



We are at a turning point; Industry 4.0 and 5.0 are already underway. Ireland must make decisive plans to cement our place as a leader in this area.

Intel Case Study

The 1960s was a time of significant change in the world. From this environment of transition, two dreamers, Robert Noyce and Gordon Moore, came together and founded Intel, firm in the belief that they could develop technologies that could change the world. What followed was a story of growth driven by one of the most important inventions of the twentieth century, the microprocessor.

As Intel's ambitions to serve a global market grew, it looked to Europe for a manufacturing base that could become its centre of operations for the region. In 1989, a campus in Leixlip, Co. Kildare was chosen as the location for Intel's manufacturing in Europe. To date, Intel has invested \$22 billion in turning the 360-acre former stud farm into one of the most technologically advanced locations in the world. This facility is the largest private investment ever made in the history of the Irish State.

Today, Ireland is part of Intel's global manufacturing site expansion plans. Construction activity began in early 2019 on the multi-year project, which will double the available manufacturing space in Ireland to enable production of the latest generation Intel 4 technology. \$7 billion has been invested in the construction project so far. The project will create 1,600 full time, hi-tech roles once complete and will involve 6,000 construction workers at its peak.

Industry 4.0 is defined by connectivity. Increasingly, smart devices and machines will be aware of the environments they are working in, respond autonomously, and communicate with other equipment. The internet of things (IoT) creates a cyberphysical architecture where data is generated, analysed, and responded to across an integrated system. IoT will provide manufacturers with insight into previously hidden operating opportunities, efficient practices, and innovative responses to uncertainty. For instance, the ability to gauge temperature, humidity, performance, motion, usage- and convert the data gathered into insights. Where appropriate, these insights can actuate a regulating or corrective action. Advanced capabilities in connectivity will make customisation and personalisation- for which there is a growing demand - easier to deliver.

The digitisation of industries and domestic life is accelerating the global demand for semiconductors. The onset of the Covid-19 pandemic, and the public safety measures that followed, further hastened the rate of digitisation. To put this into perspective, in the first quarter of 2021, global shipments of PCs were 55% above the previous year. Digitisation means that semiconductors are ubiquitous and used in an increasingly diverse range of products. The accelerated pace of digitisation is also intensifying the demand for critical physical and digital manufacturing skills.

In the thirty-two years that Intel has been based in Ireland, the country has become a global leader in technology and advanced manufacturing. This trajectory is mirrored in the progression of Intel Ireland's operations, from an assembly facility in 1989 to manufacturing the leading-edge semiconductors using remarkably complex processes in 2021. One example of the advanced technologies of Industry 4.0 in use at Leixlip is augmented reality (AR). Over two years ago, a manufacturing team began to use AR in training sessions. Used to teach new tasks, the AR implementation team quickly found that the technology worked particularly well in the training of new hires.

1968

Since Intel's founding in 1968, the company has been an integrated device manufacturer



Wearing the headset and seeing tools, diagrams, guides, and real-time instruction allows complex tasks to be repeated in the secure augmented space before performing the same tasks in the real environment of the fab. The AR training increases competency, achieves more consistency in terms of methodology, and reduces training times. Recent studies demonstrate that AR can improve the efficiency of training and also enhance comprehension in certain subjects.

Since the first pilot, the AR programme at Intel Ireland has expanded in both size and ambition. In addition to training, the AR headsets are also used for remote assist purposes. This means that a person working in the fab can reference a true-to-life diagram pinned to the screen of the headset while they work, leaving their hands free to perform tasks. The remote assist capacity also allows a vendor to guide an operative to diagnose and fix problems. The vendor gets a close-up view of the issue and can give step-by-step instructions to guide the repair process remotely. In doing so, the downtime is reduced, and there is greater availability of tools in the fab.

Manufacturing is one of the foundations of Ireland's digital future. We have built a resilient manufacturing ecosystem with products that are essential to global supply chains. But innovation requires sustained and progressive investment, not only in monetary terms but also investment in citizens and communities. We are at a turning point; Industry 4.0 and 5.0 are already underway. Ireland must make decisive plans to cement our place as a leader in this area.

In order to secure that place, Intel Ireland supports the Government's efforts to accelerate digital policies and plans. One such example is the establishment of the Industry 4.0 Stakeholder Forum composed of representatives across the manufacturing value chain as set out in the Government's I4.0 Strategy. While the Forum marks another important step forward for Irish manufacturing, Intel Ireland proposes that the Forum's activities be accelerated to meet the pace and scale at which Industry 4.0/5.0 is growing.

Advanced manufacturing must remain an area of priority for Government. It requires a dedicated official to oversee the implementation of relevant policies and to lead the transition to a green, low-carbon industry. Such a portfolio would develop Ireland's manufacturing ecosystem and facilitate growth, preparing the workforce for jobs of the future in manufacturing and securing Ireland's place as a world leader in Industry 4.0/5.0.

Additionally, Intel Ireland would like to see improved access and increased support for lifelong learning to ensure everyone in Ireland can benefit from Industry 4.0/5.0 and jobs of the future. The World Economic Forum reports that 'for those workers set to remain in their roles, the share of core skills that will change in the next five years is 40%, and 50% of all employees will need reskilling.'¹ Intel is a strong supporter of primary, secondary, further, and higher education in Ireland and seeks to promote and improve access to STEM education at all levels.

Diversity and inclusion are essential to lifelong learning policies. To ensure these issues are addressed, we propose expanding the scope of training and overall accessibility in advanced manufacturing. Investment in micro-credentials and inclusive infrastructure will ensure Ireland delivers world-class education programmes that are open to all.

Since Intel's founding in 1968, the company has been an integrated device manufacturer, or IDM, designing and building our own semiconductor chips. To meet the ever-increasing demand for semiconductors and the insatiable need for high performance computing, in March 2021, CEO of Intel, Pat Gelsinger, announced a considerable investment in Intel's manufacturing capability. Under these expansion plans, Intel will continue to design and build our own products while also manufacturing semiconductors for fabless companies by means of Intel Foundry Services. Intel Ireland will have a leading role to play in Intel's future as one of the most advanced manufacturing facilities in Europe.

¹ World Economic Forum (2020) 'These are the Top 10 Job Skills of Tomorrow.'