End of Year Report

2020

TECHNOLOGY CENTRES
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Executive Summary

Since our foundation in 2010, our Technology Centres have contributed significantly to the success of Irish business and industrial development. The eight centres, in nine locations, employ 316 of the brightest researchers and work collaboratively with more than 260 businesses and industries across food and beverage, pharmaceuticals, medical devices, engineering, ICT, education/training and finance.

The centres, given the depth and breadth of their work, have created a solid foundation for Ireland’s continued economic success and cemented our strong international reputation for research, development and innovation (RD&I). This is the first joint Technology Centre impact report, which highlights the successes of the year.

2020 and beyond

In this unprecedented year, marred by the Covid-19 pandemic, protracted Brexit negotiations and the climate crisis, the Technology Centres stepped up wherever and whenever we were needed. We deployed equipment and personnel for the testing and manufacturing of personal protective equipment (PPE); helped industry rethink supply chains; assisted with remote working and explored more energy-efficient systems and food waste disposal methods and more.

Throughout the year, the centres played a key role not only in winning significant RD&I investment from Europe but also in securing millions of euro in funding for individual Irish companies.

Our industry research and innovation programmes contribute significantly to supporting Irish companies to be successful, grow their business, create jobs and deliver significant wider economic impact.

Many thanks to Enterprise Ireland, the Irish Government and the companies who work with the Technology Centres for helping us collaboratively build the next generation of RD&I.

I am delighted to see the great advancements and achievements of the Technology Centres during 2020 and to witness the impact of their Research and Development activities on business in Ireland. I am also heartened to see such strong delivery in these challenging times, this was impressive and particularly important in the context of Covid-19 and Brexit. Well done to the centres and I look forward to seeing continued success, collaboration and impact in 2021 and beyond.

Julie Sinnamon  
CEO of Enterprise Ireland
Impact assessment

Our eight Technology Centres, across nine locations, employ 316 of the brightest researchers working collaboratively with over 260 businesses and industries ranging across food and beverage, pharmaceuticals, medical devices, engineering, ICT, education/training and finance.

2020 in numbers

Companies that use a Technology Centre for their research, development and innovation (RD&I) activities have the following advantages over those who don’t

- Turnover: 2.41x
- Export sales: 3.28x
- Domestic sales: 1.32x
- Full time employees: 1.96x
- R&D spend: 2.69x

For every €1 the state invests in the Technology Centres there is a 6 to 20 fold return.
Performance

Our Technology Centres work with more than 260 companies to provide breakthrough research. Our success has been recognised through awards of more than €19m from competitive funding programmes such as EU Horizon 2020 and €19m from industrial investments (cash and equipment).

Each year, funding has been increased in recognition of the positive impact the centres have had – directly and indirectly – on industry performance.

Research, development and innovation (RD&I) activities are a proven game changer when it comes to commercial success, according to Enterprise Ireland’s Annual Business Review 2019 survey of client companies. The report found that Enterprise Ireland (EI) client companies who invest in R&D using the Technology Centres perform better than those who don’t use the centres for these activities.

Companies involved with RD&I through Technology Centres have higher domestic and international sales, more employees and a greater return on their R&D spend.

Source: Enterprise Ireland’s Annual Business Review 2019

Note: These numbers are not the result of evaluations or specifically asking companies to attribute the percentage of their success to Technology Centre membership. There is no causation argument being made. These are the raw facts that, according to EI Annual Business Review data, show companies involved in Technology Centres perform better in areas cited above.
Return on Investment

Technology Centres achieve an impressive 6 to 20 fold return on the State’s investment, according to independent economic analysis.

Projected Return On Investment (ROI) for each Centre based on Investment into Centre

<table>
<thead>
<tr>
<th>Centre</th>
<th>Phase</th>
<th>Funded</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy Processing</td>
<td>2</td>
<td>€14m</td>
<td>13.7x</td>
</tr>
<tr>
<td>Pharmaceutical Manufacturing</td>
<td>2</td>
<td>€5m</td>
<td>17.2x</td>
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<td>€7.2m</td>
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<tr>
<td>Microelectronics</td>
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<td>€10m</td>
<td>20x</td>
</tr>
<tr>
<td>Data Analytics &amp; AI</td>
<td>2</td>
<td>€12m</td>
<td>5.9x</td>
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<tr>
<td>Manufacturing</td>
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<td>€23.5m</td>
<td>16.9x</td>
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<tr>
<td>E-Learning</td>
<td></td>
<td></td>
<td>Ph 2</td>
</tr>
</tbody>
</table>

Source: Independent Economic Impact Evaluations of Centre Performances

Note: These numbers were ascertained at review stage of each centre.
An extraordinary year: Covid, Brexit and the Climate Crisis

The positive role of research, development and innovation for business was brought sharply into focus this year with the Covid-19 pandemic, a hard Brexit and the climate crisis.

