



# ENABLING DIGITAL IRELAND

A Summary Report on  
Ireland's ambitions to be a  
leader in the provision of  
digital government services



# Foreword from the Office of the Government Chief Information Officer

In the autumn of 2016 the Microsoft CEO, Satya Nadella, visited Ireland and I was fortunate to attend an address he gave to a small group chaired by (then) Minister of State Dara Murphy. At the close of a very interesting discussion which covered GDPR, the environment, and disruptive technologies amongst other things, I discussed with him the relevance of these disruptions for the State.

A few weeks later, Microsoft's Public Sector Director met me to follow up on the previous conversation and we identified two or three areas which we both thought could provide a positive impact in helping to take forward the Government's ambitions for Digital and ICT.

Subsequently, I and a couple of key members of my team participated in a joint session to work through a number of areas where Microsoft and its Applied Innovation team felt they might be able to bring new ideas and thinking. We homed in on three: one to help position Ireland more evidentially within a Global context; one to add significant value to a "corporate" Government

Digital service; and a third to sit alongside our legislative preparations and really help tease out the practical and technical implications of our data-sharing ambitions.

I was impressed with the knowledge and commitment of the Microsoft team that day. Moreover, I was convinced that the objectivity and global responsibilities of the individuals involved would help us collectively develop something that would be worthwhile and help advance our overall progress in terms of optimised digital transformation and excellence in eGovernment.

I would like to thank Microsoft and The Fletcher School for an enjoyable and thought-provoking joint engagement, the context and outputs of which are reflected in this report.

**Barry Lowry**  
**Government CIO**  
**June 2018**



## Ireland: The Trusted Digital Leader in Europe

As home to the top ten global technology companies, hundreds of indigenous ICT companies, and a growing start up community, Ireland is well positioned to be the digital leader in Europe.

Securing this leadership status is an economic and social imperative for Ireland. Digital leadership and the creation of a digital and data centric economy will bring job creation and growth for the country and its citizens. This mission becomes increasingly important in the context of a post-Brexit world where Ireland has an opportunity to lead and direct positive change at EU level.

While the government's ambition is clear, the path to achieving it is less so.

It is for this reason that Microsoft is delighted to have partnered with the Office of the Government Chief Information Officer (OGCIO) on the development of this important joint Summary Report. We believe the Report will contribute to a programme of action for the public sector to ensure the country achieves the digital leadership it desires and, importantly, at a pace that is far quicker than other countries.

The Fletcher School's Digital Evolution Index and Smart Societies (D5) Benchmark are valuable tools in helping to establish where Ireland ranks today against the world's leading digital nations. The Momentum measurement is even more important; it's the one we need to address and track with vigour. It demonstrates the need for urgent action here in Ireland on the deployment of cloud and digital services across all parts of government. This is essential if Ireland is to maintain its competitive advantage and realise the goal of leadership in Europe.

If the Government leads in terms of a move to a 'cloud friendly' and 'digital first' approach, others will follow: industry, state bodies, the non-profit

community. Yet Government can do a lot more. It can also create an environment that supports, encourages, and incentivises others to innovate and adopt cloud and digital technologies. A positive regulatory environment, together with fiscal policies that reward the move to digital will make sure that the private sector modernises and progresses at the same pace as government, future-proofing Ireland's enterprise economy. Government can also play a key role in building trust between citizens and new technology; its commitment to privacy and security will help build trust and drive demand for digital services from citizens.

Microsoft and our Applied Innovation team are delighted to have participated in the development of this joint Summary Report. We are ready to play our part in supporting the OGCIO, and the broader Irish Government, in the implementation of its recommendations of this report and, ultimately, in helping Ireland's Government to deliver enhanced services to its citizens in a secure and safe manner.

We believe that innovation can become a way of life in Ireland; that the country's performance on Fletcher's Smart Societies Benchmark can be dramatically improved; and that the country, with the leadership of the Government and the support of the OGCIO, will achieve its ambition of being the Digital Capital of Europe.

We relish the opportunity to play our part in making this goal a reality and look forward to the journey ahead.

**Cathriona Hallahan**  
**Managing Director, Microsoft Ireland**



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# I. Executive Summary

Ireland<sup>1</sup> has made great strides in recent years towards becoming a digital nation, capable not only of hosting and regulating global technology companies but also of reaping the social and economic benefits of new technologies, such as cloud and machine learning. Ireland's successful digital journey has now brought it to a moment of important strategic choice: will it enable and undertake the digital transformation necessary to become a genuine leader amongst the digital nations of the world?

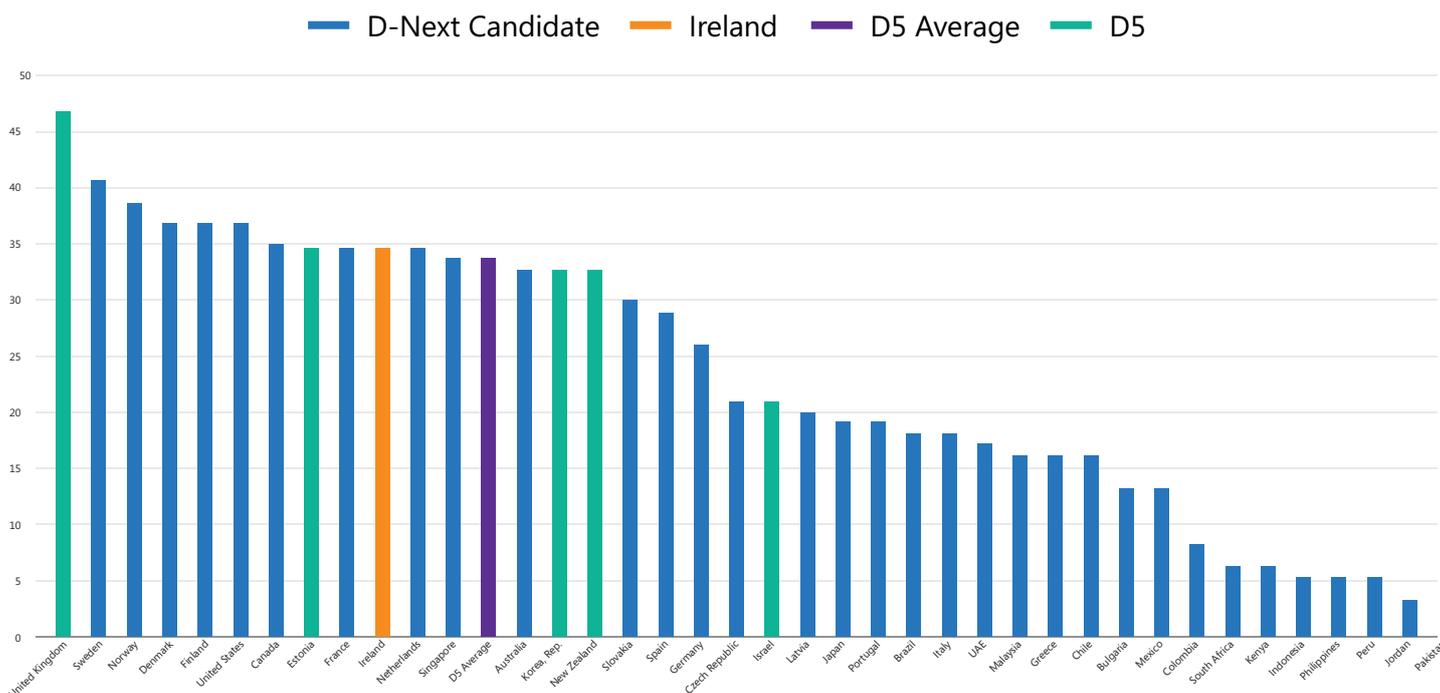
In a connected world the digital competitiveness of nations is determined not by geographical distance but by factors such as their capacity to digitally transform their public and private sectors. Research from The Fletcher School of

Law and Diplomacy at Tufts University on the leading digital nations (the Digital 5, or D5) shows that Ireland is well-positioned to evolve into an advanced digital society. In fact, Ireland could be a candidate country to join the group of advanced digital nations if it can address key gaps and adopt best practices from countries such as Estonia and New Zealand. As the graph below shows, the opportunity is real; Ireland currently excels against other nations in the D-Next model, and even outperforms an average of the original D5 countries.

