Making it in Ireland: Manufacturing 2020

Executive Summary

Minister's Foreword

For too many years we became unduly distracted by selling property to each other rather than selling goods and services overseas. The dangers of such a reliance on one sector are obvious to all recent observers of the Irish economy. That is a mistake we cannot afford to make again.

This is why I am very pleased to welcome this report by Forfás that clearly sets out the potential for manufacturing in Ireland. The report has been informed by people who are directly involved in manufacturing and captures their belief in the importance of *the making of things* to Ireland's economic recovery. We are all aware of the constrained economic global and national environment that we are operating in.

Today, the manufacturing sector in Ireland employs 205,700 people directly and 400,000 people across all skills levels when indirect employment is taken into account. It is an integral part of Ireland's economic fabric, is a key driver of innovation, is a crucial player in Ireland's return to export-led growth and contributes to employment across all skills levels and in all regions throughout the country.

There is considerable promise for the sector in Ireland, with Forfás estimating the potential to create 43,000 direct new jobs by 2020. We know that this is not a given – and that an alternative scenario could see a continued loss in jobs in manufacturing.

However, it is clear that Ireland has a number of strengths on which to build. Ireland has strengths in a range of sectors including Food, Medical Devices, Pharma/BioPharma, ICT, Engineering and Green Technologies. Irish people are problem solvers, we are innovative, we are flexible and adaptable to change, and we can work in multi-disciplinary teams and with different cultures. These strengths have become even more important for Irish and foreign owned firms based here, and for the attraction of new investments in the context of the disruptive changes underway globally.

We *do* need to take action, and the Government is fully committed to addressing barriers to growth and working with the sector to realise its potential. This report sets out the actions needed to address what is in our control in terms of cost competitiveness and access to finance – building on the steps already taken by this Government to improve our international competitiveness and restore stability to the public finances and the banking sector. Addressing barriers, while necessary, will not be enough to position Ireland's existing and new firms to capture opportunities in an intensely competitive global environment. I have asked the enterprise agencies and others to drive the delivery of a *National Step Change Initiative*, aimed enabling companies to take one step up to drive enhanced productivity and competitiveness, to internationalise, to deepen engagement in innovation and to collaborate to compete.

Developing our people will be crucial to future success – and the complementary report *The Future Skills Needs of the Manufacturing Sector to 2020,* published by the Expert Group on Future Skills

Needs and Forfás, sets out a roadmap for action to provide the appropriate training and education for our people to ensure they can take up opportunities in the sector over coming years.

Enterprise and Government can work together to make the ambition set out in this report a reality. I established the industry-led Manufacturing Development Forum in 2012, and it will play a key role in ensuring the effective implementation of many of the actions in this report, and in championing the manufacturing sector in Ireland.

Richard Bruton T.D.

Minister for Jobs, Enterprise and Innovation

Executive Summary

Background

Manufacturing plays a crucial role in any economy. Manufacturing is a driver of innovation and technological advance, provides employment across a broad range of skills levels, and generates additional indirect jobs throughout the economy.

Some commentators have suggested that manufacturing is dying – particularly in developed economies. The reality is that manufacturing is *changing*. As it becomes more complex a very different set of capabilities will be required, capabilities that bring developed economies very much back into play for investment in manufacturing activities. This strategy looks at how manufacturing in Ireland can best compete over the period to 2020 in the context of the disruptive changes underway globally.

In Ireland the manufacturing sector has been overshadowed and its competitiveness impacted by growth in the domestic economy over the 2000s, a period when growth was driven by construction and consumption. Although manufacturing contributes significantly to Ireland's exports (at €78.5 billion in 2012)[1], a continued decline in employment over the past decade is a cause for concern, particularly in light of the high unemployment levels currently experienced in Ireland. Today there are 205,700[2] people directly employed in manufacturing.

There are strong industry views that more can be achieved with an increased policy focus on manufacturing. The Action Plan for Jobs 2012 (APJ 2012) sees manufacturing as essential for a return to more sustainable export-led growth. This strategy has been developed in response to the Action to:

Develop a long term vision for the manufacturing sector and put in place a strategic plan that will help to realise this vision[3].

The APJ 2012 set out the overall ambition *to have 100,000 more people in work by 2016 and 2 million in work by 2020*. Within this ambitious context it is envisaged that 43,000 more people could be directly employed in manufacturing between 2011 and 2020[4] - direct employment that can have wider positive employment impacts of a similar number of jobs throughout the economy.

This future is not a given[5]. It is ambitious, yet it *is* achievable if the right actions are taken. Although we have no control over (and are dependent upon) a recovery in global market demand,

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1 Annual Business Survey of Economic Impact, ABSEI 2012, Forfás (Agency supported firms) Exports have been relatively resilient throughout the recession

2 Quarterly National Household Survey, QNHS Q3 2012, CSO

3 Under action 7.1.3 a specific step required that Enterprise Ireland identify barriers to start-ups undertaking manufacturing in Ireland and identify what actions are needed to address them: See Chapter 6 in the full report that is available online at www.forfas.ie/publications

4 Based on an analysis of agency supported employment in manufacturing

5 Appendix I sets out a number of alternative scenarios and underlying assumptions

Ireland's manufacturing sector can become better positioned to take advantage of opportunities as they arise.

A restoration in Ireland's competitiveness is crucial. It is absolutely critical that the existing barriers to growth - cost competitiveness and access to finance[6] - are addressed as a matter of priority.

However, addressing these barriers while necessary will not be sufficient. We need to achieve a transformative step change across the manufacturing sector in terms of productivity, innovation and competitiveness and in the supporting eco-system if this future is to become a reality.

Ireland has a number of strengths that provide a solid platform for growth and there is a future for manufacturing in Ireland.

Coordinated and concerted action by government, the enterprise development agencies and firms is necessary to make that genuine step change in order to realise opportunities to create jobs and sustainable growth. As many other developed economies are revisiting their manufacturing strategies, Ireland needs to be serious about establishing a differentiated and internationally recognised reputation for manufacturing.

Forfás has consulted extensively with industry, the enterprise development agencies, academia and key stakeholders in developing this strategy. The Manufacturing Development Forum (MDF) established in 2012 by the Department of Jobs, Enterprise and Innovation (DJEI) was a valuable source of insights throughout the process. The MDF will play a critical industry role in helping to promote manufacturing and to make the step change necessary to realise the potential of manufacturing here in Ireland.

The full report is available online at www.forfas.ie/publications. It provides a baseline analysis, sets out the areas of opportunity for manufacturing in Ireland across sectors and activities, places a focus on the indigenous sector, and details the supporting business environment for manufacturing. It also includes a number of case studies of companies that have invested time and resources on transformation initiatives and have captured new market opportunities. This report is complemented by a more in-depth study published by the Expert Group on Future Skills Needs (EGFSN)/Forfás – *Future Skills Requirements of the Manufacturing Sector to 2020.*

A Definition for Manufacturing

The broad definition set out in The *Report of the High Level Group on Manufacturing* (2008) remains valid today. It defined manufacturing as: encompassing a broad range of activities from research and development through design, production, logistics and distribution to marketing and after sales services. The definition recognises that activities across the supply chain may be located in different countries and undertaken by different companies across the world, where it makes most strategic or economic sense. Within this context, this strategy emphasises the importance of retaining a focus on production – the making of things - at the core.

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[6] Access to finance is more pertinent to Irish owned firms

Manufacturing is Changing – Global Trends

By 2020 manufacturing will be different from what it is today. Changing consumer demands, the pace of advances in technologies, environmental concerns and intensified globalisation and competition are driving new models of manufacturing. European research has identified three types of factories at the forefront of these new models, each with different primary characteristics, namely: Smart, Virtual and Digital[7]. It is important to note that the term 'factory' should not be interpreted as being one physical plant in one location, but is more about the entire manufacturing activity, whether globally dispersed or not. It is also important to note that these are not mutually exclusive; rather, they are concepts for approaching the process of manufacturing as we progress to 2020. In broad terms, they are characterised as follows:

- **Smart Factories** offer agile manufacturing (flexibility and short-time cycles) and customisation involving process automation control, planning, simulation and optimisation technologies, robotics, and tools for sustainable manufacturing; Smart factories are underpinned with Lean and ICT systems, characterised as energy efficient, reliable, and cost-effective production operations.
- **Virtual Factories** are global networked operations built on pervasive ICT systems. Seamless integration of intelligence from all aspects of the business (regardless of where located and including external partners and suppliers) facilitate and drive decision-making. In simple terms, a complex global network of operations functions as one.
- **Digital Factories** offer greater simulation, modelling, evaluation and knowledge management and deliver enhanced Product Lifecycle Management (PLM) from the product concept level through to manufacturing, maintenance and disassembly/recycling; and facilitate better real-time decision making and quality control throughout the production process.

These models will be a global phenomenon: where advanced technologies are embraced; agile manufacturing is the norm; where simulation, modelling and analytics drive decision making; where sustainability is embedded throughout the operation; and where globally dispersed elements of the value chain operate seamlessly. In fact the *Factory of the Future* is already the 'now' in global companies such as Siemens, Intel and GE.

For many manufacturers in Ireland, however, these concepts seem like a far too distant (and unrealistic) future. But the fact is that Lean Principles, Sustainable Manufacturing and the pervasive use of ICTs cannot be ignored by *any* manufacturing firm in operation today - regardless of scale or ownership. These are the near term realities – and perhaps more pertinent to many of Ireland's manufacturing operations today. How they apply will be different according to individual firms' needs, strategies and contexts. For example, the smaller firm supplying to a larger player may need to adopt technologies, embrace sustainable manufacturing principles, and/or achieve certain standards if they are to remain a competitive supplier.

The changing nature of manufacturing has implications for all firms in terms of how they operate and in how they do business – in particular:

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[7] http://ec.europa.eu/research/industrial_technologies/pdf/ppp-factories-of-the-future-strategic-multiannual-roadmap-info-day_en.pdf. These models have been described within the strategic research domain of ICT enabled intelligent manufacturing

- ***Customer responsiveness*** is crucial – needing agility and flexibility on the 'factory floor', market led product development and customised solutions;
- Companies increasingly need to ***collaborate to compete***; and
- ***New ways of working*** are needed that harness the full potential of each person in the workplace.

Standing still is not an option. We can already see a shift toward increasing complexity with the convergence of sectors and technologies requiring multidisciplinary skills; the need for adaptive, flexible production processes to cater to increased customisation; the shift toward nano-scale; increased collaboration and the sharing of resources and broader networks across companies and countries. These changes offer significant opportunities for the future of manufacturing globally – and for Ireland, although they involve disruptive changes to established business practices and to ways of working.

Manufacturing Matters: A Critical Component of Ireland's Economy

In Ireland, as with other developed economies, employment in manufacturing has been declining over the past decade. However, manufacturing remains a key contributor to Ireland's economy. In summary:

- There are approximately 205,700 people[8] employed *directly* in manufacturing – and a similar number of people employed *because* of manufacturing – that is a total of over 400,000 people[9];
- Manufacturing provides employment across a broad range of occupations, through from operatives, technicians and trades to engineering and technology professionals;
- Exports of agency assisted manufacturing companies were €78.5bn in 2012[10] up from €54.8bn in 2000, and have proven to be relatively resilient through the recession – in fact, exports was the only component that contributed to GDP growth since 2009;
- Productivity in manufacturing has been increasing over recent years – annual average growth rates in per hour labour productivity across manufacturing sectors amounted to 5.6 per cent over the period 2007 to 2010[11] - enhancing the competitiveness of Ireland's firms on international markets;

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8 QNHS Q3 2012, CSO. Chapter 4 in the main report on www.forfas.ie provides more detailed analysis of current status of manufacturing across a number of key indicators and trends

9 Based on multiplier used in Action Plan for Jobs 2012

10 ABSEI 2011, Forfás. Note that for Goods Exports and Imports CSO show a total of €92.6 billion in goods exports for 2011 (January 2012). Goods are categorised according to SITC codes (which are different categories to NACE codes) and include some non-manufactured products such as live animals, cereals and mineral ores. Manufacturing exports amount to €76 billion based on CIP 2010 data – agency supported firms contribute in the region of 95 per cent to manufacturing exports

11 Ireland's Productivity Performance, 1980-2011, National Competitiveness Council, April 2012. There are differences in terms of productivity performance by sector and by 'traditional' manufacturing and 'modern manufacturing'

- As a sector, manufacturing is a key driver of RD&I. In Ireland manufacturing firms invested €718.5 million in R&D in 2011, which equated to 39 per cent of business expenditure on R&D;
- Manufacturing firms sourced €14 billion of materials and services from Irish based suppliers in 2011– although this has decreased from €17.5 billion in 2001. Manufacturing firms contributed €7.6 billion in payroll to the economy in 2011[12];
- Manufacturing is regionally dispersed, providing employment opportunities throughout Ireland; and
- Although Ireland is home to a number of large scale global players, almost 95 per cent of manufacturing firms employ less than 50 people[13].

While this paints a reasonably positive picture overall – much more needs to be done to enhance the capabilities of the sector to compete in international markets today and to respond to the disruptive change in evidence.

