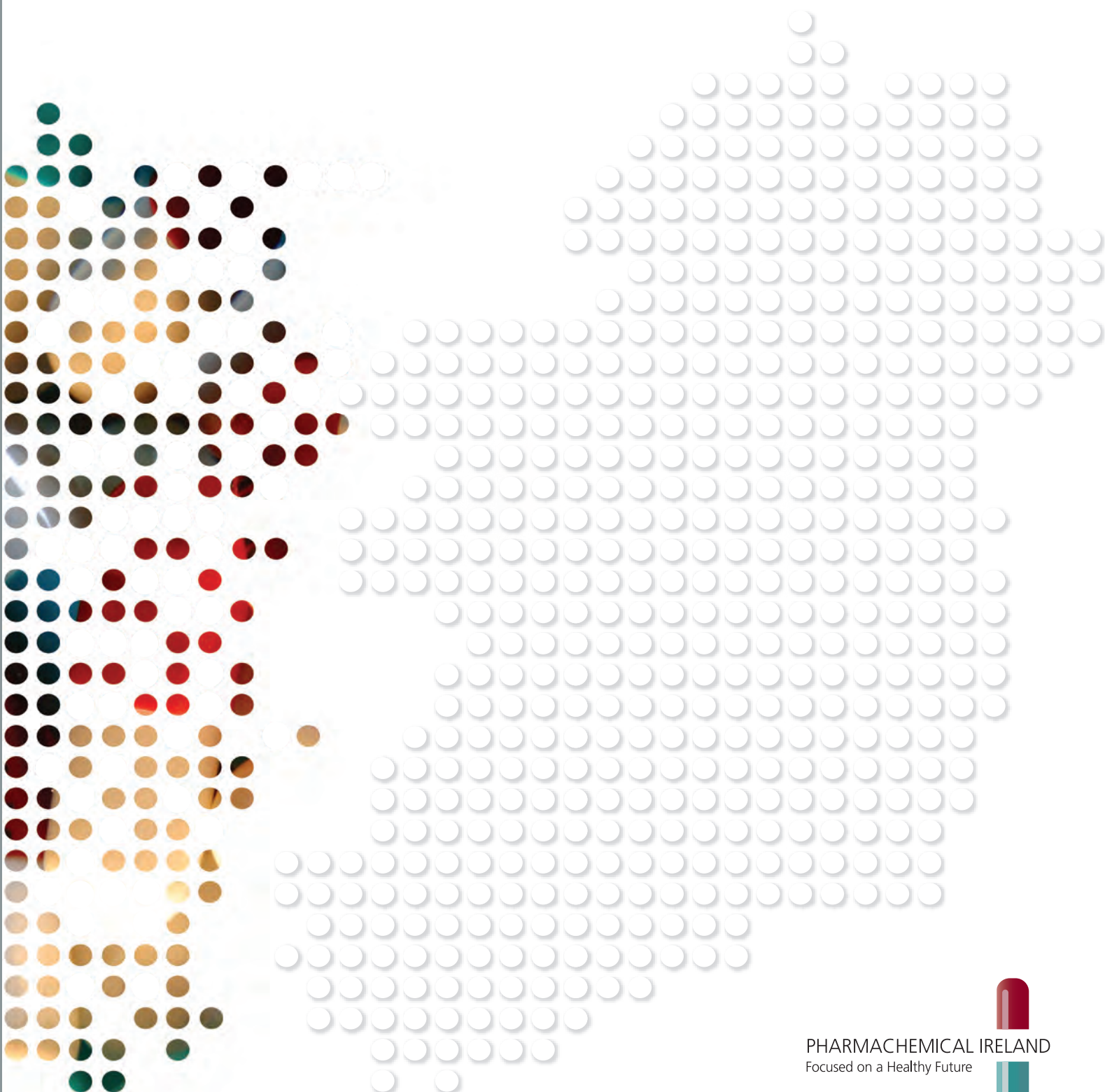


Innovation and Excellence

PharmaChemical Ireland Strategic Plan



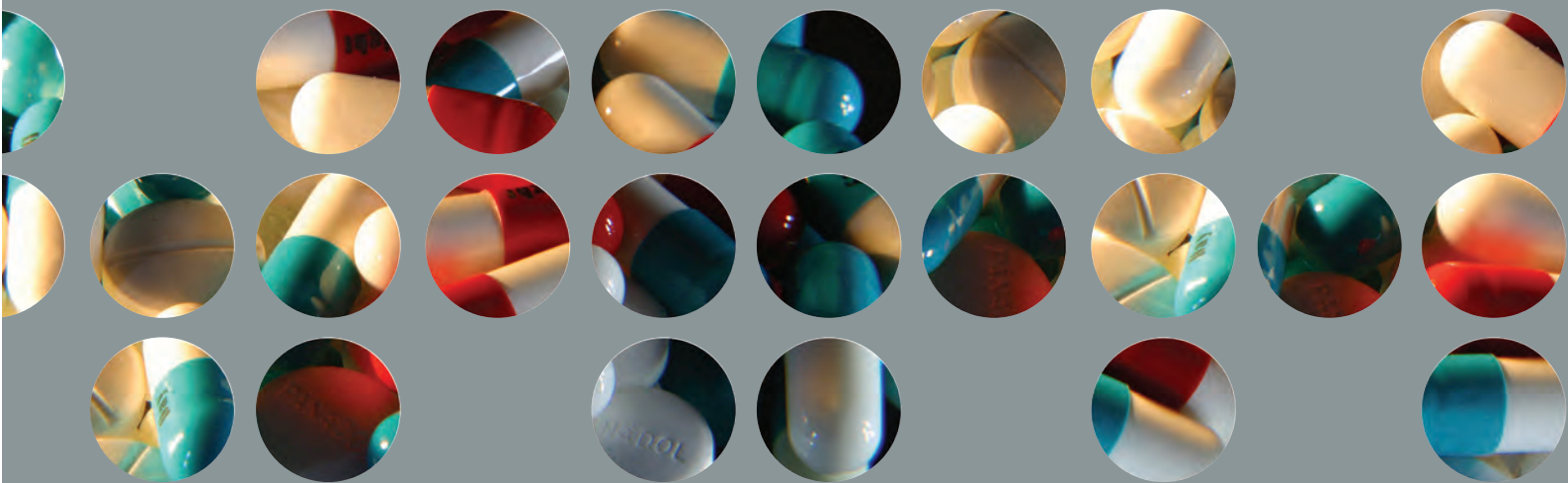
PHARMACHEMICAL IRELAND
Focused on a Healthy Future



a business sector within IBEC | the Irish Business and Employers Confederation

VISION STATEMENT

With the support of industry, Ireland will position itself as a recognised centre of excellence for innovation and development in pharmaceutical, biopharmaceutical and chemical supply, thereby becoming a location of choice for the launch of new products.