The central challenge for Ireland, beyond the need to foster digital entrepreneurship and attract highly skilled technological talent from around the world, is that its public services are under-digitised

**Figure A: Final D-Next Model Scores (January 2018)**

Source: Digital Planet, The Fletcher School at Tufts University, May 2018



in comparison to its global digital competitors. In light of this, the Irish Government must decide if it will take on the opportunity to digitally transform both its services to citizens and its internal processes. In doing so it will not only lay the foundations for Irish digital leadership in Europe and around the world, it will set an example to the rest of the country to follow in embracing a digital future.

The deployment of the best available technologies, the creation of policies to promote public sector interoperability, and the implementation of a cross-government 'cloud friendly' strategy, will all

help Ireland meet this public service challenge. The results of this concerted effort by Government will include: superior public services for citizens and businesses, in terms of scale, scope, and reach; greater efficiencies, better outcomes, and lower costs across government; improved reliability, security, and resilience; and genuine user trust in the technologies themselves. More than this, however, a positive strategic choice to transform Ireland into a world-leading digital nation will help to secure the global prospects and opportunities of Irish citizens, communities, and businesses in the global economy for decades to come.



## Joint Summary Report Key Findings

Ireland is well-positioned to evolve into an advanced digital society and to become a world-leading digital nation. If Ireland can build on its strengths and learn from the best practices of digital leaders such as Estonia and New Zealand, as well as leading and creating exemplars itself, it will enhance its competitive edge in the global economy.

Central to seizing this opportunity is accelerating the digital transformation of Ireland's public services, which will improve service delivery, drive cost efficiencies, and create economic and entrepreneurial opportunities for citizens and businesses.

To do so, the Irish Government must deliver a legal and regulatory framework that enables digital transformation. It must also foster trust in available technologies, such as secure hyperscale public cloud, and deploy them effectively.

The work undertaken by the OGCIO, Microsoft, and The Fletcher School, as detailed in this joint Summary Report, has drawn out a number of key insights, including the policy and technical recommendations below.

### Key policy-related recommendations:

- Implement a cross-government 'cloud friendly' strategy and policy framework that includes data classification, security and privacy standards, and technical measures that can flex as available technologies evolve.
- Build trust with government and Irish citizens by partnering with industry to prove the value of technology in the delivery of citizen services and the responsible and transparent use of data and the Cloud by government.
- Implement 'go digital' policies that drive efficiencies across public service operations, such as broader use of MyGovID and the elimination of paper-based processes for citizens and between government departments.
- Make data open and discoverable to maximise the value of government investment by reducing duplication and encourage data re-use.
- Ensure public services are designed to work seamlessly across organisational silos, relying on the free movement of data and digital services in the European Union in line with the Digital Single Market policy.

### Key ICT-related recommendations:

- Explore the opportunity to create a production pilot between two government systems to demonstrate the suitability of a solution like Unified Xchange Platform (UXP) and the Digital Postbox for implementing a scalable, resilient, managed, and well-audited solution for national data integration.
- Leverage technology to support government's regulatory compliance obligations, such as the GDPR, to encourage Irish citizens to build trust in government's data use and cloud practices.
- Perform periodic benchmarking, including 'valuation of gaps', to prioritise investments and track progress.
- Join and participate in the D5 group of digital nations (now D7, likely to grow to D9) to ensure access to digital nations' best practices.

## II. Introduction

Ireland is on the threshold of a fundamental digital transformation, in terms of society, economy, and government. An already vibrant tech sector has enabled Ireland to become a hub for many global technology companies, and successive Irish governments have taken an active role in creating the wider EU Digital Single Market (DSM). As a result, Ireland is now in a position to compete with leading digital nations around the globe.

In order to seize this opportunity it is incumbent on the Irish Government to deliver a number of things. First, a legal and regulatory framework that enables digital transformation in a fully transparent and compliant way. Second, a sense of genuine trust in emerging technologies amongst users, both citizens and businesses. Finally, the identification and deployment of technologies that can underpin trust at the same time as delivering the hoped for economic and entrepreneurial opportunities.

The Government must lead by example when it comes to embracing new technologies and the services based on them. By being an early adopter, Government can demonstrate to citizens and businesses the ability of services, such as cloud or machine learning, to deliver positive outcomes in responsible ways, notably by being secure and respectful of people's privacy. At the same time as being a domestic leader in adopting new technology, Ireland's progress towards global digital competitiveness requires the Government to learn from other countries. It also requires the Government to work with the private sector to create regulatory frameworks that ensure new technologies are developed and delivered to be trustworthy, responsible, and inclusive.

Against this backdrop, in March 2018 Microsoft together with The Fletcher School of Law and Diplomacy at Tufts University provided an objective view of Ireland's prospects and progress in these areas, drawing on their experience with governments around the world to the OGCIO.

The OGCIO, Microsoft, and The Fletcher School worked together to:

- Assess Ireland and benchmark it against leading digital nations around the world.
- Look at the Irish Government's policy and technical options for using new technology to deliver citizen services and to build on best practices (see six questions in Table 1).
- Examine, as a practical proof of concept, via a Digital Postbox prototype, the Unified Xchange Platform (UXP), a Cybernetica solution on Azure. UXP is a technology that connects information systems across separate (public sector) organisations to enable both secure data exchange between them and trustworthy communication with citizens and businesses.

This joint Summary Report summarises the work carried out by this joint project and sets out both the resultant digital benchmarking (pg.12) and technical proof of concept findings (pg.20), as well as potential opportunities and recommendations for next steps (pg.24).

## Table 1: Six digital transformation questions to consider

These questions address issues important to Government's involvement in digital transformation:

1. Does a benchmark against the 'Digital 5' countries help assess Ireland's strengths and weaknesses in its journey to become a leading digital society?
2. Can enhancing digital trust enable Ireland's international digital competitiveness?
3. Is a common, extensible interoperability infrastructure for different agencies essential to share data and integrate systems with one another, as well as the private sector?
4. Can government services running on premises be integrated with the Cloud by using modern security controls and with minimal application changes?
5. Will moving core security components into the cloud enable enhanced security features to withstand DDOS and offer greater resiliency?
6. Can a public services Digital Postbox, built upon a common extensible interoperability infrastructure, enable a trusted channel for digital communication for citizens and government?

# III. Ireland's National Priorities as they relate to Digital

## a. Ireland's ICT principles

Ireland recently launched a consultative process for a new National Digital Strategy to follow on from its *'Doing more with Digital' 2013 paper*<sup>2</sup>. The earlier paper outlined the strategic direction for the use of digital technologies in the country: *"the optimal economic and social use of the internet by Business, Government, and Individuals"*<sup>3</sup>. A fundamental theme of the new strategy, due to be published at the end of 2018, will be the strong correlation between a successful 'digital government' and a successful 'digital nation'.