Ireland's Distinctive Strengths ….*but*…

Ireland has a number of distinctive strengths – strengths that are needed in the new manufacturing era and that can make a difference to Ireland's reputation for manufacturing. However, these are strengths that need to be protected and further developed. Many of the strengths have a counter-point, so that although Ireland does have strengths – many come with a *'but'* and inform where Ireland needs to focus its efforts.

For example, although Ireland is well regarded as a 'good place to do business' with a generally positive pro-business environment and competitive tax regime, companies cite relative cost competitiveness and access to finance on reasonable terms as *the* key issues facing them today.

Ireland has strengths in manufacturing related sectors, and in particular has an internationally renowned track record in regulated sectors. However, there tends to be a negative perception and lack of understanding of what manufacturing is like today - of the increased sophistication and complexity, and of the broad range of career options it offers.

Ireland has a well-educated and highly skilled workforce. That said, a number of skills gaps have been identified, which although not necessarily involving large numbers, they are in critical roles that will become even more in demand as manufacturing continues to evolve, including, for example engineering, electronics, software, tool design, robotics and analytics[14]. Management capabilities and leadership skills need to be enhanced across a broader cohort of firms to drive international business growth for the innovative firm and to realise the step change needed to compete successfully in the new era of manufacturing. Ireland's capabilities in international sales, in understanding markets and cultures, in connecting to the customer and in developing stronger internal feed-back loops to inform new product and/or services development need to be

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[12] ABSEI 2012, Forfás (Agency supported firms)

[13] Business Demography 2010, CSO, 2012

[14] See also Chapter 7 of the full report at www.Forfás.ie/publications for further details as well as the complementary report Future Skills Requirements of the Manufacturing Sector to 2020, EGFSN/Forfás, April 2013

enhanced. We need to continue to strengthen capabilities in innovation and to drive the adoption of technologies that are relevant to them across all manufacturing firms.

Internationally, Ireland has a reputation for people with a can do attitude, an ability to identify and to solve problems, and a high degree of flexibility in the workforce – attributes which can substantially differentiate Ireland's offering. On the other hand some firms cite a degree of inflexibility and embedded work practices that constrain the step change needed.

There is collaboration and networking in evidence particularly in the areas of RD&I and skills development (for example, through Skillnets) and within industry associations[15], again demonstrating characteristics that will become increasingly crucial to success over the coming years. More could be achieved by firms collaborating to compete, or by strengthening the sub-supply connections between foreign subsidiaries based here and Irish firms.

Ireland's investment in R&D over the past decade is beginning to bear fruit with increasing international awareness of Ireland's excellence in certain fields of science and technology. However, there is a perception that investments have not been directed sufficiently toward engineering for manufacturing, and that previous strengths in areas such as polymers have been eroded. Smaller firms in particular face higher barriers to entry and difficulties in leveraging state funded R&D. The *Report of the Research Prioritisation Steering Group* published by Forfás in 2011 recognises the needs of manufacturing activities and sectors.

As we paint the picture of Ireland's future in manufacturing, the imperative to cultivate our strengths and to address constraints is reinforced. The extent of the change is such that a business as usual approach would see Ireland's manufacturing capabilities falling behind by 2020 as the rest of the world moves on.

Painting a Picture of Ireland's Future in Manufacturing

We set out an ambitious, yet realistic vision for manufacturing in Ireland for 2020. By 2020 Ireland will become internationally renowned as:

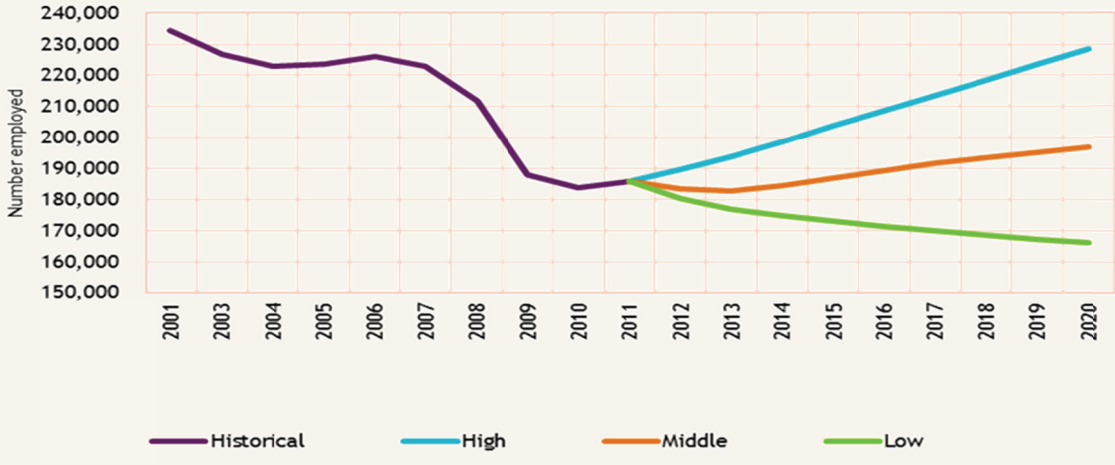
A place that excels in manufacturing – and where manufacturing adds value

- A place where manufacturing is focused on the **customer** – *Agile, responsive and collaborative*
- A place where **people** make the difference – Multi-disciplinary and highly skilled with a distinctive capability in simplifying the complex
- A place that **innovates** in product development and manufacturing processes - *embracing leading edge technologies*
- A place where **quality** is embedded across business operations, demonstrated by differentiation and a track record in highly regulated sectors

[15] Business Networks on the Island of Ireland, InterTrade Ireland, 2010

It is estimated that up to 43,000 more people could be working directly in manufacturing by 2020 under a *Competitive Manufacturing Scenario*[16]. This number could be doubled if indirect jobs are taken into account. Achieving this job creation assumes that the necessary step change is achieved and that Ireland's relative competitiveness is improved. We cannot be complacent. In a 'do nothing' scenario as many as 20,000 more manufacturing jobs could be lost by 2020 (Figure 1).

Figure 1 Manufacturing Employment Scenarios to 2020



Source: Analysis based on Forfás Annual Employment Survey Manufacturing Employment Data

Areas of Opportunity

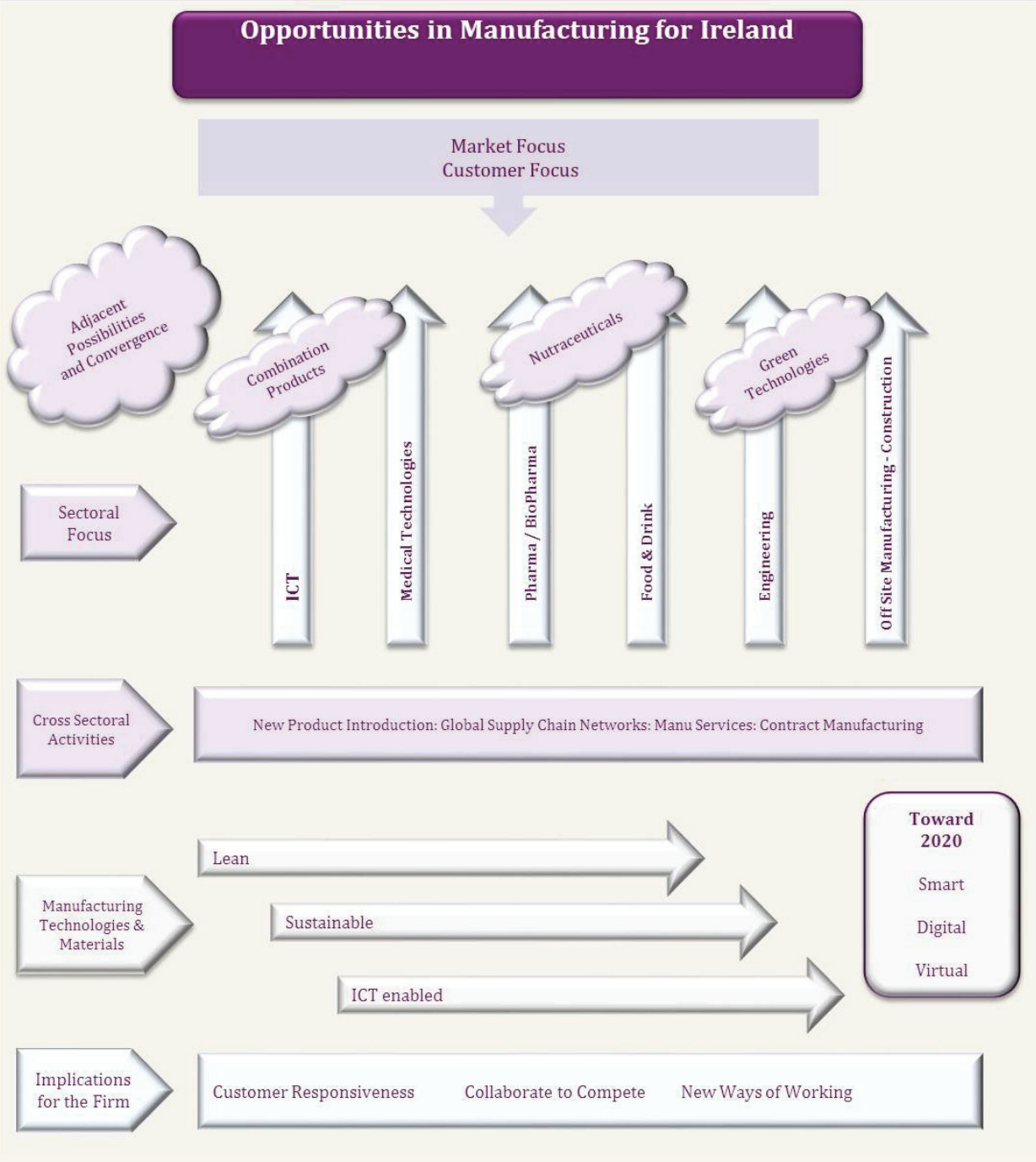
A number of opportunity areas have been identified – building on Ireland's existing sectoral strengths and capabilities in the context of the disruptive changes set out above. Lean Principles, adoption of ICTs, and the sustainable agenda are pervasive, as are the likely changes to ways of doing business and ways of working.

Ireland needs to continue to keep abreast of change and to refresh its proposition to attract investment – from new and existing foreign firms and from start-ups and existing Irish firms across a range of manufacturing and related activities.

The areas of opportunity are set out as follows:

1. **Focus on Sectors** : Maintaining what we have; and Building on Strengths
2. **Functions & Activities** : Adapting and Responding to Globalisation
3. Developing and Adopting **New Technologies** and **Materials**
4. Focus on **indigenous** potential – Manufacturing Start-ups and Scaling.

[16] The Competitive Scenario reflects the targets in the Government's Action Plan for Jobs 2012 for the period to 2016, and continues these projections for the period 2017-2020



A Focus on Sectors

Global drivers of change impact upon market growth and present opportunities for Ireland's manufacturing firms. Aging populations, environmental concerns, increased affluence in emerging markets, increasing digitisation and changing consumption behaviours are driving growth in markets such as healthcare, wellness, food, green technologies (including energy, water etc.) as well as for more customised products and services in markets such as ICTs, consumer products and automotive. Building on our strengths, we look specifically at opportunities in Food, Pharma/Biopharma, Medical Technologies, ICT and Engineering as well as the potential for Offsite

Manufacturing (OSM) in construction, areas that deliver to global market demands. We also consider 'new' areas arising from convergence and adjacent possibilities.

Sectors - Maintaining and Reenergising What We Have

Concerns have been raised by firms that in the eagerness to identify 'new' sectors and areas of opportunity, the focus may be taken off reinforcing and sustaining the not insignificant 205,700 currently being directly employed in manufacturing. In order to reach the potential jobs envisaged in the *Competitive Scenario*, it is crucial that a focus is maintained on sustaining the jobs already in existence in manufacturing.

There will always be a constant churn in employment as firms re-structure globalised operations and adapt to economic circumstance. Steps can be taken by firms, and by the Government to support firms, to reposition themselves - to invest in identifying new market opportunities, enhancing productivity and in building innovative capacity so that they remain competitive and relevant to their existing and potential customers. For multinational subsidiaries based in Ireland, their positioning within corporate global strategies is crucial, as is their ability to extend their current mandates.

It is important to acknowledge that a continued increase in productivity is likely to result in a period of low job growth in the short term, particularly as international markets continue to experience and forecast relatively low growth over the coming years. This period of restructuring is necessary. It will see firms in a considerably stronger position to take advantage of growth opportunities as they arise leading to sustainable employment.

Many existing firms in Ireland have already invested in the necessary changes. Many others may not have accepted that there are things within their own control.

The enterprise development agencies provide business development and advisory services and supports to assist firms in transformational change, development and sustainable growth.

It is about building on these supports to facilitate a step change across the broad cohort of manufacturing firms in Ireland, to encourage increased cross-sectoral and cross ownership peer learning and to enable access to the most appropriate intervention depending on the specific needs of a company[17]. An overarching priority in this regard is leadership and management capability. Firms need also to commit the time and resources required to realise change, and to engage openly and inclusively with the workforce (indeed for some, it is about acknowledging that change is needed in the first instance).

