

IRELAND - NATIONAL REPORT

ICT-enabled AMT



Fostering the Adoption of ICT-enabled AMTs by European SMEs



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CCSDE

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2			

Applicable Documents

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0.Introduction

‘The manufacturing sector is the second-largest employer in Ireland’

– MINISTER HEATHER HUMPHREYS, TD

With Irish manufacturing SMEs and start-ups gaining more and more power over the global market, and due to the ‘Brexit’ fact, Ireland seems to be poised to replace UK as the European technology hub.¹ In particular, Ireland is now ranked second only to Switzerland and Germany to be the leader in industry 4.0, due to the excessive use of sophisticated and automated processes, intensity of innovation and industry openness.²

In fact, recent research has shown that activities related to manufacturing industries have reached a seven-month high in August 2018 on the back of exceptional increase of both inputs and outputs.³ This results in manufacturing accounting for approximately 22% of GDP to Ireland, with most firms sourcing more than €14bn of services and products from suppliers based in Ireland.⁴

Some of the major industries thriving in Irish economy involve agriculture, food and beverages, chemicals, clothing, construction, electronics and data processing, pharmaceuticals, textiles and tourism.⁵ More specifically, from 2015 until 2017, the Irish manufacturing trends showed that foods and beverages represented 21.8% of all goods, while in 2018 the pharmaceutical industry ranked first.⁶

Production by Sector 2015 - 2017			
	2015	2016	2017
	%	%	%
Mining and Quarrying (05,06,07,08,09)	0.5	0.4	0.6
Food products (10)	19.5	18.2	20.6
Beverages (11)	2.3	2.2	2.3
Textiles, wearing apparel, leather and related products (13,14,15)	0.3	0.3	0.3
Paper and paper products (17,18)	1.2	0.9	1.1
Chemicals and chemical products (20)	15.9	12.9	9.1
Basic pharmaceutical products and preparations (21)	32.5	39.2	39.2
Rubber and plastic products (22)	1.2	1.1	1.2

¹ <https://www.indeed.com/prime/resources/talent/augmented-reality-revolution-thrives-in-dublin-2>

² <https://www.siliconrepublic.com/companies/confirm-centre-sfi-conor-mccarthy>

³ <https://www.irishtimes.com/business/manufacturing/irish-manufacturing-sector-gains-momentum-in-august-1.3616595>

⁴ <https://www.cordantpeople.ie/resources/manufacturing-ireland-key-statistics>

⁵ <http://www.atlapedia.com/online/countries/ireland.htm>

⁶ <https://www.cso.ie/en/releasesandpublications/er/iips/irishindustrialproductionbysector2017/>

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Basic metals and fabricated metal products,machinery and equipment (24,25,28)	5.3	4.6	5.1
Computer,electronic,optical and electrical equipment (26,27)	10.8	10.7	10.3
Wood and wood products, other non-metallic mineral products, furniture (16,23,31)	2.4	2.2	2.6
Transport equipment (29,30)	0.6	0.3	0.3
Other (12,32,33)	7.5	6.9	7.3
Total NSV	100.0	100.0	100.0

Nevertheless, margins still remain under pressure due to sharp increases in inputs cost for a wide range of materials, such as basic metals or electrical equipment as opposed to wood and food industry among other sectors.⁷

a. Scope of the project

Addressing the needs of micro-SMEs involved in industry 4.0 sectors, FAME project aims in developing an innovative training program in conjunction with supporting tools in order to help them overcome the environmental, organizational and technological barriers appearing in ICT-enabled intelligent manufacturing, with a special focus on human resources and technology services. The training package of FAME emphasizes in the main drivers for investing in Advanced Manufacturing Technologies (AMTs).

b. Target Groups

Micro-SMEs lacking the knowledge and resources to overcome AMT barriers are among our main target group. More specifically, the project focuses more on SMEs from the following sectors:

- Food and Beverages
- Wood industry
- Metal industry -NACE 24 25
- Electronic and Electrical Equipment

⁷ <https://tradingeconomics.com/ireland/industrial-production>

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c. Project objectives

With Advanced Manufacturing Technologies being the key to industrial competitiveness among Europe, the project is expected to enhance the skills of SMEs and grow a large network of FAME adopters and enthusiasts supported by a virtual Academy aiming in strengthening the capacity SMEs through the development of local ecosystems.