In good times and bad, Technology Centres provide support to enable businesses – both new and well established – to pivot quickly and efficiently when market conditions change. Our expertise, methodical approach and top-class facilities allow companies to test ideas in a safe environment before they bring innovations to market. Our collaborative efforts, while in partnership with industry, ensure we can address problems quickly and effectively.

Covid

Principal investigators from Food for Health Ireland (FHI) played an important role in the Government’s initial response to the global Covid-19 crisis including helping to establish the HSE Contact Tracing Centres and call scripts; development of the Irish Coronavirus Sequencing Consortium; and a screening platform to assess the effectiveness of foods and food ingredients for enhancing immunity.

During the pandemic, Irish Manufacturing Research (IMR) supported hundreds of B2B engagements; provided critical support for three new personal protective equipment companies to help them quickly provide millions of units to healthcare workers; and helped develop two types of ventilators for use in non-ICU environments and less-developed economies.

Under IMR guidance, more than 40 companies improved and ramped up their supply chains. Some manufacturers even pivoted to supply new products into new markets which involved moving from supplying products to the automotive sector to producing and supplying a completely different product to the medical field.

Through its creation of an integrated circuit, Microelectronic Circuits Centre Ireland (MCCI) contributed to the development of a single-use rapid testing kit for infectious diseases that can be used during a viral outbreak in a disaster zone or for a quick diagnosis in a doctor’s surgery.

CeADAR – Ireland’s National Centre for Applied Artificial Intelligence – assisted companies engaged in the fight against the pandemic by giving them immediate access to the intellectual property of 60 prototypes it had developed. The centre continues to work with 10 small- and medium-sized companies (SMEs) to develop solutions ranging from patient data analysis to the safe return to work.

As the pandemic progressed and schools shut down, education technology research centre Learnovate trained teachers in virtual teaching methods, based on current best practice. The materials, training sessions and supports were developed based on extensive surveys with teachers, parents and students.

Even as vaccines were approved for production in late 2020, Pharmaceutical Manufacturing Technology Centre (PMTC) continued to innovate in its collaboration with the pharmaceutical sector by helping develop an inhalable version of existing antiviral drugs to target Covid-19. If successful, this research could speed up the dissemination and effectiveness of treatment for the virus.

Principal investigators in the Dairy Processing Technology Centre (DPTC) joined forces with the Irish Epidemiological Modelling Advisory Group (IEMAG) and the National Public Health Emergency Team (NPHET) to provide expert advice on genomic sequencing, an essential expertise in the fight against Covid-19. DPTC also supported the Covid-19 response by providing polymerase chain reaction (PCR) equipment to the National Diagnostic Centre labs providing early critical support during the pandemic.
Brexit

Irish food exporters faced the perfect storm in 2020 as the combined forces of a hard Brexit and the pandemic halted air travel, threatened travel over the UK land bridge to Europe and closed factories and restaurants.

Adding to these pressures was the reduced consumer sentiment towards beef in the UK and EU markets, due to concerns over impacts on the environment and on health.

Ireland’s reputation has been strengthened in 2020 by the work of Meat Technology Ireland (MTI), the world’s only industry-led meat processing research and innovation consortium dedicated to tackling environmental and societal challenges, by launching the world’s first eating quality breeding index in 2020.

Covid-related closures had a dramatic impact on international dairy markets – with significant oversupply, depressed prices paid to farmers and overall disruption to the supply chain.

Brexit further compounded these issues with the threat of delays in moving perishable products to valuable European markets. DPTC’s research is helping the dairy industry find new markets, develop longer shelf-life products and ensure greater product stability. These innovations allow companies to access more distant international markets leading to increased competitiveness, greater market diversification and greater protection against market turbulence.

Climate Crisis

The key challenges for the manufacturing and food sectors are the production of high-value quality products that are cost-effective and sustainable as set out by international targets and commitments such as the EU 2030 Climate and Energy Policy Framework and the UN Sustainability Goals.

To that end, DPTC is committed to Sustainable Milk Processing and working towards the decarbonisation and reduced environmental footprint of Irish Dairy Processing. Building on a platform of innovative research, the Centre’s research programme for the next five years will employ a Total Process Chain Approach to Excellence in Dairy Processing. It will enable the initialisation of a system change within the whole process chain for dairy products by closing loops and recovering and re-using resources, such as energy, water and nutrients, reducing chemical loading through minimal processing and clean design. Achieving the aim will involve the integration of economically and environmentally innovative technological models, processes and equipment. This work is critical for the long-term sustainability, economy future development and growth of the Irish Dairy industry.

MTI research has discovered that high genetic merit MTI animals are finished earlier with better commercial yield resulting in lower environmental impact.

