



Establishing a Grand Innovation Challenge Process for Ireland

A Working Paper from the American Chamber of Commerce Ireland
Research, Development and Innovation Leadership Forum

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About the American Chamber

The American Chamber of Commerce Ireland is the leading international business organisation in Ireland and is the leadership voice of US companies here. The American Chamber's membership includes US companies operating from Ireland, their strategic partners, and organisations with strong bilateral trade links between Ireland and the United States. The Chamber engages with members at a leadership level and runs a high quality event programme covering a range of subjects.

The Two-Way Relationship



Acknowledgement: The Chamber was delighted to have the research leadership and facilitation support of Leonard Hobbs on this project. Leonard is one of Ireland's leading technologists in the ICT sector with close to 30 years of experience, mostly with Intel, spanning leading edge research to technology transfer to advanced manufacturing and high volume operations in the US, Europe and Ireland. In May 2017, Leonard was appointed the Director of Research and Innovation at Trinity College Dublin.

FOREWORD



The American Chamber believes that the strategic innovation goal for Ireland should be to attract further public-private investment through proven partnerships between US foreign direct investment (FDI), Ireland's research, development and innovation system (RDI), indigenous enterprise and the wider public sector, which would double national spending on RDI by 2025.

The American Chamber believes Ireland should show innovation leadership by establishing a globally significant challenge-centric programme – one that addresses an issue of national and global significance and captures the imagination of the public. This programme will draw on the nation's innovative capacity while enabling the further development of foreign direct investment assets in Ireland to attract new enterprise.

The aim of this working paper is to stimulate debate among enterprise policy stakeholders on the criteria for consideration, and the strategies to establish a process for a 'Grand Challenge' for Ireland. The paper expands on the analysis of the strategic recommendation made in the Chamber's paper 'Ireland's Innovation Pathway to 2025' published in 2015 and on the ambition within the Government's 'Innovation 2020' strategy to have 'Innovation address the grand challenges of our time'.

This paper reflects the views of the American Chamber's Research, Development and Innovation Leadership Forum. The Forum aims to identify positive steps that can be taken to enhance the innovation environment in Ireland to maximise economic and societal impact. In addition, the Chamber sought the views of key stakeholders in Ireland within the research ecosystem, the broader industry sector, academia and the relevant government agencies. The recommendations of the paper are based on the evolution of Ireland's national innovation ecosystem, and how it needs to compete with other nations in delivering results locally with global impact. The American Chamber believes that the development and deployment of a Grand Challenge process and programme could drive this evolution.

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Executive Summary

- Ireland should establish a globally significant challenge centric development and innovation programme by 2020 as the next logical step in evolving the country's innovation-led economy.
- This paper describes examples of Grand Challenge programmes across the world, such as Denmark, a stand out example with a recent shift in its national innovation strategy.
- Ireland trails the innovation investment levels of other Innovative leading nations with a level 1.5% of GDP.
- In 2015 the Chamber published a paper: 'Ireland's Innovation Pathway to 2025' setting out an ambition for Ireland to become a global leader in the use of "Challenge Centric Investment."
- The experience in Ireland suggests that sustaining the public's imagination to solve a 'challenge' requires alignment with government programmes. Resourcing and industry support will be keystone components for any future programme.
- An extensive outreach process was undertaken through a series of one-to-one interviews which provided feedback themes on the criteria for a Grand Challenge Programme. Feedback revealed that a catalogue of Grand Challenges should be defined with target implementation dates into the next decade.
- The paper recommends a proposed Model for the Grand Challenge Programmes based on Public Private Partnerships (PPPs) in Europe and, in particular, 'Joint Undertakings' which combine public and private investment in pursuit of multi-million Euro projects..

Introduction

The American Chamber of Commerce Ireland believes that Ireland should **establish a globally significant challenge-centric development and innovation programme** by 2020 as the next logical step in evolving the country's innovation-led economy.

This next phase for the national research, development and innovation ecosystem will be key to establishing productive collaborations between the public and private sectors in focusing the nation's innovative capacity to address challenges of real impact on the lives of Ireland's citizens with global application.