Innovation

Innovation and Excellence

PharmaChemical Ireland Strategic Plan

Introduction

The global pharmaceutical, biopharmaceutical and chemical industries face a challenging decade ahead. Major 'blockbuster' drugs are due to come off patent, and this will lead to a significant fall in revenues. As the sector opens up to generic competition, some commentators have estimated that this fall could be as much as €100 billion. Compounding the problem is the fact that new high-profile replacement products are not emerging from research in the same numbers as those that are going off patent.

This has major implications for the industry in Ireland as many of these blockbuster drugs are produced here. Ireland depends heavily on the pharmaceutical sector which generated over 50% of Irish exports, worth some €44 billion, in 2008. Responding to the challenges facing the sector must be a national priority.

In order to remain the great success story that it has become, industry, government and other related stakeholders need to meet these challenges head on. Companies need to respond by linking research directly to manufacturing, via process and product development. They also need to be as cost-effective and efficient as other lean manufacturing sectors such as the automotive or airline industries

The key objective is to develop the sector as a global centre of excellence for innovation and development, thereby ensuring that Ireland becomes a location of choice for the launch of new products.

With our deeply embedded knowledge of the pharmaceutical, biopharmaceutical and chemical supply sectors in Ireland, we need to take a leadership position to guide the future of the industry. PharmaChemical Ireland has developed this strategy document to assist all the stakeholders connected to the industry to meet these challenges.



Dominic Carolan

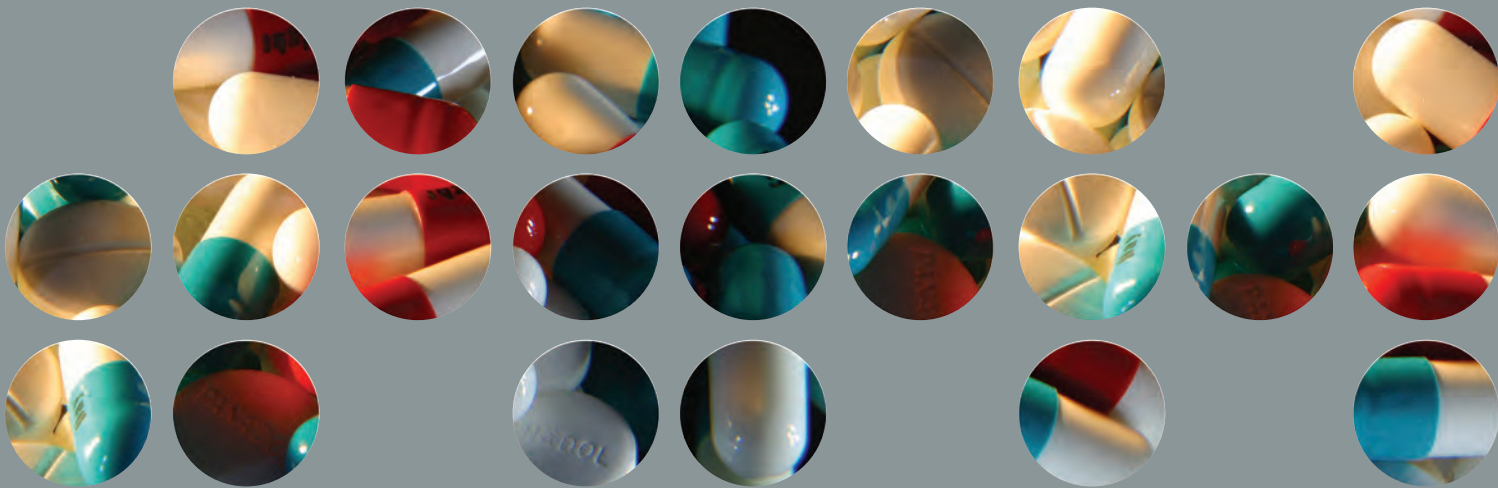
Senior Vice President and Managing Director
Genzyme Ireland Ltd
Chairman, PharmaChemical Ireland



Matt Moran

Director, PharmaChemical Ireland

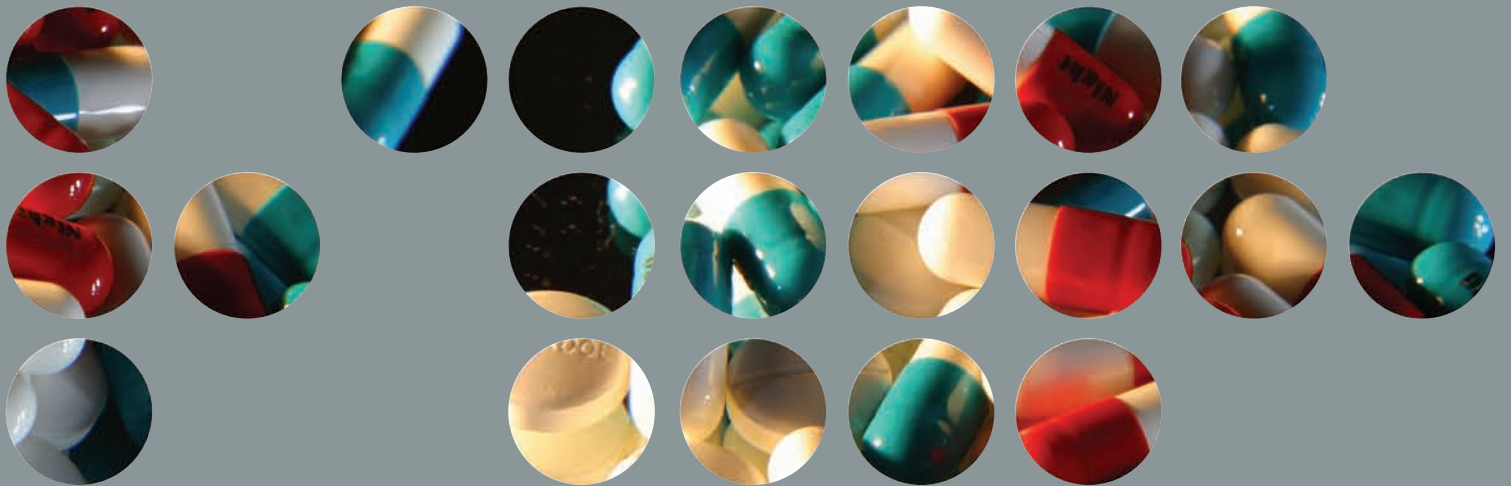
IBEC will promote the interests of business and employers in Ireland by working to foster the continuing development of a competitive environment that encourages sustainable growth, and within which both enterprise and people can flourish.