CeADAR’s project with software company ProvEye in monitoring threatened Irish habitats using drones and artificial intelligence (AI) techniques is assisting in the fight to save the environment and meet our international climate commitments.

The centre is also collaborating with global reinsurance company MunichRe on several green energy projects exploring the power dynamics of windfarms to maximise output and ensure the operational integrity of the equipment.

CeADAR is also leading on the use of sophisticated AI techniques in pollution monitoring and mitigation as part of an international aid initiative with a developing country. It also worked with Boeing Aerospace on optimising aircraft flight paths to minimise fuel consumption, and with Irish SMEs on forecasting electrical energy from windfarms.
CIRCULÉIRE is a €4.5m public-private Innovation network aiming to assist companies transition from a linear to circular business model, co-created by the Irish Manufacturing Research centre, three strategic partners – the Department of the Environment, Climate and Communications, the Environmental Protection Agency and EIT Climate-KIC – and 25 founding industry members.

**CIRCULÉIRE objectives:**

- Reduce CO₂ and waste by 20% for all founding members
- Increase awareness and understanding of circularity economic opportunities
- Identify barriers to adoption and strategies to overcome
- Develop frameworks, toolkits and deep demonstrations to derisk and prove value of Circular Economy (CE)
- Inform Irish CE policy innovation
- Increase Ireland’s CE performance and relevance internationally
Our Technology Centres

Irish Manufacturing Research
Sustainable Manufacturing
Digitisation
Automation & Advanced Control
Design for Manufacturing

Ireland's Centre for Applied AI
AI & Machine Learning
Data Analytics

Dairy Processing Technology Centre
Milk Composition
Adaptive & Sustainable Milk Processing

Food for Health Ireland
Food & Health
Food Science
Nutrition & Technology

Learnovate
Digital Learning and Talent Development
Business Value Learning

Microelectronic Circuits Centre Ireland
Digital Signal Processing & Data Converters
Power Management, RF & Transceivers

Pharmaceutical Manufacturing Technology Centre
Process Control & Optimisation
Applied Data Analysis
Pharmaceutical Cleaning Technology

Meat Technology Ireland
Meat Characterisation & Meat Tenderness
Meat Health Safety & Shelf Life Extension
Genomic Predictions
CeADAR is Ireland’s National Centre for Applied Artificial Intelligence. The centre has more than 90 member companies (60% small- and medium sized enterprises – SMEs, 40% multinationals – MNCs) across all sectors and its innovative collaborative work gives Irish companies a commercial edge in big data, artificial intelligence and machine learning. It has a dynamic spinout programme with five venture-funded companies who are working in-house.

Shaping artificial intelligence: CeAdar secured €7.4m additional funding for AI projects with Irish industry partners

**Factbox**

- **Founded in:** 2011
- **Location:** Nexus, UCD, Belfield Office Park, Dublin 4
- **Member companies:** 90
- **Employees:** 55
- **Focus Areas:** Every industry sector
- **Webpage:** [www.ceadar.ie](http://www.ceadar.ie)
- **Research partners:** UCD and TU Dublin
Case study

CeADAR’s FinTech Breakthrough

This project, codenamed Transpire, is led by Corlytics with CeADAR and Version1 as partners.

The artificial intelligence (AI) regulation platform received €3m funding from the government-backed Disruptive Technologies Innovation Fund following a rigorous, highly competitive process.

Making the law accessible

This technology, a trained AI platform for regulation, combines human expertise with artificial intelligence to demystify laws and regulations. The platform enables firms to deliver effective regulatory outcomes while protecting consumers.

Transformative artificial intelligence and machine learning automates the monitoring, interpretation and risk assessment of laws and regulations across multiple disciplines and jurisdictions, saving firms time and money.

Highlights:

► Selected by European Commission to be a European AI digital innovation hub, the only one in Ireland

► Awarded highly coveted European BDVA Gold i-Spaces accreditation, reflecting excellence in big data and AI. There are only seven other Gold i-Spaces in Europe

► Awarded €500,000 funding for a supercomputer for AI, big data and machine learning for all Irish companies to use, supported by our real-world AI deployment expertise

► Granted €1m from the prestigious Disruptive Technologies Innovation Fund for a blockchain project in the global supply chain and €3m for a joint project in AI fintech

► Obtained €2m in 2020 EU funding for AI projects in many sectors including industry 4.0, health, smart cities, climate, green energy

► Ran extensive training programme to upskill Irish companies at both technical and strategic levels in the application of AI

► Opened all demonstrator intellectual property (IP) to companies involved in tackling the Covid-19 pandemic

► Generated more than 50 IP licences to Irish companies

► Assisted 90 member companies
Dairy Processing Technology Centre (DPTC) is a world-class dairy processing research and technology centre, driving value creation, competitiveness and the sustainability of Ireland’s dairy processing industry. Through enhanced focused on cost-efficient processing and by creating, validating and commercialising a pipeline of science and technology-based manufacturing platforms for dairy ingredients, the DPTC supports its partners in increasing the amount of high-quality dairy products they create for the domestic and export markets.