As part of developing a digitally empowered society, the 2013 paper set the context for joined-up and coordinated use of digital technology within Ireland's Government. The specifics of the Government-focused elements were defined most recently in the *'eGovernment Strategy 2017-2020'*<sup>4</sup>, which built on previous papers dealing with ICT in the reform of public services<sup>5</sup> and the *'Public Service ICT Strategy'*<sup>6</sup>. We already see tangible elements of this strategy in the recently published *Data Sharing and Governance Bill*, focusing on how Government securely shares data to improve public services.

Overall, the Government has committed to improving the nature and quality of the services delivered to citizens. Its approach is geared to developing a government operating environment that uses data and digital technologies to improve users' experiences, whilst at the same time improving the effectiveness of government services with enhanced and more transparent data usage, capabilities, and governance<sup>7</sup>. This aligns with the Government's wider Our Public Service

2020<sup>8</sup> framework and the previously identified digital actions<sup>9</sup>:

1. Improve the delivery of shared whole-of-government projects.
2. Expand the model of sharing services and expertise across organisations.
3. Expand the ICT capability of Departments and increasing efficiencies by creating common systems and infrastructure.
4. Improve how data is collected, managed, and shared.

Taken as a whole, this is an ambitious strategy, something underscored by ministerial statements that Ireland *"plans to be a leader in the provision of digital government services"*<sup>10</sup>.

The Government's approach strongly aligns with the importance that the EU attaches to the success of the Digital Single Market (DSM) and its government digital transformation priorities, outlined in the *'EU eGovernment Action Plan 2016-2020'*<sup>11</sup>, and later reinforced by 2017's Tallinn 'eGovernment Declaration', which committed EU Member States and EFTA countries to *"ensuring high quality, user-centric digital public services for citizens and seamless cross-border public services for businesses"*<sup>12</sup>.

Ireland's Digital ICT Pillars should, therefore, be seen alongside the principles set out in the EU eGovernment Action Plan<sup>13</sup>; see Table 2.

2 [Doing more with Digital](#), National Digital Strategy for Ireland, July 2013.

3 [Ibid](#) at p. 1.

4 [eGovernment Strategy 2017-2020](#), Department of Public Expenditure and Reform, June 2017.

5 [Supporting Public Service Reform – eGovernment 2012-2015](#), Department of Public Expenditure and Reform, April 2012.

6 [Public Service ICT Strategy](#), Department of Public Expenditure and Reform, January 2015.

7 [Op. cit.](#) eGovernment Strategy 2017-2020 at pp. 2-4.

8 [Our Public Service 2020](#), the Department of Public Expenditure and Reform, December 2017.

9 [The Civil Service Renewal Plan](#), Department of the Taoiseach and the Department of Public Expenditure and Reform, October 2014.

10 [Minister of State O'Donovan announces eGovernment Strategy 2017-2020](#), Department of Public Expenditure and Reform, June 2017 11

11 [EU eGovernment Action Plan 2016-2020](#), European Commission, 19 April 2016.

12 [Ministerial Declaration on eGovernment - the Tallinn Declaration](#), 6 October 2017.

13 [Op. cit.](#) EU eGovernment Action Plan 2016-2020 at p. 4.

**Table 2: Comparison of Irish and EU digital pillars and principles**

Ireland's Digital ICT Pillars	EU eGovernment Action Plan: 7 Principles <sup>14</sup>
<p><b>Build to Share:</b> Creating ICT shared services to support integration across the wider Public Service to drive efficiency, standardisation, consolidation, reduction in duplication, and control cost.</p>	<p><b>Digital by Default:</b> Public administrations should deliver services digitally (including machine readable information) as the preferred option (while still keeping other channels open for those who are disconnected by choice or necessity). In addition, public services should be delivered through a single contact point or a one-stop-shop and via different channels.</p>
<p><b>Digital First:</b> Digitisation of key transactional services and the increased use of ICT to deliver improved efficiency within Public Bodies and provide new digital services to citizens, businesses, and public servants.</p>	<p><b>Once Only Principle:</b> Public administrations should ensure that citizens and businesses supply the same information only once to a public administration. Public administration offices take action if permitted to internally re-use this data, in due respect of data protection rules, so that no additional burden falls on citizens and businesses.</p>
<p><b>Data as an Enabler:</b> In line with statutory obligations and Data Protection guidelines, facilitate increased data sharing and innovative use of data across all Public Bodies to enable the delivery of integrated services, improve decision making and improve openness and transparency between Government and the public.</p>	<p><b>Inclusiveness and Accessibility:</b> Public administrations should design digital public services that are inclusive by default and cater for different needs such as those of the elderly and people with disabilities.</p>
<p><b>Improve Governance:</b> Ensure that the ICT strategy is aligned, directed and monitored across Public Bodies to support the specific goals and objectives at a whole-of-government level and with an emphasis on shared commitment.</p>	<p><b>Openness and Transparency:</b> Public administrations should share information and data between themselves and enable citizens and businesses to access control and correct their own data; enable users to monitor administrative processes that involve them; engage with and open up to stakeholders (such as businesses, researchers and non-profit organisations) in the design and delivery of services.</p>
<p><b>Increase Capability:</b> Ensure the necessary ICT skills and resources are available to meet the current and future ICT needs of the Public Service.</p>	<p><b>Cross-border by Default:</b> Public administrations should make relevant digital public services available across borders and prevent further fragmentation to arise, thereby facilitating mobility within the Single Market.</p>
	<p><b>Interoperability by Default:</b> Public services should be designed to work seamlessly across the Single Market and across organisational silos, relying on the free movement of data and digital services in the European Union.</p>
	<p><b>Trustworthiness and Security:</b> All initiatives should go beyond the mere compliance with the legal framework on personal data protection and privacy, and IT security, by integrating those elements in the design phase. These are important pre-conditions for increasing trust in and take-up of digital services.</p>

## b. Ireland's current ICT & cloud strategy and usage

The Public Service ICT Strategy<sup>15</sup> committed Government to delivering services via a secure 'Government Cloud' service, internally and/or externally hosted. This approach addresses many of the perceived risks that relate to a cloud outsourcing model and underpins a broad adoption of cloud across a number of government departments, especially for non-sensitive data.

This 'Government Cloud' will deliver current and future public services in a secure, cost effective,

and efficient manner, using a robust, resilient, best-of-breed technical infrastructure and architecture. Specifically, it will ensure the flexibility needed to deliver quality ICT services to meet changing user demands for online services, even in the face of spikes in demand. This transformation also provides an opportunity for rationalisation and consolidation of current systems into state of the art data centres, which will deliver additional cost and security benefits.



# IV. Attributes of advanced digital nations

## a. D5 Benchmark

The Fletcher School has built its Smart Societies Benchmark<sup>16</sup> with data on over 240 different indicators drawn from various data sources, public, and proprietary databases. The indicators covered three major areas: citizens and their well-being; the economy; and, the state of institutions. Each indicator was classified under one of 12 broad benchmark components (see Table 3), and countries were scored for their performance in each of them, with these scores creating the Benchmark.

Each component is made up of different clusters of indicators. As an example, inclusivity's score is an aggregate of different clusters of inclusion-related indicators: labour market inclusion; economic mobility; diversity and acceptance; and, policies that promote inclusion. In turn, the 'policies that promote inclusion' cluster includes indicators such as data on policies, laws, and regulations that promote access for marginalised or disadvantaged groups.

**Table 3: D5 benchmark components**

### People Components:

- Inclusivity.
- Environment and quality of life.
- State of talent and the human condition.
- Talent development.

