

Innovation Data Baseline

Final Report

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Executive Summary

This report summarises the findings of a study into methods and approaches for measuring the impacts of investment in innovation support in Scotland¹. The study is part of a wider programme of work being progressed by the Scottish Government on behalf of the Enterprise and Skills Strategic Board (ESSB). Specifically the research focused on the activities of the Enterprise² and Skills agencies (Scottish Enterprise (SE), Highlands and Islands Enterprise (HIE) and Scottish Funding Council (SFC)).

The objectives of this research were to:

- Identify the baseline data and methods required to improve the evaluation of innovation support interventions in terms of short and longer term outputs and impacts on the Scottish economy.
- Review the existing data and methods used by the agencies to monitor and evaluate innovation support activities.
- Make recommendations for new approaches to address gaps in current data collection and encourage consistent measurement and evaluation across all agencies.

Role of the Agencies and Innovation Expenditure

Each of the agencies has a different role in supporting innovation. The primary role of [SFC](#) relates to supporting research capability and activity in Higher Education (HE) and supporting and encouraging

¹ The Enterprise and Skills Strategic Board wishes to gain a better understanding of the impacts from investments made across the Enterprise and Skills system on Scotland's innovation performance. Therefore, for the purpose of this work, the term 'innovation support' includes investment in research as well as investments that are more narrowly focussed on business support.

² Please note that the research is focused on historical innovation activity (pre-2020), therefore the South of Scotland Enterprise Agency was not included as part of the review. However, the recommendations presented would be applicable and relevant.

engagement between education/research institutions and external actors in the innovation system (e.g. firms, public sector agencies, etc.).

As the bodies responsible for promoting and supporting economic development, [SE](#) and [HIE](#) focus on developing innovative capacity and supporting innovation activity within the business base. While offering broadly similar packages of support for businesses, these are tailored to reflect the different nature of the economy across lowland Scotland and the Highlands and Islands.

In 2018/19 it was estimated that Scottish Government's total annual spend on innovation interventions was around £479m. Further detail on the breakdown of expenditure is available in **Section 1** and **Appendix A** in the main report.

Of this total, £349m is delivered through the Enterprise and Skills agencies: SFC - £308m (88%), SE - £37m (11%) and HIE - £4m (1%). The Research Excellence Grant funding that SFC administers to Scottish universities is by far the largest single programme by value (£238m, 68%).

Why Support Innovation?

There is a strong and well-established evidence base demonstrating the role of innovation as a key driver for economic growth and productivity through the development of new products, processes, services and business models, which increase sales, and thus economic output, ultimately creating wealth and employment³. The important role of innovation as an enabling tool is also reflected in the Scottish policy environment⁴.

³ Research by the OECD and NESTA which suggests that innovation could account for between 25% and 50% of labour productivity gain, see [the Innovate UK Blog](#)

⁴ [Scotland's Economic Strategy](#)
[Scottish Government Economic Action Plan](#)
[Scotland CAN DO](#)

While many competing definitions exist, in order to place some practical parameters around the scope of the research, the Scottish Government's Enterprise and Skills Analytical Unit have developed a broad high-level definition of innovation:

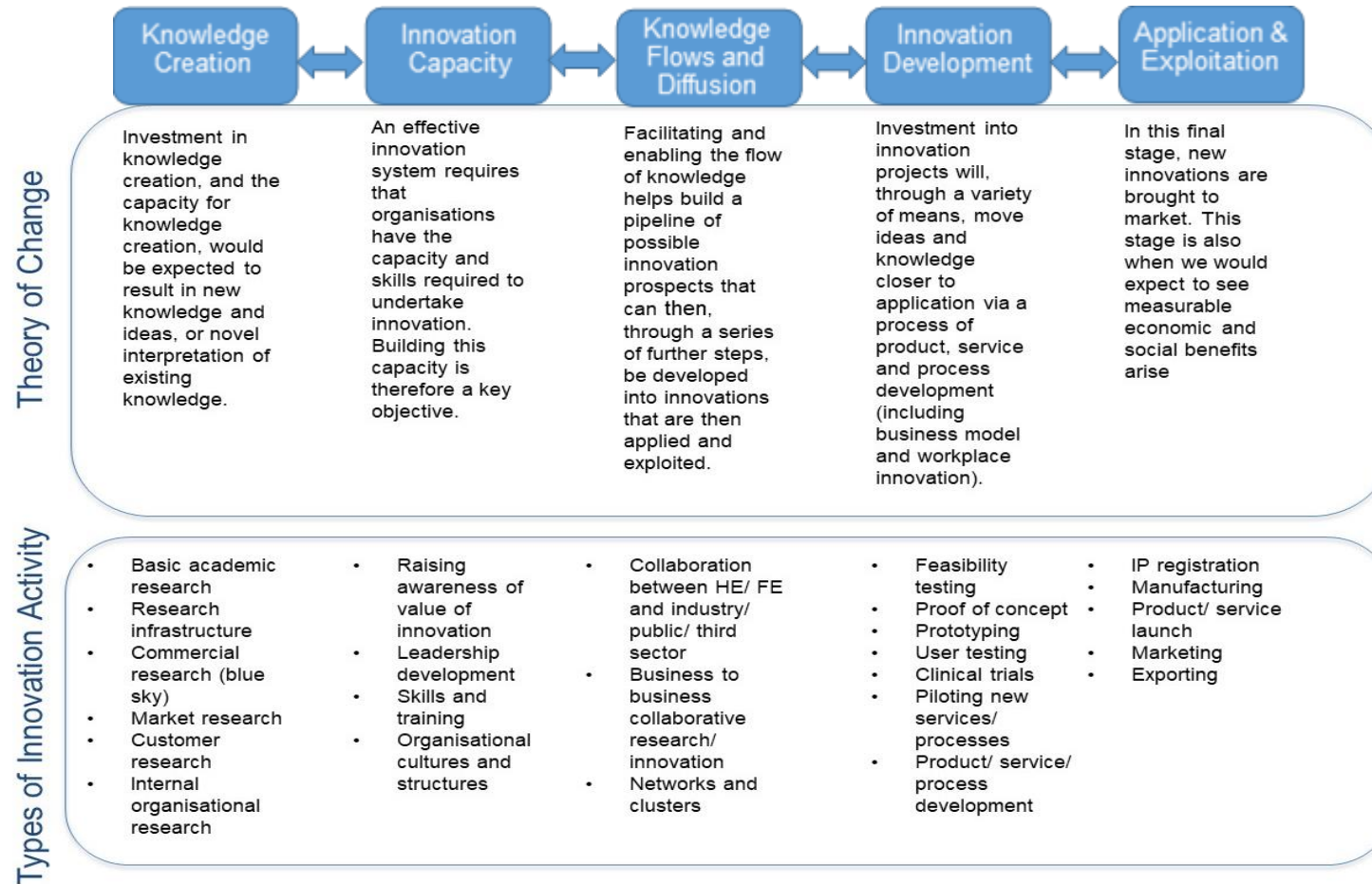
“new ways of combining existing (and/or new) resources to better address existing (and/or new) needs”.

Conceptual Framework and Theory of Change

The research drew on existing literature⁵ to develop a conceptual model that would simplify (as far as reasonable) the complexities of the innovation process and demonstrate the (direct/indirect) linkages across the system from knowledge creation to eventual exploitation (**Figure 1**). This model was agreed with the agencies and then used as a framework against which to assess current measurement practice.

⁵ [OECD Oslo Manual \(2018\)](#)

Figure 1: Innovation Model – Theory of Change and Activities



While the model depicts innovation as a linear process, it also recognises that real world innovation is in fact rarely linear. The outputs of one stage may not lead to the next, and iterative ‘feedback loops’ are possible across the model. It is also true to say that while much of the focus here has been on economic impacts, the model can and does also accommodate wider social and environmental impacts arising from innovation activities.

Finally, while the model does not directly address spillover effects, it may be possible and indeed useful to identify these by other means. Knowledge spillovers are often (unintended) outcomes from engaging in, or undertaking, innovation - new knowledge created has a number of potential applications by a number of different actors, outwith its intended use. However, at the individual intervention level it is extremely challenging to attribute, track and quantify the wider knowledge spillover impacts/benefits from one particular intervention to other firms, industry sectors, countries, society, etc. However, given the evidence to suggest the importance of these effects⁶, this is an area worth further consideration.

Further detail on the component elements of the conceptual model, and the accompanying theory of change, is provided in the main report (**Section 2**).