This centre supports a resilient and sustainable food system by encouraging collaboration between industry and academia; conducting confidential research and fostering new talent in the Irish dairy ecosystem. It aims for “environmental protection and economic competitiveness as equal and complementary” as outlined in the Government’s Food Wise 2025 strategy.

Leading with dairy: DPTC is on the cutting edge of technological advancements in the Dairy Processing Industry with two scientists named in the top 1% elite scientists in the world.

Factbox
- Founded in: 2014
- Location: University of Limerick
- Member companies: 8
- Number of employees: 16

Webpage: www.dptc.ie

Focus Areas: Milk Composition, Driven Adaptive Processing and Sustainable Milk Processing

Research providers: UL, UCD, Teagasc, UCC, NUIG, DCU, TU Dublin and TCD
Research Areas:

► Innovative research: Industry-led research programme secured for the next five years which is designed in direct response to current market volatility, Brexit, changing customer requirements, regulations and increasingly stringent EU climate, water and nutrient directives. Building on a platform of innovative research, the centre will play a crucial role in ensuring the long-term sustainability of the industry.

► Circular economy: Integrating industry into the national circular economy, through quantification of economic value and valorisation of organic residues, as bio-economy feedstocks will also play a key part of the centre’s future endeavours.

► Reducing carbon and water footprint: Working with industry partners to ensure Irish dairy processors can supply products for export with a minimal carbon and water footprint. This includes innovations and advancements in energy reduction in core unit processing operations.

► Reduce water and energy consumption: High-rate anaerobic digestion research demonstrated the potential to significantly reduce energy consumption in waste water treatment, reduce sludge generated by 80% with the potential to produce biogas, an alternative fuel source. Providing viable options to our partners to displace usage of fossil fuels.

► Develop next generation industry professionals: Developing the next generation of dairy scientists, process engineers and microbiologists for the Irish dairy processing industry.

► Enabling Knowledge Transfer and value creation for industry partners through active collaboration and interaction with world-class experts, a hands-on approach to research, dedicated training events (85) and the large volume of technical reports (580) demonstrating the high caliber of research and potential value that is possible from the implementation of DPTC research outputs.

About the industry

► Agri-food is Ireland’s most important indigenous industry, playing a vital role in Ireland’s economy.

► Dairy products, valued at €4bn a year, are exported to more than 155 countries globally.

► The DPTC consortium represents 90% of the milk processed in Ireland.
Food for Health Ireland (FHI) brings together industry and scientists to improve global health through food innovation. The centre’s research examines global food trends and challenges, providing results that can be translated into commercially viable products that improve health and support the agri-food sector.

Ensuring better aging: FHI developed two breakthrough health ingredients for the over 50s that are clinically proven to help with more muscle mass and better blood glucose control.

**Factbox**
- Founded in: 2008
- Location: University College Dublin,
- Member companies: 9
- Number of employees: 35

**Webpage:** [www.fhi.ie](http://www.fhi.ie)

**Focus Areas:** Food science and technology, nutrition, foods and food ingredients with health benefits

**Research providers:** UCD, Teagasc, DCU, UCC and TCD
The centre links key academic research experts with food industry partners to facilitate collaboration on the development of innovative food products and ingredients, which offer our customers important health benefits, backed up by strong scientific data.

– Maurice O’Sullivan, Global R&D Director, Protein in Applied Health and Nutrition, Kerry Group

Our research over the last 12 years has allowed Irish food companies to develop lucrative new global markets using dairy products (with added health benefits) produced in a sustainable way. We continue this mission in our third phase by focusing on value-added foods and innovative dairy products that benefit human health.

This industry-led research programme includes four pillars:

- **Translational technology partnerships**: Ensuring research translates into commercial outputs with clear market focus
- **Irish grass-fed dairy**: Exploring data that helps differentiate Irish dairy from the competition on the basis of nutrition, health and sensory benefits
- **Health benefits of Irish cheese**: Create manufactured cheeses with metabolic and cardiovascular benefits
- **Fermented dairy ingredients**: Apply state-of-the-art bioconversion technologies to enhance digestive and immune health – a market worth €59.7bn

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**Research Areas:**

**Highlights:**

- **€14.4m** - third research phase launched in November 2019 with funding from Enterprise Ireland and industry partners.
- **€6.3m funding boost** - received €500,000 funding for infrastructure, plus more than €1m through the Career-Fit Plus programme and €4.8m awarded to Principal Investigators (PI).