Grand Challenges have existed for some time and continue to inspire scientists, engineers, inventors and entrepreneurs to reach new heights. They have the potential to galvanise public/private transdisciplinary and trans-organisational collaborations. Parties can focus on delivering a challenge of significant economic and social relevance. The pursuit of these high-level challenges also gives rise to the creation of innovative ecosystems and clusters, which can go on to deliver further benefits to the nation, as new companies are spawned by the learnings acquired in pursuit of the Challenge itself.

This paper describes examples of Grand Challenge programs across the world. Denmark is a stand out example with a recent shift in its national innovation strategy to an initiative entitled "Denmark – a nation of solutions". This initiative identifies grand societal challenges that can be translated into growth and employment within a 3 to 5-year window.

As part of the American Chamber's consultation, many stakeholders from industry, academia and government organisations were engaged in this process of gathering input on the selection criteria for a Grand Challenge. They were also involved in discussing the key strategies required for such a challenge to be implemented and governed.

Based on the feedback gathered, a set of criteria has been created to advance the debate. These included fourteen line items covering global applicability, scalability, time required to deploy the solution, and pre-existence of the required skill set to deliver on the Grand Challenge.

Several strategies are proposed in this paper focused on the implementation of a Grand Challenge process. These include:

- the allocation of **significant extra public funding** for the research, development and innovation (RDI) system, which would be matched by private investment
- **cross-government department collaboration**, a governance structure which manages budgets and measures progress towards discrete goals within a tight timeframe, and
- **the development of a selection process** for the first and subsequent Grand Challenges.

The American Chamber believes these recommendations should result in a catalogue of challenge-led projects, each with a defined roadmap for execution

The American Chamber believes these recommendations should result in a catalogue of challenge-led projects, each with a defined roadmap for execution and a strong marketing campaign to engage the public in understanding the merits of the Grand Challenge, with the aim of mobilising public support.

Finally, a **potential implementation structure is proposed which is based on a European innovation public-private partnership (PPP) model** to engage senior leadership across all stakeholder groups while looking to industry, in collaboration with academia, to lead the development of Grand Challenge categories and relevant roadmaps.

The American Chamber is providing **thought leadership** within a stakeholder dialogue on this topic. The **next steps** should aim for the formulation of agreed criteria, **an implementation process and a funding plan for a Grand Challenge Programme for Ireland as an identifiable part of the Government's 2018 programme** in readiness for launch and implementation by 2020.



CONTEXT

Policy Environment and Comparatives

Policy Perspectives

The EU Commission has stated Europe has *“major difficulties in translating its ideas into marketable products – in crossing the internationally recognized innovation valley of death”* and subsequently set up a process to address the challenge within the H2020 framework. Ireland today faces a similar challenge.¹ Ireland trails the innovation investment levels of other innovative leading nations with a level 1.5% of GDP. For example, according to the OECD, Israel, Switzerland and Finland have been investing at levels of +2.5% of GDP. Ireland continues to target its innovation investment in the lower Technology Readiness Levels (TRL)² with 70% of Irish research centre spending being at TRL 4 or lower.³ The American Chamber is of the view that a truly innovative economy would need to invert this relationship and invest more in the higher TRL levels – building on the quality of excellence in its existing research eco-system.

In 2015 the Chamber published a paper: ‘Ireland’s Innovation Pathway to 2025’⁴ setting out an ambition for Ireland to become a global leader in the use of “Challenge Centric Investment.” The Chamber envisioned that this would be accomplished through flagship programmes delivering measurable socio-economic impacts which leveraged Ireland’s RDI ecosystem. Applied to thematic challenges – these programmes would take on significant societal and/or economic challenges. This could build on a foundation of public-private investments in which US FDI collaborations with an evolving RDI ecosystem would be an enabling feature. Success would create a new FDI proposition aimed at doubling the level of FDI investment to Ireland over the next decade. This in turn would drive the investment in RDI towards 3% of GDP and position Ireland amongst the global RDI leaders.