Towards that purpose, FAME will design and develop an innovative training framework comprising a modular training course along with learning materials facilitated by:

- a. The Virtual AMT Adoption Assistant for personalized training
- b. A Learning Motivation Environment that supports a skills retention service after the completion of the training.

1. ICT-enabled AMT in Ireland

Recent surveys showed that there is a lack of understanding among SMEs of the implications of Industry 4.0 on their businesses, which leads to an exceptional need of a specific digitalisation strategy.⁸

On its effort to dominate in industry 4.0, the Irish Government launched I-Form, a new research centre specializing in advanced manufacturing with the aim of being actively engaged to a wide range of different technologies, focusing mostly on 3D printing.⁹ Its mission is form the future of advanced manufacturing delivering impactful research outcomes.

In general, ICT being established and using a well-developed global supply chain model, it is a sector that changes with exceptional pace, as products are commoditised relatively early in the life cycle and the manufacturing services are well-embedded.¹⁰

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<https://www.engineersireland.ie/EngineersIreland/media/SiteMedia/communications/publications/Engineers-Ireland-Industry-40-Policy-Statement.pdf?ext=.pdf>

⁹ <https://www.siliconrepublic.com/innovation/manufacturing-i-form-ireland>

¹⁰ <https://dbei.gov.ie/en/Publications/Publication-files/Forf%C3%A1s/Making-it-in-Ireland-Manufacturing-2020.pdf>

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a. VR / Simulations

68% of Irish tech professionals are more willing to join a startup than an established company, with IoT and AR/VR ranking first in the list of most desirable industries.

Virtual Reality (VR) has been around for more than 30 years and yet it is only recently that has received a lot of press on the back of huge investments in technology.¹¹ Towards that direction, developments within manufacturing have already begun to implement VR solutions in order to enhance user experience.

Within the context of product design, VR aims in digitally simulating a product, allowing the user to interact with it. Generally, implementation of VR, together with Augmented Reality (AR) and Mixed Reality (MR) technologies, in supply chains ensures faster design cycles and economies.

To that purpose, Ireland's focus on VR activities should include virtual testing, virtualised training, production modelling for optimisation and supply chain modelling in the product and process design. AR and MR shall also be integrated in the process, including programming, solution design, data analysis and finally training.¹²

2. Management

When it comes to 'Structure of Production', Ireland is ranked in the 3rd position in 2018, while it drops to 15th position when 'Drivers of Production' are measured. This means that the key enablers that make a country capital on emerging production technologies still do not take full advantage of Industry 4.0 or still have a slow pace of growth.¹¹

a. Supply chain management with suppliers/customers, network-centric production

Supply Chain Management (SCM) in Ireland plays a significant role to the competitiveness of manufacturing companies due to the open nature of the economy, the high rates of imports and

¹¹ <http://www.imr.ie/project/virtual-and-augmented-reality/>

¹²

<https://www.engineersireland.ie/EngineersIreland/media/SiteMedia/communications/publications/Engineers-Ireland-Industry-40-Policy-Statement.pdf?ext=.pdf>

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exports (especially from the industrial sectors), the strong IT base, the less favourable geographical position that pushes the country to look for more broad-based SCM approaches and finally the fact that Irish SMEs are migrated into global supply chains.¹³

That said and considering the complexity of global supply chains management, Ireland has established a well-developed proposition comprising supply chain business models that are relevant to Irish firms as they become **international** through outward direct investment (ODI). This is the reason for an internationally renowned track record in Supply Chain Management of **foreign owned subsidiaries**, while addressing the original and constantly changing needs of the parent company and managing hidden costs as well as strategic partnerships.¹⁴

Some of the most important **drivers** that cause the SCM change in Ireland are listed below:¹⁵

1. Combination of labour-intensive manufacturing with lower labour cost
2. Raw material among a global customer market
3. Outsourcing supply chain management in conjunction with virtual supply chain models and architectures
4. Strong ICT base that facilitates the supply chain information management enabling supply chain integration.

b. Optimization of national distribution networks, lifecycle and data Management systems

With the Irish marketplaces becoming more and more sophisticated combined with the fact that Irish consumers are getting more demanding, customer service is becoming an integral part of marketing strategies, especially when designing of national distribution networks.