Review of Current Practice

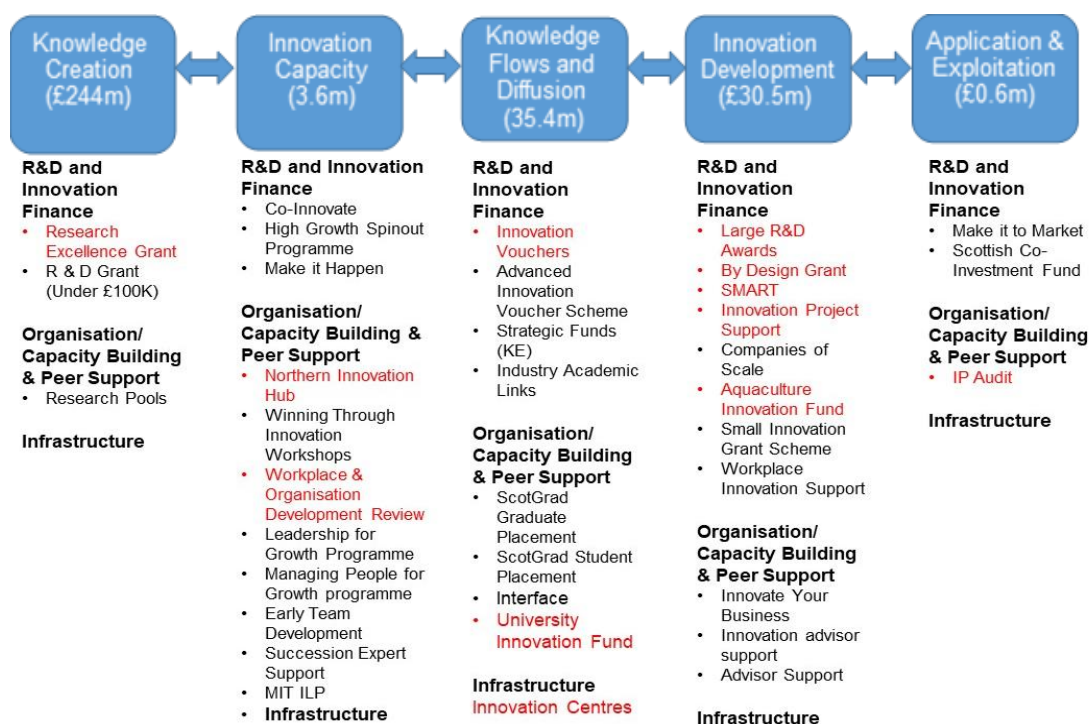
Investment in innovation was then mapped thematically across the innovation model and by type of intervention. **Figure 2**, below, provides an overview of the total annual expenditure (2018/19) in each category and provides examples of programmes delivered by the agencies.

⁶ See for example, <https://www.nber.org/papers/w10433>

The programmes highlighted in **red** were then examined in more detail to review current data collection and reporting practices, with greatest priority given to those with higher levels of expenditure.

These interventions together account for 87% (£303m) of the agencies' spend on innovation support in 2018/19.

Figure 2: Innovation Support Mapping



Summary of Main Findings

Across the agencies there are no developed frameworks for the specific goal/purpose of measuring and monitoring the impact of their investments in innovation support⁷. Instead, additional measures are typically included within existing (often long established) frameworks designed to measure wider agency targets/objectives. These frameworks are necessarily quite high level and often too broad to support a detailed and consistent account of the impacts of specific forms of innovation support.

As a result, a number of common issues/challenges were identified:

- attribution – there are challenges in attributing changes in performance (e.g. employment or sales) to specific interventions;

⁷ The Innovation Centres Programme Monitoring and Evaluation Framework is an exception.

- timescales – long timeframes of many innovation interventions to deliver quantifiable impacts;
- inconsistencies in terminology and interpretation of indicators - many are similar, but expressed in slightly different terms; and
- there is limited attempt made to capture the extent of “successes” across the innovation system.

Specific Agency Practice

Scottish Funding Council

SFCs’ role in the innovation system is different to that of SE and HIE, as its investments are directed to HE and FE institutions, and are often distributed as formula-based grants. The data sources used to track these core grants tend to be existing secondary sources (such as those provided by HESA) which provide more general measures of institutional performance rather than measures specific to SFC’s particular investments. Attributing impacts to SFC’s core grants is therefore challenging.

This is less the case with SFC’s strategic funds, which are often used to support defined programmes (such as the Innovation Centres). Many of these are subject to more specific measurement and reporting frameworks, which allow clearer attribution.

Scottish Enterprise

Overall, driven by its strategy⁸, SE has adopted a consistent approach across the breadth of innovation project and programme activity, and gathers a range of specific data.

This includes; R&D jobs, sales/exports from innovation activity, leveraged investments (private and collaborative R&D) and ‘innovation’ active companies. While not performing the same function

⁸ Building Scotland’s Future Today, see [SE’s strategic Framework](#)

as a measurement framework, SE also periodically commissions quantitative and qualitative evaluation studies to inform the evidence base that adds a rich source of intelligence.

Highlands and Islands Enterprise

In common with SE, HIE has a defined measurement system for capturing data to report against its published targets and assess the impacts of its services and activities.

This measurement system is aligned to the National Performance Framework and is driven by the priorities of the Scottish Economic Strategy and HIE's own strategy and operating plans.

HIE's framework has a set of general and more innovation specific metrics such as: R&D jobs, clients engaged in knowledge transfer, patents/licences approved and new products/processes developed, etc. In addition, HIE also has a series of tracking measures in the form of 'ladders' which track progress in five areas including innovation. The innovation ladder comprises five stages (chance, intent, active, embedded and evolving) – each of which assess the extent of commitment to, and action on, innovation within organisations. These measures allow tracking over time.

Current Practice Delivering Against Policy Goals

In support of the current practice review, a GAR (Green Amber Red) assessment was undertaken and can be viewed at **Section 5** of the main report. The main finding is that the collection and reporting processes for gathering data on the inputs to innovation (which are largely financial) and the activities that are delivered/supported, are relatively robust across the cross-section of programmes reviewed.

In contrast, there is little in the way of data being gathered across the agencies that would support a consistent and accurate assessment on

the outputs/outcomes and impacts being generated through the innovation spend.

Specifically, we would note that a key strategic objective for Government is for Scotland⁹ to be within the top quartile of OECD countries in terms of productivity (and equality, wellbeing, sustainability). Investing in innovation is one of the key mechanisms to help drive inclusive growth across all these areas. However, current approaches do not gather the data necessary to measure the contribution of Scottish Government innovation expenditure to this over-arching policy goal.

Conclusions and Recommendations

One of the main objectives of the study was to assess whether it was feasible to measure the totality of impact generated through Scotland's investments in innovation across the three agencies, which was estimated at £349m in 2018/19.

On the basis of current approaches and measurement practice undertaken by the agencies, such an assessment is not possible, for the following reasons:

- there are significant gaps where either data are not collected at all, or the available data are not sufficiently robust or complete;
- measures/metrics are sometimes inconsistent in their definition across different agencies, even if similar in general meaning;
- the attributional links between investments and impacts are not always clear, and there is reliance in some places on benchmark measures of innovation performance (such as those in the HE BCI for universities or BERD for the wider economy) which cannot easily be attributed to specific support or investment;

⁹ [National Performance Framework](#)

- there is considerable potential for double counting of impacts where companies have received multiple forms of support from the same/or another agency/organisation;
- there is little sharing of data across the agencies;
- impact data (e.g. turnover and employment gains) are frequently based on forecast rather than actual data; and
- the long timescales between intervention and impact in innovation projects are such that impacts are not always captured by existing data collection methods as longer term tracking is limited.

Recommendations for Action

In providing recommendations about how to improve and address gaps in measurement systems, there is a need to be pragmatic, given the complexity and overlapping nature of the linkages across the innovation journey and conceptual model. In particular, there is a need for a pragmatic means of assessing, and therefore balancing, the costs and benefits of monitoring and evaluation.

In order to implement a measurement framework that can better evidence the impact of Scotland's expenditure on innovation, there will also be practical considerations such as:

- securing the “buy-in” and cooperation of the three agencies and wider stakeholders such as the universities;
- strategic commitment reflected in agency/partner's policy and allocation of resources to develop and populate a new framework; and
- timescales for implementation and ‘payback’ i.e. reflecting the longitudinal nature of the innovation journey it will be a number of years post-implementation before any framework starts to generate meaningful data and intelligence.

Taking all this into consideration, we have outlined an updated Framework of proposed measures across the innovation journey, presented at **Section 6.5** of the main report.