Ireland's GDP growth is based on aggregated output – by taking one step up, each individual firm can play its role in contributing to Ireland's recovery and future.

Sectors - Building on Strengths

The fact is that none of the sectors in which manufacturing firms operate is static. Even those that may be categorised as mature or traditional sectors are evolving in response to (sector specific)

[17] Some foreign owned companies cite an interest in the Leadership for Growth, International Trade Missions and Lean programmes provided by Enterprise Ireland for its client base

global drivers of change. New sub-sectors emerge and new opportunities arise at the blurring of the edges of well-established sectors. New methods, technologies and materials can have a disruptive impact on more traditional sectors.

A brief synopsis for each sector, placing the emphasis on what is changing is outlined below followed by an overview of opportunities arising from convergence.

Food

Harvest 2020 sets out to achieve the potential to increase exports by 42 per cent by 2020 in response to increasing global demands and opportunities in developing economies[18]. An update on its implementation was published in September 2012 which includes key actions to be delivered upon in 2013[19].

Ireland benefits from its green image and reputation for quality which is hugely important given the increased focus on traceability (from fork to farm), food security, standards and quality production systems. Brand recognition is vital to build consumer trust and confidence and international reputation.

The food sector operates to tight margins in circumstances where the multiples have considerable purchasing power. In the first instance, it is important that companies continue to embrace both Lean and sustainable principles across their entire business operations – investing in automation, ICTs (technology deepening) and re-skilling of their workforce. In addition, more companies need to build capabilities and to add value through the development and introduction of new products and services.

Food companies cite challenges in terms of access to finance, including onerous conditions imported by banks and limitations imposed by State Aid Guidelines, as a key issue. According to the industry, issues relating to access to finance, as well as relative cost competitiveness, constrain the potential growth of the sector in Ireland.

Pharma/Bio-pharma

The most fundamental change facing this sector is the shift toward personalised healthcare[20] with targeted therapeutic interventions leading toward growth in innovative delivery mechanisms, companion diagnostics, niche busters and an increase in biologics. The shift toward biologics and niche busters is seeing consolidation in the market, increased complexity in manufacturing processes, new materials and packaging and the need for firms to have cold chain logistics management capabilities to ensure that the manufacturer's FDA approved storage conditions are carefully observed along the distribution chain.

For Pharma companies globally, the expiry of patents is of key concern, as are issues relating to over-capacity, significant R&D costs and low product pipe-lines.

Across the sector, the level of sophistication in manufacturing is increasing, requiring multi-disciplinary capabilities, new processes and analytical methods, shorter product runs and multi-

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[18] Harvest 2020, Department of Agriculture, Fisheries and Food, 2010

[19] Food Harvest 2020, Milestones for Success, Department of Agriculture, Fisheries and Food, 2012. The implementation of Harvest 2020 is being led by the Food Harvest 2020 High Level Implementation Committee

[20] Tailored to the needs of the patient, enabling the delivery of the appropriate treatment, in the appropriate way at the appropriate time

product 'flexible' factories, as companies improve their abilities to adjust to ever-changing market demands.

Capturing future opportunities for Ireland depends on the ability to respond to these challenges. Companies need to prepare for more complex new product introductions through process development, innovation, operational excellence and productivity enhancements (e.g. Lean, Six Sigma). A continued focus on developing skills and capabilities[21] is required as is an enhanced focus on smart materials and packaging and traceability. It is crucial that the recommendations of the *Report of the Research Prioritisation Group* are implemented to strengthen the industry relevance of State funded research particularly in areas of manufacturing technologies.

The shifting nature of the sector will also have implications for: sub-supply (e.g. in a move towards the 'plastic' factory and single use systems) which should be of interest to indigenous companies; for water quality and supply; and for increased energy demands.

ICT Hardware

The ICT sector has a well-developed global supply chain model, comprising a number of very large players as well as smaller, agile, technology intensive and innovative firms. The sector is one in which the pace of change is exceptional, where products become commoditised at an early stage in their life-cycle, where mass customisation and manu-services models are well embedded. The R&D life cycle is relatively short, iterative and highly competitive and a close connection with the customer is an essential part of the process. The phenomenal increase in Big Data and mobility pose real challenges for the sector and Cloud Computing has been identified as the industry's solution to manage these challenges.

Despite a considerable reduction in terms of employment of those involved in ICT hardware manufacturing[22], Ireland remains host to a number of global players and a range of Irish owned electronics firms.

For Ireland growth opportunities in the ICT/electronics manufacturing sector are in R&D and/or Intellectual Property (IP) intensive low or medium volume manufacturing activities: pilot production and prototyping; 'intelligent' devices and systems integration serving the manufacturing and other sectors aimed at increasing energy efficiencies; advanced Integrated Circuit (IC) design and fabless manufacture (e.g. System on a Chip, Lab on a Chip)[23]; and in furthering the applied research agenda in manufacturing process developments, analytics and optimisation of the supply chain.

As well as being a sector in its own right, ICTs have a pervasive impact across all businesses, and ICT adoption is becoming a necessity for *all* manufacturing firms. The greater use of ICTs in production processes facilitates greater quality management and control, enhanced efficiencies, optimisation of energy and waste reduction through real time analytics, modelling and simulation.

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[21] Including Quality by Design, Process Analytical Technology, information based analytics and Quality Risk Management, RFID, Materials Technologies, IP creation, protection and exploitation

[22] Prior to the Internet/digital era, software replication was classified as manufacturing. Much of the decline in hardware employment post 2000 resulted from global decisions to relocate manufacturing activities to lower cost economies in response to the commoditisation of electronics products

[23] Irish owned companies include Magnetic Solutions, Powervation and Redmere. Foreign owned IC design companies include Analog Devices and Xilinx

ICTs are an enabler in terms of building customer and supplier relations, optimising business processes, access to markets, logistics and supply chain management and engaging in open innovation etc.

Medical Technologies

The Medical Technologies sector is a well-functioning eco-system in Ireland and continues to demonstrate strong growth potential. High value opportunities (e.g. combination products, technologies for independent living) are being driven globally by advances in science and technology and convergence, particularly with pharma and ICT. Companies are challenged with demonstrating increased product efficacy and achieving high quality standards while facing downward price pressures from procurers.

To realise opportunities and future investment by foreign and Irish firms, Ireland needs to prepare for more complex production by embedding operational excellence across the entire business and by embedding real time analytics capabilities. Firms need to enhance capabilities in product and engineering design, as well as in innovation in product, process, materials and packaging. Contract manufacturing operations (CMOs) need also to further develop capabilities to offer leading edge technologies, the 'flexible factory' and to engage as strategic partners. Sub-suppliers need to keep abreast of the changing dynamics, technologies and materials relevant to the medical devices sector and to innovate to provide relevant solutions.

Engineering

There are a number of innovative engineering companies based in Ireland. The Engineering sector encompasses those that are engaged in sub-supply (e.g. plastics, components) and those involved in own branded products either Irish or foreign owned, serving a range of markets including medical devices, plant and machinery, agricultural equipment, automotive, aeronautics and other industrial products.

In general, however, a step change in capability is required across the engineering company base, both indigenous and foreign owned. This requires aggressive marketing by the enterprise development agencies of RD&I programmes to increase the uptake by foreign owned firms of existing programmes[24], and to encourage indigenous firms to develop their own IP and products for export markets. It also requires optimising sub-supply opportunities between foreign and indigenous firms; building connections with State funded materials research to address the future needs of other sectors such as Biopharma (the 'plastics factory'), Medical Technologies (nano-scale) Construction (smart buildings); assisting Irish owned firms to reorient their strategies toward growth market opportunities and foreign owned firms to review their strategic positioning within their global corporations; and building sales capabilities in the context of a more sophisticated solutions based proposition.

Engineering is a problem solving discipline, a crucial building block to Ireland's manufacturing future across all sectors and this capability needs to be nurtured and complemented with flexibility in the workplace.

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[24] Foreign owned engineering firms have the lowest take up of the IDA Ireland R&D programme relative to other manufacturing sectors (See Chapter 4 in the full report – www.forfas.ie/publications)

Off-Site Manufacturing - Construction

In 2009, Enterprise Ireland identified factory based construction or off-site manufacturing (OSM) as one of the areas offering potential although the construction industry has suffered a significant decline over the period since then[25]. Interest in OSM is gaining traction internationally as difficult economic conditions in the construction industry have increased the appeal of Lean methods and practices. The influence of the green agenda, technological advancements, developments in quality materials, the rising use of Building Information Modelling (BIM) and sophisticated manufacturing facilities now offer significant productivity gains on projects not possible before[26].

Although today there are a relatively small number of Irish based firms currently engaged in OSM, it is an area that offers potential as the construction sector seeks to recover. OSM can help to transform construction into a highly productive, technologically rich sector – delivering a competitive offering to both domestic and overseas markets. The potential for exporting modular and pre-fabricated buildings or elements of buildings may be somewhat reliant on a cost to value consideration, given the relatively high transport costs and home based competition in markets such as UK, Germany and Belgium. Factors such as availability of natural resources (aggregates), the economic realisation of new developments in materials over the coming years (e.g. composites, smart materials, graphene) and investments in R&D will all play a role.

Adjacent Possibilities and Convergence

Adjacent Possibilities is based on the premise that enterprises and economies find it easier to master new products that are similar to ones they already make – utilising accumulated productive knowledge[27]. An example might be the application of the knowledge, expertise and competences of glass extrusion to photonics or of the textiles sector to the development of composites (where Ireland is already seeing connections being made). Convergence is primarily enabled by advances in technologies, and results in the emergence of 'new' sectors and products such as nutraceuticals and combination products - areas in which Ireland has considerable opportunity based on existing sectoral strengths.

Whatever terminology used, 'new' sectors and areas of opportunity arise from the blurring of existing sectors and/or application of core competences from one to another. From Ireland's manufacturing perspective the areas of Combination Healthcare Products, Functional Foods and Nutraceuticals, and Clean Technologies present more immediate opportunities.

Ireland can realise potential from emerging or nascent areas of opportunity by maintaining a watching brief on what is happening at the edges of known sectors and by stimulating cross-sectoral knowledge sharing in the first instance. A systematic approach needs to be taken as opportunities become apparent to garner insights into changes that may be needed to support its growth - including skills, regulations and standards, planning regulations and the IP environment - so that a more proactive (and anticipatory) approach is taken to enterprise strategy development.

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[25] Forfás developed a strategy for the construction sector that is scheduled for publication early 2013

[26] Construction Research & Analytics, Industry Insights and Alliances, McGraw, Hill 2011

[27] Factories of the Future Public Private Partnerships – Strategic Multi-Annual Roadmap, prepared by the Ad-hoc Industrial Advisory Group, Directorate-General for Research, Industrial Technologies, European Commission, EUR24282EN, 2010

Functions and Activities – Adapting and Responding to Globalisation

Looking horizontally, across manufacturing sectors, there are a number of areas of interest from Ireland's perspective. These will resonate differently for individual firms, depending to some extent on ownership and/or scale or reach of internationalised activities. In addition to the areas set out below, IDA Ireland will continue its efforts to attract a broad range of headquarter activities from manufacturing firms (engaging with both its existing client base for mandate extension and potential new names). Activities include customer support centres, sales lead generation, RD&I functions, shared services, IP management etc.

Manu-services

Manu-services require a much closer connection to the customer than is necessary when delivering a (mass produced) product at a certain price point. A manu-services model can have a transformative impact on what might otherwise be a relatively low value and/or commoditised product.

Sometimes referred to as servicisation, this concept relates to where added value is provided by the manufacturing firm through a mixture of software, products and services to the extent that the traditional distinction between manufacturing and services has become increasingly blurred.

For the manufacturing firm, a manu-services approach requires changes in the way it does business. It involves a business model that is somewhat different from the more direct 'price for product' model. It will generally require a different sales approach, different revenue models, new forms of innovation, longer term management of customer relationships, and/or collaboration with partners that offer complementary services. For Ireland's manufacturing companies with existing product offers, the opportunity is to develop additional revenue streams from associated services. The immediate need is to: raise awareness amongst manufacturing firms that can assess its relevance for their operations; develop and disseminate case studies; build the relevant capabilities and skills; and broker partnerships.

Contract Manufacturing – Strategic Partnerships

The use of contract manufacturing organisations (CMOs) depends very much on the industry, although recent trends indicate growth in the provision of services to the Medical Devices and Biopharma sectors. There may be opportunities presented for Ireland depending on the primary business driver for outsourcing and based on a strategic partnership model[28]. Opportunities are likely to be in the delivery of higher order services including system assembly, manufacture, test, delivery, software and silicon design and customer service. This model is based on strategic partnerships, requiring quality, reliability and flexibility. There are also opportunities for several smaller CMOs that occupy niches and can demand higher margins.

CMOs play a key role as part of the overall eco-system for manufacturing. They provide a solution to start-ups that alleviates the need for capital investment; provide an attractive proposition for attracting overseas entrepreneurs; and can bring together development, design and engineering capabilities for new product introduction and process development working with their client companies. Building on Ireland's expertise in supply chain management (SCM), the potential for Ireland to position itself as an attractive location for CMO management is strong.