With a 2020 horizon, Ireland has identified three models of manufacturing:

1. **Smart factories**, which offer flexibility and short-time cycles in manufacturing as well as customization using process automation control, simulations, robotics and tools for optimisations and sustainable manufacturing. This model is energy and cost efficient and it is characterized as the most reliable one.

¹³ <https://arrow.dit.ie/cgi/viewcontent.cgi?article=1000&context=nitlcon>

¹⁴ <https://dbei.gov.ie/en/Publications/Publication-files/Forf%C3%A1s/Making-it-in-Ireland-Manufacturing-2020.pdf>

¹⁵ <https://arrow.dit.ie/cgi/viewcontent.cgi?article=1000&context=nitlcon>

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2. **Virtual factories**, which involve global networked operations based on ICT tools. This model facilitates decision making regardless where the business is located or the external partners that are involved.

3. **Digital factories**, which are ideal for simulations, modelling and evaluation delivering enhanced Product Lifecycle Management. In addition, it facilitates real-time decision making providing quality control throughout the process.¹⁶

c. Enterprise Resource Planning

According to a research conducted among the top performing SMEs in IT sector, the use of ERP systems enables them to deal with demanding business environments and changing customer needs, being the primary reason for them to remain at a market leader position. Facilitating the process of decision making and forecasting the future needs, ERP systems can help SMEs adding more value to organizational success and maintain standardization. Although 60% of the surveyed SMEs have found ERP advantageous for inventory management, timely scheduling of production cycles and shipment of products, only 5% implement ERP systems out of the box in order to achieve even greater operational excellence, while 9% are using **mobile** or **customizable ERP systems** to improve the quality of services.¹⁷

Regarding the relationship of the use of ERP systems with managerial thinking, recent studies have shown that such systems enable managers leverage supply chain management (SCM) and customer relationship management (CRM). In particular, SCM applications can provide additional benefits according to the following scale:¹⁸

1. Reduction of planning cycle (95%)
2. Reduction of production cycle (10%-50%)
3. Reduction of delivery cycle (10%-40%)
4. Lower stock levels (10%-25%)
5. Reduction of late deliveris (25%-50%)
6. Enhanced productivity (2%-5%)

¹⁶ <https://dbei.gov.ie/en/Publications/Publication-files/Forf%C3%A1s/Making-it-in-Ireland-Manufacturing-2020.pdf>

¹⁷ https://esource.dbs.ie/bitstream/handle/10788/2526/mba_ghose_a_2015.pdf?sequence=1&isAllowed=y

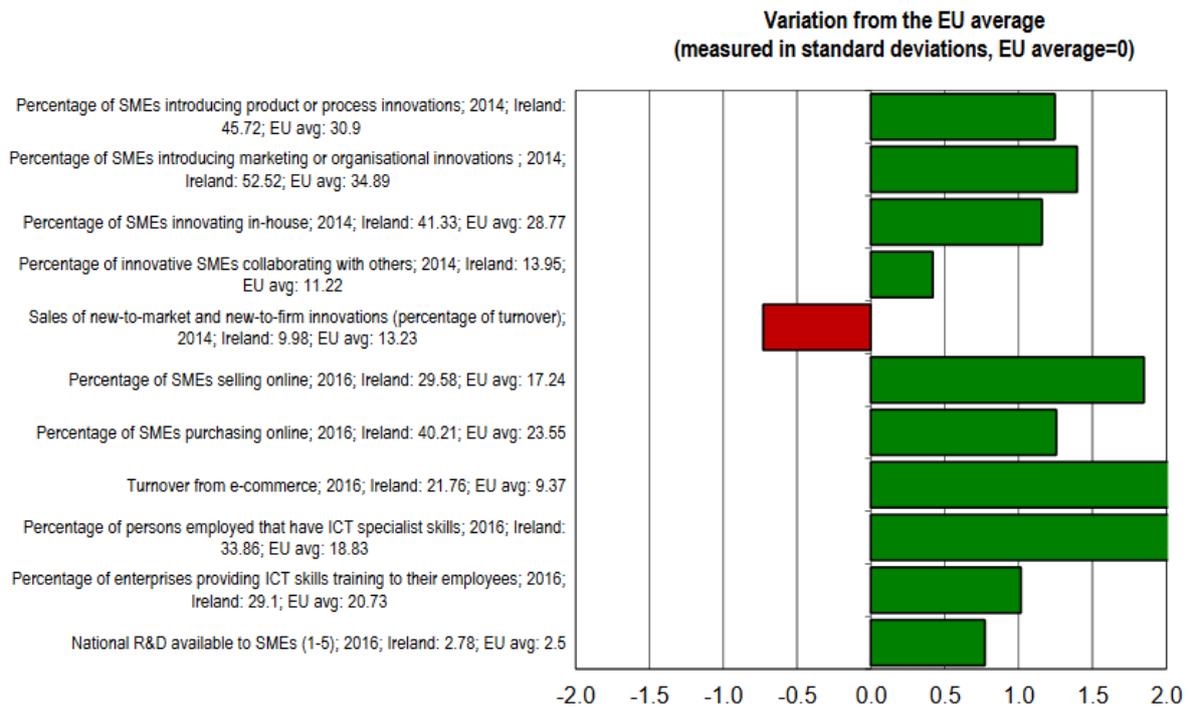
¹⁸ http://www.grh.hec.ulg.ac.be/cours/supports/ITOC/ERP_and_SMEs.pdf