At a high level, in addition to the commitment of resources there are implications for each of the agencies as follows:

Scottish Funding Council

SFC should seek to gather data from HEIs on:

- the use of Core Grant monies (specifically the Research Excellence Grant and University Innovation Fund) against defined categories of expenditure (these could relate to infrastructure, research activity and staff, for example);
- more comprehensive measures of research activity and resources including the number of active research projects and research active staff (taking account also of the Scottish Government work on research and KE measures and review of existing data sources such as the HE-BCI Survey);
- the number and location of businesses and other external organisations with which they engage (this could be captured in the HE-BCI and could be an issue to input into the HESA review process); and
- engage with and support the universities to collect data on the impacts of their innovation activities.

Enterprise Agencies

For the enterprise agencies there are three overarching principles that should be considered to support development and implementation of a new framework:

- there is a need to adopt a consistent set of measures between the agencies such that data collection and reporting can be more aligned;

- there should be greater commitment to longer term tracking of assisted organisations to assess impacts over time - this is particularly important for innovation support where timescales can be lengthy; and
- data collection should move from reliance on forecasts to actual impact data – which will require the longer term tracking noted above.

Other Stakeholders

Delivering and undertaking innovation activity is not the sole responsibility of the agencies and there is a role for wider actors and stakeholders. These wider stakeholders include: ESSB, Scottish Government, universities, research institutions, innovation centres and businesses. There are resource implications for these wider stakeholders, which also need to be considered in defining their role in any future framework.

Next Steps

The next steps in taking forward the new framework would be as follows:

- further engagement with the three agencies to define in more detail the specific (and consistent) set of measures within the framework and scope out the various data collection methods – this might also extend to wider partners and stakeholders;
- agree and develop a data governance model that identifies roles and responsibilities including responsibility for the co-ordination of the data collection and reporting processes;
- develop a common reporting format (template) for the agencies to input data on an annual (or otherwise agreed) basis;

- develop data collection processes (including arrangements for longer term tracking) and allocate necessary resources to support; and
- begin data collection to establish a baseline position for Year 1.

It is worth noting that some of these actions could be implemented with limited impact on resources. These include:

- developing a consistent set of measures and common reporting template across the agencies; and
- establishing agreed data collection processes and timeframes across the agencies.

Implementing new data collection processes may then require the allocation of resources and this is a decision to be made by the agencies and the ESSB.

1. Introduction

This report has been prepared as part of a programme of work to examine methods for measuring the impacts of investment in innovation support by the Scottish Government and its Enterprise and Skills agencies (Scottish Enterprise, Highlands and Islands Enterprise and Scottish Funding Council).

The work was commissioned by the Scottish Government on behalf of the Enterprise and Skills Strategic Board (ESSB) and the objectives were to:

- identify the baseline data and methods required to better evaluate innovation support interventions in terms of both short and longer term outputs and impacts on the Scottish economy;
- review the existing data and methods used by the agencies to monitor and evaluate innovation support activities; and
- make recommendations for new approaches that will address gaps in current data collection and encourage consistent measurement and evaluation across all agencies.

1.1 Innovation Support

The proposed framework is aimed at measuring the impacts of investment in innovation related interventions as defined by the Scottish Government Enterprise and Skills Analytical Unit (ESAU). In particular, this focusses on investments made by:

- Scottish Funding Council (SFC);
- Scottish Enterprise (SE); and
- Highlands and Islands Enterprise (HIE).

Each of the agencies has a different role in supporting innovation, which can be summarised as follows:

- SFC provides funding and support to universities and colleges in Scotland. Its primary roles in the innovation system relate to supporting research capability and activity in higher education (HE) and supporting and encouraging engagement between HE, Further Education (FE) and external actors in the innovation system (e.g. firms, public sector agencies etc.) for the purposes of advancing innovation;
- Scottish Enterprise (SE) also has some involvement in funding and delivering programmes that support the interaction between the academic knowledge base and the wider economy, but also has a strong focus on developing innovative capacity and supporting innovation activity within Direct Relationship Managed (DRM) and Non-Relationship Managed (NRM) firms; and
- Highlands and Islands Enterprise (HIE) has a broadly similar focus to that of SE, but reflects the characteristics of the company base across the region. There are fewer large companies and fewer innovation active companies and thus HIE's support tends to be smaller in scale and more focussed on capacity building. There are, however, a number of internationally significant research based projects such as; Scottish Association for Marine Science (SAMS), Orkney Research and Innovation Campus (ORIC) and (Wave Energy Scotland (WES)). HE in the region is mainly limited to UHI which has a developing capacity for supporting innovation activity, although others including the Glasgow School of Art also have a footprint in the area.

Initial work by the Scottish Government collated the various investments in innovation made by the three agencies¹⁰. In total, it is estimated that the Scottish Government contributed around £479m in

¹⁰ Please note that there a number of programmes/projects that are delivered via Scottish Government, or where the Agencies simply act as a conduit/mechanism for allocating funding. This work was carried out by the Innovation and Enterprise Division of the Scottish Government.

2018/19 to supporting innovation interventions across a diverse range of project, programmes and schemes¹¹. Of this total, £349m is accounted for by the activities of the three agencies, as set out in **Table 1.1**, over.

The remaining expenditure is via the Scottish Government, and includes:

- Innovation funding including the Climate Challenge Fund, Decommissioning Challenge Fund, Energy Investment Fund, Low Carbon Infrastructure Programme, Low Carbon Innovation Fund, R&D Grants to Businesses, Wave Energy Fund and Unlocking Ambition (*inter alia*);
- Capacity building and peer support, including Scotland Can Do, Women into Enterprise, Scale Up, Hydro Nation, Space Technology and Vanguard Initiative; and
- Infrastructure and facilities including the Lightweight Manufacturing Centre, National Manufacturing Institute for Scotland, MMIC, the Oil and Gas Technology Centre and Charging Points for electric vehicles.

Within the £349m in agency spend, the Research Excellence Grant that SFC administers to Scottish universities is by far the largest single programme by value (£238m, 76%).

A breakdown by total funding is as follow, with the detail in **Table 1.1**, over,

- SFC – £308m (88%)
- SE – £37m (11%); and

¹¹ This estimate is based on a combination of spending figures provided by the Agencies during the course of this study and figures extracted from an internal Scottish Government mapping exercise during 2019, which, based on Programme for Government activity, sought to provide an indication of the amount and distribution of business innovation spend across areas of government in 2018/19.' Please note that these exclude spending on City and Regional Deal projects.

- HIE - £4m (1%).

Table 1.1: Agency Innovation Support Activities

HIE		SE		SFC	
Programme	£	Programme	£	Programme	£
Northern Innovation Hub	£1,300,000	Large R&D Awards	£11,700,000	Core Grants (Research Excellence Grant)	£237,807,000
R & D Grant (HIE)	£1,265,863	SMART	£7,000,000	Post Graduate Research Grant	£35,183,000
Aquaculture Innovation Fund	£311,816	R & D Grant (Under £100K)	£4,866,809	The Innovation Centre Programme	£13,924,000 ¹²
Scot Grad-Graduate Placement	£304,815	Innovation Project Support	£4,795,311	University Innovation Fund	£15,896,784
The Innovation Centre Programme-HIE	£250,000	Workplace Innovation Funding (AM)	£2,447,246	Industry/ Academia Links Fund (formerly SEEKIT) ¹³	£2,268,000
Co-Innovate	£195,000	High Growth Spinout Programme	£1,749,970	Research Pools	£940,000
Innovation advisor support	£164,435	By Design Grant	£942,911	Strategic Funds KE	£544,000

¹² SE also contributed £503,866 to the Innovation Centres Programme in 2018/19

¹³ Funding for the Industry/Academia Links Fund does not come from the SFC core budget. Rather, the funding is provided by the Scottish Government specifically for this programme.

Small Innovation Grant Scheme	£82,065	SE/RSE Enterprise Fellowships	£718,482	Interface	£778,000
MIT LIP	£65,000	Advisor Support	£525,722	The Innovation Voucher scheme	£542,000
Advanced Innovation Voucher Scheme	£63,048	Development Support	£316,714		
Innovate your Business	£49,522	Workplace & Organisation Development Review	£300,823		
Scot Grad Student Placement	£33,274	Scottish Co-Investment Fund	£280,509		
Make Innovation Happen	£23,160	IP Audit	£259,292		
Disrupt Aqua	£775	Companies of Scale	£222,882		
		Innovation Services Expert	£204,616		
		INT532 ScotGrad Innovation Support	£198,804		
		Workplace Innovation Funding (NRM)	£133,920		
		Early Team Development	£98,059		
		Succession Expert Support	£82,434		
		Make It to Market	£72,334		
		Leadership for Growth Programme	£39,330		

		Employer Engagement (Masterclasses & Workshops)	£30,783		
		Consortium Expert Support	£24,286		
		Managing People for Growth programme	£12,965		
		SDT265 Offshore Wind Expert Support	£12,382		
		Winning Through Innovation Workshops	£3,432		
TOTAL	£4,108,7 73		£37,040,0 16		£307,882,7 84

Source: Scottish Government (data provided by the Agencies)

1.2 Study Method

The study was conducted in two phases as described below.