The government’s latest policy document on innovation³ sets out a new RDI investment target of 2.5% of GNP by the end of the decade. It recognises the need for *“a coherent joined up innovation system”* which would be *“internationally competitive and act as a magnet and catalyst for talent and industry”*. It foresees a doubling of private investment in R&D. While it continues to focus on 14 priority areas, it proposes to position these areas within 6 broad enterprise themes. Encouragingly it proposes to adopt a *“challenge centric approach by focusing on research that has the potential to address national and global challenges”* and describes a whole-of-government strategy that will ensure that the public sector research system takes advantage of collaborations with the private sector. It goes on to acknowledge that *“challenge-led innovation is an increasingly important concept and that stimulating solutions driven collaboration will foster inter-disciplinary consortia of enterprise, higher education institutes and public service delivery bodies”*.

Grand Challenges across the World – Different Pathways

UK | **The Longitude Prize** is a £10m prize fund that will reward a competitor that can develop a point-of-care diagnostic test to conserve antibiotics for future generations and revolutionise the delivery of global healthcare. The test must be accurate, rapid, affordable and easy to use anywhere in the world.⁵

US | **The Sun Shot Initiative** is a federal government program run by the US Department of Energy’s Solar Energy Technologies Office. It bills itself as a national effort to support solar energy adoption in order to make solar energy affordable for all Americans.⁶

EU | **The Graphene and The Human Brain Project** are €1bn projects expected to last for 10 years and turn scientific advances into concrete opportunities, growth and jobs while addressing some of the major societal challenges Europe is facing.⁷

New Zealand | **National Science Challenges** is designed to take a strategic approach to the government’s science investment by targeting a catalogue of goals, which, if achieved, would have major and enduring benefits for New Zealand. Funding of nz\$1.6b (us\$1.1b) is expected over 10 years.⁸

Canada | **Grand Challenges Canada** funds a wide portfolio of projects that integrate science and technology with social and business innovation for low and middle income countries. Since 2010, over 700 projects in more than 80 countries address topics such as “saving lives at birth”, “global mental health” and “point of care diagnostics”.⁹

Foundations | **the Bill and Melinda Gates Foundation**¹⁴ launched ‘Grand Challenges in Global Health’ in 2003. Focused on 14 major challenges, it is granting over \$450m to scientists in 33 countries. In developing countries, the focus is on improving people’s health and wellbeing while in the US, it’s on getting young people access to the education opportunities.¹⁰

Ireland | **‘Your Country, Your Call’ initiative** was launched with a prize fund of €100k and the promise of a further €500k in funding focused on ambitious employment targets. The initiative eventually saw the two projects merge into the establishment of an *International Digital Services Centre* to provide a one-stop shop for SME’s to grow exports by embracing a digital transformation of their business.¹¹

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CASE STUDY

Denmark – A Nation of Solutions¹²



Denmark is recognised by the European Commission as an innovation leader¹³ with its performance in public-private co-publications a notable attribute. Furthermore, Denmark is a country of comparable size to Ireland¹³ (population 5.6m, GDP/capita \$53k versus Ireland's population 4.6m and GDP/capita \$54.5k). In late 2012¹⁴ Denmark began moving in a new direction in their national innovation strategy by launching an initiative entitled *'Denmark – A Nation of Solutions – enhanced cooperation and improved frameworks for innovation and enterprises.'*¹⁴

The vision set out Denmark as a nation where innovation solutions to address grand societal challenges would be translated into growth and employment. After receiving over 500 proposals from a variety of stakeholders, a number of workshops were run resulting in 21 priority areas. It was recognised that all the challenges could not be addressed at once. They would need to select challenges that they believed could meet with existing resources, and would be relevant from a global perspective.

A selection was made based on a set of 7 principles¹⁵ and, although not all principles were met for all challenges in their published 'INNO+ catalogue', they did act as an important benchmark for eventual selection:

- To be based on a societal challenge that may prove to be a driving force for growth
- To be built on a societal demand
- To have a significant effect on growth in Denmark in the short to medium term
- To build on knowledge-based innovation and a public sector-initiated innovation effort, as well as public regulation, public procurement etc.

- To build as far as possible on knowledge-based strongholds
- To build as far as possible on industrial strongholds
- To involve close and binding collaboration between companies, knowledge institutions and public authorities, including international collaboration when possible.