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3.ICT-tools

The following chart indicates the variations from the EU average in several areas of interest for the FAME project as they indicate room for improving the present situation through fostering of the adoption of AMT technologies among Irish SMEs.¹⁹



Note: Data bars pointing right show better performance than the EU average and data bars pointing left show weaker performance.

[Source: 2017 SBA Fact Sheet — Ireland]

a. Intelligent components

Smart manufacturing plays a key role in Irish economy, as new concepts such as cyberphysical systems facilitate entirely new business models. As the consumer becomes part of the manufacturing process and Industry 4.0 is driven by mass customisation, business models are indeed changing towards the digitalisation of the process.

¹⁹ <https://dbei.gov.ie/en/Publications/Publication-files/2017-SBA-Fact-Sheet.pdf>

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Artificial Intelligence aims in transforming manufacturing enterprises to service-based ones through the Industrial Internet of Things (IIoT), which connects the traditional automation infrastructure with the digital world.²⁰

b. Mass customization (Additive Manufacturing)

As manufacturing 4.0 aims in adopting advanced automation, vision systems and robotics among other technologies and then in having everything wrapped into a cloud platform, Irish Manufacturing Research (IMR) is investing into Additive Manufacturing (3D-printing) in order to help industries in Ireland discover the advantages of such technologies in a demanding business environment.²¹

I-Form, the SFI Research Centre for Advanced Manufacturing in Ireland, has a particular focus on additive manufacturing (3D printing) bringing together a pool of expertise in materials science, data analytics, engineering and computing in order to improve understanding, modelling and control of the manufacturing process.

One of the area of I-Form research is focusing on 3D printing with high strength, lightweight carbon fibre, as the use of this material could have increased number of implications for the aerospace and automotive industries. Generally, 3D printing opens up new creative possibilities and alternatives in design that are not possible with traditional methods.²²

Another initiative taken by the Irish Government is the '**Metal 3D Printing – Additive Manufacturing Laboratory**' aiming in revolutionising manufacturing in Ireland. The lab houses the country's first scale EOS 3D metal printer together with post-processing accessories and offers a major opportunity to manufacturing industries in Ireland, transforming the factories of the future.²³ The mission is to translate the potential of 3D metal additive manufacturing technologies to Irish businesses. The printer is equipped with a 200 W fibre laser melting fine metal powder and building up the product, layer by layer, allowing to create products with complex geometries.²⁴

²⁰

<https://www.engineersireland.ie/EngineersIreland/media/SiteMedia/communications/publications/Engineers-Ireland-Industry-40-Policy-Statement.pdf?ext=.pdf>

²¹ <http://www.imr.ie/project/additive-manufacturing/>

²² <https://www.siliconrepublic.com/machines/i-form-research-centre-3d-printing>

²³ <https://www.wit.ie/news/engineering/3d-printing-technologies-to-transform-irelands-engineering-and-manufacturin>

²⁴ <https://www.technologygateway.ie/3d-metal-additive-manufacturing/>

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c. Industrial Internet of Things (IIoT)

The Industrial Internet of Things (IIoT) refers to the application of Internet of Things technologies within an industrial context. In this scenario, technologies, machines, people and businesses generate data across the value chain from suppliers to the end customers, including all the processes that constitute the manufacturing enterprise.²⁵

However, there are still many barriers to the adoption of IIoT, comprising lack of skills and standardisation together with security risks.