Phase 1: Developing the 'Ideal' Data Framework

The first phase focussed on developing an ideal world framework for measuring the impact of innovation support, building on a conceptual model of innovation processes and taking account of existing work in this field, including work by the Scottish Government around a theory of change model for innovation support. This first phase comprised the following stages:

- **Stage 1: Inception:** initial discussion with the Scottish Government client team to agree the scope of the work and arrange access to relevant background research and contacts;
- **Stage 2: Desk Review and Initial Consultations:** review of the 'Theory of Change' model and other relevant literature on innovation measurement to inform the development of the proposed 'ideal' data framework and consultation with the Scottish Government and the agencies to seek their input on the kinds of measures that should be considered. The latter comprised semi-structured interviews conducted face to face, where practical, covering:
 - a. views on the nature of innovation and the ways in which innovation leads to economic benefit
 - b. views on the most useful measures to assess innovation support in a general sense
 - c. more specific thoughts on the most useful measures for the programmes under review

d. issues and constraints regarding the practicalities of collecting relevant data and how these might be addressed;

- **Stage 3: Framework Development:** development of the ‘ideal’ data framework in draft form, drawing on the previous desk review and consultation work. The framework defined measures in line with the theory of change and logic chain principles and formed the basis of a Working Paper setting out the conceptual model for discussion with the Scottish Government and the agencies.

The Working Paper also presented a suggested list of innovation support interventions to be examined in more detail in Phase 2; and

- **Stage 4: Workshop:** a workshop with the Scottish Government and the agencies at which the study team presented the draft framework (also issued in advance of the meeting), facilitated discussion on the framework and discussed any amendments and the next steps. The Working Paper was also circulated to relevant contacts within the Scottish Government and the agencies as required.

[Phase 2: Review and Recommendations](#)

The second phase of the study focussed on reviewing current practice across the three agencies in relation to measuring the impacts of innovation support. It comprised three stages:

- **Stage 5: Review of Current Practice:** further engagement and consultation with the agencies to examine existing methods and formats used to collect data relating to the innovation interventions under review (and more generally). This was an iterative process involving: initial discussions with relevant personnel within the agencies; provision by the agencies of relevant materials and information relating to impact measurement and data collection;

and review of these materials and further contact with each of the agencies to clarify any queries and discuss the underlying data collection and reporting processes. The study team also consulted with the University of Edinburgh (Edinburgh Innovations) to discuss data collection processes and the developing CRM system;

- **Stage 6: Summary and Analysis:** Stage 6 focussed on summarising the data collated in Stage 5 and mapping this against the ideal data framework developed in Phase 1 with a view to identifying gaps and areas of overlap.
- **Stage 7: Recommendations and Reporting:** the final stage involved the production of a Draft Report which was circulated amongst the agencies and Scottish Government contacts for comment prior to the production of the final study report.

2. Measuring Innovation

2.1 Why Support Innovation?

Innovation has been a consistent policy priority for many years, both in Scotland and the UK and internationally. Widely considered essential for economic growth and productivity, innovation drives the development of new products and services or improving existing ones, increasing sales, and thus economic output, and ultimately creating wealth and employment.

Innovation in Scotland

Founded in 2014, Edinburgh Molecular Imaging is helping doctors and clinicians see the invisible with molecular imaging technology. Based on fluorescent imaging, the technology has the potential to detect disease in real time during interventional procedures including surgery, providing more accurate treatment while sparing healthy tissue. This is done by literally illuminating diseased tissue with fluorescent dye, providing doctors with a clear view of the extent of the disease

Research and development (R&D) is often considered central to innovation and innovation policy, but innovation is, of course, more than R&D, important as that is. While many innovations are technological – faster computers, more powerful phones and more fuel efficient cars – innovation is also about doing things better.

While the link between innovation and productivity is complex, there is evidence to suggest that innovation plays a key role in productivity growth. Indeed, work by the OECD and Nesta suggest that innovation could account for between 25% and 50% of labour productivity gains¹⁴. Productivity growth will come through increasing output at a rate faster than employment growth, but also through increasing the efficiency of firms' operations.

However, the benefits arising from R&D and innovation more widely are not just economic. Innovation helps us develop better medicines, more effective public services and greener energy with resulting social and environmental benefits.

Although comparable estimates are not available for innovation as more widely conceptualised (as compared to R&D), a review of existing evidence by RAND Europe¹⁵ argued that there may be even

¹⁴ <https://innovateuk.blog.gov.uk/2015/08/06/productivity-and-innovation/>

¹⁵ *Evidence synthesis on measuring the distribution of benefits of research and innovation*, RAND Europe, 2017.

greater benefits across society than the economic R&D estimates suggest (through ‘spillover’ effects), including benefits on culture, public engagement, social cohesion and environment, even if these are difficult to measure.

Innovation in Scotland

Facing high and rising levels of violent crime, the police in Scotland adopted in the mid 2000s a new public health approach to the issue. Interdisciplinary, science-based and multi-partner, this innovative model pioneered a new approach to identifying the drivers of violent crime and targeting resources at prevention as well as law enforcement. Since its adoption, crime statistics have dramatically reduced, and countries across the world have sought to learn from Scotland’s approach and implement similar models.

Therefore, there are compelling reasons for governments to invest in measures that encourage and support innovation.

2.2 Measuring Innovation

Comprehensive and robust measurement of innovation and its impacts is challenging from both a conceptual and a practical perspective. We have reviewed the measures and indicators currently collected by the Agencies to track their investments and note that these are predominantly in line with their Business Plan objectives/targets and take account of all of the Agencies’ activity. A sample of these are considered later (and in more detail in the Appendix).

We have instead adopted a more conceptual approach as our starting point. Rather than attempt to develop a measurement framework based on current practice, this approach seeks first to articulate an ‘ideal world’ model for measuring innovation support and its impacts, and then to assess current practice against this model. This will help identify gaps and suggest areas for future data collection.

Defining the Scope

The definition of innovation that has been developed by the Scottish Government's Enterprise and Skills Analytical Unit to guide this work is as follows:

“new ways of combining existing (and/or new) resources to **better address** existing (and/or new) needs”.

This is an undeniably broad definition, and it is worth pointing out that much of the literature on innovation, and innovation measurement, is based on economics and management science. This has given the field a strong bias towards economic models of innovation that posit economic motives and outcomes.

While these economic outcomes will be a primary focus, it is important to bear in mind that innovation extends beyond the economic domain, and indeed is a crucial driver of wider social progress in fields as diverse as health and wellbeing, environmental protection and public services. This is also consistent with the ambition of the Scottish Government to be in the top quartile of OECD countries not just for productivity but also equality, wellbeing and sustainability.

An 'ideal world' framework for the measurement of innovation support should be able to accommodate this diversity.

2.3 Conceptual Framework

The measurement framework must be underpinned by a robust conceptual model that explains the processes (and direct/indirect linkages) by which the target outcomes and impacts may be achieved. In the context of innovation, there is a rich and complex literature on which to draw, and different frameworks and models of innovation have evolved over time.

A useful review of these can be found in the OECD Oslo Manual (2018)¹⁶, which provides detailed guidance on measuring innovation at a macro level. While very useful as a reference guide, the Oslo Manual is intended to inform national survey design and data collection rather than to assess the more specific impacts of particular innovation support activities. Nonetheless, it does provide much in the way of valuable insight, particularly around the nature of innovation processes and the roles of different actors within an innovation system.

It is helpful to begin with a consideration of innovation and how it occurs. Innovations derive from knowledge, existing or new – but innovations are more than ideas. They depend on the implementation of new or existing ideas/ knowledge. Thus there are at least two distinct processes at work – the creation of knowledge and its application (with numerous interactions in-between). This is implicit in the definition above.

This could be considered an oversimplification, and one that supposes this to be a linear process, when the reality is more complex and iterative. It also does not account for the fact that knowledge may be created in a wide range of ways, and the processes for acquiring and applying knowledge or ideas are also many and varied. Similarly, it is important to note that innovation is not solely undertaken for commercial purposes, and that a wide range of organisations will have a role in the innovation system.