### Institutions Components:

- Freedoms offline and online.
- Trust.
- Safety and security.
- Public services.

### Economy Components:

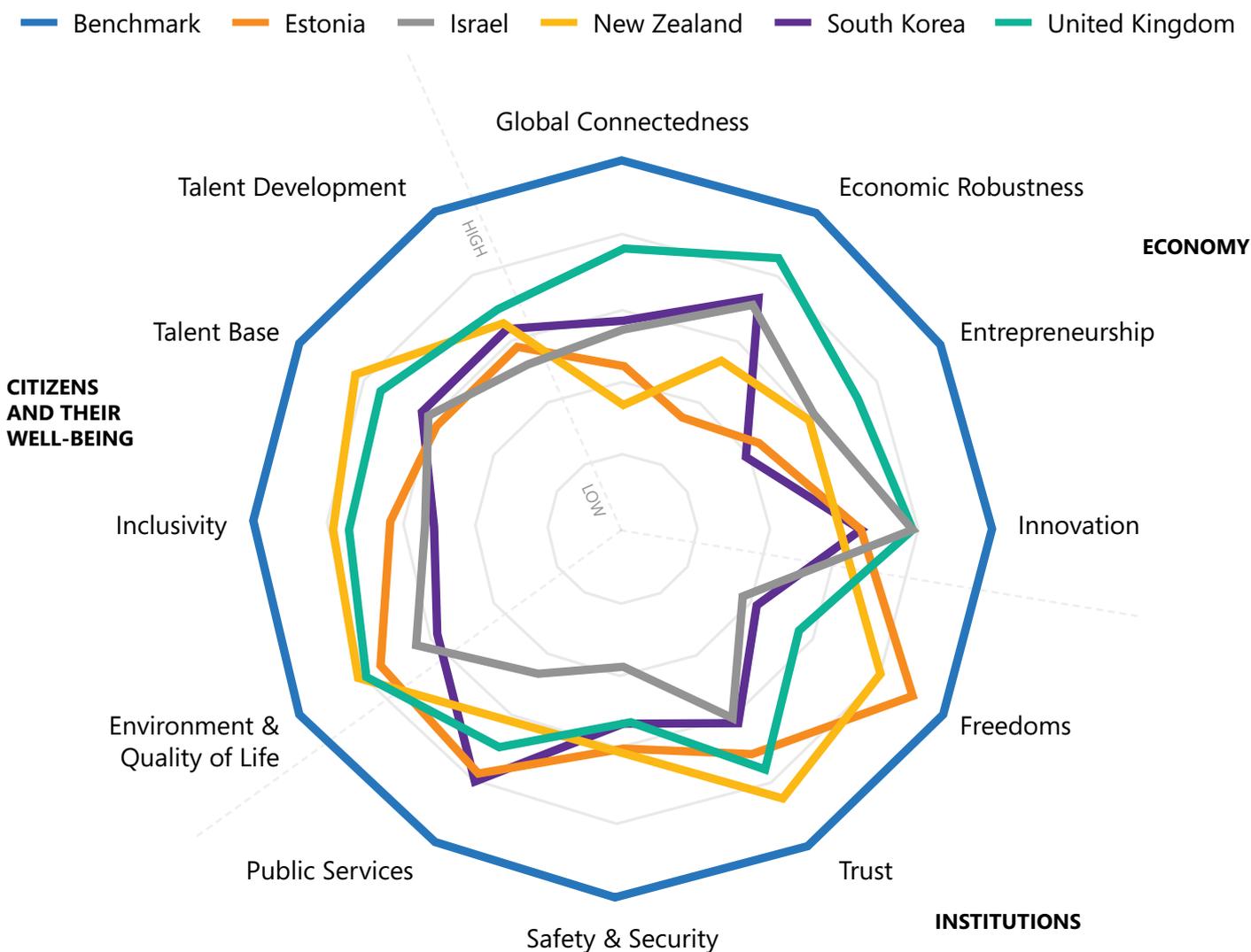
- Global connectedness.
- Economic robustness.
- Entrepreneurial ecosystem.
- Innovation capacity.

The Benchmark score for a component is the aggregate of the top scores for each of its indicators. The scores for each component were normalised. Countries are then scored along these indicators, and the resulting country score is compared with the benchmark to evaluate each country's progress and to derive patterns and differences in priorities.

The current Benchmark draws on the Digital 5 (D5) states (see Figure B). Collectively, the D5 nations

underpin the Benchmark against which all nations can be assessed. Although they do share several characteristics, notably democratically elected governments that play an active role in offering services to their citizens, they each offer a distinct example to Ireland of what countries can do to succeed (see the two 'exemplar' boxouts for the New Zealand and Estonian lessons specifically relevant to Ireland).

**Figure B: D5 countries and the smart society benchmarks**  
 Each was rated on how well they use digital technology across 12 competencies in three major areas.



Source: Digital Planet, The Fletcher School at Tufts University, May 2018

**Estonia & Institutions:** Estonia's initial priorities were strong institutions and assuring citizens' post-Soviet freedoms. Its e-solutions have resulted in government transparency and easy access to data and public services, through an open and decentralised system that links multiple digital applications and services. Its necessary next step is establishing greater connectedness and robustness of its economy, something it can certainly achieve given its heavy investment in digital infrastructure.

**Israel & Innovation:** Israel's innovation stems from its national security infrastructure and its *Digital Israel*<sup>17</sup> initiative, with its emphasis on high-speed internet connectivity. The successes of businesses looking to operate online can be enhanced by using the same technological platforms for improving public services and the interaction of government and citizens.

**New Zealand & Well-Being:** New Zealand's policy-makers have used digital technology, notably through a 'Cloud First' policy, as a tool for government to interact with its 'customers', i.e., citizens and businesses, so that they can

experience public services in a seamless, integrated, and trusted manner. The challenge is that the country's physical distance from much of the world makes it harder to narrow the gap in its global connectedness.

**South Korea & Public Services:** *South Korea's Government 3.0*<sup>18</sup> initiative already successfully provides personalised public services and has the potential to help ensure greater transparency, provide more data on the workings of public agencies, encourage more cross-agency collaborations, and help people find jobs and economic opportunities more readily.

**The UK & Economy:** In addition to having a leading global economy, a strong technology and innovation base, and a culture of entrepreneurialism, the UK's *Government Transformation Strategy 2017-2020*<sup>19</sup> and its 'Government as a Platform' approach both help provide first-rate digital services that grow talent, improve workplace conditions, and help transformations through shared platforms and data.

**Question #1: Does a benchmark against the "Digital 5" countries help assess Ireland's strengths and weaknesses in its journey to become a leading digital society?**

A baseline is required, and The Fletcher School's Smart Societies Benchmark not only uses a sufficiently broad range of indicators but also places them in the context of global "digital competitiveness", reflecting the realities faced by ambitious digital states such as Ireland.

**Question #2: Can enhancing digital trust enable Ireland's international digital competitiveness?**

Trust is a core Institutional component of the D5 benchmark itself and is essential to digital competitiveness. People and organisations avoid technology and services that they do not trust. The question of trust with respect to processing of personal data is critical. The General Data Protection Regulation (GDPR) sets out obligations central to digital trust, primarily ensuring data is processed in an appropriate manner, and that personal data is processed in ways that are transparent to citizens.