Innovation

MISSION STATEMENT

PharmaChemical Ireland will lead the sector towards achieving its vision by bringing together all relevant stakeholders in the State, namely, industry, the Government, the research community and the public at large, to effectively communicate the unique attractiveness of Ireland as a leading location for the supply and development of such products.



and Excellence

Background

The Irish pharmaceutical, biopharmaceutical and chemical industries are strong contributors to Ireland's economy and continue to grow steadily. The sectors have flourished because of the following intrinsic economic strengths:

- an innovative and resourceful workforce;
- a proven level of manufacturing and compliance experience;
- an inherent ability to comply with tough and demanding international regulations;
- competitive corporation tax rates;
- high education standards.

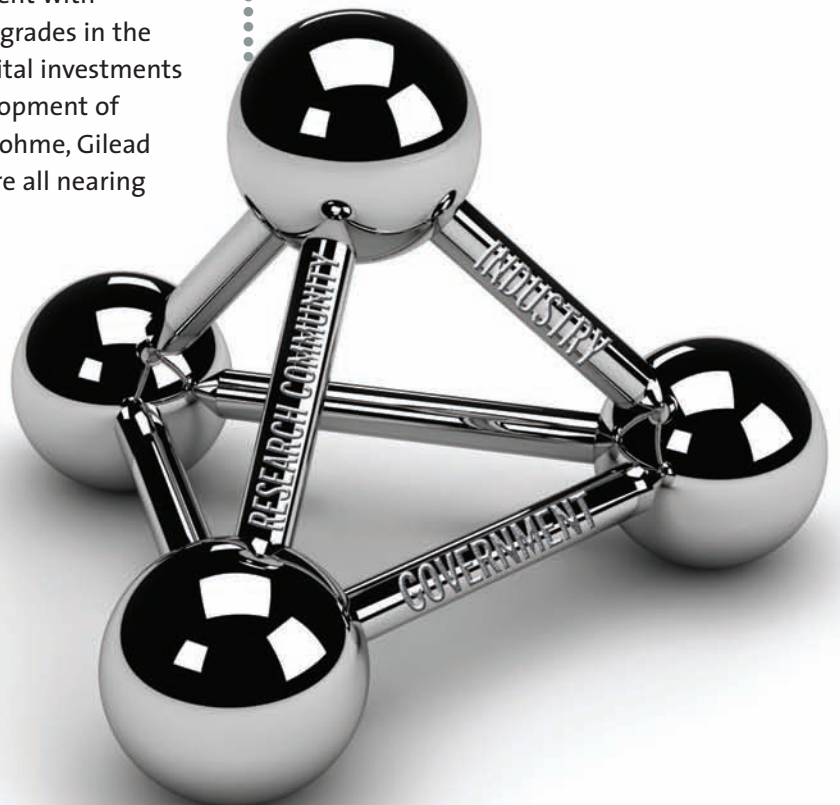
Ireland has an enviable history of success in the field, attracting some of the world's leading pharmaceutical companies. A significant amount of Allergan's global supply of Botox is made in Westport, while Pfizer's Lipitor, the world's top-selling pharmaceutical, anti-cholesterol medicine, is made exclusively in Cork, with revenues of over \$12 billion. These examples of industry success are repeated across the country, particularly in hubs such as Cork and Dublin. Eight of the top 10 pharmaceutical companies in the world have Irish facilities, and the country is one of the premier global locations for pharmaceutical and chemical product manufacture.

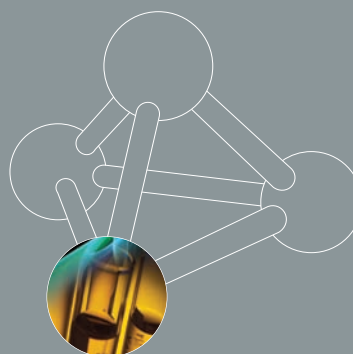
Recently published Central Statistics Office (CSO) figures show that the sector exported products to the value of €44.17 billion in 2008, representing 51.2% of the national total. In 2007 the figure was €43.07 billion, 48.2% of the national total. The sector contributed more than €1 billion in corporation tax in 2008 and employs over 24,000 people, with at least twice that number working in businesses that supply goods and services to the industry.

A recent survey of 20 pharmaceutical companies in Ireland indicated expenditure of about €350 million during 2009 on capital projects, consistent with continuous investment and facilities upgrades in the sector over the past decade. Recent capital investments range from plant upgrades to the development of greenfield facilities. Merck, Sharp and Dohme, Gilead Sciences, Genzyme, Pfizer and Eli-Lilly are all nearing completion on major projects this year.