The resulting INNO+ catalogue¹⁶ was published in 2013. The INNO+ catalogue contained thematic areas, together with 21 underlying focus areas. Central to each area was a concrete goal which required a research project in collaboration with enterprise. Another important criteria was that innovation partnerships should create new synergies which could not be created by existing innovation and research projects.

A subsequent report by the relevant government department took the view that within a period of three to five years the projects should deliver solid results, enabling the business sector to expand revenue and employment. The challenge topics include: Innovative Transport and Urban Development, Food Production, Digital Solutions and Energy. The programme is executed within an agency called Innovation Fund Denmark.¹⁶

The Danish INNO+ (Innovation +) catalogue profiles 21 proposals which Denmark has determined to be promising areas of focus for strategic investment. The catalogue was published following extensive stakeholder dialogue and analysis. Shortlisted areas were chosen from an initial 500 proposals submitted for consideration.

Project examples include:

- The first project partnership "Blue Jobs via Green Solutions" began in 2015 with a goal of reducing marine CO2 emissions by 30% by 2020.
- This was followed by a second project, 'Future Cropping' currently operating with an ambition to develop new farming techniques with emission monitoring technologies.
- The goal of the "Next" partnership was to establish Denmark as the preferred country for early clinical testing of new medicines. Some tentative results¹² have shown it has had good success in creating synergies between the partners, with Danish and International industry getting access to excellent research. A further spinoff success has been strong collaboration with doctors and patients getting access to the newest medical treatments. The overall funding of the project was €6.7m and was shared 1:1:2 between Innovation Fund Denmark, the hospitals and industry.



Lessons Drawn

- It is clear Grand Challenges have existed for some time and continue to inspire scientists, engineers, inventors and entrepreneurs to reach new heights in achieving lofty goals.
- Grand Challenges can galvanise public/private transdisciplinary and trans-organisational collaborations as all parties can focus on delivering on a challenge of significant economic and social relevance.
- The pursuit of these high level challenges gives rise to the creation of innovative ecosystems and clusters which can go on to deliver further benefits to the nation- new companies are spawned and learnings acquired in pursuit of the Grand Challenge.
- Grand Challenges, when issued as a competition, can be effective but their scope can be limited when viewed in terms of participation and results. In addition, the ultimate goal of winning a prize can detract from the possibility of establishing a lasting ecosystem, as the competitive nature can limit the participation to a few winning organisations. As such, the overall capability of a small island such as ours may not be optimised following such a model.
- The move by countries such as Denmark and New Zealand to build a 'catalogue' of Grand Challenges, which are based on defined goals, and in the case of

Denmark on a limited time frame in terms of delivery, are worth considering. It not only promises to deliver across multiple fronts but also has the potential to add a 'can do' attitude to the innovative culture as good science gets translated into impactful products and services.

- Factors to consider in the establishment of a Grand Challenge process for Ireland include establishing a broad consensus in selecting the challenge across all sectors, public and private as well as bringing public opinion at large along the journey.

The experience in Ireland suggests that sustaining the public's imagination to solve a 'challenge' requires alignment with government programmes. Resourcing and industry support will be keystone components for any future programme. Critically, proponents of the 'Ireland's Call' were of the view that such programmes needed to 'think big and feel big' to meet expectations and deliver impact.

With this in mind, the criteria and process for selecting the Grand Challenges will be important. Governance aspects will also be significant as other countries have strong agreement at the most senior political level for the challenge. These comparators also have a clear structure in place for ownership and management of the process.

Stakeholder Research Results

An extensive outreach process was undertaken through a series of one-to-one interviews. These were carried out with over 40 stakeholders from industry, academia and Government, in the latter half of 2016, followed by a workshop hosted by the Royal Irish Academy in Jan 2017.