17 [Digital Israel](#) (English language [here](#)), Ministry of Social Equality, June 2017  
18 [Government 3.0 & E-Government in Korea](#), Ministry of Security and Public Administration, 2013  
19 [Government Transformation Strategy 2017-2020](#), UK Government, February 2017

## b. ICT/cloud friendly policies in leading digital nations

The governments of the D5 leading digital nations have recognised their fundamental role in steering their respective nations through the 'Fourth Industrial Revolution'<sup>20</sup> (4IR) and they act to set an example for people and organisations on the use of technology to improve society. Governments seeking to emulate them should:

**Transform Government:** One goal should be to develop a cross-government policy framework to transform government services using current and new technologies. Success will require strong political and managerial leadership, as well as an engaged and informed staff. Policy reforms must remove bureaucratic barriers and strengthen data sharing between departments. This will provide better and more efficient governance and services to citizens and will serve as a model for the private sector.

**Implement a 'Cloud First' strategy for procuring IT services:** A 'Cloud First' policy promotes the evaluation of cloud services before considering non-cloud options. Governments

across the world have adopted this approach, e.g., the UK<sup>21</sup> and New Zealand<sup>22</sup>. By driving cloud adoption, governments save tax payer money and can also position themselves to benefit from data driven technologies that rely on the storage and computing capacity of the cloud, e.g., artificial intelligence and data analytics. Where 'Cloud First' policies do not fit the risk profile of the data, hybrid cloud models should be promoted<sup>23</sup>.

**Audit existing regulatory frameworks for 4IR readiness:** Governments that are quick to create a regulatory environment that guides the delivery of new technology, will gain most. Technology's fast pace, however, makes increasing demands on policymaking. Governments should review existing frameworks to ensure they assist with the development and deployment of new technologies in ways that are trustworthy, responsible, and inclusive. Regulatory requirements should be updated where needed to provide consistency and clarity on the use of new technology by regulated entities.

20 The Fourth Industrial Revolution (4IR) is characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres. See: [The Fourth Industrial Revolution: what it means and how to respond](#), World Economic Forum 2016.  
21 [Government Cloud First Policy](#) UK Government, May 2013  
22 [Government ICT Strategy and Action Plan to 2017](#) and associated [guidance](#), New Zealand Government, June 2013  
23 [What are public, private, and hybrid clouds?](#), Microsoft Azure, 2018

### **Exemplar: New Zealand's collaborative reimagining of public services**

Fletcher's 2017 Smart Societies benchmarking study flagged New Zealand's Public Services as an area of comparative weakness.

The Office of the Government Chief Digital Officer had already begun work, however. Research showed people prefer public services based around their lives and life events, e.g., having a baby or getting a job, and dislike dealing with multiple agencies, repeatedly providing the same information. A plan emerged for a "centrally led, collaboratively delivered" framework to foster inter-agency collaboration through changes in digital services, technology, information, and investment.

An early example of this effort was SmartStart, a cloud-based integrated solution involving four major government agencies in a predictive, one-stop service for new and expectant parents. Launched in December 2016, there have been immediate savings in time and paperwork for families and the government. At least 56,000 births are expected to be registered over the coming year through SmartStart (93% of all expected births in 2018). As a next step, New Zealand plans to integrate AI into SmartStart for greater personalisation of services.

### **Exemplar: Estonia partnered to protect 'digital by default' public services**

In Estonia, 99% of all of public services are available online 24/7 (only marriages, divorces, and property transactions require Estonian citizens to appear in person) and 95% of Estonians file taxes online, a process that takes no more than 3 minutes. Nonetheless, Fletcher's Smart Societies benchmark flagged that despite this 'digital by default' approach, or perhaps because of it, Estonia lagged its D5 peers in cybersecurity.

Not a stranger to malicious attacks, the country had outlined its vision for eGovernment, digital identity, and digital resilience in its *Estonian Digital Society Strategy 2020*. To execute on the resilience aspects of this vision, the Government Chief Information Officer collaborated with Microsoft to assess and implement a cloud-based solution for storing citizen data outside of Estonia's borders, resulting in the world's first 'data embassy' in Luxembourg. Should the need arise, Estonia could 'reboot' itself from a safe third country. Ever since, Estonia's scores on legal protections and resiliency measures have been steadily increasing. Today, Estonia is well ahead of its D5 peers on measures of resiliency.



# V. Ireland's Smart Society footprint

In their Digital Planet 2017 report<sup>24</sup>, an extensive multiyear study of digital evolution across 60 countries, Bhaskar Chakravorti and Ravi Shankar Chaturvedi of The Fletcher School highlighted the role of the digital system in redefining the competitive advantage of nations, following the 2008 reset to the global economy. "Digital competitiveness has become front and centre for countries, their policymakers, businesses, and their citizens today," Chakravorti and Chaturvedi noted, a phenomenon driven primarily by the irreversible incursion of digital technologies into every aspect of human endeavour and, consequently, the growing centrality to global trade of cross-border flows of technology, ideas, and data.

The report defined the competitiveness of a country's digital economy as a function of two factors:

1. Its current state of 'digitalisation', as determined by the interplay of four drivers, i.e., demand conditions, supply conditions, institutional environment, and innovation and change.
2. Its pace of digitalisation over time (also known as 'digital momentum'), which is measured by the growth rate of a country's digitalisation score over the years.

## Ireland's substantial progress so far

According to The Fletcher School's Digital Evolution Index 2017 (DEI 2017), Ireland currently ranks #16 in its state of evolution, in near parity with the Netherlands, New Zealand, Japan, and Germany. However, in its momentum, i.e., the pace of digitalisation over time, it ranks #47, well behind its nimbler neighbours and economic peers such as Portugal, New Zealand, UK, Estonia, Finland, and Germany.

To understand the drivers behind this DEI 2017 performance the researchers used the Smart

Society Benchmark to look at Ireland's progress from 2012 to 2017, assessing the country's performance against the twelve components in three categories: People, Institutions, and Economy. (See Table 3 on pg. 12) Over that period, Ireland's 'smart society footprint' expanded in nine of the twelve components, with the biggest gains being made in the Economy and Institutions categories (see Figure C). The biggest gaps were in the public services, state of talent and talent development, and entrepreneurship and innovation.

A deeper analysis of Ireland's 2012 to 2017 performance in the People category shows high economic mobility and greatly improved labour market inclusion, e.g., the proportion of women to men in the labour market was 67% in 2000 and 78% in 2017. Causes for concern include Ireland's worsening old age dependency ratio and a weakness in attracting global working-age talent<sup>25</sup>. When it does attract talent, however, Ireland is successful at retaining it due to easier visa renewal and naturalisation processes.

Data from the Economy category shows that Ireland is well positioned for the era of digital globalisation. Its established strengths are in the mobility of financial flows, goods, and services, with a growing strength in facilitating the mobility of data. There is significant room to progress further, nonetheless, by expanding innovation and taking on a leadership position on digital innovation, given Ireland's position as a hub and European home to some of the biggest technology firms in the world. A persistent area of weakness is in entrepreneurship and innovation, caused in part by a lack of vibrancy in its start-up environment and a lack of funding opportunities for new ventures<sup>26</sup>.