PHARMACEUTICAL EXPORTS

- Ireland's pharmaceutical industry currently generates over 50% of the country's exports, which contributes to making Ireland the largest net exporter of medicines in the world
- The sector exported products to the value of €44.17 billion in 2008, representing 51.2% of the national total
- The sector contributed more than €1 billion in corporation tax in 2008





The challenge facing the industry

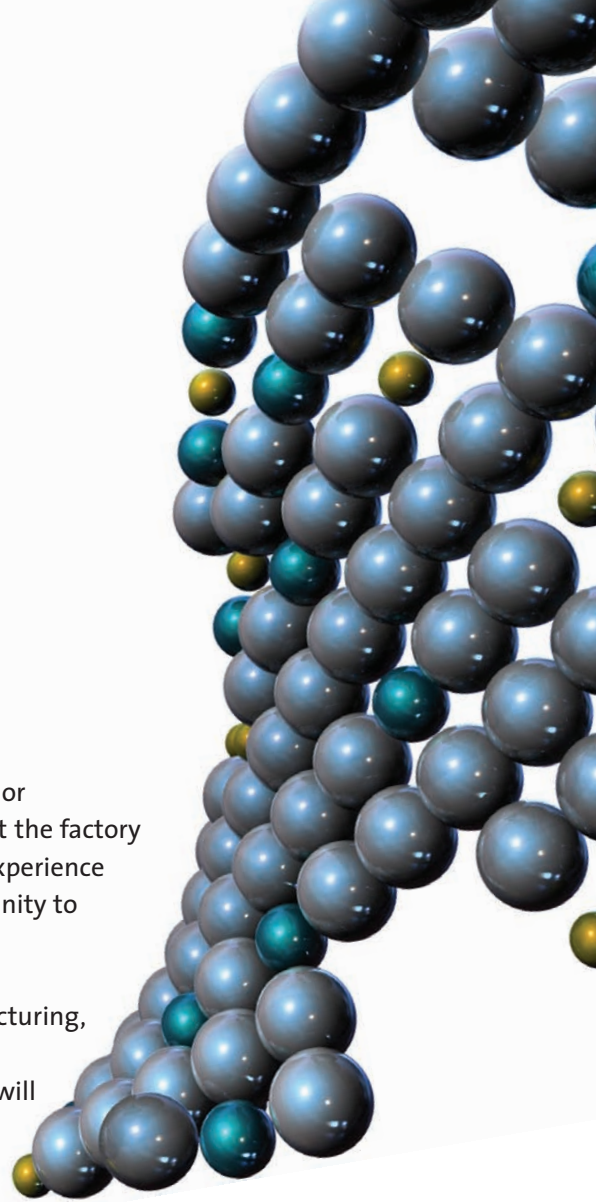
While the current success of the pharmaceutical sector is a cause for optimism, complacency must be guarded against. The industry currently faces two major challenges: the impending expiration of many patents and a diminishing level of research. A number of products currently manufactured in Ireland have come off patent and more patents are due to end over the next two to three years.

Once a pharmaceutical agent comes off patent and cheaper generic alternatives enter the market, strong downward price pressure ensues on the original product, driving revenues down. Compounding this issue is the fact that current research efforts struggle to produce innovative products to meet therapeutic needs, given that regulators and payers are increasingly unwilling to support incremental improvements to existing therapies.

These challenges require an active response. This entails giving global companies new reasons to base major facilities in Ireland – setting the country apart from competitive economies that are chasing the same investments.

Ireland cannot compete directly with low-cost economies on cost grounds alone. Companies need to secure competitive advantage through smarter ways of doing business, including better use of technology, innovation, and cost-control. It is vital that employees in these facilities continue to be flexible and to work with their sites to ensure that required change is facilitated and embraced.

Major industry regulators, including the Irish Medicines Board (IMB) and the US Food and Drugs Administration (FDA), actively encourage the pharmaceutical industry to improve manufacturing processes. It is estimated that the top 30 pharmaceutical companies in the world could save \$10 billion by taking just 16% off their cost of goods. These savings will be found in the manufacturing functions through ongoing innovation.

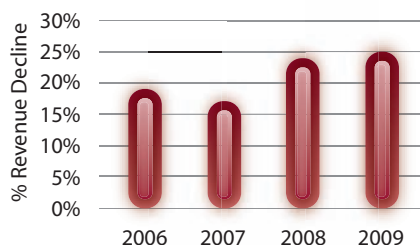


Ireland must be at the forefront of manufacturing innovation. Major multinationals are dedicating effort and resources to innovation at the factory level, bringing the lab into the workplace. Using knowledge and experience from the manufacturing presence in Ireland offers a huge opportunity to compete more effectively.

Already known as a hub for pharmaceutical and chemical manufacturing, Ireland's challenge is to become a hub for the development and scaling-up of existing products. If this can be achieved, the sector will be secure in the long-term, thereby enhancing Irish intellectual capital.

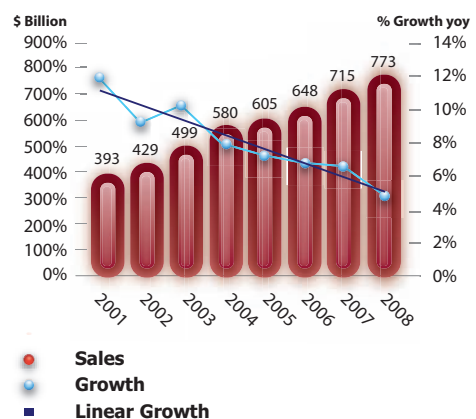
Ireland can also gain a reputation for swift technology transfer and development – shortening the time it takes for a drug to move from clinical trial to the market. This would be a clear strategic advantage for a sector where the amount of days saved leads to multiples of millions of euro in savings.