The participants in the one-to-ones and subsequently at the workshops were invited to:

1. Provide inputs into what criteria should be selected for a Grand Challenge

2. Describe how such a Grand Challenge should be executed.

3. Suggest examples of a good Grand Challenge.

Main Feedback Themes on the Criteria for a Grand Challenge Programme:

- a. **deliver operational solutions** in real environments in the near term.
- b. **be ambitious in scale**, avoid making just an incremental change.
- c. **draw upon existing capabilities, clusters and technologies**, as opposed to developing ideas from the research phase.
- d. **have a social and economic impact** on Ireland.
- e. **address a global concern** that is small enough to test but large enough to prove in Ireland. Perhaps something that only a small country could do.
- f. **add to the existing eco-system** beyond its current boundaries.
- g. must be sustainable given the **existing critical mass or pipeline of expertise** available.
- h. **utilise Ireland's unique assets** (e.g. the ocean, wind) or/and focus on **areas of existing large public spending** (e.g. health, social protection, education and infrastructure/transport).
- i. **actively captures the public's imagination** and mobilises political support for the programme's ambitions.
- j. **substantial industry funding** needs to be committed up front.
- k. provides Ireland with a **lasting competitive advantage** in the selected field.

The Case for a Catalogue of Challenges Attractive for Investment:

Feedback suggests that a catalogue of Grand Challenges should be defined with target implementation dates into the next decade. The development of a solution roadmap which would outline the steps towards completion of the first Grand Challenge, and describe subsequent Grand Challenges, would be a useful method to get all stakeholders engaged. Also, the 'supply chain' of the challenge should be understood and well-articulated.

A catalogue of Grand Challenges should be defined with target implementation dates into the next decade.

Government should articulate a vision of the programme. The Grand Challenge programme owner should have a process whereby they can interact directly with the corporate offices of MNCs. This engagement could be facilitated by IDA in partnership with SFI and its international network of peer reviewers, to help sell Ireland as a good place to do development to deploy innovations into user or market environments. Consideration could be given to the establishment of 'international innovation offices' in locations such as Boston and San Jose to act as portals for the Grand Challenge, co-located with consulates and development agencies where possible.

Main Feedback Themes on the proposed implementation strategies for a Grand Challenge Programme:

- **A New Process:** maximising Ireland's potential to delivery impact through a challenge centric funding programme.
- **Clear Outcomes:** clarity on identified project milestones, progression and outcomes against goals and a mechanism to share learnings through the course of the project.

- **Scale:** estimated public funding in the region of €50 - €100m, for a first 5 year phase of the Grand Challenge program, would be required to make the challenge relevant.
- **Clear Ownership:** committed and resourced CEO level leadership with recognised credibility is required for the duration of each Grand Challenge project, together with an appointed secretariat for the overall program management.
- **Anchor Sponsor:** A clearly identified government sponsor(s) embedded in an existing governmental organisation or alternatively a Government endorsed 'Foundation' is required to give strong political commitment to the aims of the programme.
- **Political Support:** programme needs to be at the core of a Programme for Government and represent a strong commitment from multiple/relevant Government departments.
- **Shared Commitment:** could be constructed like the European Public Private Partnership (PPP) process on a 1:1 shared funding basis - projects are defined by the industry but 'blessed' by the public bodies
- **Industry Leadership:** enterprise needs to be 'front and centre' in owning and driving the program.
- **Investor Certainty:** certainty, consistency and clarity is required on how the existing incentives such as the R&D tax credits/investment incentives will be applied to these higher TRL level projects.
- **IP Management:** needs to be simple and certain - complexity and uncertainty deters partnership formation. Learn from and apply international best practice from pioneer jurisdictions like Denmark.
- **Programme Data:** Access to relevant project data amongst the partners will be key to productive collaborations.
- **Cost Neutral:** the economic benefit to the country needs to be equivalent to or greater than the original investment.
- **International Promotion:** marketing of the challenge will be important to attract the right international players.

A Criteria Checklist

Based on discussions with the stakeholders described above, the policy context and consideration of international practice, the following recommended criteria for a Grand Challenge is presented as a checklist. A weighting for each criterion is proposed for indicative purposes only. In addition, it could prove useful to select some minimum threshold to ensure the desired profile of the Challenge is met – an effective 'knockout' rule.