Rather than seek to tackle the complexities of innovation systems directly, we have instead sought to simplify the conceptual framework and accompanying theory of change while retaining sufficient breadth

¹⁶ [OECD Oslo Manual \(2018\)](#)

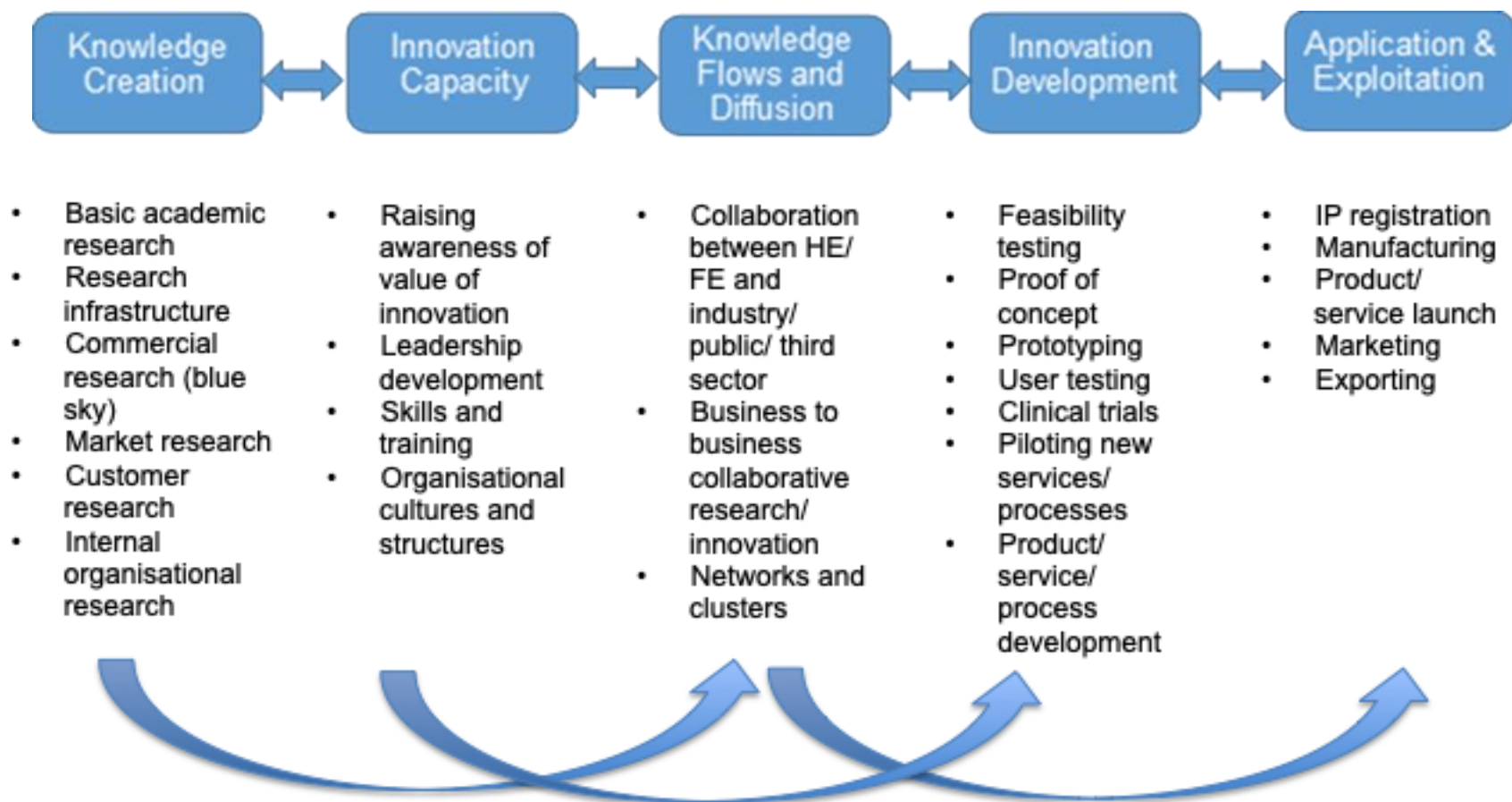
that a wide range of innovation activities and interventions can be accommodated.

The key categories have been mapped out against an 'idealised' notion of an innovation journey from knowledge creation to eventual exploitation (commercial or otherwise). For now, we are disregarding the fact that such a linear model is not the reality. In fact, one step does not necessarily lead to another and there may be feedback loops. Failures will occur along the way, and some ideas will take a longer time than others to be developed. Some innovations may also need more development than others before reaching application, and others may move forwards and backwards through the process from idea to application. Some will never progress at all.

It is also the case, as demonstrated by the Covid-19 crisis, that new and even unforeseen demands and issues can impact on the process and on the timing and scale of any outcomes at different stages in the innovation journey.

Thus, when interpreting and applying the proposed framework, it is important to bear in mind these complexities. The key elements of the proposed framework are summarised in **Figure 2.1**, over, and described in the section that follows.

Figure 2.1: Innovation Journey Model



Knowledge Creation

This includes a variety of means through which knowledge/ ideas are created. Academic and scientific research are obvious inclusions, and interventions here would include investment into research activities, but also investment into research infrastructure and into the development of research capacity and capability. These are typically subject to considerable public investment as the potential for commercial return is highly uncertain, and in many cases, unlikely. In the context of the current project this is very much the focus of SFC's innovation interventions.

Beyond the academic community, this would also include early-stage (e.g. Technology Readiness Level stage 1 - 3) research activities within firms, and other organisations, as well as individual invention. Models of open innovation and user innovation rightly argue that knowledge and ideas can come from a broad range of sources, including competitors, suppliers and customers, as well as within organisations themselves. Interventions in this area would include support for organisations to undertake research, market research and internal review work (e.g. for inclusive business model innovation). Some support of this nature may be provided by the enterprise agencies, for example through R&D grants.

Innovation Capacity

Just as research capacity is essential to the creation of new knowledge, so an innovative economy depends on the capacity of organisations and individuals across the economy to undertake innovation activities. Knowledge creation and innovation capacity could be considered the essential building blocks for an innovative economy.

The first aspect here is awareness and understanding of innovation and its potential value (to organisations, the economy and society).

Thus, interventions which serve to raise awareness and build understanding of the value of innovation would belong here. This could also include teaching and training at all levels of the education system, essential to developing innovative capacity within individuals. However, this is outwith the defined scope of the current review.

The capacity for innovation will also depend on the assets and resources available to organisations, including the skills and expertise of staff (business leaders and 'operational' staff), the availability of suitable investment (public and private sources) and the organisational structures that can support innovation.

This category includes a broad range of possible interventions from skills and leadership to organisational development support. Many of these kinds of interventions are delivered by the enterprise agencies (and arguably also by Skills Development Scotland, although not included within the current scope).

[Knowledge Flows and Diffusion](#)

Innovation rarely happens in isolation, and is more often a collaborative effort and is typically shared or developed in collaboration whether between academic researchers and external organisations, or organisations and partners, competitors or customers or even amongst staff within organisations. An effective innovation system is therefore one that supports and enables the flow and exchange of information.

This is rich territory for intervention and support here includes infrastructure and investment that supports, encourages and incentivises knowledge sharing. Most obviously, there are substantial investments in knowledge exchange activities between universities (and colleges) and external organisations (such as industry). This category also includes business to business innovation support and

activities that support the wider uptake of existing knowledge, ideas or technologies that can support innovation (e.g. high speed broadband roll out).

The former is a major area for SFC investment while the enterprise agencies tend to be more focussed on the latter, although in practice there will be programmes in this category that are supported by all three agencies.

Innovation Development

As noted above, innovation is about the implementation of ideas or knowledge (new or existing). This process overlaps with knowledge flows and diffusion but generally extends further through the iterative development and testing of new products, services, processes and business models until they are ready for market application.

This essentially comprises the development phases for research and experimental development and can include feasibility work, proof of concept testing, prototyping, user research and testing, design and development. Again, this is a common area for intervention, not least as commercial investment may still perceive this to be too high risk. Thus, there is a strong tradition of public investment in organisational innovation development.

This is the main focus for the innovation support (by value of investment) provided by HIE and SE.

Application and Exploitation

The final category, or stage in the innovation process, would be the application of innovations, usually in the form of new products, services or business models being brought to market (commercial or otherwise) or new processes being introduced.

This area is less often the subject of public sector intervention largely because private investment is more likely here than elsewhere on the

innovation journey due to the greater predictability of likely financial returns. There is also a less compelling 'market failure' rationale for public sector intervention at this stage (although this does not prohibit the public sector investing in "public goods", which is a recognised market failure).

