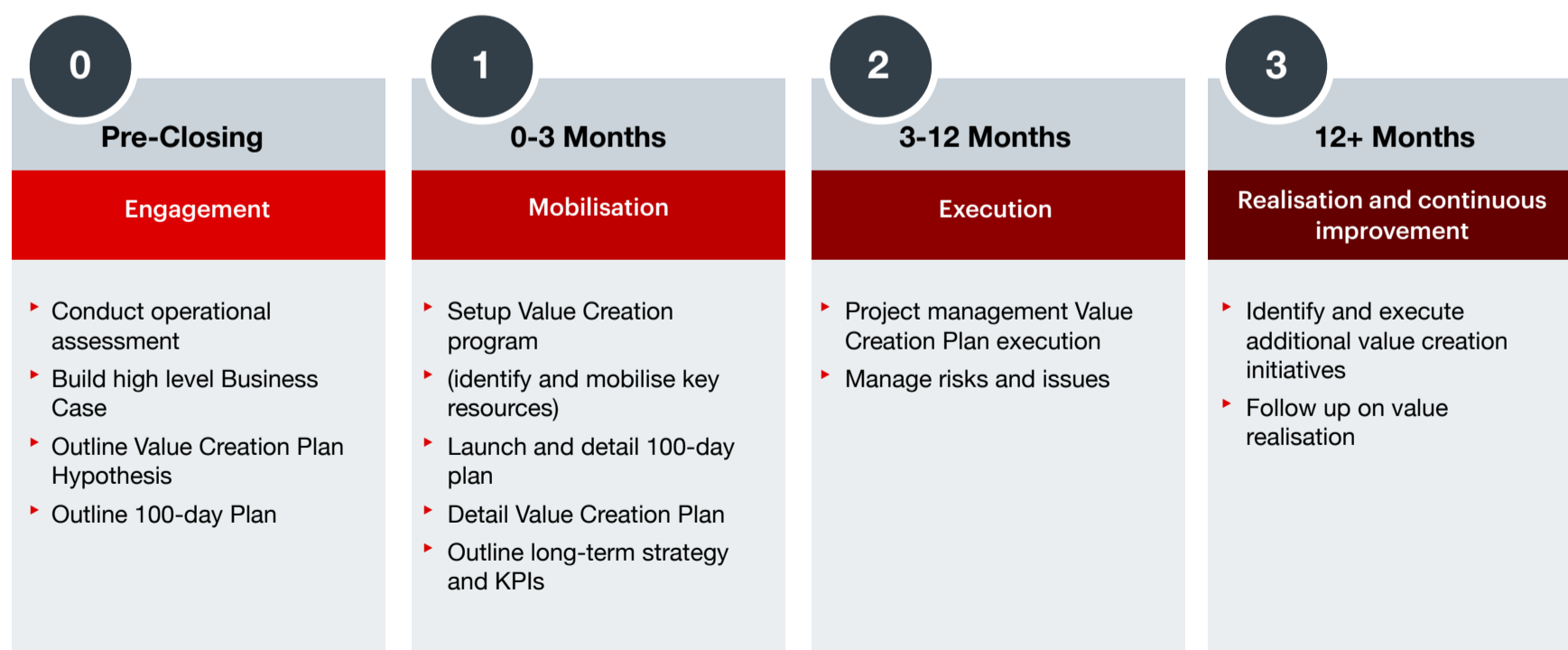
support for undertaking carefully selected value creation initiatives. Unlike the classical private equity model, which relies on financial leverage, buyout of controlling stakes and wholesale management changes to impose what is often perceived as an aggressive and alien top-down programme,

Oak Universe provides capital for growth and transformation by taking a minority stake and working in partnership with existing owners and management to inject the finance, expertise and project management in support of an agreed value creation plan. The partnership is expected to last over a 5-7 period of transformation, running from initial engagement and planning through mobilisation and execution of key initiatives to their full realisation and value creation impact.

## A 3-5 Year Partnership for Value Creation/WIN-WIN Engagement

Oak Universe works with owners and management to design and execute a bespoke value creation path, one which overcomes these limiting factors and bridges advanced technology into business value and growth.

### Sample of high-level value creation timeline and key activities



**Oak Universe invests in companies with outstanding value creation potential, but most importantly selects those with openness to change and with whom a true partnership for value creation is possible. To validate this fit, Oak Universe undertakes the initial Engagement Phase at its own expense, exploring growth opportunities and planning the value creation approach jointly with owners and management.**

The initiatives that drive value creation can be highly varied, for example new market entry, reshoring of production, M&A to effect vertical integration or bolt-on acquisitions, best-in-class digital enhancements to processes and data analytics, supply chain optimisation. In some cases, the transformation could amount to a wholesale reworking of the company's business model. Besides Oak Universe's inhouse team of management consultants and investment professionals, the firm draws upon an extensive R&D network and Expert Board to provide access to expertise and new know-how required by the value creation initiatives, including extensive links with academia.

The partnership between Oak Universe and the portfolio company includes support in corporate governance, both via representation on the Board of Directors and in the Management Team, but also via establishment and ongoing support for a Programme Management Office (PMO) and direct input to Business Units by external experts or consultants of the Oak Universe Value Creation Team.

**The opportunity for Nordic manufacturing is to build on the solid foundations already laid but also to help firms get to grips with the disruptive trends examined in this article.** Whether a future generation will regard the 2020s as having marked the beginning of a new era will depend not only on policies encouraged by Government, market trends and the innovative nature of the Nordic region's manufacturing firms, but most critically upon the champion manufacturers of tomorrow having been able to reinvent themselves for growth and enduring relevance. Oak Universe is determined to play its part in this critical endeavour.



# Oak Universe

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