CRITERIA	WEIGHTING	SCORE
1. Can the Grand Challenge deliver a complete solution within 5 years?	+3	
2. Does the Challenge address an economic and/or social issue for Ireland whose results would have global applicability?	+2	
3. Can the proposed solution be scaled into a high volume solution for Ireland?	+0.5	
4. How unique is this Challenge - has this been attempted/solved elsewhere in the world?	-0.5	
5. Are the required components for the solution in a deployment - ready state or is further research required to develop the component?	-1	
6. Is this challenge particularly suited to Ireland based on our size, natural resources or unique features?	+1	
7. Is there an existing critical mass of expertise including scientific competence, industrial competence, cluster, skills supply etc.?	+3	
8. Does the challenge address an issue which requires cross government department partnerships?	+2	
9. Will the Challenge engage with the SME and FDI sector equally?	+3	
10. Will this Challenge gain broad public attention and support?	+2	
11. Will this Challenge draw upon a trans disciplinary response including from the Arts and Humanities sector?	+0.5	
12. Will the Challenge foster an entrepreneurial culture driving further innovation within the economy?	+0.5	
13. Will the challenge engage with multiple regions and industry clusters in the country?	+0.5	
14. Does the Challenge require connections with international programs, such as other H2020 initiatives?	+1	

Recommended Programme Structure

Proposed Model for the Grand Challenge Programme

A model proposed is to use the Public Private Partnerships (PPPs) in Europe and in particular, the 'Joint Undertakings'¹⁷ which combine public and private investment in pursuit of multi-million Euro projects. The key features of this model would include:

- The establishment of an Expert Group to include members from the University, MNC and SME sectors to agree the Grand Challenges Ireland should pursue, and to describe a roadmap and a catalogue of challenges over time, based on an assumed/agreed funding envelope.
- The establishment of a cross-departmental and inter-agency 'public authority' group which would provide input on the Grand Challenge catalogue and to own the procedures and determine public funding levels for the Challenges.
- The establishment of a Grand Challenge directorate which would oversee the entire process, including the governance of the program and the calls for project proposals.
 - ↳ The directorate would select a full-time CEO and COO for each Grand Challenge whose role would be to define the business plans, build the most effective consortia from the most appropriate players and execute the business plans.
 - ↳ It is envisaged that an existing agency, such as SFI which already administer large 'partnership programs'¹⁹ could fulfil this role if adequately resourced.
- The establishment of a High-Level board which would have ministerial and/or Taoiseach involvement and include senior stakeholders in Ireland from industry, academia and government, along with international expertise which would include members from large corporates, the EU Commission etc. This board would own the Grand Challenge programme and would champion the goals of the initiative at Cabinet level.



NEXT STEPS

The American Chamber of Commerce Ireland believes that the time is right to establish a globally significant challenge-centric development and innovation programme in Ireland by 2020 – one that addresses an issue of national and global significance and captures the imagination of the public – as the next logical step in evolving the country's innovation-led economy.

This next phase for the national research, development and innovation ecosystem will be key to establishing productive collaborations between the public and private sectors in focusing the nation's innovative capacity to address challenges of real impact on the lives of Ireland's citizens with applications globally.

The American Chamber is providing thought leadership in the stakeholder dialogue. The next steps should aim for the formulation of agreed criteria, an implementation process and a funding plan for a Grand Challenge Programme for Ireland as part of the Government's 2018 programme in readiness for launch and implementation by 2020.



Promote the farm as the centre of innovation | Eliminate waste in the food supply chain – establish a circular bio-economy | The World's healthiest nation | Address obesity with a number of technical, medical and educational interventions | Reduce the number of diabetes type 2 sufferers | Reduce the number of Chronic respiratory disease sufferers | Implement a complete program for personalised health | Make Ireland the world's most connected country in the "Internet of Things" era | Solve the rural-urban divide, address the digitisation challenges in Ireland | Make Ireland the best country to grow old in | Create a smart border where goods and people can pass North and South seamlessly on the island of Ireland | Implement a digital currency for Ireland | Eliminate cash | Ireland to be the expert for developing Services for the autonomous transport era | Energy management – the smart grid | Technology in Education – Reduce the cost of 3rd level education | Rediscover our ability to teach the world | Flooding predictions and prevention | Exceed our EU CO₂ targets

The above Grand Challenge ideas were gathered from the stakeholder interviews which were performed as part of this review. They are not endorsed by the Chamber and should be regarded as indicative only.

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