For example, a technology firm will invest in taking a new technology to market having received support (of various kinds) to develop the technology to this stage. However, some forms of public sector support may apply including investment and loan finance, supply chain sourcing and export development. Again, the enterprise agencies are more likely to invest in this area. SFC would not invest in these kinds of activities.

It is important to note that intervention and investment occur at *each stage* in the innovation process or journey as summarised above. Thus, for each of these categories there will be a set of inputs, which support specific activities, generate outputs and lead ultimately to the intended impacts. Some of these outputs will then feed into subsequent stages of the innovation process, while others will end at that point.

This reflects both the different drivers and motivations at play for different actors across the innovation system (with respect to the objectives of the interventions these can be quite varied and divergent), and also the failure rate along the journey from knowledge creation to market application.

This framework is, as noted, a simplification of real world practice in innovation. However, the categories are purposely designed to be sufficiently broad to accommodate the range of innovation support provided by the public sector.

What is does not include is consideration of the external factors that can affect the nature and extent of innovation within individuals, organisations and an economy, such as:

- market forces and unforeseen shocks (such as COVID 19);
- policy and fiscal measures (e.g. R&D tax credits); and
- social and environmental factors (e.g. climate change prompting innovation in low carbon technologies).

2.4 Theory of Change

In order to be implementable and robust as a framework for measurement, the identified categories should provide a coherent account of a route to impact from the initial investment to the intended outputs and eventual impacts (economic, social, environmental, etc.).

Knowledge Creation

Investment in knowledge creation, and the capacity for knowledge creation, would be expected to result in new knowledge and ideas, or novel interpretation of existing knowledge. That resulting knowledge would then require to be developed and used such that it then returns value in different ways. Some of this knowledge would be shared such that its primary impact will be in contributing to understanding in a particular domain or discipline, while other forms of knowledge will continue to be developed more widely.

A new interpretation of a Shakespeare play, for example, would contribute to the understanding of the work of the playwright, but may go no further than this (an end in its own right), while scientific research might help develop a new technology which then might progress through the innovation stages described above to result in a new product reaching the market and delivering financial, economic and other wider social returns. As such, while basic research activity is

often focussed primarily on the advancement of knowledge, a proportion of the outputs from this activity will contribute (eventually) to economic impacts such as productivity gains, albeit usually as a result of subsequent investment and development activity. In this way, research activity and its immediate outputs in the form of codified knowledge might be considered ‘capital stock’ which might, at any point in time, be utilised for the purposes of innovation.

The immediate or direct outputs arising from the investment in research activity would be mainly in the form of traditional academic outputs that seek to codify knowledge – research papers, conference presentations etc. – or could also be in the form of new technologies e.g. software code, or even cultural outputs. It is, however, too simple to propose that these outputs would then be picked up by other actors in the innovation system and developed to final application. It is more likely that the knowledge gained through research effort would be exchanged with other actors through interaction between researchers and others.

Indeed, such interactions also often result in new knowledge being created. Thus the linkages between knowledge creation and subsequent stages in the innovation process are not always straightforward.

It is also important to note that the drivers for supporting basic research in universities will often be based more on the value of knowledge as a public good than they are on the potential for future economic impact¹⁷. This is not to say that there will be no benefit or impact from investing in this activity. High quality scholarship (as

¹⁷ A public good is a good that is both non-excludable and non-rivalrous, in that individuals cannot be excluded from use or could benefit from without paying for it, and where use by one individual does not reduce availability to others or the good can be used simultaneously by more than one person. Knowledge is an example of a public good.

measured by strong research performance) would be expected to result in reputational gains for institutions, attracting further research talent and investment, as well as students. Strong scientific research capacity is also a magnet for often high value inward investment as witnessed, for example, in the Cambridge biotech cluster.

The knowledge created may also eventually deliver benefits to society in ways that are not directly economic but may have economic consequences. For example, psychological research into child development may lead to revisions to guidance on road safety education that could subsequently develop into practice, leading to a reduction in traffic accidents amongst children, and savings in relation to hospital admissions. In this way, the original investment in research provides the inputs to a process that delivers both social and economic benefit.

Innovation Capacity

As noted above, an effective innovation system requires that sufficient organisations (and individuals) have the capacity and skills required to undertake innovation. Building this capacity is therefore a valid policy objective.

Support in this respect would be expected to increase the numbers of organisations that understand the potential benefits/impacts from being more innovation active, and have the capacity to undertake innovation. This in turn would be expected to lead to more organisations investing in, and undertaking innovation ('innovation active'). This activity could lead to the development of new products, services and processes and increased levels of economic and social benefits (e.g. through new sales, increased efficiency, employment and productivity gain). In particular, more innovation active companies should be more productive.

Knowledge Flows and Diffusion

Ensuring the flow of knowledge, ideas and information across the innovation system is critical to its effectiveness. It is often the case that the sources of knowledge are not best placed to turn that knowledge into innovation. Facilitating and enabling these connections helps build a pipeline of possible innovation prospects that can then, through a series of further steps, be developed into innovations that are then applied and exploited in different market contexts.

As noted above, new knowledge may be created through these interactions (for example between universities and industry), and the process is not always as simple as the transfer of knowledge from one party to another. This suggests some overlaps between the stages of the innovation journey as set out above, and is an example of the complexity in innovation processes.

An example of the types of direct intervention here includes knowledge exchange programmes that connect universities and firms. For example, firms may take advantage of research expertise and specialist equipment within the university to validate a technology, or a university may recruit commercial experience/expertise from the private sector to support a university spin-out to secure external investment.

This activity may result in a successful output where the actors take forward a collaborative project to the next stage of the innovation journey (innovation development). Similarly, there may be no quantifiable output although it could help the actors recognise the value in collaboration/knowledge exchange, making them more open to engaging and collaborating in the future, thereby stimulating the innovation pipeline.

Knowledge flows and diffusion do not always require university (or college) involvement. Knowledge flows between companies and their

suppliers, competitors and customers are also important, and knowledge may also transfer (or leak) with changing personnel within firms. These effects may be facilitated by interventions designed to stimulate these networks.

At this stage again, it should be expected that a proportion of activities arising within and from these interactions will progress no further.

Innovation Development

Within this broad category, investment into innovation projects will, through a variety of means, move ideas and knowledge closer to application via a process of product, service and process development (including business model and workplace innovation).

This may include taking forward the outputs of knowledge exchange activities, but may also develop ideas created or acquired in other ways (e.g. from within organisations). This is also likely to be a somewhat iterative process where projects may need to 'go back' a few steps in the process to seek further inputs (e.g. go back to researchers for input on feasibility or advise on amendments to products). As with other stages in the journey, a degree of failure is also to be expected, and should be considered in assessing the outcomes of testing and development processes.

The outputs should be a series of innovations (for example in the form of prototypes, market tested propositions etc.) that are closer to being market ready, having been tested, developed, designed and refined to improve their chances of eventual success. As a result, investment and support for the development phases of innovation might be expected to result in more innovations reaching the market with a higher change of success, and therefore greater prospect for economic and/ or social impact. This would again include productivity gains.

Application and Exploitation

In this final stage, innovations are brought to market. While knowledge itself is essentially a non-rival good (it is available to all), organisations may wish to protect their investments by making relevant knowledge excludable. The primary mechanisms for this are various forms of legal protection for intellectual property (IP). Of course, IP protection could take place at a much earlier stage in the innovation process but is included here as a means of exploiting innovation (usually for commercial purposes).

This stage is also when innovations are launched on the market and investments and activities here would be expected to lead directly to economic and social benefits (again there will be successes and failures). Agency interventions have a role in bringing these innovations to market and, in particular, promoting Scottish innovations to a global audience via export markets.

Thus a new product may lead to increases in sales and a new or improved process may result in productivity gains. A new healthcare treatment may result in public health benefits (e.g. people living healthier lives for longer) and a consequent reduction in spending on acute care services.

Linkages across the Model

Across the model, attributional links can be made (direct, indirect and leveraged) but these are more complex than may first appear. So, while knowledge is an essential input to innovation, not all knowledge will lead to innovation.

In addition, the outputs of research activity may not be a direct input to subsequent development – as noted above, much of the transfer of knowledge is mediated by interactions between people. Measuring these interactions can be challenging unless they fall into the predefined categories of existing data collection systems (discussed

below). So, attributing and tracking/measuring eventual gains in economic output to general investment in basic research in universities is something of an inferential leap for a number of reasons:

- the original investment is likely to have been made with different policy goals in mind (e.g. education and knowledge as a public good rather than an economic driver);
- numerous intermediate steps (including potential failures) and investments are required to implement the outputs of research in society or the economy, these benefits cannot be solely attributed to the original research investment; and
- many of the activities supported by the original investment may never contribute to innovation in this way, therefore economic measures alone should not be used to judge the success (or otherwise) of the original investments.