- **Two breakthrough health ingredients** - developed an ingredient combination that is clinically proven to increase lean tissue mass in the over-50s and a novel dairy ingredient that can control blood glucose levels.
Irish Manufacturing Research (IMR) is a leading research and technology organisation providing a portfolio of research, training and other specialised services to industry across four thematic pillars: digitisation, sustainable manufacturing, design for manufacturing, automation and advanced control.

IMR’s goal is to demystify, derisk and deliver emerging technologies and new knowledge to enable industry to succeed at the cutting edge of advanced manufacturing.

Taking action on climate: IMR leads the way with CIRCULÉIRE, the first national platform for circular manufacturing – revolutionising the way we design, make and use products.

Factbox

**Founded in:** 2014
**Location:** Dublin and Mullingar
**Member companies:** 53
**Number of employees:** 77
**Webpage:** www.imr.ie

**Focus Areas:** Digitisation, automation and advanced control, design for manufacturing, sustainable manufacturing

**Research providers/partners:** IMR is an independent Research Performing Organisation (RPO) and partners with all academic research institutes in Ireland and internationally
**Highlights**

- €23.5M Phase 2 funding awarded and €8M of additional Industry and Competitive investment secured in 2020, driving the twin transition towards a sustainable and digital economy.

**Pandemic support**

- Helped more than 40 companies ramp-up supply chains; supported more than 100 B2B engagements and digital enablement with remote working
- Offered critical support to three new companies to set up successful manufacturing businesses in Ireland supplying regulation-compliant surgical face masks and other hi-tech personal protective equipment (PPE) to hospitals, ensuring security of supply to Ireland and Europe
- Rapid production and delivery of thousands of face shields and other PPE to the hospital sector
- Delivery of two ‘battlefield’ ventilators by our rapid prototyping IOT/digitalisation team that are suitable in emergency situations
- Provided more than 50 IBEC clients with continuing professional development training developed by IMR on remote management best practices
- Surveyed clients to determine business challenges facing SMEs
- Provided critical technical expertise for border county businesses on: new advanced training centre for manufacturing and digital skills courses; digitisation support for the concrete industries, mentoring support; digital supply chains; R&D with leading multinationals and Irish companies in the region funded through direct EU grants
- Conducted 22 webinar events during the year to stimulate company engagement on a range of relevant topics such as remote working, VR/AR, robotics
- Supported training initiatives with/for partner technology centre MTI and its members

**Digital innovation hub**

IMR as a lead digital innovation hub has led three EU R&D initiatives with €2m in leveraged European funding provided directly to Irish indigenous companies:

- DIH² project focus on “development and deployment of an adaptive robotic stitching system enabling increases in productivity and scalability of operations” with Ventac and Malone Group
- Croba project focus on “fully automated and adaptable post-processing of 3D printed parts, leading to 10% production efficiencies” with Steripack
- MAAS focus “development of a wing-scanning system for Airbus, enabling the development of relationships between Irish SME TEG and Airbus”

**Brexit support:**

- Provided more than 50 IBEC clients with continuing professional development training developed by IMR on remote management best practices
- Surveyed clients to determine business challenges facing SMEs
- Provided critical technical expertise for border county businesses on: new advanced training centre for manufacturing and digital skills courses; digitisation support for the concrete industries, mentoring support; digital supply chains; R&D with leading multinationals and Irish companies in the region funded through direct EU grants

**IMR’s Automate Irish Manufacturing (AIM) initiative**

funded under the Regional Enterprise Development Fund (REDF) programme, along with critical supports provided to industry during the Covid-19 crisis, has helped create over 100 jobs.

**Inter-network engagement**

- Conducted 22 webinar events during the year to stimulate company engagement on a range of relevant topics such as remote working, VR/AR, robotics
- Supported training initiatives with/for partner technology centre MTI and its members
Case study

Symbio Beer

Turning bread into beer: a small pilot with big potential

When beer maker St Mel’s Brewery and bread producer Panelto Foods were introduced to one another by IMR, an innovative spark was lit. Both companies had been examining sustainable manufacturing and ways to reduce costs and food waste.

David McCormack, director of sustainable manufacturing at IMR said: “Part of our role in IMR is identifying emerging technologies and concepts in manufacturing and introducing them to Irish companies both to position Ireland as an advanced manufacturing location and to help us reach our national waste and emissions targets.”

In March 2020, the two Longford companies began working on an innovative EPA-funded pilot where Panelto supplied St Mel’s with leftover bread and the brewery used it to make beer. Bread can be used to produce starch which is needed in the brewing process and is usually produced using expensive malt barley. The first beer in the pilot, Symbio Beer, has just been launched.

Food waste is a major problem. In addition to the lost economic value, it represents a massive waste of resources (land, water, materials), as well as producing greenhouse gas emissions.