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[28] For example, if the business driver is to gain access to a new technology this will imply setting up a long term relationship and relying on the technical knowledge of the CMO

Global Supply Chain Networks

Ireland already has a well-developed proposition and track record in SCM in foreign owned subsidiaries. Ireland can build on this to provide a more advanced offering to address the changing needs of the parent company. The increased complexity of managing global supply chains requires strong risk management capabilities, identification and management of hidden costs arising from distance to market and volatility, and strategic partnership management. Likewise, supply chain and related business models are increasingly relevant to Irish firms as they internationalise through acquisition and/or outward direct investment (ODI). Overall, adopting a supply chain model in these instances should enhance the capabilities of the Irish based entity, and present an opportunity to maximise the return to the State arising from its internationalisation. Indigenous firms need to consider a number of related aspects including: acquiring and/or developing skills and capabilities; investing in integrated technology infrastructures; sourcing appropriate partners and due diligence; and determining the functions that could be centralised (e.g. technical support, financial shared services).

A major element of enterprise policy in the '80s involved the Linkages Programme, which brokered introductions between foreign multinationals establishing in Ireland and indigenous firms that could supply product and/or services. In light of the reduction in the proportion of materials and services sourced locally, EI and IDA Ireland have initiated a joint Global Sourcing Strategy[29] to boost business connections between foreign MNCs and indigenous firms. Both the foreign subsidiaries and Irish firms would realise benefits (which would also result in economic return for Ireland). For foreign subsidiaries it would reduce the risks and hidden costs in longer supply chains, result in closer supplier partnerships and further embed their activities in Ireland. For indigenous supplier companies it would introduce a new customer base, strengthen their capabilities in selling, product development and customer relationship management and equip them to expand into overseas markets.

New Product Introduction/Pilot Manufacturing

Innovation is at the core of any successful manufacturing firm. The demand for increased customisation, the availability of new materials, the increasing importance of Product Lifecycle Management (PLM) and increased complexity present considerable challenges for firms as they seek to develop and introduce new products. The introduction of combination products or those involving biologics offers even greater challenges.

Consolidation and mergers and acquisitions (M&A) by global multinationals can often present challenges in terms of 'new to them' products and rationalisation etc. In such circumstances, many foreign firms based here need to be in a position to offer New Product Introduction (NPI) capabilities and to be part of the solution following on from M&A activity.

With an increased focus on 'connecting the dots' between state funded R&D and the needs of companies, on enhancing the ability to collaborate across disciplines, and on effectively utilising our problem solving capabilities, Ireland could become a location of choice for piloting/testing new products and developing efficient and sustainable production systems. Further action would be required to develop/provide appropriate test/trial and scale-up facilities to make this a reality and to leverage the existing R&D expertise.

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[29] A supply chain initiative was launched late 2012 by the enterprise development agencies is aimed at boosting Irish companies supplies to MNCs by €500 million annually (in response to APJ2012 actions 5.11 and 3.3)

Finally, Irish firms can benefit from access to appropriate facilities and from advisory services and expertise to inform more structured methods for NPI. A key challenge relates to building the capability of smaller firms who have not yet engaged in own product or process development.

Manufacturing Technologies and Materials

Manufacturing Technologies

Ireland has demonstrated capabilities in advanced manufacturing processes and technologies. The *Factory of the Future* requires engagement with advanced manufacturing technologies across the entire operation. These concepts may be beyond the current capability of many smaller firms – but regardless of what stage of development a company is currently at, there is an opportunity to take the next step up.

Adopting existing technologies: For some firms it is about being assisted to identify and adopt existing technologies[30] that are relevant to them, to their stage of development and strategic pathway. Firms will likely need to invest in building the necessary skills and capabilities (whether through on-the-job training, in-house or external courses), and to engage in opportunities for peer-to-peer learnings.

Developing new technologies: For other firms it is about being at the leading edge of new developments - engaging in in-house R&D and/or collaborating with Ireland's research capabilities or with research capabilities abroad across the range of relevant domains and platform technologies[31].

The real opportunity (and challenge) is to position Ireland as a Centre of Excellence for manufacturing technologies - to build a reputation for being at the leading edge of technology development and adoption. This would involve: stimulating increased collaboration across companies and research institutes; developing the facilities for trial/test and demonstration of new technologies by large and small companies; making it easier for SMEs (in general) to engage with R&D and/or at a minimum to adopt technologies in the workplace; and encouraging new technology-intensive and software start-ups that are focused on addressing the needs of the manufacturing sector.

Materials

An in-depth knowledge of materials, their characteristics, performance and application should form a critical part of Ireland's distinctive offering in manufacturing. Next generation materials will require next generation analytics for characterisation and next generation processes for manufacture, Product Life-cycle Management (PLM) etc. It is not only about new/advanced materials. New ways of processing/forming or coating/surface engineering for an existing material will enhance its characteristics. Bringing materials from previously distinct sectors and disciplines together can also add value to the final product.

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[30] Technologies can relate to production processes, supply chain optimisation, Product Lifecycle Management (PLM), Customer Relationship Management (CRM), energy efficiencies, eBusiness, open innovation etc.

[31] Chapter 7 and appendix V in the full report available at www.forfas.ie/publications set out Ireland's research institutes that are directly relevant to manufacturing activities and sectors

We need to further develop the capabilities of Irish based sub-suppliers in terms of advanced materials, design, testing, prototyping; advance transformational change and reconfiguration of existing manufacturing; and attract new investment from materials sub-suppliers.

A Focus on Indigenous Potential

Over the years there has been an increased policy focus aimed at achieving more in terms of economic activity and performance from indigenous firms. The indigenous sector, and particularly the food sector, has performed well during the recession in export markets. This continued focus is needed, particularly in light of existing constraints for investment in capital intensive operations and the relatively small proportion of start-ups engaging in manufacturing activities.

Start-Ups

Entrepreneurs, and the start-up companies that emerge as a result, provide the feedstock for future exports and employment and the means by which new sectors could take root in Ireland. Start-ups can also increase levels of innovation in the market place, increase productivity and improve competitiveness.

Out of a total number of circa 11,000 start-ups economy wide, less than 600 (or circa 5 per cent) relate to manufacturing activities[32]. This is not necessarily unexpected, as the vast majority of companies trading on the domestic market relate to retail, hospitality and construction. What is of some concern is the relatively low numbers of Enterprise Ireland supported High Potential start-Ups (HPSUs) that are involved in *production* – only 6 out of 35 HPSUs in manufacturing related sectors in 2011, compared with 19 in production out of 30 HPSUs in manufacturing related sectors in 2007[33].

Manufacturing start-ups face greater barriers to entry and challenges when compared with those involved in services activities. Starting up in production is a more complex, capital intensive and daunting proposition. There are other routes to realising new investment in manufacturing that can alleviate the risk of a Greenfield option. These include, for example: management buy outs and acquisitions; distributors opting to establish manufacturing facilities here based on their in-depth understanding of the market and ability to innovate to deliver to customer needs; an established company setting up a new entity to address a new market opportunity following development of a new product. The development agencies can work with firms to identify the relevant model and broker introductions as appropriate.

The need for capital investment could be minimised in some instances, for example if access to State funded equipment was enabled and/or 'sand pit' trial and test facilities were made available; through the utilisation of onshore CMOs and/or through the use of 3D (additive) manufacturing at prototyping stage (where relevant).

Scaling

The focus on scaling is not new. However, despite the success of a number of Irish firms in global markets, the vast majority remain small and lack the human and financial resources needed to take on the challenge of internationalisation. Enterprise Ireland established its Scaling Division in

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[32] Business Demography 2010, CSO

[33] Forfás review of HPSUs (sectors and activities) 2007 & 2011

2005 to focus on assisting more client companies to increase turnover from the €5m+ levels. Its Leadership for Growth, Chief Operations Officer (COO) and Chief Finance Officer (CFO) management development programmes, International Selling, RD&I and three tiered Lean programmes are all relevant in this regard, as well as advisory services, mentoring and trade missions. It is essential that these initiatives are continued and capture a broader cohort of firms. Managers of firms also need to acknowledge their own limitations, and be prepared to put in the time, effort and resources (human and financial) needed to deliver real change and growth.

A significant increase in scale is unlikely to be achieved by organic growth alone. Successful scaling companies generally engage in M&A activities and/or partner successfully to target larger scale market opportunities that they would not be capable of doing alone. Enterprise Ireland indicates that firms have difficulties in getting sufficient financing at a reasonable price to make an acquisition worthwhile. It is apparent that the issues relating to access to funding hinder growth potential in these instances.

The concept of collaborating to compete needs to become a reality for a greater cohort of Irish companies. By collaborating in order to capture larger scale market opportunities, individual firms engage in a reinforcing circle that enhances capability, opens doors and leads to increased scale. Although there are some good success stories, many smaller Irish firms are reluctant to engage in collaboration. This requires a mind-set change – a change that is easier said than done – but one that is essential for growth.

Promoting the Success of Irish Owned Manufacturing

Much of the analysis of Ireland's indigenous firms is based on the existing data based on economic activity in the State. While this is a valid perspective to take in terms of assessing the return to the State from its investment in supporting enterprises, it falls short in terms of telling the full story of the extent of internationalised activities. Employment based *in* Ireland and exports *from* Ireland continue to be the key metrics captured and used in analyses of the performance of indigenous firms. The fact is that Irish manufacturing multinationals employ almost 75,000 in affiliates overseas[34] - an additional 80 per cent on top of the 95,000 employed by them in Ireland. Enterprise Ireland has already embarked on telling the Irish story, and of particular note is the video developed during 2012 which shows Irish firms' success on global markets[35]. We need to build on such initiatives and continue to promote the story of Irish success (both nationally and internationally) and engender a sense of pride about Ireland's own.

Ireland has a Future in Manufacturing…*if*

There *is* a future for manufacturing in Ireland – a future that can only be realised if action is taken now.

The government does not create jobs – but its actions serve to create the right environment for businesses to invest, thrive and grow. Government action involves addressing constraints as they arise as well as putting in place changes needed to meet the evolving needs of industry.

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[34] Business in Ireland, 2010, CSO, 2012 . CSO data indicates that Irish multinationals employed almost 249,000 people in foreign affiliates – 30.2 per cent of which relate to manufacturing entities

[35] http://www.enterprise-ireland.com/en/ Where Innovation Means Business

The development agencies play a key facilitating role, through from marketing Ireland as a good place to do business, to working with and supporting companies to make the step changes they need to in order to build capability and capacity and to remain competitive in a global environment.

Firms too, have a role to play. It is the aggregated productivity and output of each individual firm that contributes to Ireland's GDP growth. Company leaders and managers who recognise the need for change and take the necessary steps to embrace continuous improvement are those that succeed. This is valid for all companies regardless of stage of development or ownership – where taking *one step up* improves their competitiveness and their contribution to Ireland's future growth. Employees and individuals can take the initiative to up-skill and to reinforce Ireland's reputation for its 'can-do' attitude.

All need to work collectively and with conviction if Ireland is to build from its existing manufacturing base to create a compelling and distinctive reputation for manufacturing in Ireland. Critically:

- **Immediate barriers must be addressed** to realise future potential in manufacturing - specifically, relative cost competitiveness and access to finance; and
- A **National Step Change** initiative is needed to place Ireland's manufacturing more to the forefront internationally, to: improve competitiveness, productivity and innovation; to connect to the customer and expand into new markets; and to collaborate to compete and engage in new ways of working.

Action is also needed to address negative perceptions of manufacturing, to develop the skills for the new era of manufacturing and to target investments in RD&I infrastructures to support engineering technologies for manufacturing.

How Will We Measure Success?

There are many factors that impact upon an individual firm's performance, and therefore upon the aggregate of enterprise performance and its contribution to Ireland's future economic growth. As a small open economy, global factors are outside of our control. It is also true that sectors perform differently, that ownership can play a role in performance and that indicators can be impacted by outlier firms (e.g. large scale). Nevertheless we need to have visibility on whether or not the actions being taken by government and its agencies to support the development of manufacturing firms and actions taken by firms themselves are making a difference.

The following table sets out a small number of high level metrics that can inform progress, which will vary by sector and by firm ownership as appropriate. They are informed by existing strategies including Trading and Investing in a Smart Economy, the Strategy for Science, Technology and Innovation, international norms (where applicable) and an analysis of past performance.