Figure 1. Total Average Big Pharma* Revenue Decline due to Scheduled Patent Expiries



*Big Pharma average includes J&J, Novartis, Merck & Co., Abbott, Eli Lilly, Glaxo SmithKline, Pfizer, Sanofi, Bristol Myer Squibb and Roche;
Source: Moody's FM

Figure 2. Global Pharma: Sales & Sales Growth 2001-2008



Source: IMS Health Market Prognosis. March 2009

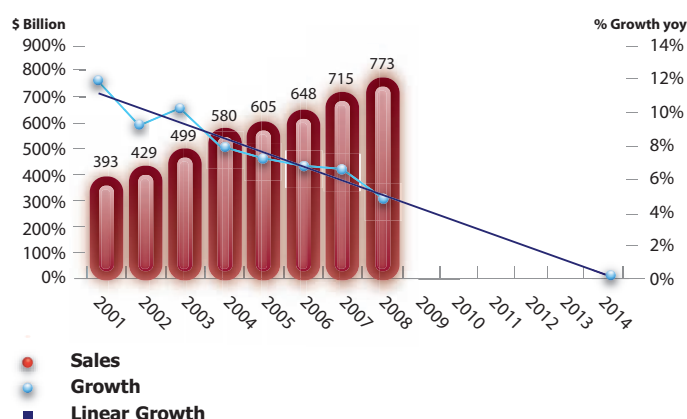
Innovation and Excellence

PharmaChemical Ireland Strategic Plan

Irish sites can build on their success to encourage the global parent to centralise knowledge-based activities at the Irish hub. Such a strategy is clearly reflected in the Government's Smart Economy report. The document makes a number of recommendations to enhance the active management and taxation of intellectual property. Swift action by the Government in this area would greatly enhance the possibility of the Irish hub concept becoming a reality.

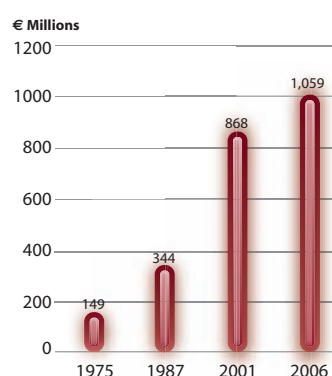
It is important that the Government continues to apply our current low rate of corporation tax. Specifically, it is crucial that the Government enhances the R&D tax credit scheme by moving from a system based on incremental investment in research to one based on absolute investment (eg, volume-based costing method).

Figure 3. Global Pharma: Sales Growth, extrapolation



Source: IMS Health Market Prognosis. March 2009

Figure 4. Cost of developing an innovative medicine



Source: J.A DiMasi and H.G. Grabowski, 'The Cost of Biopharmaceutical R&D: Is Biotech Different?, Price of Innovation: New Estimates of Drug Development Costs', Managerial and Decision Economics 28 (2007): 469- 479

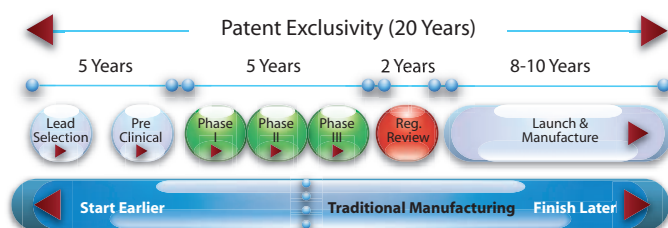
Companies need to be encouraged to invest in innovation. Ireland not only needs to continue its investment in R&D infrastructure, but also to expand this to include the processes that take place between research and manufacturing. This includes process design and development as well as product optimisation – taking the product from the clinic or design laboratory to the market. Seamless transition from R&D to manufacturing is a key step in ensuring the sector's future. This will enable the country to develop its existing manufacturing base.

Finally, if Ireland is to successfully persuade global pharmaceutical companies to invest in innovation, it is crucial that our healthcare policy complements this by supporting access to innovative medicines and medical technologies that are developed in Ireland. It is vital that the Government continues to take a long-term view of the overall cost of healthcare where medical treatment funding is regarded as an investment in the nation's health and economic prosperity. Such an approach will send a positive signal to pharmaceutical companies.

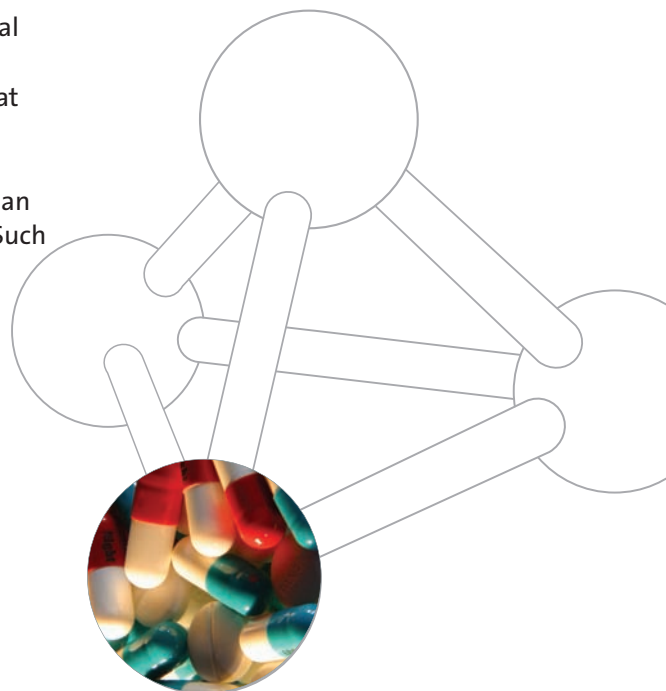
DIRECT EMPLOYMENT

- Employment in the sector has grown from 5,200 in 1988 to 24,500 in 2008
- Over 24,500 people are employed providing services to the sector
- Over 50% of the employees are third-level graduates