Both companies have reported numerous long-lasting benefits for the €100,000 pilot with IMR. They believe it could have a big impact down the line for other companies to help them reduce costs, waste and become more sustainable businesses.

Benefits:

► Higher price for waste materials: Waste bread repurposed for the brewing industry can get a higher price than when going into the agricultural food chain as pig feed

► Lower price for ingredients: In brewing, partly replacing the expensive malted barley with bread would lower costs

► Circular supply chain: After beer is brewed, waste mash – which still has food value – remains. It can be returned to the bakery and added to its bread mixes to improve the nutritional profile without altering the taste

► Reduce food waste: One million tonnes of food waste are generated in Ireland each year, one-fifth of that from the commercial sector. This initiative helps tackle the issue.

► Improve international reputation: Innovative new consumer products help reinforce Ireland’s reputation as a ‘green island’ focused on sustainability and its climate commitments

► Industry cross-pollination: When companies work on projects together they share knowledge, contacts and innovative practices that can lead to long-term sustainability

► Far-reaching consequences: IMR is working with 25 other companies to help them transition from the traditional linear business model (take, make and waste) to a circular model
Learnovate is a research and innovation centre focused on education and learning technologies (edtech). With more than 20 full-time researchers and practitioners, Learnovate has one of the richest concentrations of edtech expertise in Europe. The team has deep expertise in learning science, technology, user-centric product design and customer-centric innovation.

Helping educators teach remotely: Learnovate created six 3rd level and three post-primary teaching guides to support remote learning during Covid-19.

Factbox

**Founded in:** 2011  
**Location:** Trinity Technology Campus, Dublin.  
**Member companies:** 35-40  
**Employees:** 19  
**Webpage:** www.learnovatecentre.org

**Focus Areas:** Learning technology helping clients transform employee, student and customer learning experiences. Providing thought leadership to the world’s learning and development community on the innovative use of learning technology for maximum organisation success.

**Research providers:** TCD, UCD, DCU
Highlights:

► Helped the education sector move online during the pandemic

► Established a new research theme in response to industry ‘Accelerated Digital Transformation’ to support the required rapid transformation to remote working and learning

► Developed best practice guides for online learning including pedagogy, assessment, collaboration and feedback based on validated research

► Supported development of an artificial intelligence tool that trains healthcare workers on the correct use of PPE, through a collaboration with partner SureWash

► Conducted free webinar ‘Unleash the power of online learning’ to more than 550 Irish SMEs to support their digital transformation

► Conducted three nationwide surveys with teachers, parents and students to develop best practice guides for online learning

► Offered outputs of safety critical training project to PMTC clients to support their training needs

► Covid-19 PR activities: 46 articles and estimated coverage views of more than a million

► Learnovate spin-in company SoapBox Labs created 25 jobs and more than €10m in funding

► Developed a soft-skill competency assessment platform
An employee career development engagement platform code-named Develop has been created by Learnovate. It pioneers the use of personalisation tools, game-based assessment, social network analysis, and using Artificial Intelligence (AI) planning for employee learning environments.

Research suggests that only 15% of employees are fully engaged and productive. Develop enables employers to support an individual's career path by identifying skills gaps, creating learning paths to close competency gaps and providing a clear roadmap to achieving career goals. For employers, implementing a system such as Develop, will result in happier, more productive employees and reduced attrition rates – all of which impact profitability.

Investment that organisations make in human capital is not being realised or maximised, due to a lack of employee engagement. In 2017, Gallup reported that 85% of employees worldwide are not engaged and a 2019 Deloitte Global Human Capital Trends Report suggests that learning and development is key to enhanced employee engagement.

The Develop platform focuses on soft skills or the emotional intelligence traits that are transferrable from job to job. It uses Bartram's Great Eight Competencies with a privacy-by-design approach to ensure GDPR compliance. Develop is a fully functioning platform that has been validated by six industry partners.
Microelectronic Circuits Centre Ireland (MCCI) works collaboratively in the microelectronics circuit design space to improve the performance of mixed-signal circuits used in industry. MCCI’s research centres on mixed-signal, analogue and radio frequency circuits. Projects have algorithm, digital design, Integrated Circuit architecture or system architecture components.

MCCI’s goal is to be the top microelectronic circuits research centre globally, for industrial and academic collaboration, by 2025. It provides high-impact research outcomes and develops its researchers into future leaders for Irish companies and the global semiconductor landscape.

Securing international funding:
MCCI played a key role in member company winning €3m from H2020 and €2.2m in venture capital funding.