Nonetheless, in this example, the investment in research is necessary but not sufficient to support innovation. The scale of the investment into research capacity in the academic base (through the SFC Research Excellence Grant) makes this particularly relevant to the current study. If a (possibly sizeable) proportion of research activity will not ever deliver a significant economic return (bearing in mind that this may not be its primary purpose), then a simple financial or economic return on investment calculation may not do justice to its wider social value. Instead, measures of social impact would be required.

Elsewhere in the model, linkages are again present, and in some cases may be easier to measure. Innovation requires organisations with the capacity to undertake innovation activities. Thus, this can be considered an essential input again to the innovation process. Within the Innovation Development category, product or service development may proceed through a series of stages from early feasibility through

testing and prototyping to production (for example), the output of a new product, service or process is then an input to the final category of application and exploitation.

This model and theory of change presents one way of considering innovation, and seeks to provide a framework to articulate the interconnectedness of different activities (and different areas of innovation support) and how they contribute to the expected end goals of social and economic benefit. Two further points are worth making:

- it should be expected that a proportion of projects within each category may not advance further for a variety of reasons, not all of which may be negative (e.g. where research identifies that a technology will not work, thereby saving further investment)¹⁸; and
- the outputs of different categories may feed into further activities elsewhere in the model but may also lead directly to economic and social benefit (e.g. productivity) without further support.

Spillovers

One of the (often unintended) outcomes and benefits from engaging in, or undertaking, innovation is “spillover effects”. The basic principle is that new knowledge created through, for example, academic research has a number of potential applications by a number of different actors, outwith its intended application. In the context of innovation these can be regarded as “knowledge spillovers” and whilst these effects can occur at every stage of the innovation journey (for example, technology spillovers within the upstream and downstream supply chains or market spillovers where an applied/exploited

¹⁸ For example, the Logan Review of the Scottish tech sector identified that the high failure rate of business start-ups is a key component of the tech eco-system – allowing entrepreneurs and innovators to gain experience/knowledge and promote resilience within future start-ups, see [the Scottish Technology Ecosystem Review](#)

innovation benefits society more generally), they are most commonly recognised at the knowledge creation stage.

The presence of spillovers are often referenced as a market failure/efficiency rationale to justify public sector intervention – the underlying theory being that, while the input costs of innovation (e.g. on R&D) may be known, the impact and wider benefit cannot be known and therefore priced/monetised. The end result being a firm chooses not to invest in, for example, a particular innovative process or product.

There is also the potential for these spillover effects to lead to externalities, whereby competitors or “free riders” are able to absorb or “appropriate” this knowledge in ways that the resulting benefits cannot be captured by the knowledge producer / product innovator. Again, the end result is often under investment in innovation.

Research undertaken by BIS¹⁹ provides evidence on the positive relationship between knowledge spillover and productivity, which will; often have the positive effects of “inducing complementarities in R&D efforts” amongst actors (e.g. competitors), which could have a further downstream positive impact on productivity.

This leads to an interesting dichotomy, in that, at the individual knowledge producer / product innovator level they may seek to minimise the opportunity for competitors or other actors to benefit from their knowledge, whilst at the macro level the presence of spillovers is viewed as a positive outcome as it often leads to greater investment (and returns) in knowledge creation.

While we would note the importance of capturing/highlighting knowledge spillover effects as a longer term outcome of innovation activity within the theory of change and logic model, developing

¹⁹ [Estimating Innovation Spillovers: an International Sectoral and UK Enterprise Study, Research Paper 178](#)

metrics to capture these effects may not be appropriate and best undertaken via other approaches such as large scale econometric analyses, qualitative evaluation and case studies, etc.

For example, at the individual academic institution or firm level (where the responsibility for gathering and reporting performance monitoring data often resides) the direct benefits and impacts of developing a new product or process may be measured through straightforward metrics such as sales or profit per unit of output.

However, what is harder to identify and measure is if this knowledge has been adsorbed or appropriated by other actors in the economy and, if so, the extent to which it is having a measurable positive impact. There may also be significant time lags in the creation of knowledge and the emergence of spillover benefits for other actors.

It is therefore extremely challenging to accurately attribute, track and quantify the wider knowledge spillover impacts/benefits from one particular intervention to other firms, industry sectors, countries, society, etc.

3. Mapping Investment and Support

3.1 Introduction

Using the conceptual model presented in **Figure 2.1**, we can begin to map Scotland's innovation support against this framework. This is shown in **Figure 3.1**, via a series of examples and have also populated this framework with measures that could be used under each heading and within the overall theory of change (**Figure 3.2**).

While specific support has been allocated against one of the five categories, a case could be made for the inclusion of some elsewhere. This underlines the overlapping nature of the categories. It should also be noted that spend in other areas (not captured or considered specifically innovation activity) may also impact on the success of innovation projects (e.g. export promotion leading to sales of new products).

We have also maintained the Scottish Government categorisation of support activities into three headings:

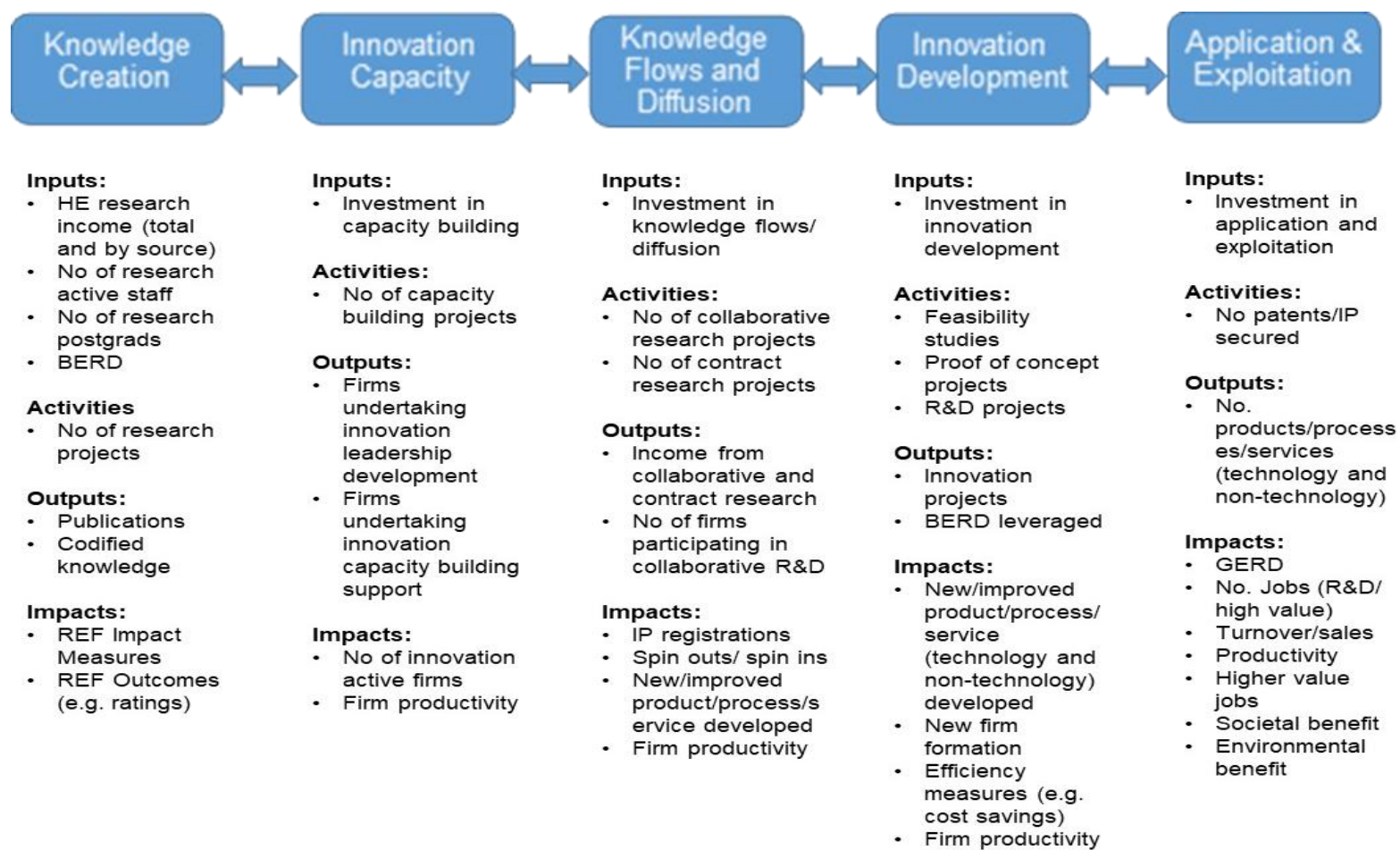
- Innovation and R&D Finance (agency spend of £331.3m);
- Organisation, Capacity Building and Peer Support (£3.5m); and
- Infrastructure (£14.2m).