When looking at the Institutions category, Ireland has made progress on aspects of trust<sup>27</sup> by improving its scores in government accountability and security, approaching the levels of Nordic nations. Despite this, Ireland's score in this category

<sup>24</sup> [Digital Planet 2017](#), The Fletcher School, July 2017

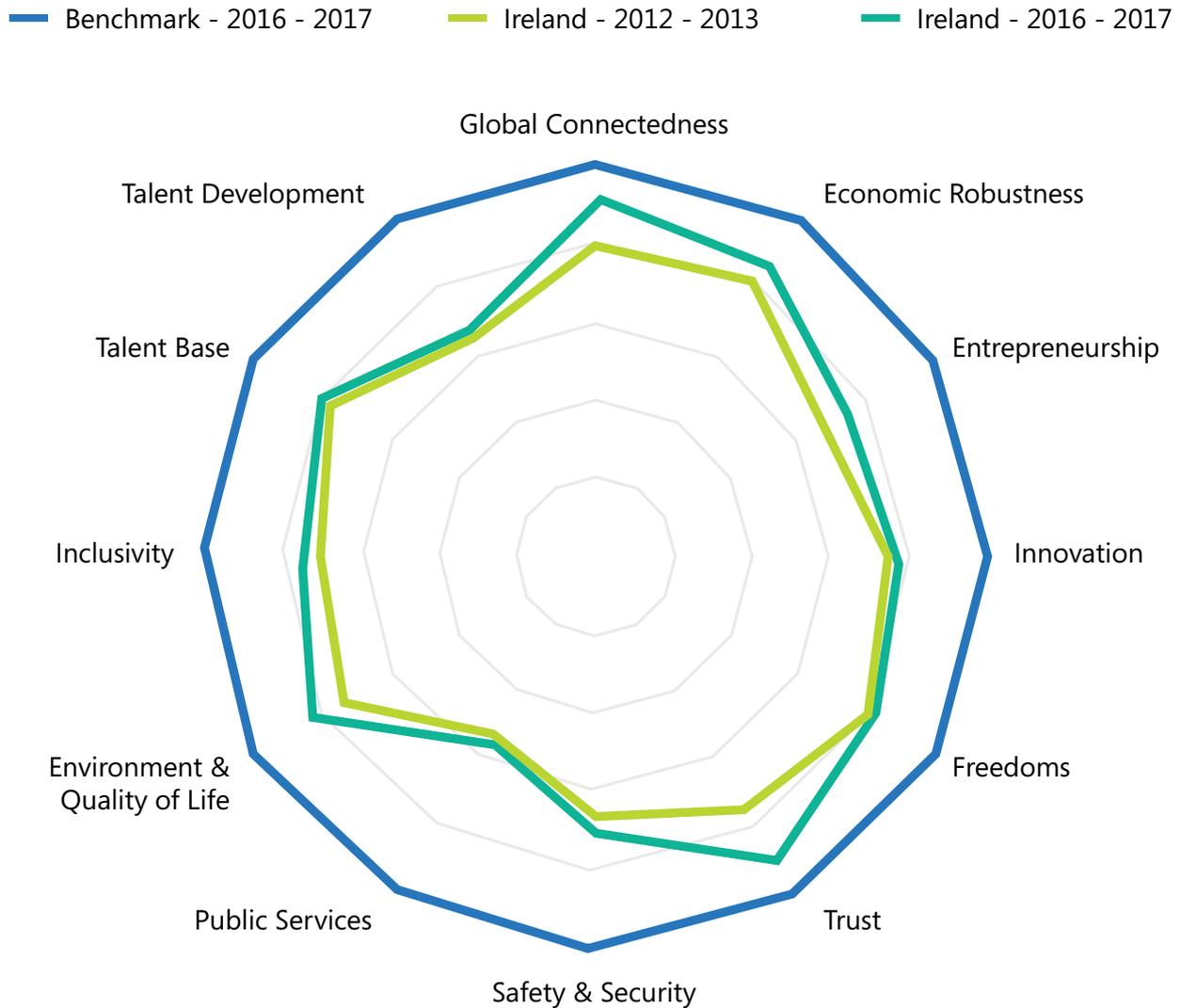
<sup>25</sup> [Towards Digital Ireland: Benchmarking Analysis](#), The Fletcher School at Tufts University, June 2018

<sup>26</sup> *Ibid*

<sup>27</sup> [The 4 Dimensions of Digital Trust, Charted Across 42 Countries](#), Harvard Business Review, February 2018

**Figure C: Irish Smart Society progress 2012-2017**

Source: Digital Planet, The Fletcher School at Tufts University, May 2018



suffers due to a receding trend in online freedoms during the study<sup>28</sup>. The lack of a viable e-ID also brought down the score as it hindered the digitisation of public services and their use. (Note, this scoring was before the launch of MyGovID in 2017, which should help with digitisation and future scores.) Digitisation of public services and significantly expanding the opportunities for the citizenry to interact with the government digitally would stimulate demand and thereby boost digital momentum.

**Necessary steps to compete with the D5 and others**

Overall, the research shows that Ireland is well poised to evolve into an advanced digital society. However, in order to reach this goal Ireland must address notable gaps compared to the D5 nations:

**Expand the scale, scope, and reach of digitised public services:** The digitisation of public services delivery, similar to Estonia’s model, is key to

improving the sluggish demand sophistication that is holding Ireland's digital momentum back. This is an area where Ireland does poorly compared to the D5 and particularly the likes of global leaders in digitised public services such as Estonia, South Korea, and the UK. Making MyGovID ubiquitous and essential to the consumption of all public services would create multiplier effects across Ireland's digital economy.

**Increase outreach to attract high skilled global talent pools to Ireland:** Despite New Zealand's remote location, the country has done a remarkable job in making itself attractive to high skilled global talent. Ireland has an impressive record of retaining talent but an increased focus on attracting global talent will enable Ireland to reverse the worsening old age dependency ratios.

**Transform Ireland into a digital start-up island:** A persistent area of weakness for Ireland, compared to the D5 peers, is in entrepreneurship and innovation. The lack of vibrancy in its start-up environment is exacerbated by the lack of alternate funding opportunities such as venture capital

funding for new ventures. Ireland would do well to explore collaboration opportunities with Estonia's eResidency<sup>29</sup> to jumpstart its start-up climate.

**Establish Ireland as the "best practice hub" for digitised public services:** Ireland has a set of unique strengths vis-à-vis its EU peers. It is one of the EU's most important regulators in the technology sector, is already a hub for many global tech companies' EU operations, and it is home to several major data centres<sup>30</sup>. Despite this, Ireland's public services could do much more to actively use the digital assets and services that currently have Ireland as a base for engaging Europe and the wider world.

In addition to taking immediate policy and technical steps to address some of the points raised above, Ireland should consider a deeper evaluation of both the gaps and the approaches to closing them in order to prioritise action areas and identify optimal approaches and technologies that will enable the country to realise its digital ambition.

# VI. Technical proof of concept: Secure data exchange and interoperability framework

If Ireland wants to match its D5 peers, or even leap-frog them, it must embrace and extend some of their best practices and lead by example when it comes to digital transformation. A key area for leadership is addressing data sharing and communications between Government and citizens. This communication will have to be efficient, effective, economic, and, above all, worthy of trust, if others are to embrace it and then build on it as a foundation for a globally competitive digital Ireland.

To address the specific need for secure data exchange and interoperability among previously siloed public sector systems, a 'Digital Postbox' Proof of Concept (PoC) was undertaken. The PoC used the [Unified Xchange Platform](#) (UXP), a version of Estonia's tried-and-tested X-Road (see boxout).

## UXP – Enabling secure communication

UXP is a solution from Cybernetica<sup>31</sup> and is based on Microsoft's cloud platform, Azure. It is designed to connect information systems belonging to separate organisations, creating a unified communication framework for secure data exchange between them.