Table 1 Measuring Success

Measure : Manufacturing Firms	**Potential by 2020**	**Current Performance**[36]
Employment – net direct jobs	+22,000 by 2016 +21,000 2017- 2020	2012 Gross circa +11,000: Net circa +2,500
Productivity (growth in per hour labour /Ind)[37]	6% - 8% annual growth	Ave 5.6% 2007-2010
Innovation[38]		
Expenditure on R&D as a percentage of sales (All)	2% of total sales	0.8% (2000) : 1.6% (2011)
% of all firms spending > €250K per annum on R&D	30% of all firms	9 % (2000) : 20 % (2011)
% of sales attributable to new product development (Irish owned firms)	7.5% - 10% of sales	7% (2010) : 7.4% (2011)
International Reach (Irish owned firms)		
Export Intensity [39]	55% of Sales	48% (2011)
Diversification - Increase the share of[40]: Food and Drink Exports to outside UK Other exports to outside UK Food and drink exports to Asia	 62% of exports (2015) 63% of exports (2015) 7% of exports (2015)	
Collaboration		
Inter-firm Linkages/Sourcing[41]	+ €250m p.a.	
Enterprises Engaged in R&D Collaboration	50%	35% (BERD 2009/2010)

[36] Current/trend data sourced from ABSEI 2011, AES 2012, Forfás: Trading and Investing in a Smart Economy, DJEI, 2010, Ireland's Productivity Performance, 1980-2011, Forfás, 2012 (Fig 26)

[37] Assumes continued improvements in capital intensity, automation and engagement in higher value added activities across manufacturing sectors. Monitoring of progress should also take into account performance relative to comparator countries

[38] Based on a review of international norms, SSTI targets and past performance, and assumes continued focus on stimulating RD&I activities at firm level and enhancing absorptive capacity. High level metrics are influenced by the sectors that contribute greatest proportion to sales/outputs

[39] Based on analysis of CAGR 2000-2011 on exports, sales and intensities and projecting to 2020, and adjusted to account for sub-supply intensive activities

[40] Trading and Investing in a Smart Economy, DJEI, 2010 set targets for 2015

[41] For manufacturing is estimated at 50 per cent of the total €500m in the IDA/EI in their sourcing initiative 2012

Taking Action

The suite of actions set out below under 4 headline areas encompasses the level of the business environment and the level of the firm. The strategic aim has been set out underpinned by a number of more specific actions. Although each action has a particular focus, there is a strong inter-play between them. Strengthening capabilities at the level of the firm is highly dependent on peoples' capabilities, skills and attitude. You will note, therefore, e.g. that skills related actions pervade many of the areas set out – and at both the business environment level (education) and at the level of the firm. Likewise, the concept of collaboration, partnering and peer-learning is reflected in many instances.

	Area of Focus
Redressing Perceptions	
1	Redressing Perceptions of Manufacturing
Addressing Barriers to Growth	
2	Delivering Structural Improvements for Cost Competitiveness
3	Retaining a Competitive and Pro-Business Tax Regime
4	Addressing Funding Issues for Capital Intensive Manufacturing Activities
A National Step Change Initiative	
5	*A National Step Change Initiative*: Strengthening Ireland's Manufacturing Base Pillar A Enhancing Productivity and Competitiveness Pillar B Connecting to the Customer & Extending International Reach Pillar C Broadening and Deepening Innovative Capabilities Pillar D Strengthening Collaborative Actions for Economic Growth
6	Strengthening Ireland's Own – a focus on indigenous potential: start-ups and scaling
7	Developing Ireland's People for Manufacturing – Making the Difference
Infrastructures	
8	Prioritising investment in Infrastructures for Manufacturing

Perceptions of Manufacturing

In Ireland, industry cites a lack of awareness of how manufacturing has evolved as a sector – in terms of its complexity and sophistication. There appears to be a general negative perception in terms of manufacturing nationally which permeates into the policy and support system. There is a sense that the 'newer' activities in internationally traded services sectors have grabbed the attention of policy makers and educationalists, to the detriment of manufacturing over the past number of years. It is not a case of either/or – but more a case of redressing the imbalance of recent years.

There *are* opportunities for manufacturing in Ireland over the years to 2020 – which can be realised.

As a priority it is important to redress public and political perception about the potential for manufacturing in Ireland, about the changing nature of manufacturing, its potential to offer job and career opportunities across a range of skills levels and across all regions, and about its valuable contribution to Ireland's recovery.

Ireland *is* in manufacturing and will continue to be in manufacturing in the future.

1	**Strategic Action** **Undertake a strategic campaign of coordinated actions over 2013 to promote *Making it in Ireland - Manufacturing 2020* nationally and internationally.**	**DJEI,** **MDF/ Agencies**
1.1	Develop a suite of key messages based on the evidence in this report to inform a coordinated programme of national and international (media, electronic etc) communications for *Making it in Ireland - Manufacturing 2020* that would be used consistently by politicians, government department and agencies. Build on the existing agencies 'blackboard' campaign (*Innovation Ireland)*.	DJEI and Agency Communications Managers
1.2	Identify and 'recruit' a small cohort of manufacturing champions who would become the faces of manufacturing in Ireland, and who would be supported in promoting manufacturing in Ireland at various relevant events and in various journals and articles over 2013.	DJEI
1.3	Deepen engagement of the Manufacturing Development Forum across Government to maintain a continued focus on the concerns and opportunities facing the sector in the context of significant change.	DJEI
1.4	Undertake an initiative to promote careers in manufacturing. In doing so, Discover Science and Engineering (DSE) should collaborate with manufacturing industry sectoral representative organisations, higher education institutions, SOLAS and relevant professional and trade organisations to deliver this initiative.	DSE/ Industry Assoc

Delivering Structural Improvements for Cost Competitiveness

Consultations with managers of manufacturing firms cite Ireland's relative cost competitiveness as being *the* most significant challenge facing them. Although Irish firms are affected to a greater degree than foreign firms by the domestic cost environment, it would be remiss to interpret this as a non-issue for foreign firms. The fact is that relative costs feature strongly in the Foreign Direct Investment (FDI) decision making process[42] and that Ireland could potentially reposition itself in the market place for greater levels of investment from FDI (greenfield and expansions) across a broader range of activities if cost competitiveness were improved. For Irish firms trading on international markets, cost inputs determine their pricing structures and affect their ability to compete. For start-ups, a cost competitive environment in Ireland could positively influence their decisions with regards to where to establish production in the first instance.

Of particular relevance to manufacturing firms are: Costs of Employment; Utilities; Transport; Regulatory Burdens and Property Costs. In a number of circumstances, there is a strong interplay between costs, market structure and/or availability of infrastructures – and this is apparent in the analysis in Chapter 7 of the main report and the actions below. For further analysis and recommendations see recently published reports by Forfás[43].

Although much may be outside of the control of government, it is important that actions are taken to address those aspects of costs where government *can* play a role. Equally important is for government to ensure that modifications to existing policies or the introduction of new measures do not (inadvertently) increase the costs for business. In some instances, firms can take a proactive role in reducing costs, e.g. through initiatives to improve energy efficiencies or minimise waste. Much of the control of labour costs (above the minimum wage) falls to firms – although cost of living and inflation are factors that impact on the real wage for individuals and the potential to effectively negotiate wage reductions. Other factors such as the tax wedge (i.e. the gap between what the employer pays and what the employee receives) and replacement rates (i.e. the proportion of out-of-work benefits received when unemployed against take home pay if in work) are also relevant.

2	**Strategic Action** **Make concerted efforts during 2013 to address the step change needed to realise structural reform to improve Ireland's relative cost competitiveness in support of manufacturing and enterprise development, growth and job creation**	**DJEI / Whole of Govt**

[42] Location assessment and decision making is a complex process and depending on the nature of the investment other factors come into play, such as knowledge infrastructures, access to markets etc

[43] Costs of Doing Business 2012, Overview of the Main Infrastructure Issues for Enterprise, etc http://www.forfas.ie/

2.1	**Costs of Employment** ▪ Continue the measures included in recent Budgets[44] to ensure that all replacement rates move below the 100 per cent mark and ultimately move toward the 70 per cent benchmark; ▪ Ensure that proposed policy changes do not result in increases to the costs of employment (e.g. pension auto-enrolment); and ▪ Ensure that there are no further increases in the labour tax wedge and provide an indication of when it will be feasible to reduce marginal rates below 50 per cent, by broadening the tax base (e.g. property tax, user charges etc.).	DoF DoF
2.2	**Energy** Make concerted efforts to remove additional cost burdens to firms resulting from domestic policy and to enhance competition in the energy market. ▪ Continue to raise awareness and to support firms in undertaking initiatives to increase energy efficiencies and reduce use; ▪ In the context of the significant additional costs for consumers arising from the peat PSO, unless there is a clear economic rationale for maintaining them, subsidies for peat generated electricity should be discontinued; ▪ Prior to converting peat plants to biomass, a full cost benefit analysis of the implications for Irish electricity prices and energy security and sustainability should be undertaken; and ▪ As a maturing technology, the price support scheme for onshore wind should be revised so that the price support levels for new onshore wind projects are phased out over time.	Agencies/ SEAI, Ind Assoc/ Gov Depts DCENR DCENR DCENR
2.3	**Waste** Prioritise the implementation of the key commitments made in the new waste policy, *A Resource Opportunity - Waste Management Policy in Ireland*, that will lead to improved competitiveness - in particular there is a need to accelerate progress on: ▪ Reducing the number of waste regions from ten to three; ▪ Developing waste plans for the three new waste regions that will provide confidence and facilitate private investment in cost effective recycling and energy recovery infrastructures; ▪ Ensuring that Ireland's negotiating position at EU level on the new, more ambitious waste targets to be put in place by 2017 is informed by national competitiveness as well as environmental considerations; and on	DECLG

[44] Actions taken in recent budgets include e.g. reductions in social welfare payments (2010), changes to tax credits and tax bands along with the introduction of the USC (2011), entitlement to jobseekers benefit based on a five day rather than six day week where a person is working for part of a week (2012)

	▪ Ensuring continued and enhanced efforts by Government departments, agencies, business representative associations and businesses themselves to grow awareness among all SMEs of how best to exploit waste management reduction processes and technologies.	Gov Depts / Ind Assoc / Agencies
2.4	**Water** We need to ensure that moving from the current regime (where water services are provided by 34 local authorities) to Irish Water, leads to greater efficiencies and reduced capital and operational costs as potential economies of scale are exploited and the burden on business is reduced. Key actions required in this area include: ▪ Prioritise reducing the high leakage levels in urban centres to improve efficiencies and reduce the need for new capital investment; and ▪ Develop a water regulatory framework that reduces inefficiencies in the capital and operational costs of water services infrastructure and ensures that water services charges are fully cost reflective and passed on to all customers in a fair and transparent manner.	DECLG
2.5	**Regulation** ▪ Continue to review the decision making processes for environmental and IPPC[45] licensing, taking account of the need to meet the State's obligations under the relevant EU Directives, with a view to: ▫ enhancing the process in terms of consistency and time lines; ▫ reducing uncertainties in relation to new investments or plant expansions that create jobs; and to ▫ reviewing costs of compliance in line with a risk based approach.	DECLG/ EPA
2.6	**Property Related Costs** ▪ Accelerate the revaluation processes for Rates through the introduction of self-assessment or the outsourcing of valuations [the enactment and implementation of the Valuations Bill is critical to expedite the process]. ▪ Encourage Local Authorities to continue to exercise restraint in setting commercial rates in 2013 (a reserved function of elected members) and, where possible, to reduce rates. ▪ Introduce waivers/50 per cent reduction in Local Authority development levies for a period of 2 years, in the context of the changed economic circumstances, the need to remain internationally competitive for investment, and the reduced cost of delivery of the required infrastructure for which levies are charged[46].	Valuation Office DECLG, Local Authorities Local Authorities/DECLG

[45] Integrated Pollution Prevention Control

[46] New Development Contribution Guidelines were published by DECLG in January 2013, available at http://www.environ.ie/en/Publications/DevelopmentandHousing/Planning/

	▪ Develop more robust and transparent charging mechanisms that match levies with the economic cost of providing development arising from the new draft guidelines on development contributions.	Local Authorities

Retaining a Competitive and Pro-Enterprise Tax Regime

It is important that Ireland continues to strengthen its rankings as a good place to do business, with a particular focus on maintaining its pro-enterprise competitive tax regime. The measures in Budget 2013 for manufacturing and SMEs, and in particular, the reaffirmation of the commitment to a tax regime supportive of investment, is welcome. Actions 2.1 and 5C.10 are also relevant.

3	**Strategic Action** **Maintain a pro-business environment with regard to Ireland's tax regime, ensuring that the enterprise perspective remains central to decision making processes.**	**DoF**
3.1	Continue strong coordinated reassertion of Ireland's commitment to maintaining the current 12.5 per cent corporation tax regime and monitoring the competitiveness of Ireland's tax offering.	DoF

Addressing Funding Issues

Irish owned companies cite significant difficulties in accessing finance on reasonable terms – particularly for capital intensive investments and start-ups. Together with relative cost competitiveness, manufacturing CEOs /managers state that these are genuine constraints to the future development of the manufacturing sector in Ireland and to employment creation. For manufacturing, the fact is that capital investment is not a luxury; it is inextricably linked with business development and growth.

Funding sources include bank financing, equity financing options, agency supports which operate under state aid guidelines, and the tax framework. Each of the four funding sources has been affected to some degree by current economic conditions. Actions have been taken in response, including the recently commenced Enterprise Ireland *Development Capital Fund Scheme* which will contribute to alleviating the shortage of risk/growth capital available to more established companies. While initiatives in one area can help to address constraints in another it is a fact that a healthy funding environment for manufacturing will see all four elements playing complementary roles in facilitating the growth and development of manufacturing enterprises.