Factbox
Founded in: 2010
Location: Tyndall National Institute, Cork
Member companies: 21
Employees: 90+ researchers.
Webpage: www.mcci.ie

Focus Areas: High-speed transceivers, precision circuits, power management, digital technologies for future networks, communications and the internet of things (IOT), medical devices, connected health, smart agri and automotive industries

Research providers: Tyndall National Institute, UCD, UL, CIT
About the industry:
► Employs almost 13,000 people
► Exports worth almost €10bn/year
► In-house R&D of over €300m/year

The centre’s innovations include applications for: future networks, communications and IOT; medical devices and technologies and connected health; digital and processing.

Case study
Altratech

Enterprise Ireland client, Altratech, is developing a single-use test kit that will allow point-of-care testing of infectious diseases whether during a viral outbreak in a disaster zone or for a quick diagnosis in a doctor’s surgery. MCCI developed an integrated circuit to meet the company’s unique application needs, enabling the company to win €3m from H2020 and raise €2.2m in venture capital funding.

Highlights:
► Developed integrated circuit for Altratech infectious diseases testing kit (see case study)
► Created smarter pacemaker for Boston Scientific: combined pacemaker and novel circuits into a single chip to create a smarter, more sensitive, power efficient component
► Defined research roadmap through Decawave collaboration
► Attracted more than €9m in annual research funds
► Delivered 12 top-tier peer-reviewed publications
► Collaborated in more than 50 research projects
► Holds 19 IP licences to date

Key impacts: Independent Centre Review 2019
► 458 full-time equivalent (FTE) jobs created between 2015-2017, attributed to research engagement
► 1,755 additional FTE jobs expected to be created by 2023
► Economic Value Add (EVA) represents a 1:20 return on investment – every €1 invested by Enterprise Ireland in MCCI, provides a €20 return.
Meat Technology Ireland (MTI) is a strategic one-stop shop for beef and sheep meat processing research and innovation. The €8.1m five-year research centre was founded by an industry consortium and is co-funded by Enterprise Ireland. Ireland is the world’s fifth largest beef exporter and has an excellent reputation internationally.

Making better meat: MTI developed the world’s first animal breeding index for meat eating quality.

**Factbox**
- **Founded in:** 2017
- **Location:** Teagasc Ashtown Food Research Facility, Dublin
- **Member companies:** 8
- **Number of employees:** 20
- **Webpage:** [www.mti.ie](http://www.mti.ie)

**Focus Areas:** Genomic predictions, meat tenderness, meat safety, meat characterisation technologies, meat and health, future market opportunities

**Research providers/partners:** Teagasc, TU Dublin, DCU, UCC, UCD and the Irish Cattle Breeders Federation (ICBF)
Highlights:

- The only industry-led research consortium globally
- Launched the world’s first meat-eating quality breeding index (MTI, ICBF and Teagasc)
- Created the world’s largest database for sensory results – three times larger than the nearest comparable database
- Working with schools, doctors and health professionals on meat nutrition and education

Case study

Creating the best quality, most sustainable beef through genetics:

MTI has developed the world’s first animal-breeding index for meat eating quality. Three MTI PI’s named in the top 1% in the world for citations in the Clarivate list of highly cited researchers.

Great genetics lead to the best meat products so understanding and improving a herd’s genetic quality is key. The national Irish dairy industry was transformed through genetics and now MTI is doing the same for the beef industry by developing a breeding index for meat quality.

Using the world’s largest genomics database (ICBF) to drive improvement in the national herd, ICBF, Teagasc and MTI are tackling sustainable beef production. Our research found that animals of high genetic merit mature earlier, giving a better and more efficient commercial yield for both the farmer and the factory.

Researchers contend that there is large exploitable genetic variation that may reduce the age of slaughter for cattle. In this project, MTI sees excellent potential to develop and deploy a sustainable beef-breeding index that helps reduce methane emissions while maximising commercial yield.
Pharmaceutical Manufacturing Technology Centre (PMTC) provides advanced technology solutions for the pharmaceutical manufacturing sector in collaboration with industry. Its research is industry-led which ensures it remains relevant and can deliver impact for participating companies. Through its collaborative research model, PMTC effectively co-creates innovative solutions and advanced methodologies that solve current industry challenges for pharmaceutical manufacturing in the following areas: plant cleaning, process control and optimisation, data analytics and utilisation.

PMTC research improves member companies’ efficiency, productivity and delivery methods, helping to increase profitability and sustainability. PMTC’s economic impact is largely attributed to these improved efficiencies and process innovation, with a number of companies reporting significant savings when implementing the centre’s research recommendations.

PMTC brings together multinational pharmaceutical companies with Irish SMEs providing opportunities to derisk and showcase novel technologies for small- and medium-sized enterprises.