As a 'domain-neutral, efficient integration platform' UXP on Azure enables information systems of one organisation to make use of web services implemented by another organisation. UXP on Azure helps decision-making organisations to control their liability: it takes care of all the security aspects of the interaction; access can be controlled; and, the data exchange (requests and responses) between the organisations are signed and timestamped and sent over encrypted and

### UXP's origins in Estonian eGovernment: X-Road

X-Road is the government of Estonia's national data exchange environment. It is designed to be secure, versatile, resilient, scalable, and auditable.

Estonia has never had a national 'master database'. Data is distributed and stored across multiple entities' systems, but by the late 1990s an increasing amount of data was moving between them. Estonia saw a need for authorised users (including government departments, public service organisations, private companies, and citizens) to be able to share and rely on this data in a secure,

controlled way that did not create duplicates and did not create additional security risk. Core to this was that the data should be carefully protected in transit, and protected from unauthorised interference and modification.

A mechanism was needed and what emerged was X-Road. Its standardised interface across multiple, disparate platforms allows cost synergies, smoother communication between end-users and databases, and reduced dependency on already stretched civil servants, who could instead focus on high-value activity that genuinely required human input.

mutually authenticated channels. In the simplest case (see Figure D), a UXP-based system has the following participants:

**Member organisations:** Public agencies and private companies that wish to communicate with each other through information systems.

**Governing agency:** Which coordinates communication activities, creates and distributes security policy, maintains and distributes registry of members, and distributes gateway software.

**Trust service providers:** Who provide certification and time-stamping services as part of the authentication process.

In other words, in UXP members communicate directly without intermediaries; the governing agency does not take part in the actual message exchange.

UXP on Azure is the fundamental framework for the next technology, the Digital Postbox, which puts Government in contact with citizens.

### The Digital Postbox – Getting documents to citizens

The Digital Postbox acts as a secure medium for delivering digital documents to the citizen. Any (government) organisation wanting to send the

document to the citizen first sends the document to the Postbox system together with the identity of the target citizen. The Postbox notifies the citizen by e-mail, which includes a link to the Postbox portal. The citizen logs into the portal using their MyGovID or another similar mechanism, previews the document and then downloads it.

The UXP on Azure secure data exchange framework (as above) guarantees confidentiality, integrity and proof of all the communication between Postbox and other information systems.

The Postbox system contains the following participants and systems:

**A Government organisation:** Which runs an information system that creates digital documents concerning citizens. The information system sends the documents to the Postbox using UXP.

**A Postbox hosting organisation:** Hosts Postbox service. The Postbox service stores the received documents and provides them to the Postbox Portal. Integrity of the documents stored in Postbox is protected by UXP signatures and the internal integrity checks.

**A Postbox Portal:** Host which runs the Postbox Portal web service that citizens actually use, accessing it with their authenticated MyGovID, etc. This portal host can be the same as the Postbox hosting organisation (as above) but this is not a requirement.

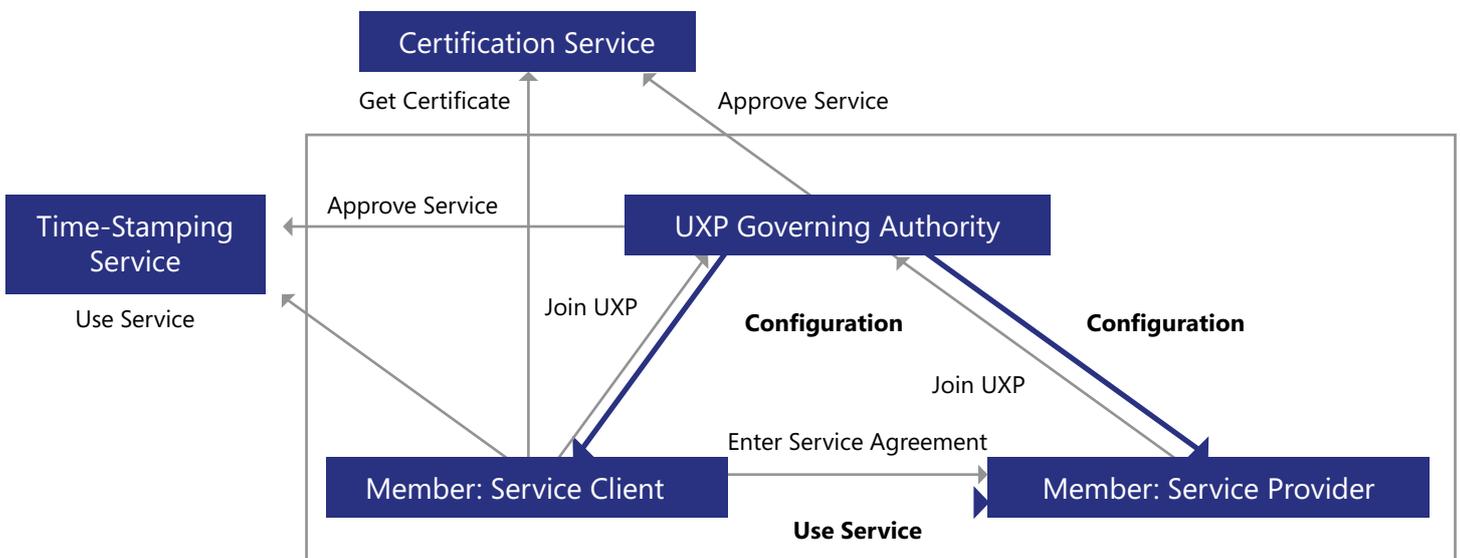


Figure D: Participants of the UXP system

## Better, safer decision-making

One of the main goals of UXP on Azure is to improve decision-making capabilities of organisations. UXP provides the means for one organisation to get from another organisation the information that forms the base of a decision. The information exchange is secured, and proof of origin and authenticity of information is created. This allows the decision-making organisation to justify its choices or actions by showing and proving that the decision was made on information received from other organisations. UXP on Azure creates proof for all messages by turning the web service requests into digital documents that can be verified and used as a proof in court of law, i.e., signed transactions comply with requirements to 'qualified electronic seals' according to eIDAS regulation.

## Trustworthy communication within government and with citizens

Citizens, businesses, and other persons that engage with the Irish Government and the wider public sector through UXP and/or Postbox should be offered an easy-to-use, open, secure, and transparent experience.

An example scenario would be the generation of a certificate, permit, or other form of digitally signed document that has been requested by the citizen; in other words, "I want to get a copy of my birth certificate / a handicap parking permit / a building permit". The issuing government agency would be authorised to securely transmit the digital file to the Postbox Service, then send the citizen a notification (email or text) with a link back to the secure Public Service Postbox System. By having that agency only send a link to the document, all communications and transmission of sensitive data is handled through one government system instead of each agency having to build an equivalent system. The system also allows for the use of a wide array of commercial email services and mobile networks that are already used by citizens but which are otherwise not secure and beyond the direct control of the government agencies.

Another scenario would see the Postbox used by and between government agencies, such as reporting agency key performance indicators (KPIs) to a central statistics or operations agency. This reporting could be on a variety of factors, including budget and other established criteria. A

'transportation agency', for example, might report daily accident data. This allows for an audit trail and a clearly defined automated process for data collection and aggregation across agencies. Data elements can, in fact, be shared on an ongoing basis with low friction and higher frequency. All agencies are increasingly pressured to share data on KPIs, and to share other data with citizens and businesses to support innovation or service delivery. By building out the data exchange technology with Cybernetica's UXP on Azure and the Postbox, this pressure can be channelled to enable digital transformation, not least in national statistics and 'big data'.

## Scalability and reliability

UXP on Azure has been designed by Cybernetica to be scalable and reliable from the ground up. Its two central design principles are: there must be no single points of failure and no central bottlenecks; and, it must be possible to increase reliability and performance of any component by adding redundancy.