Industrial restructuring is the on-going process of change in composition of economic activities in terms of sectors and activities and a move toward higher value added output that is sustainable. It presents a particular challenge for Ireland in the current period of high unemployment and fiscal adjustment. Policies and interventions need to be directed toward supporting the attraction of investment in new sectors and activities throughout the country, and in supporting the application of new technologies and new knowledge to enhance the competitiveness and productivity of existing activities. Utilising the full scope for support allowable under EU state aid rules and

ensuring that existing initiatives are fit for purpose is important in this context. For example, in relation to the availability of equity, the new Employment and Investment Incentive Scheme (EIIS) has potential for enhancement. The use of alternative sources of EU funding is becoming increasingly important in the current constrained environment. There are also enduring issues in relation to bank financing indicating that the required cultural shift in lending practices is not yet complete.

On another note, some firms have queried the different approaches taken by the agencies when providing supports (whether equity or direct grant aid). The equity approach facilitates cash flow, whereas state held equity would not be a viable proposition for foreign owned subsidiaries. Given the increased mobility of indigenous firms, global competition for investment and the changing economic circumstances, it is timely to review what mechanisms are most appropriate. There are also additional avenues to EU funding that need to be explored further.

4	**Strategic Action** **Ensure that the funding environment is supportive of the needs of the capital intensive manufacturing sector, with all of the elements working effectively, to support the delivery of the step change needed to enhance productivity and innovation.**	**DJEI/ Agencies**
4.1	Develop and implement new *Capability Funds* for manufacturing to run for a period of 2 years, aimed specifically at supporting capital investment by firms as part of a defined strategic business development initiative to drive increased productivity and competitiveness, consistent with the objectives of the strategy for Manufacturing.	EI/IDA/DJEI
4.2	Ensure that, in the ongoing negotiations with the EU Commission on the state aid modernisation programme, the importance of state support in securing enterprise investment from SMEs and large firms (with a particular emphasis on the needs of manufacturing firms - such as capital investment and technology deepening) is fully reflected to secure the best regime for Ireland and other European regions.	DJEI
4.3	Develop further proposals to make full use of the potential for state support for productive investment under EU state aid rules	DJEI, Forfás, EI, IDA
4.4	Consider alternative sources of EU funding, building on assessments already undertaken, and maximise the opportunities under EU programmes (including, for example the upcoming Competitiveness of Enterprise and SMEs (COSME) 2014-2020 and Key Enabling Technologies (KETs)).	DJEI, Forfás, EI, IDA
4.5	To provide certainty and enhance the potential of the Employment and Investment Incentive Scheme (EIIS) to encourage investment in Irish manufacturing: ▪ Extend the EII scheme to 2020 as outlined in Budget 2013, with early application to the EU Commission to enable approval before the end of Q2, 2013; ▪ Fully exclude the EII relief from the high income earner restriction; and ▪ Seek an expansion of the EU guidelines in the current EU negotiations so that all medium sized companies, including those in non-assisted areas, can qualify for investment under the EII scheme.	DoF, DJEI

4.6	Continue to work with the banking sector to assist them in a cultural shift in lending practices, and ensuring that relevant lending personnel are sufficiently equipped with an understanding of the strategic business development objectives of manufacturing operations and range of lending options in order to make informed lending decisions.	EI/ CRO
4.7	Undertake an analysis of the rationale for the different approaches taken to support indigenous and foreign owned firms and consider what models are most appropriate in the current economic climate (taking into account approaches taken in other EU member states and state aid guidelines).	Forfás, DJEI, EI, IDA

A National Step Change Initiative - Strengthening Ireland's Manufacturing

In light of the disruptive changes underway in manufacturing, a concerted effort is needed to realise the step change required to position Ireland's manufacturing sector for growth. We need to develop and deliver a ***National Step Change Initiative***. The proposed initiative builds on a number of interventions already in place to provide a coordinated and cohesive approach across all relevant actors. Actions will be required both at the level of the firm and in terms of enhancing the business environment across four main pillars:

- **Productivity**: driving Lean principles, energy efficiencies and sustainable practices throughout the operation, and adopting technologies new to the firm (including ICTs) and engaging with employees through change processes;
- **Innovation**: enhancing level of engagement and capabilities in R&D and innovation in product, process, business models and organisational change;
- **International marketing and selling capabilities**: building stronger connections with customers and expanding market reach; and
- **Collaborating to compete** more effectively on international markets.

The initiative (and elements of it) will resonate differently for different firms. For example, for firms that are seeking new market opportunities (e.g. sub-supply for the Medical Devices market) advisory services and support for accreditation will be directly relevant; for some it may be about obtaining supports and/or funding for investment in capital equipment and automation to enhance productivity; and for others supports such as Innovation Vouchers will assist in stimulating early engagement in R&D. Firms should be facilitated to engage in the way that is most relevant and appropriate to their stages of development. As well as the enterprise development agencies, others have a role to play in helping to deliver on a *National Step Change Initiative,* whether by way of providing direct assistance or in terms of enhancing the business environment –including for example, banks, fund managers, training providers, standard bodies and utilities providers.

It will require time and commitment by firms themselves and an ambition to deliver more than might otherwise be achieved without support.

Actions are set out across each of the four pillars (designated A to D), and involve actions at the level of the firm and at the level of the business environment.

5	**Strategic Action : Overarching** **Deliver a *National Step Change Initiative* to strengthen Ireland's manufacturing base, focused on capability building and enabling companies to: drive enhanced productivity and competitiveness; to internationalise; to deepen engagement in innovation and to collaborate to compete. *Specific actions are set out across 4 key pillars*.**	**DJEI / IDA/EI through the existing Cross Agency Senior Mgt Team**
5.1	Raise awareness of the imperative to engage in a National Step Change Initiative and of the commitment required by managers and employees in the first instance to realise significant benefits to deliver profitable sales, exports and jobs.	DJEI/ MDF/ Agencies/ Ind Assoc & Employee Rep Groups

Pillar A: Enhancing Productivity & Competitiveness - Lean, Green and ICTs

The nature and extent of change will be specific to a company's scale and stage of development – in some instances it will be about companies identifying and adopting technologies that are new to them, in others it will be at the leading edge of the *Factory of the Future* spectrum. Technologies encompass those used in the production process (including analytics, simulation, modelling, Lean techniques, CNC[47], Computer Integrated Manufacturing etc.) as well as Information and Communications Technologies (Tracking & Tracing, Customer Relationship Management, Open Innovation etc.). In many instances it will require considerable capital investment, restructuring and training to realise full potential.

Over the past number of years, Enterprise Ireland introduced supports for companies through its Lean Business Offer and IDA Ireland works with its client base on a transformational change agenda. Often these initiatives are interpreted as (only) being about 'cutting costs' or 'eliminating waste'. However an enhanced understanding is developing of the pervasive nature and end-to-end business implications of these initiatives that require change management expertise to harness peoples' commitment, attitude and capabilities.

Transformation is ultimately about changing a way of working – about developing competences, problem solving skills and innovative capacities and about delivering on the responsiveness and flexibility needed to deliver increased sales in a highly competitive global market. Leadership and change management capabilities are critical in this regard.

During consultations a number of foreign owned firms expressed a desire to engage in the structured Lean Business Offer that is delivered by Enterprise Ireland and highlighted that this initiative is not currently available in IDA Ireland.

[47] Machine tools that use programmes to automatically execute machining operations - CNC (computer numerical control) machines offer increased productivity, flexibility, consistency and reliability

Through their ManagementWorks initiative, Skillnets offers a number of programmes to SMEs. Initial engagements with firms tend to be in the area of strategy and actions which can be taken to improve their current performance. Of particular interest is the potential to encourage some firms to participate in Lean style programmes as drivers of continuous change and improvement.

From a national perspective, building a more comprehensive data set through a benchmarking process would allow for an increased evidence based understanding of the qualitative capabilities of firms[48]. Such a database would facilitate the delineation of cohorts of firms, monitoring progress and the evaluation of the effectiveness of a more tailored suite of interventions.

5A	**Strategic Action National Step Change Initiative: Pillar A** **Build on existing Lean and Transformational change initiatives to deliver a single *National Initiative* to drive enhanced productivity and change, by facilitating access to a *common suite* of advisory services, benchmarking tools, peer networks and in-firm training to companies (regardless of ownership).**	**IDA/EI Cross Agency Senior Mgt Team**
5A.1	Develop and make available a *national* benchmarking tool that: ▪ Enables companies to measure performance against international norms (sector specific) and which can be accessed in a way that is appropriate to a company's needs and stage of development ranging from on-line diagnostic self-help tools to facilitated data gathering and workshops; and ▪ Builds a comprehensive dataset over time which will facilitate aggregated qualitative analysis, monitoring of progress at a programme level and the development of more tailored and customised suite of interventions.	EI/IDA/DJEI
5A.2	Review and enhance, as required, the existing Enterprise Ireland Lean Business Programme to deliver to the needs of foreign owned firms, as appropriate, taking into account aspects that may be particular to a foreign subsidiary operating as part of a global corporation.	DJEI/EI/IDA
5A.3	Continue to build and enhance Enterprise Ireland's 'approved' panel of change management specialists and mentors with expertise of dealing with companies across a broad spectrum of capability, sector, scale, ownership and international reach[49].	EI
5A.4	Facilitate peer-to-peer learning across companies, sectors and ownership through a semi-structured model of site visits, case study dissemination and on-line fora (e.g. via LinkedIn).	Ind Assoc & Employee Rep Groups MDF/Agencies

[48] A database PROBE is utilised by Enterprise Ireland in its Lean Initiative that facilitates benchmarking against international norms/sectors etc. Although data held relates to indigenous firms only, and to those that have undertaken benchmarking as part of a Lean process, it does capture circa 1,000 benchmarks and could form the basis for the development of the national dataset proposed. It is not, however, a longitudinal dataset

[49] Currently available on Enterprise Ireland's website and includes some international consultancies. This may need to be expanded further to support the proposed cross agency National Step Change Initiative

5A.5	Continue to promote the Becoming Lean initiative and Lean training programme introduced in 2012 by Skillnets that would cater to the needs of micro and small manufacturing firms. The newly formed LEOs should be equipped to provide signposting/referrals of the programme to potential client companies.	Skillnets CEB/LEOs
5A.6	Building on existing initiatives employee representative groups should continue to engage with their members to raise awareness of the challenges facing the sector, of its potential, and of the need for adaptability and flexibility. They should encourage high levels of employee participation in opportunities for continuous learning and contributing to a *workplace of the future* that will provide sustainable and rewarding employment. Effective participation also requires collaborative engagement by management.	Ideas Institute Employee Representative Groups
5A.7	Continue to deliver the Leadership4Growth and management development programmes, and facilitate leaders of Irish based foreign multinationals who would benefit[50] modifying the content (only if necessary) to their needs and also in the context of the *workplace of the future*.	EI/IDA

Pillar B: Strengthening International Reach - Connecting to the Customer

Ireland's Foreign Trade Council continues to focus on strengthening Ireland's economic links and on building the capabilities of firms to target a greater number of international markets[51]. Building international trade relations requires continued focused and coordinated efforts to identify and address barriers.

At the firm level, Irish based firms are engaging more directly in marketing and sales, in connecting into and/or managing global supplier networks. The sales cycle for more customised and solutions based products is longer than a 'price for standardised product' which requires strong cash flow management, commitment and confidence. The connection to the customer has become increasingly important for all firms – even those multinational firms that may not have direct responsibility for sales but are involved in RD&I need to find ways to tap into market intelligence, customer trends and preferences.

Ireland's capabilities in international sales, in understanding markets and cultures, in connecting to the customer and in developing stronger internal feed-back loops to inform new product and/or services development as well as strategic partnership management need to be further enhanced.

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[50] The L4G programme may be of particular benefit, for example, to smaller scale subsidiaries based here

[51] Trading and Investing in a Smart Economy, DJEI, 2010 sets out the actions required to enhance Ireland's exports and trade

5B	**Strategic Action National Step Change Initiative: Pillar B** **Support firms to expand into international markets and deepen customer connections through targeted skills development, peer learning and collaboration; enabled by continued focus on developing strategic trade relations; and coordinated in-market support.**	**ExportTrade Council** **Agencies**
5B.1	Enhance sales skills and capabilities to address more complex solutions based selling, Customer Relationship Management and Partnership Management - capabilities which would serve to expand into international markets and global supply networks[52]. Include aspects relating to cultural awareness and knowledge of market specific regulations and requirements.	Private Sector providers / HEIs / EI
5B.2	Establish a Peer Learning Group on International Selling that could serve to encourage exporting firms to initiate a step change to broaden their market reach to new territories.	EI
5B.3	Encourage and facilitate manufacturing companies to *collaborate to compete* – to work together to bring complementary products, services and/or capabilities together to address market opportunities that could not be served by one company and/or to take advantage of a manu-services model. Building on Enterprise Ireland's recently launched clustering initiative (October 2012).	EI/IDA
5B.4	Develop new (and restore) direct air links with key existing markets (e.g. US West Coast) and high growth markets and maintain air links with key European markets.	DAA/DoT
5B.5	Align the Foreign Earnings Deduction with Ireland's Trade, Tourism & Investment Strategy, recent trade missions and the enterprise development agencies' strategic markets, by including all of the following countries: the Kingdom of Saudi Arabia, the United Arab Emirates and Qatar in the Middle East; and South Korea, Japan, Singapore and Malaysia in Asia.	DoF

Pillar C: Strengthening Innovative Capabilities

For companies to be successful on international markets it is essential that they continuously innovate to meet the changing needs of existing customers, and to develop new products and solutions to respond to unmet demand, to capture new markets and customers. The significant

[52] See also Key Skills for Enterprise to Trade Internationally, EGFSN/Forfás, June 2012

change underway in manufacturing has placed an increased emphasis on the importance of process R&D and, at a minimum, of technology adoption.