Figure 5. Achieving Success In Drug Discovery - Development + Manufacturing



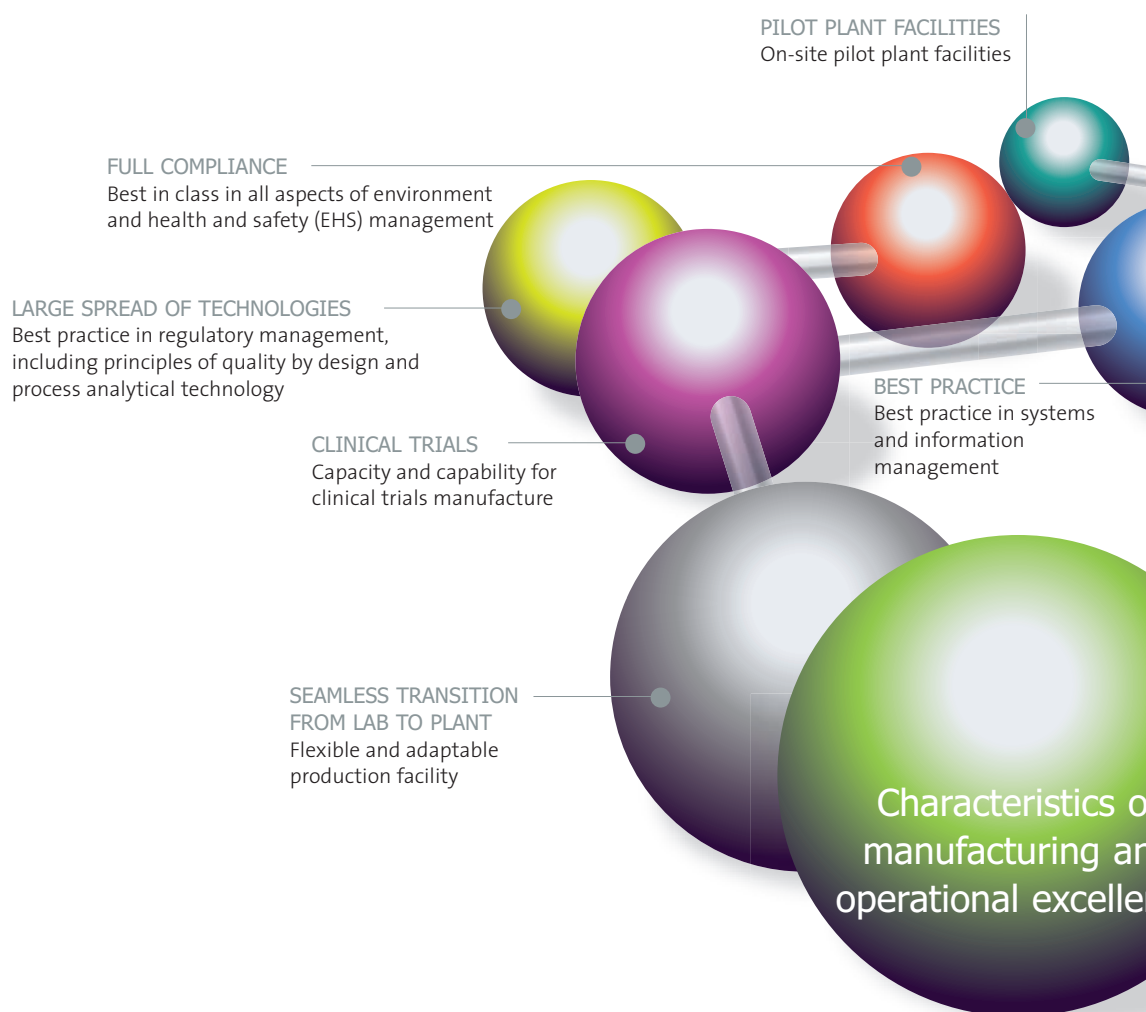
Start Earlier, Finish Later
'Receiver' to 'Co Creator'



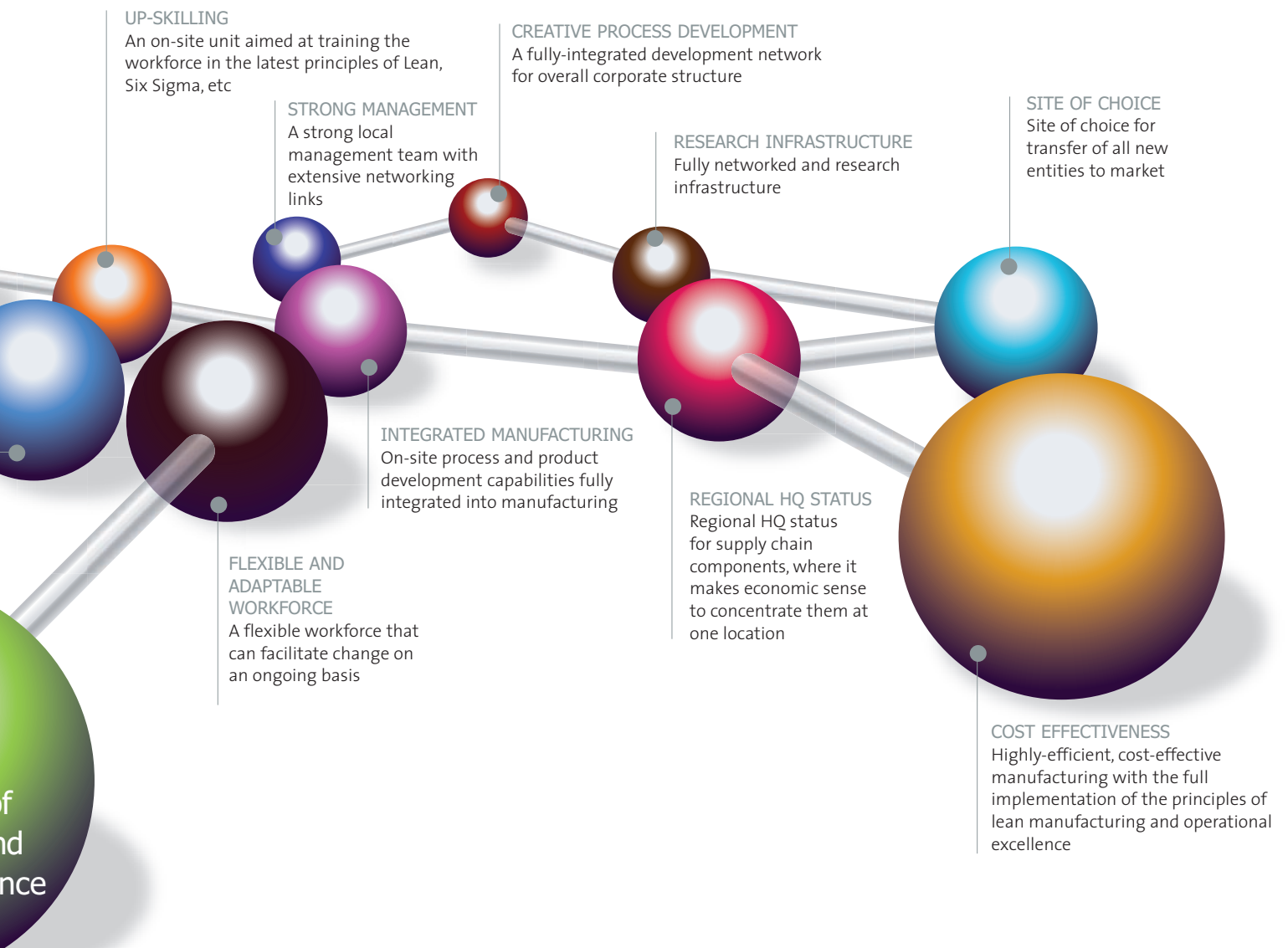
Building Ireland's Smart Economy
A framework sustainable economic Renewal
(Dec 2008) Department of the Taoiseach