The primary means for achieving the first objective is the decentralised architecture of UXP. The security servers communicate directly (X.509 certificates using TLS 1.2) without any intermediary and thus avoid central bottlenecks. The centralised services (central configuration and public key infrastructure {PKI} services) are not queried for every incoming message. Instead, they are queried once and the relevant information is cached. This

### **Question #3: Is a common, extensible interoperability infrastructure for different agencies essential to share data and integrate systems with one another, as well as the private sector?**

Having a common, extensible interoperability infrastructure will allow agencies to reuse data and services in a consistent, uniform, and secure manner across government. It will support the secure transport of data and authorised access to that data for reuse. It should also promote innovation in service design. Fundamentally it will make 'The Only-Once Principle' (TOOP) practical and will replace having separate data holdings for every government service by sharing key data sets transparently and in line with GDPR.

prevents the security servers from overloading the centralised services, and allows them to continue operating when the central services encounter minor downtime.

## Security and trust

In order to communicate securely, organisations must implement a security protocol. Keys must be exchanged, encrypted channels established, messages signed and verified, and various checks must be made. Designing a comprehensive security system is difficult and implementation is costly and error-prone. Thus, it does not make good sense to simply specify a set of general security requirements or protocols and then expect every communicating organisation to achieve

secure and interoperable implementation. In UXP this problem is solved by standardising both the security protocol and its implementation. The security-related functionality that the UXP members must implement is encapsulated into reusable components called security servers. The governing authority distributes the security server software, which the infrastructure members install as part of their information systems. To the application software, security server is an almost transparent gateway that accepts standard SOAP requests from the client and forwards them to the service (via service provider's security server); RESTful web services may also be used. The application software does not need to implement any part of UXP's security protocol.

### **Question #4: Can government services running on premises be integrated with cloud by using modern security controls and with minimal application changes?**

The flexibility of cloud services allows for integration with on-premises deployments. Today's hybrid cloud technology and common stack approach enables services that can span across on-premises instances into cloud-based instances, either as a core operating model or on demand. Similarly, even when hybrid models are not necessary, standard identity management across government facilitates seamless interoperability between the cloud and on-premises services.

### **Question #5: Will moving core security components into the cloud enable enhanced security features to withstand DDOS and offer greater resiliency?**

The security of digital services is an obvious key concern for Government. Cloud providers have the scale to dedicate significant investment in the area of security for the benefit of all their customers. Even significant government investment cannot compete with this level of investment. Security and privacy are designed in from the ground up. Providers have thousands of engineers continually developing new services and options, built with the latest and most rigorous development methodologies. New code is safer than old code, and new code that is constantly revised and tested by thousands of cybersecurity experts is safer still.

### **Question #6: Can a public services digital postbox, built upon a common extensible interoperability infrastructure, enable a trusted channel for digital communication for citizens and government?**

The electronic delivery of messages and documents saves costs, speeds up delivery time, and is more convenient for citizens and businesses. Using a single centralised digital postbox means that important data, and efforts to ensure its security and integrity, can be consolidated. By centralising efforts in this manner, it will harness economies of scale which can lead to further savings. In an EU context, both Denmark and Norway have successfully delivered digital postbox solutions to their citizens, resulting in a faster and more efficient communication process. In Denmark it is mandatory to receive letters from the public authorities from a digital mail box. The Danish government estimates that the digital post service will save c.€270 million annually.

# VII. Findings, opportunities, and recommendations

Ireland has ambitions to be recognised as one of the very strongest digital performers in the world and is progressing well as a digital nation. However, achieving this depends on its ability to embrace and extend best practices of leading digital nations.

The work undertaken by OGCIO, Microsoft, and The Fletcher School to set Ireland in the context

of other leading digital nations, to look at broad technical and policy questions relating to digital transformation, and to examine a practical proof of concept technology in the form of UXP on Azure and the Digital Postbox, succeeded in drawing out a number of findings, opportunities, and recommendations. These have been summarised in the table below.

Policy actions	Technical aspects
<b>Key findings of the research project</b>	
<ul style="list-style-type: none"> <li>Ireland is well-positioned to evolve into an advanced digital society. To do this, it should address the gaps identified in Fletcher’s Smart Society Benchmarking Study by adopting technology best practices from Estonia, New Zealand, and the rest of a ‘new D7’ and by leading by example in prioritised areas of digital services.</li> <li>Ireland’s public services are under-digitised. By deploying best available technologies such as secure hyperscale public cloud, Ireland can expand the scale, scope, and reach of digitised public services, drive efficiencies in costs and outcomes across the government, and accelerate its public sector digital transformation.</li> </ul>	<ul style="list-style-type: none"> <li>Enabling secure communication among organisations is heavily dependent on strong cybersecurity including PKI infrastructure.</li> <li>Many government systems run on private networks that are not readily connected to the public cloud.</li> <li>The Digital Postbox proof of concept demonstrated the first integrated version of X-Road data interoperability system in the cloud, a technology best practice from Estonia.</li> </ul>

## Key opportunities

- Use best available digital technologies to retain Ireland's competitive edge in the global economy.
- Build trust with government on the use of cloud technology through joint projects and proofs of concept between industry and government.
- Build trust with Irish citizens by partnering with industry to prove the value of technology in the delivery of citizen services and the responsible and transparent use of data by government.
- Make more use of public cloud where appropriate and in alignment with Ireland's objectives, e.g., hybrid.
- New cloud-based technology such as UXP (see section VI. *Technical proof of concept: Secure data exchange and interoperability framework*) can transform the ability of government to integrate its data, processes, and systems, allowing rapid implementation of new transformative services for citizens.
- Making data open and discoverable will maximise the value of government investment by reducing duplication.
- Reducing citizen and business overhead by eliminating the need to provide the same information time and again and to encourage data re-use.



## Key recommendations

- Implement a cross-government 'cloud friendly' strategy and policy framework that includes data classification, security and privacy standards, and technical measures that can flex as available technologies evolve.
- Perform periodic benchmarking, including 'valuation of gaps' to prioritise investments and track progress.
- Join and participate in the D5 group of digital nations (now D7, likely to grow to D9) to ensure access to digital nations' best practices.
- Add 'interoperability by default' so public services are designed to work seamlessly across organisational silos, relying on the free movement of data and digital services in the European Union in line with the Digital Single Market policy.
- Implement 'go digital' policies that drive efficiencies across public service operations, such as broader use of MyGovID and the elimination of paper-based processes for citizens and between government departments.
- Leverage technology to support government's regulatory compliance obligations, such as the GDPR, to encourage Irish citizens to gain trust in government's data use practices.
- Explore the opportunity to create a production pilot integration between two production government systems to demonstrate the suitability of a solution like UXP for implementing a scalable, resilient, managed, and well-audited solution for national data integration.
- Reducing citizen and business overhead by eliminating the need to provide the same information time and again, and to encourage data re-use.
- Enable public services to be a single point of contact rather than have citizens and institutions have to deal with multiple parties and have many stages involved in a single transaction.
- Better data driven outcomes for policy measurement and formulation through efficient discoverability, access to, and re-use of data
- Leverage hyperscale cloud to enable broad scale management of distributed systems, examples include utilising application SLA checks to maintain high level system availability.
- Leverage highly secure hardware utilising encryption technology to maintain integrity (data and systems) and confidentiality over distributed systems.
- Further explore the role of identity and access management in the control and monitoring of data sharing between citizens and their access to systems.

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