From a manufacturing perspective, although BERD has increased over recent years in terms of amounts spend on R&D, the number of firms has remained relatively static. The engineering cohort appears to be less engaged in RD&I than other sectors and underrepresented in terms of overall State investment in RD&I. The agencies have worked with industry representatives to define the research agenda for Medical Devices, ICT, Food, Pharma/Biopharma, or are in the process of doing so, to inform HEI industry-led R&D through Technology Centres. There has been minimal engagement in defining the research needs of engineering firms including those that serve the industrial products markets (e.g. Agricultural Machinery, Equipment, Automotive, Aeronautics and Construction) and those engaged in Print & Packaging.

Despite significant investments by the State in developing Ireland's research infrastructures and capabilities, there is also a perception that investments have not been directed sufficiently toward manufacturing. It is also difficult for companies to navigate their way to the most appropriate resource. It has also been more challenging for SMEs to engage in the existing Technology Centres that are relevant to manufacturing, although some new initiatives introduced by i2E2 (Energy Research Centre) and ICMR (Irish Centre for Manufacturing Research) could point the way for others to emulate. Enterprise Ireland's Gateways Programme (that replaces the Applied Research Enhancement Centres) should also serve as a point of entry for SMEs in particular to the available research capabilities in HEIs.

It is important too, that Ireland's IP regime remains competitive and attractive in the international context. Developments of international regimes regarding the treatment of IP and intangible assets need to be monitored on a continuous basis.

Where relevant, the actions align with the work of the Research Prioritisation Action Group (for Manufacturing) that was established to progress the implementation of the *Report of the Research Prioritisation Steering Group*.

5C	**Strategic Action National Step Change Initiative: Pillar C** **Reorient State Investments toward enhancing Ireland's RD&I capacity in Manufacturing, targeted toward specified industry needs (including an emphasis on mechanical and other engineering disciplines relevant to manufacturing) and increase firm level engagement in RD&I.**	**Agencies/** **Research Institutes/** **Gov Depts**
5C.1	Undertake a concerted effort to encourage more manufacturing companies to engage in RD&I (with a particular focus on the cohorts with relatively lower take-up to date)[53], building on existing work to raise awareness of initiatives and applicability to firms at different stages of capability and to encourage collaborative approaches (e.g. pooling innovation vouchers).	IDA/EI

[53] And utilising existing instruments/incentives to the maximum possible to effect the change needed (e.g. IDA R&D Fund, and EI R&D Fund etc.)

5C.2	Facilitate technology adoption by firms that is 'new to them', including micro firms, as part of structural upgrading of the manufacturing base.	EI/CEBs/LEOs
5C.3	Establish a Strategic Technology Officer Group to assist companies with the potential to scale to address growth inhibitors through peer learning.	EI
5C.4	Stimulate increased engagement and reduce barriers to engagement by SMEs in collaborating in state funded Technology Centres, by tailoring input, costs and opportunity to suit size and ambition of the firm. The recently introduced model by ICMR and i2E2 should be considered by other Technology Centres[54].	Tech Centres EI/IDA
5C.5	Complete the ongoing audit of State funded equipment in HEI research facilities and assess the potential to provide access to firms on a pay-for-use basis to undertake pre-production trial and test, particularly where equipment may be underutilised.	HEA
5C.6	Raise awareness amongst manufacturing firms of the importance and value of innovation in services (particularly in the context of manu-services), including behavioural analysis, real time analytics and monetisation models.	EI/IDA
5C.7	**R&D Infrastructures and Collaboration:** Engage with manufacturing firms, particularly within sectors that have been relatively underrepresented to date (such as engineering) to determine and define specific needs at a research programme level (spanning through from basic, to applied to experimental development). ▪ Draw on existing capabilities/resources and initiatives to deliver to industry specified needs and increase collaboration between HEIs and industry; and ▪ Establish strategic collaborations with international research institutes and Research Technology Organisations (RTOs)[55].	IDA/EI/SFI/ DAFM
5C.8	Following on from action 5C.7 above if an infrastructure deficit has been identified in *applied research/experimental development* (for testing, prototyping etc.) carry out a feasibility study to assess the potential for establishing a Research Technology Organisation in Ireland.	DJEI (TI)[56]

[54] The ICMR, i2E2 have introduced a three tier model to stimulate interaction at different levels, including: Board level (significant input and access across the entire Centre); partner level (input and outputs based on specific projects); and subscriber level (basic access level, a first step). See Technology Innovation for Irish Manufacturing and Energy Competitiveness, Issue 1, October 2012

[55] Including, for example the Fraunhofer Institute – which should also inform action 5C.8

[56] Technology Ireland

5C.9	Develop a consolidated marketing brand and message for the various Research, Technology Centres and Principal Investigators to facilitate easier access by industry to relevant knowledge & expertise and to strengthen Ireland's R&D message overseas in terms of critical mass.	DJEI (TI)
5C.10	Retain and enhance the potential of the R&D tax credit for enterprise as part of the review of the R&D tax credit which was announced in Budget 2013.	DOF/DJEI/Forfás

Pillar D: Strengthening Connections and Collaboration

5D	**Strategic Action National Step Change Initiative: Pillar D** **Strengthen effective collaboration to deliver enhanced growth and job creation, by stimulating sub-supply connections, facilitating companies to collaborate to compete and by developing further cross sectoral / cross ownership connections.**	**EI/IDA/SFI / Ind Assoc**

The following sections look at sub-supply connections; followed by cross sectoral collaboration.

Strengthening the Sub-supply Connections - Building the Eco-system for Manufacturing

The connections between foreign subsidiaries based here and Irish firms have weakened in terms of sub-supply over the past decade. While acknowledging that much is now about engaging in *global* supply networks where procurement decisions are made outside of Ireland, there is potential to strengthen linkages and to strengthen the supplier eco-system for Manufacturing in Ireland to address identified gaps currently and as the manufacturing sector evolves. Procurement includes goods, services and licensing of technologies and IP. Enterprise Ireland and IDA Ireland have recently launched a Global Sourcing Strategy[57] to help strengthen business connections between foreign MNCs and Irish firms.

The agencies will continue to work with indigenous firms - to build up their knowledge, intelligence and understanding of the MNC procurement process and to facilitate peer to peer coaching/learning from companies that are successfully engaging with the foreign multi-national subsidiary. Relevant indigenous firms should continue to be included in FDI itineraries where appropriate, aligned with the systematic approach being taken to broker introductions between MNCs based here and potential suppliers.

For some indigenous firms, there is a basic requirement to acquire accreditation relevant to specific sectors to enable them to reposition their own strategies and target market. The analysis undertaken by the agencies should also lead to greater understanding of gaps in Ireland's market

[57] Delivering on Actions 5.11 and 3.3 in the Action Plan for Jobs 2012 that requires that Enterprise Ireland and IDA Ireland establish a senior management team to deliver on key priorities such as maximising procurement opportunities for Irish business with MNCs. http://www.djei.ie/press/2012/20121130.htm

place that could be filled either by attracting FDI and/or stimulating start-ups to address a market need.

Both the foreign subsidiaries and Irish firms would realise benefits which would also result in economic return for Ireland. For foreign subsidiaries it would reduce the risks and hidden costs in longer supply chains, result in closer supplier partnerships and further embed their activities in Ireland. For indigenous supplier companies it would introduce a new customer base, strengthen their capabilities in selling, product development and customer relationship management and equip them to expand into overseas markets.

Much of the analysis undertaken by the agencies in developing the sourcing initiative will also serve to identify existing and/or emerging gaps in Ireland's eco-system to support manufacturing firms and future investment.

	Connections and Collaboration **Strengthening the eco-system for Manufacturing**	
5D.1	Continue to drive implementation of the actions set out in the Global Sourcing initiative to raise awareness of what is available on the Irish market and to optimise the proportion of goods and services procured by MNCs from Irish sources.	IDA/EI
5D.2	Support the work of the enterprise development agencies and help to raise awareness and signpost companies to advisory supports and services for accreditation, raise awareness with regard to the importance of Standards and sector specific needs and facilitate firms' engagement (as appropriate) on International Standards Development Groups.	NSAI
5D.3	Continue to engage in a targeted approach to fill existing or emerging gaps in Ireland's eco-system for manufacturing to include: ▪ Targeting investments from mid-tier and/or early stage FDI companies (e.g. engineering service houses, equipment providers, and sector specific contract manufacturers); ▪ Fostering start-ups that aim to address identified gaps and that have the potential to export over time; and ▪ Assisting existing Irish firms to re-orient their strategies, building on existing competences to serve market needs.	IDA/EI
5D.4	Promote and facilitate industry-led initiatives such as FUSE, and identify ways in which such initiatives could be replicated without over-engineering them or losing the 'ground-up' commitment.	EI

Strengthening Cross Sectoral Collaboration to Realise New Opportunities

Although there are many opportunities arising as a result of changes within sectors, it is increasingly apparent that as manufacturing evolves new opportunities present themselves at the blurring of the edges of existing sectors. Some progress has been made in relation to combination products in particular and areas of adjacent possibilities – although such examples are not necessarily well known.

If Ireland is to realise future opportunities, a more proactive role should be taken in breaking down existing silos and in facilitating cross sectoral engagement. This requires a different approach to be taken by government departments, agencies and companies. It necessitates a strong cluster development approach (both within and across sectors), distinguishing between geographic colocation and genuine clustering activities that deliver synergies and higher growth potential than might otherwise be realised.

For manufacturing activities there are aspects of the business and challenges that are common to all – regardless of sector or ownership. This includes aspects such as enhancing energy efficiencies, Product Lifecycle Management and adopting Lean principles all of which provide an excellent 'safe space' in which companies can share experiences and exchange information and knowledge. The Leadership for Growth initiative has also stimulated peer networks that have continued on since individuals engaged in the programme. These opportunities and networks should continue to be identified and stimulated.

Initiatives such as Ideagen could be broadened to cater to established firms, bringing individuals together from across different sectors and disciplines. The existing Ideagen initiative (launched 2009) targets entrepreneurs, innovators and researchers in the higher education sector. It involves facilitated three hour networking and information sessions. They are organised on a regional basis, focused on a specific sector, and serve to share knowledge on sectoral trends and research activities and to generate innovative ideas.

	Connections and Collaboration **Embed a more structured cross agency and cross sectoral collaborative approach to stimulate the potential for identifying and realising 'new' areas of opportunity at an early stage.**	
5D.5	Establish focused working groups *across* the agencies and across existing sectoral departments that would strengthen knowledge sharing and solidify the opportunities in new convergent areas. A more structured process would allow for new areas to be identified at an early stage. It would also help to identify the specific actions needed to remove barriers and/or to support cross sectoral opportunities in areas such as regulation, IP and skills [e.g. green, nutraceuticals, combination products] .	EI/IDA/SFI
5D.6	Develop and disseminate a series of case studies to demonstrate Adjacent Possibilities and Convergence, detailing challenges and how they were overcome.	EI/IDA/SFI
5D.7	Launch an *Ideagen Adjacent Possibilities* initiative to target established companies from different sectors to stimulate new and cross 'boundary' thinking.	EI/IDA

Strengthening Ireland's Own – A Focus on Indigenous Potential

Start-ups provide the feedstock for future exports and employment. They can be the means by which new and emerging sectors and activities take root in Ireland. Start-ups have a key role to play in creative destruction[58]. They increase levels of innovation in the market place, increase productivity and improve competitiveness. Manufacturing start-ups face greater challenges than their counterparts engaged in services, not least because of the capital intensity of the business, the complexity of the production process and supply chain. Start-ups face challenges in prototyping, material selection and the economics of manufacturing as well as a broader range of regulations that apply to manufacturing (including e.g. IPPC licenses).

There are a number of strong Irish owned firms operating on international markets and Enterprise Ireland continues to stimulate more companies to export and to build scale and capabilities. However Ireland does not appear to take the same pride in its SMEs that is evident in other countries such as Germany's Mittelstand. Much of the analysis of indigenous firms is based on data that reflects economic activity *in* the State. While this is a valid perspective in terms of recording the return to the State from its investment in supporting firms, it falls short in terms of telling the full story of the extent of internationalised activities and the success of Irish companies.

The actions above relating to addressing the negative perception of manufacturing, of promoting career path potential, of cost competitiveness, and enabling access to State-funded equipment for pre-production, trial and test are all relevant to start-ups. In addition, further action can be taken to reduce barriers to entry.