The **future** prospects for the industry in Ireland

As the global sector enters this phase of increasing competition, it will be essential that every Irish site revises its business model. Simple high-volume manufacturing will not sustain the long-term future of the industry. Outlined below are the attributes which members believe the site of the future must have in order to make Ireland a centre of manufacturing excellence, research and development and marketing of highly innovative products and services.



“To make Ireland a centre of manufacturing excellence, for research and development, for marketing of highly innovative products and services.



Recommendations

Industry, the Government and the research community can set the scene for the evolution of the sector by working together. We suggest the following recommendations for each of these partners.

Recommendations **Industry**

- Benchmarking of operations • Reduction of operation costs • Investment in Innovation activities
- Conduct or co-ordination of clinical trials • Collaboration with the Government and the research community
- Best in class in regulation requirements • Convergence of technologies • A flexible, adaptable workforce

What does the **industry** need to do to achieve this?

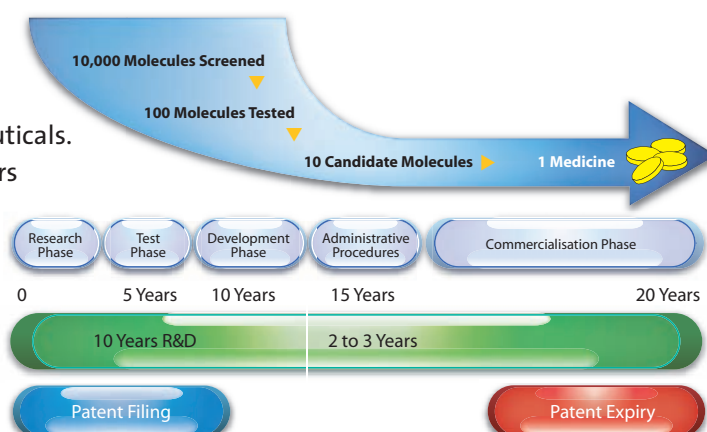
- Companies need to strive to be regarded as lean by closely monitoring and benchmarking those key indicators that allow them to track their own efficiency and productivity.
- The industry must persuade companies to invest in on-site innovation – this should include process optimisation, product development and clinical trial manufacture, scale up and technology transfer.
- The industry must establish a rationale for conducting or co-ordinating clinical trials out of Ireland. An industry taskforce comprising PharmaChemical Ireland, IPHA, HRB, representatives from the clinical research community, ICRIN, IPPOSI, IBIA should be established to examine its feasibility.
- In collaboration with the Government and the research community, industry should prepare a comprehensive marketing plan for an Irish life sciences cluster. The plan should address all components of a successful cluster such as industry, research centres, government agencies and all other supporting cluster components. Consideration should be given to positioning the country as a bridge between the US and Asia.
- Companies and their supply bases must reduce their operating costs across the board in order to recover relative competitiveness within their own corporate networks. All cost components, including labour, energy, cost of capital, waste treatment, local authority charges, etc. need to be controlled.

IPHA: Irish Pharmaceutical and Healthcare Association
HRB: Health Research Board
ICRIN: Irish Clinical Research Infrastructure Network
IPPOSI: Irish Platform for patients organisations
IBIA: Irish BioIndustry Association

- The Chemical and Pharmaceutical Report from the Technology Foresight Exercise recommends a rapid response regulation strategy. This strategy recognises the need for Ireland to be the most favourable global location to meet the properly stringent national and international regulatory requirements. It covers all forms of regulation including quality, health, safety and environment. It makes reference to a number of regulatory bodies including the Irish Medicines Board (IMB), the European Medicines Agency (EMA), the FDA, the Health and Safety Authority (HSA) and the Environmental Protection Agency (EPA).
- The Technology Foresight Report also identifies the benefit to industry of quickly meeting regulatory requirements. In the case of a medicine, this can result in significant financial savings for the company. It is essential that the industry ensures that the necessary expertise is available in Ireland. Moreover, companies need to actively invest in up-to-date regulatory approaches, such as those which have been identified by the FDA in its 21st Century Initiative, including Quality by Design, Process Analytical Technology, etc. It is important that companies apply these principles rigorously to achieve real efficiencies and cost savings through reduced testing and regulatory track streamlining.

As healthcare requirements develop and change, technologies will converge. Pharmaceuticals and medical technologies are already coming together, as shown by the evolution of drug eluting stents. Information technology and telematics will unite via medical diagnostics and pharmaceuticals. Due to the strong presence of all these sectors in Ireland the industry is well placed to drive this process forward.