Case study: The MooMonitor+ system¹¹

The MooMonitor+ is an IoT system developed by Dairymaster to monitor cattle and assign tags to cows, using the same technology as contactless payments. Each cow is assigned with a collar containing a Near Field Communication (NFC) Device including a unique serial number that serves as a sensor to identify each cow. This system is linked to a cloud server that stores the information from each cow, taking into account resting time, activity, feeding and rumination. All this information is combined into big data and after being analysed, it can provide monitoring information to the farmer, giving the possibility to improve the management of a herd.

Such developments offer important opportunities for the manufacturing sector in Ireland increasing organisational efficiencies, creating new business models and ensuring increased profitability.

Conclusions

Ireland is indeed one of the leader countries in the world of advanced technologies. This was led by the fact that Irish manufactures and suppliers have the expertise to mastermind global distribution.

Overall, the advantages anticipated by implementing elements of the Industry 4.0 are depicted in the following figure:²⁶

²⁵ <http://www.imr.ie/project/industrial-internet-things-iiot/>

²⁶

<https://www.engineersireland.ie/EngineersIreland/media/SiteMedia/communications/publications/Engineers-Ireland-Industry-40-Policy-Statement.pdf?ext=.pdf>

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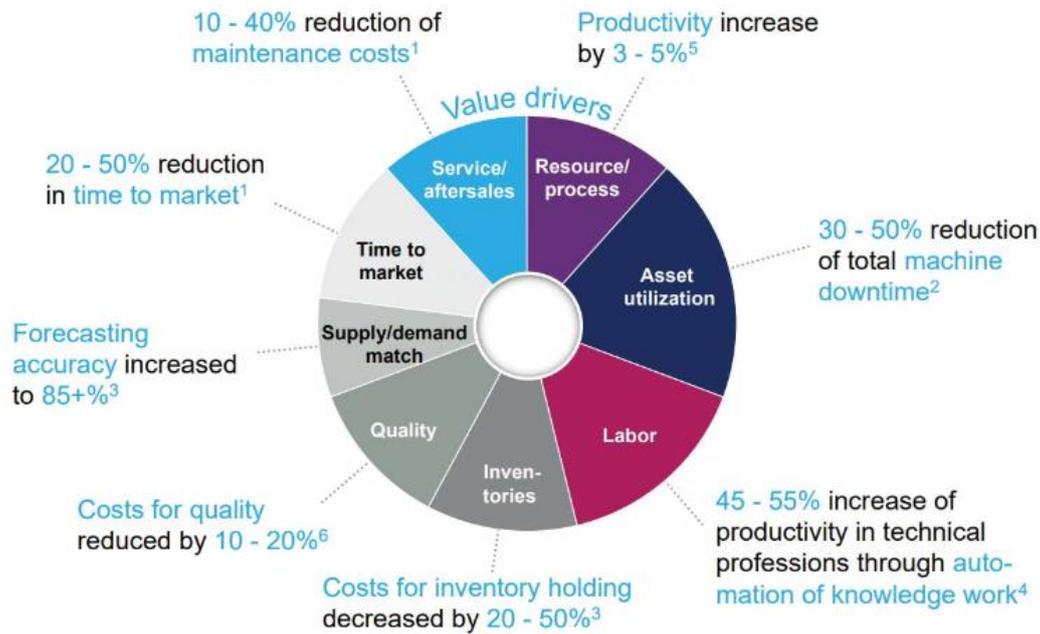


Figure 1. Anticipated advantages from implementation of Digital Manufacturing Technologies

However, in order to bridge the gap between invention and delivery, instead of remaining on the verge of regeneration, Ireland needs to invest more in advanced manufacturing. This means that national actions are a matter of urgency in order to properly prepare the country for Industry 4.0 and make sure that the manufacturing technologies flourish in terms of providing growing exports.

Taking into account that digitalization will create new jobs, eliminating old and unskilled ones. This will lead to an even higher demand for skilled jobs with contribution to existing value chains. Although Ireland has a reputation for people with a ‘can do’ attitude, and an overall highly skilled workforce, **management capabilities** and **leadership skills** need to be enhanced especially regarding international sales. Thus, it is significantly important to start developing the correct combination of knowledge and competencies in order to establish competitive training programs.

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