6	**Strategic Action** Nurture, strengthen and develop Irish owned manufacturing firms, creating a dynamic in start-ups, scaling and in taking pride in achievements to capture opportunities and generate jobs.	Agencies/ CEBs(LEOs) /DoF/CSO
6.1	Introduce a targeted *Start Fund* for indigenous manufacturing start-ups modelled on the existing Enterprise Ireland Competitive Start Fund which would facilitate feasibility, prototype development and market testing.	EI
6.2	Assess the feasibility of establishing a facility that provides access to entrepreneurs and early stage start-ups to equipment and expertise to facilitate proto-type development of new products/solutions. Consideration should be given to the possibility of private sector provision, and/or equipment being donated by vendors as part of the solution.	EI
6.3	Raise awareness of the contract manufacturing services that are currently available in Ireland, and of the potential of 3D printing (additive manufacturing) as a low cost option for prototyping and home based production at the initial consultation stage with start-ups and through Start Your Own Business courses etc.	EI/IDA

[58] Joseph Schumpeter, Capitalism, Socialism and Democracy "a process of industrial mutation that incessantly revolutionises the economic structure from within, incessantly destroying the old one, incessantly creating a new one"

6.4	Develop and promote additional modules catering to the particular needs of manufacturing firms as part of the Start Your Own Business programme, and using manufacturing champions as guest speakers to demonstrate real life examples of overcoming hurdles.	CEBs/LEOs
6.5	To remove a barrier to entrepreneurship, introduce an additional voluntary opt-in PRSI contribution to enable the self-employed (Class S) to qualify for the full range of benefits, including Jobs Seekers Benefit, which is not means-tested.	DoF
6.6	Ascertain the benefits arising to the state from Outward Direct Investment and the extent of activities in overseas markets (sales, employment etc), in order to better inform policy and to enhance the 'Irish story'[59]. Identify the additional metrics required (if any) for collection by CSO and the agencies.	Forfás/CSO

Developing Ireland's People for Manufacturing - Making the Difference

People make the difference. It is people who solve problems, who come up with creative ideas, who share learnings, who close the sale, who build relationships. A highly effective workforce is one of the most difficult to replicate – and an area in which Ireland could genuinely differentiate its manufacturing offering. An effective workforce is one that includes well educated and skilled individuals, bringing a can do attitude to bear in the workplace, and who can work effectively as part of a multi-disciplinary and multi-cultural team. Important too, are effective industry leaders, those with vision, ambition and who lead in a way that is inclusive.

Education and training are fundamental building blocks to ensuring that individuals have the technical skills and competencies to address the current and future needs of manufacturing firms. Actions required include: the need to establish a clear career path framework, to address specific skills gaps, to ensure course content is aligned with today's and future manufacturing needs, and to strengthen capabilities in innovation, design and new product introduction. The manufacturing sector would benefit greatly from a more structured dialogue between industry and education providers, particularly in relation to skills issues such as project-based work placements, curriculum design and upskilling employees to Masters and PhD levels.

For more in-depth analysis and broader suite of actions refer to the *Future Skills Requirements of the Manufacturing Sector* (EGFSN) published to complement this strategy. A number of the key actions are highlighted below. The Actions above relating to promoting manufacturing as career (1.4), international selling (5B.1), Leadership for Growth (5A.7) and workplace of the future (5A.6) are also relevant.

[59] Building on previous analysis undertaken by Forfás : Statement on Outward Direct Investment, 2007

7	**Strategic Action** **Drive implementation of the manufacturing skills study in a timely manner, to reenergise interest in manufacturing as a career, to address skills gaps, to ensure course content is aligned with manufacturing industry needs and to enhance capabilities in design and new product introduction.**	
7.1	Review and set out career paths in manufacturing, engaging industry, employee representatives and relevant providers of education and training and the qualifications bodies including industry representative bodies, SOLAS, Skillnets and Higher Education representatives.	MDF/Industry /Employee Reps/ Educ & training providers
7.2	Use the accelerated apprenticeship scheme to augment the number of apprentices qualifying as toolmakers every year. FÁS (and subsequently SOLAS) should endeavour to ensure that at least 55-60 apprentices qualify as toolmakers each year over the period to 2016. Update the toolmaking apprenticeship syllabus to reflect recent advances in manufacturing materials and processes. Assess the potential for increasing the supply of polymer technicians, including pooling resources for the associated equipment requirements. Providers should also investigate the possibility of funding equipment costs through leasing arrangements or sponsorship by clusters of companies or equipment manufacturers.	FÁS/SOLAS IOTs/Skillnets/ Plastics Ireland/ IMDA
7.3	Examine the potential for formal learning opportunities for machinists, particularly for CNC machining and programming, including the potential for the development of a Machinist Traineeship or Apprenticeship	FÁS/SOLAS
7.4	Target mechanical engineering Level 8 programmes within the next Springboard call with a particular focus on automation, development and design and strongly emphasise enterprise collaboration and work placements. Review course content in mechanical engineering and other engineering disciplines relevant to manufacturing to include a practical grounding in the process improvement techniques currently in use in industry, including Lean and Six Sigma, modules in polymer science & engineering, data analytics and substantial work placement periods.	HEA, HEIs, HEA, HEIs, Engineers Ire
7.5	Identify ways in which a structured work placement programme could operate more effectively to deliver to the needs of the graduate/ under-graduate *and* to the firm, taking into account the resource commitment required by SMEs in particular.	MDF, Industry Assocs HEIs

7.6	Address the current small scale but critical shortages in Validation engineering, Quality engineering, Polymer engineering, Automation engineering and Supply chain engineering (primarily at NFQ level 9) through upskilling employees and the unemployed (Springboard) in partnership with industry.	HEA, Skillnets, Trade Assocs
	Focus on Manufacturing SMEs in future Irish Research Council calls for the Employment-Based Postgraduate Programme and Enterprise Partnership Scheme. Enterprise Ireland should seek to promote engagement by client companies within these programmes.	Irish Research Council, HEA, EI

Infrastructures

The availability of suitable property at the right price and in the right place has long been an essential contributory factor in Ireland's success in attracting FDI. In terms of Gateway locations, ability to deliver property solutions to cater for the next wave of investment in advanced manufacturing (including e.g. Pharma/Bio-Pharma) will also be a requirement in the medium term.

Continued and prioritised investment is needed to ensure that Ireland's infrastructure remain world class and facilitate the efficient movement of people and both physical and electronic products. What is not necessarily readily understood, is that ICTs are increasingly critical for manufacturing firms, many of which are globally connected with suppliers, partners, researchers and customers and operate with increased volumes of real time rich data and graphics. *Note some infrastructure actions have been set out within the Cost section because of the direct implications for costs.*

8	**Strategic Action** **Prioritise investment in infrastructures necessary to support manufacturing firms operating in a connected global environment – enabling the efficient movement of people and goods (physical and electronic).**	
8.1	**Industrial Property** Ensure that appropriate financing mechanisms are available so that the building requirements associated with anticipated FDI investments are adequately catered for in Gateway locations, particularly in relation to attracting the next wave of manufacturing investment.	DJEI/IDA
8.2	**Advanced Broadband** Local Authorities should work with private sector and semi-states to accelerate roll-out where possible. It is critical that the State investments committed to for post August 2014 in the new national broadband strategy for Ireland (€175 million) are delivered according to the timelines set out and that opportunities to bring forward investment should be explored[60].	DCENR

[60] Delivering a Connected Society - A National Broadband Strategy for Ireland, Department of Communications, Energy and Natural Resources, August 2012

8.3	**Transport Infrastructures** While capital resources are limited, it is critical that investment in physical infrastructures and routes to international markets that support economic recovery and the activities of manufacturing firms (roads, ports) are prioritised (See Appendix VI in the main report).	DoT

Appendix I

Employment Scenarios

A set of three scenarios for possible future employment was developed to inform the occupational analysis and future skills needs of the sector, and to inform this strategy[61]:

- High is the "Competitive Manufacturing" scenario, which represents the Action Plan for Jobs 2012 (APJ 2012) projections up to 2016 and continues the APJ 2012 trend to 2020. It sees a potential increase in direct net employment of 43,000;
- Low represents a "Continuing Loss of Manufacturing" scenario and a potential loss in direct net jobs of 20,000. Gross Job Gains are 85 percent of APJ, and job losses are (averaged across subsectors) 7.5 percent of previous year employment; and
- Middle has Gross Job Gains at 92.5 percent of APJ, and job losses at 5.75 percent of previous year employment and estimates approximately 11,000 net job growth.

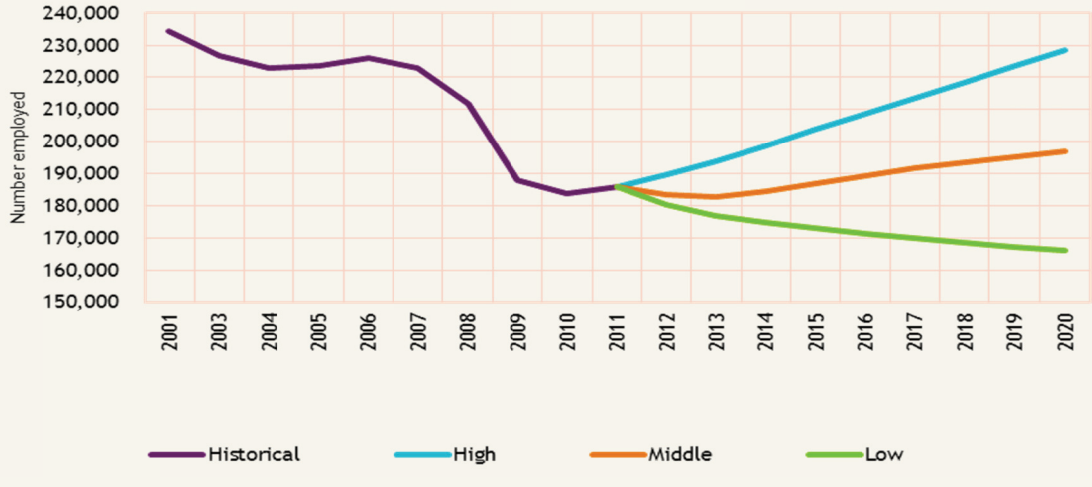
In developing the scenarios, the model disaggregated manufacturing into seven sectors. In summary:

The assumed future employment is positive for Medical Technologies, Food and Drink, Engineering and better than the manufacturing sector average;

ICT and Pharmachem are assumed to be around the manufacturing average in terms of future employment potential; and

Consumer Products and 'other' are assumed to be below the manufacturing average.

Manufacturing Employment Scenarios to 2020



Source: Analysis Based on Forfás Annual Survey Manufacturing Employment Data

[61] See also complementary report Future Skills Requirements of the Manufacturing Sector to 2020, EGFSN, 2013

Appendix II

Forfás Board Members

Eoin O'Driscoll (Chairman)

Managing Director, Aderra

Martin Shanahan

Chief Executive, Forfás

Mark Ferguson

Director General, Science Foundation Ireland

John Murphy

Secretary General, Department of Jobs, Enterprise and Innovation

Barry O'Leary

Chief Executive, IDA Ireland

Frank Ryan

Chief Executive Officer, Enterprise Ireland

Michael O'Leary

Secretary to the Board, Forfás

Appendix III Recent Forfás Publications

Costs of Doing Business in Ireland 2012 **Forfás**	April 2013
Action Plan for Jobs **Forfás, DJEI**	February 2013
Vacancy Overview **EGFSN**	February 2013
Action Plan for Jobs 2013 **Forfás, DJEI**	February 2013
A Review of the Equity Investment Landscape In Ireland **Forfás**	January 2013
Regional Labour Markets Bulletin 2012 **EGFSN**	January 2013
A Review and Audit of Licences Across Key Sectors of the Irish Economy **Forfás**	December 2012
Global Entrepreneurship Monitor (GEM) 2011 **Global Entrepreneurship Monitor**	September 2012
Annual Employment Survey 2011 **Forfás**	August 2012
National Skills Bulletin 2012 **NCC**	July 2012
Monitoring Ireland's Skills Supply – Trends in Education and Training Outputs 2012 **EGFSN**	July 2012
Ireland's Competitiveness Scorecard 2012 **NCC**	July 2012
Forfás Annual Report 2011 **Forfás**	July 2012

Key Skills for Enterprise to Trade Internationally **EGFSN**	June 2010
Sustainability of Research Centres **Advisory Science Council**	June 2012
The Science Budget 2010-2011 **Forfás**	June 2012
Annual Business Survey of Economic Impact 2010 **Forfás**	June 2012
Overview of the Main Infrastructure Issues for Enterprise **Forfás**	May 2012
Ireland's Productivity Performance, 1980 - 2011 **NCC**	May 2012
Community Innovation Survey 2008-2010 **Forfás, CSO**	April 2012
The Irish Enterprise Funding Environment **Forfás**	April 2012
The Expert Group on Future Skills Needs Statement of Activity 2011 **EGFSN**	April 2012
Playing our Part: Statement on Horizon 2020 **ACSTI**	March 2012
Report of the Research Prioritisation Steering Group **Research Prioritisation Steering Group, DJEI, Forfás**	March 2012
Vacancy Overview 2011 **EGFSN**	February 2012
Guidance for Higher Education Providers on Current and Future Skills Needs of Enterprise **Forfás**	February 2012
Ireland's Competitiveness Challenge 2011 **NCC**	January 2012

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