Figure 6. Medicines Life Cycle



Recommendations **Government**

- Low corporation tax • RDI investments Incentives • Costs • Increased support for science education
- Attraction of highly-skilled employees • Infrastructure support in place • Establishment of a life science council • Integrated strategy for the development of the industry • Implementation of the recommendations of the high-level group on manufacturing • Support for the recommendations of the European Commission High-Level Group on chemical industry

The **Government**

- It is imperative that the Government continues to endorse the 12.5% rate for corporate tax.
- The Government must stimulate investment by enhancing the R&D tax credit scheme. It should be a purely volume-based scheme and, in addition, companies should be permitted to write off R&D expenditure against operational costs.
- The Government must ensure that Ireland is an attractive location for highly-skilled employees. It should consider tax breaks for overseas employees to encourage them to locate here. They in turn will then promote Ireland as a location for future investment and attract more similarly skilled people.
- The Government must prioritise support for the teaching of physical sciences at second level. The recommendations of the Task Force on Physical Sciences need to be implemented in full.
- Enterprise Ireland and the IDA need to develop an integrated strategy for industry development and actively promote interaction between foreign-owned and indigenous firms.
- The high-level group on manufacturing identified a number of measures to support business at the level of the firm. These include the establishment of a manufacturing forum, support for productivity improvement, benchmarking and support for R&D and training. It is important that the Government implements these recommendations and ensures that the pharmaceutical sector has access to them.
- The Government should actively support the recommendations of the European Commission high-level group on chemicals.
- Government spending policies should where possible positively influence and encourage medical research into new therapies which can lead to new product candidates or improvements to existing ones.

Task Force on Physical Sciences: (2002), Department of Education and Science

The report of the High Level Group on Manufacturing: (March 2008), Forfàs

High level Group on the competitiveness of the European chemical industry final report: (2009) European Commission



• VALUE OF PHARMACEUTICAL SECTOR INVESTMENT

- Eight of the top 10 companies in the world have substantial operations in Ireland
 - Companies indicated planned expenditure of about €350 million during 2009 on various capital projects
 - The replacement value of the sector is estimated to be €40 billion
-
- The Government has committed to fund the National Bio-processing Research and Training Centre. This is a welcome development and will provide valuable support to the bio-pharmaceutical sector. However, if the pharmaceutical sector as a whole is to broaden its remit to embrace process development in a meaningful way, it will be necessary to expand the centre to support the chemical and the specifically pharmaceutical part of the industry, commonly referred to as 'small molecule'. The centre should provide expertise in such areas as organic synthesis, drug formulation, reactor design and green chemistry. (The need for such a facility was identified by the Irish Council for Science Technology and Innovation and Forfás in their statement titled Embedding the PharmaChem Industry in Ireland.)
 - The Enterprise Strategy Group recommended that public funding for applied research and in-firm R&D should be progressively increased to match that provided by the Department of Enterprise Trade and Employment for basic research. This includes support for in-firm capability, development, commercialisation, and cluster-led academic research and innovation partnerships. There are some notable examples of how this approach has already paid dividends through the Science Foundation Ireland (SFI) sponsored Centres for Science, Technology and Engineering (CSETs) and the Strategic Research Cluster in crystallisation, recently established out of the University of Limerick. The Government needs to ensure that this activity is prioritised and that the level of investment in applied research at least matches that in fundamental research.
 - The Government must ensure that adequate infrastructural supports are in place, with a waste disposal infrastructure, including provision for thermal treatment of hazardous waste.
 - The Government must avoid adding to the cost base through excessive charges for its services or those delivered via local authorities, examples of which include commercial rates, development levies, waste and water charges etc.
 - The sector is highly regulated by a number of state bodies including the IMB, HSA and EPA. Additionally, the industry is subject to regulatory oversight from the US-based FDA and European EMEA. It is critical that the regulatory burden placed upon the sector in Ireland does not place the industry at a relative competitive disadvantage to its competitors for investment.

Recommendations **Research Community**

- Greater collaboration between the research community and industry
- Intellectual property
- Industrial placements for graduates
- Government-funded research should reflect the needs of the pharmaceutical industry

The **Research Community**

- It is important that Higher Education Institutes (HEIs) ensure that industry is aware of their research programmes, thereby enabling collaboration at an early stage. HEIs should ensure that they have well-funded and dynamic translational research programmes in place in addition to fundamental research programmes.
- HEIs must ensure that industry friendly systems are in place to identify and exploit intellectual property (IP) as it arises. They should be open to innovative approaches to exploitation of IP, which may entail licensing to industry. They should ensure that effective IP units are in place, reflecting and promoting best practice, as outlined in the Forfás guides on IP.
- Interaction between the HEI sector and industry could be further enhanced if an industrial placement were integrated into courses in physical sciences and chemical engineering. This would expose graduates to the world of industry, provide them with an insight into an industrial environment and promote future collaboration.
- The Government has invested significant amounts into the research sector via the HEI-backed Programme for Research into Third Level Institutes (PRTL), which in turn has invested in a major infrastructure programme. The Government has also committed major funding to the research base via SFI, prioritising life sciences. It is critical that this work takes account of pharmaceutical, biopharmaceutical and chemical supply sector needs where applicable, in conjunction with SFI funding objectives. PRTL centres should be promoted to the industry by the relevant research institutions and, where applicable, provide research support and services to the sector.



Conclusion

If Ireland is to sustain its leading position as a global supplier of pharmaceutical, biopharmaceutical and chemical products, the respective supply sectors will have to transform. This transformation will take place at company level, with the Government, its agencies and the research sector playing a key collaborative role in this process.

Manufacturing alone will not be enough to ensure the long-term presence of the industry in Ireland. Research, development and innovation will drive the transformation process forward. Many factors present hurdles, including: expiry of patents on blockbuster drugs manufactured in Ireland; a rising cost base; competition from Asia and other locations; and the further consolidation of supply-chains. These factors will erode the country's manufacturing base unless action is taken.

Companies need to embrace the concepts of manufacturing and supply-chain excellence, as well as those of on-site innovation, such as process and product development. Ultimately, if Irish sites achieve this goal and the country can become a global centre of excellence for development and manufacturing, they will be well positioned to participate meaningfully in discovery-related activities. Also, opportunities for indigenous companies in areas such as high-end synthesis, biotechnology, contract research, specialist centres and contract manufacturing will inevitably emerge. Hence, a much more embedded, integrated and sustainable sector will develop.

In order to achieve these goals, it is necessary that stakeholders are aligned in a collaborative manner. Ireland does not have the time or resources to duplicate its effort. Now is the time to be smart and agile. The existing Government support network and the local management of pharmaceutical companies in this country are strong and integrated. It should be possible to build upon this strong history and for this country to move on to become a centre of manufacturing excellence and innovation.