Factbox

- **Founded in:** 2013
- **Location:** University of Limerick Bernal Institute
- **Member companies:** 27 (60% SMEs, 40% MNCs)
- **Number of employees:** 10
- **Focus Areas:** Pharmaceutical plant cleaning, process control and optimisation, data analytics and utilisation
- **Research providers:** UL, CIT, UCC, NUIG

**Webpage:** www.pmtc.ie

Trailblazing in pharma: PMTC trailblazing on data analytics and drug delivery in pharmaceutical manufacturing, particularly during the Covid crisis.
**Highlights:**

- Developed plant cleaning methodology for some of the world’s largest pharmaceutical manufacturing companies and created tangible outcomes by reducing cleaning changeovers by an estimated 10% a year, reducing solvent usage by 40% and reducing changeover times by an average of two weeks.

- Improved plant cleaning efficiency: saved innovation partner Novartis 28 days on an equipment cleaning regime, resulting in significant cost savings and freeing up valuable production time.

- Supported wider pharma eco-system: through knowledge dissemination days and networking events, helped pharma sector SMEs interact with MNCs and collaborate on innovative industry research.

- Generated B2B opportunities: PMTC network events generated significant B2B opportunities for our partners. In one case, business generated through a PMTC event now accounts for 40% of a company’s turnover.

- Recognised by pharma industry: received awards for collaboration between researchers at Cork Institute of Technology and Pfizer. Siphon technology was developed and deployed to deliver time and cost savings through automation of a key process step.

- Developed industry guides: created a ‘guide to data analytics for pharmaceutical manufacturing’ that showcased MNC and SME successes, their challenges and vision for the future. Guide was reviewed by the Health Products Regulatory Agency to support alignment in the related compliance areas.

- Hosted communities of practice: facilitated links across all core research themes to support ongoing active engagement with industry members helping to foster knowledge and best practice sharing while informing the future research agenda for PMTC.

- Collaborated: worked with IMR on an assessment of data analytic maturity in the sector.

- Secured funding: EI funding of €5m awarded over five years, raised match funding of €2.5m from industry and competitive funding channels.

- Awarded grants: capital equipment grant of €250,000 to build cleaning rig to mimic typical plant cleaning process operations. PMTC’s new capability will support offline development and the transfer of ‘right first time’ cleaning processes to pharma plants, which will help manufacturers work smarter and more efficiently.

**About the industry:**

The Irish biopharmaceutical industry directly employs over 28,000 people with almost the same number employed indirectly through the sector. The value of pharmaceutical exports is €80bn making Ireland the third largest exporter of pharmaceuticals globally.

Irish pharma sites successfully compete globally due to their collaborative innovation culture, manufacturing excellence and their exemplary regulatory compliance record. Growth in the sector is strong with on-going foreign direct investment and job creation. PMTC will continue to support the talent pipeline for the industry having already transferred 10 high calibre post-doctoral researchers to industry with a number of industry fellowships also currently on-going.
Irish researchers have joined the global race to find efficient new ways of using existing medicines to develop Covid-19 treatments. A consortium of researchers from PMTC and Bernal Institute at the University of Limerick, Trinity College Dublin, Waterford Institute of Technology and Teva Pharmaceuticals are collaborating on a project to research inhalable formulations of antiviral drugs with the aim of developing novel formulations.

With the current Covid-19 pandemic, the entire world is focusing on identifying new compounds, repositioning existing drugs and vaccines. Inhalation medication for respiratory-related illnesses generally shows better results when administered through the airways instead of other methods. However, there is limited research on the topic with only a few commercial releases of antivirals for viral respiratory infections with none targeted specifically at the coronavirus.

The consortium will work towards the development of engineered inhalable antiviral formulations that can be effectively delivered through the lungs and nose.

If successful, the development of inhalable antiviral formulations will decrease the severity of SARS-CoV-2 infections and the progression of the disease. This may significantly reduce in-patient admissions, the burden on public budgets and hospitals and, most importantly, deaths due to Covid-19. In addition, this project could pave the way for the team to extend the technology to new drugs as and when they are identified.
Looking to the Future

Technology Centres delivered significant support and value to Irish industry and businesses during this very challenging year, benefiting the economy of Ireland significantly in 2020. A fundamental feature of the centres’ model is their ability to adapt and respond quickly to the needs of industry.

This point was well illustrated by the important role the centres played in supporting industry during the worst days of the pandemic and plans are well advanced to ensure this continues actively into the future.

Significant challenges will follow for industry in Ireland as the full impact of Covid-19, Brexit and of course the climate crisis take effect.

The centres are well positioned to continue to support industry across many levels. This may involve dealing with specific industrial challenges in key and important sectors such as food ingredients, meat industry, dairy processing, pharmaceutical processing, ICT chip and circuit design, medical devices and engineering. Or it might entail more horizontal-type support across the sectors, such as AI/data analytics, learning and development, advanced automation robotics, design for manufacturing or sustainability.

Whatever the industrial challenges, the Technology Centres are here to support, inspire and co-develop with industry the next wave of Irish innovations now and in the future.