Finally, the mapping also includes an indicative estimate of the total agency spend against each of the five categories.

Figure 3.1: Innovation Support Mapping (2018/19 examples)



Figure 3.2: Innovation Support – Headline Indicators



Developing this framework in more detail, **Tables 3.1 to 3.5**, over, present a set of measures that can be used to assess progress in each of the five domains of innovation support activity defined in the model. A number of key points can be taken from this summary:

- while there are available sources of data against most of the measures, some are high level (macro) and do not relate directly to the investment and support provided by the agencies;
- some of the data sources provide only a sample of data (e.g. REF) and others rely on forecast rather than actual figures;
- there are some gaps, most notably in the measurement of productivity impacts arising from innovation support; and
- given that failures would be expected across the model (as discussed above) there seems to be no source of data to capture the extent of these or how the ‘spillover’ knowledge gained from failure may inform/support future activity.

Table 3.1: Knowledge Creation Measures

	Sources	Details
Input Measures		
HE Research Income: <ul style="list-style-type: none"> • UK Govt/ public agencies • Industry • Other 	HE BCI Survey (HESA – under review) SFC KE Metrics (under review) TRAC data HE Income and Expenditure (HESA)	Annual survey of HEIs Annual Data on income and expenditure against full economic costs provided by HEIs
Number of research active staff in HEIs	Research Excellence Framework (REF) HE Staff (HESA)	Every seven years <u>sample</u> of research active staff in each HEI Annual survey of HEIs
Number of research students (postgraduate)	HESA	Annual survey of HEIs
Business Enterprise on Research and Development (BERD)	Scottish Government via ONS	Annual survey of businesses
Gross Expenditure on Research and Development (GERD)	Scottish Government via ONS	
Activity Measures		
Investment by HEIs in research capacity/ infrastructure	n/a	n/a
Number of HE research projects	Research Excellence Framework (REF)	Every seven years <u>Sample</u> of research activities in each HEI
Quality of HE research	Research Excellence Framework (REF)	Every seven years Provides ratings by Unit of Assessment (discipline)

Output Measures²⁰		
No of academic research publications (including peer reviewed journals, books and book chapters and conference presentations)	Research Excellence Framework (REF)	Every seven years Details <u>samples</u> by Unit of Assessment (discipline)
Impact Measures		
HE Research Quality Ratings	Research Excellence Framework (REF)	Every seven years Ratings by Unit of Assessment (discipline)
HE Research Impacts	Research Excellence Framework (REF)	Every seven years Provides case studies and some limited data (eg no of spin out companies) by Unit of Assessment (discipline)

²⁰ Work is underway within Scottish Government to develop the range of measures that can be used to assess HE research and knowledge exchange activities in a way that can more comprehensively capture the range of outputs beyond traditional academic publications. These include, for example, knowledge exchange events, artistic and cultural outputs. The outcomes of this work could usefully inform a broader set of output measures for knowledge creation in the context of innovation support.

Table 3.2: Innovation Capacity Measures

	Sources	Details
Input Measures		
Investment in innovation capacity building activities	Agency data on project expenditure	Available but not routinely reported in this way
Activity Measures		
Number of innovation capacity building programmes	Agency data on project activities	Available but not routinely reported in this way
Output Measures		
No of firms participating in innovation capacity building programmes	Agency data on programmes	Ongoing
No of firms participating in leadership development programmes	Agency data on programmes	Ongoing
Impact Measures		
No of new innovation active firms	EU Community Innovation Survey (economy-wide and not for specific support programmes) HIE innovation ladder SE programme monitoring data	Bi-annual Ongoing Ongoing
Increase in (firm) productivity	Not currently collected	n/a

Table 3.3: Knowledge Diffusion Measures

	Sources	Details
Input Measures		
Investment in knowledge flows/ diffusion activities/ projects	Agency data on project expenditure	Available but not routinely reported in this way
Investment in collaborative R&D (companies)	Agency and project data may be available through ongoing monitoring	Data likely to be patchy
Activity Measures		
No of HE/ Industry collaborative projects	Agency and project data collected through ongoing monitoring	Ongoing
No of business to business collaborative projects	Agency and project data collected through ongoing monitoring	Ongoing
Output Measures		
No of firms involved in collaborative R&D/ innovation projects	Agency and project data collected through ongoing monitoring	Ongoing
No of HEIs involved in HE/ industry collaborative projects	Agency and project data collected through ongoing monitoring	Ongoing
HE income from collaborative and contract research	HE BCI Survey (HESA – under review) SFC KE Metrics (under review)	Annual survey of HEIs
IP registrations (patents, disclosures, licences)	HE BCI Survey (HESA – under review)	Annual survey of HEIs
No of firms licensing technologies from HEIs	n/a	n/a

No of new products/ processes/ services developed	Agency and project data collected through ongoing monitoring	Ongoing
Impact Measures		
R&D jobs created/ safeguarded	Agency and project data collected through ongoing monitoring	Ongoing
No of academic spin-outs	HE BCI Survey (HESA – under review)	Annual survey of HEIs
Sales from new products/ processes/ services developed	Some agency and project data collected through ongoing monitoring	Ongoing but largely forecast data
Increase in (firm) productivity	Not currently collected	n/a

Table 3.4: Innovation Development Measures

	Sources	Details
Input Measures		
Investment in innovation development projects	Agency data on project expenditure	Available but not routinely reported in this way
Leveraged industry investment in innovation projects	Agency monitoring data	Available
Activity Measures		
No of innovation projects: <ul style="list-style-type: none"> • Feasibility studies • Proof of concept • R&D/ Large R&D • Product development 	Agency monitoring data	Available
No of business to business collaborative projects	Agency and project data collected through ongoing monitoring	Ongoing
Output Measures		

No of new products/ processes/ services developed	Agency and project data collected through ongoing monitoring	Ongoing
IP registrations (patents, disclosures, licences)	HE BCI Survey (HESA – under review)	Annual survey of HEIs
Follow on investment in R&D (BERD)	Agency and project data collected through ongoing monitoring	Ongoing
Impact Measures		
R&D jobs created/ safeguarded	Agency and project data collected through ongoing monitoring	Ongoing (some forecast data)
R&D FDI	Agency data	Ad-hoc
Sales from new products/ processes/ services developed	Some agency and project data collected through ongoing monitoring	Ongoing but largely forecast data
Increase in (firm) productivity	Not currently collected	n/a

Table 3.5: Application and Exploitation Measures

	Sources	Details
Input Measures		
Investment in application and exploitation (e.g. marketing new product, export promotion, IP protection etc.)	Agency and project data collected through ongoing monitoring	Ongoing
Activity Measures		
No of IP Audits	Agency and project data collected through ongoing monitoring	Ongoing

No of projects taking innovations to market	n/a	n/a
Output Measures		
No of firms taking new products/ processes/ services to market	Agency and project data collected through ongoing monitoring	Ongoing
No of new products/ processes/ services launched on the market	Agency and project data collected through ongoing monitoring	Ongoing
IP registrations (patents, disclosures, licences)	HE BCI Survey (HESA – under review)	Annual survey of HEIs
Impact Measures		
R&D jobs created/ safeguarded	Agency and project data collected through ongoing monitoring	Ongoing
Sales from new products/ processes/ services developed	Agency and project data collected through ongoing monitoring	Ongoing but largely forecast data
Increase in (firm) productivity	Not currently collected	n/a

4. Current Practice

4.1 Introduction

In agreement with the Scottish Government and the three agencies, we have considered the data collection methods across a sample of key projects/programmes/schemes. In identifying which interventions should be included, we sought to prioritise those with the greater levels of expenditure, while also seeking a balance across the agencies and across different types of support.

These interventions, as shown below, account for 87% (£303m) of the agencies' spend on innovation support, as defined.

Table 4.1: Interventions for Further Review

	Investment	Capacity Building	Infrastructure
Knowledge Creation	Research Excellence Grant (SFC, £237.8m)		
Innovation Capacity		Workplace Innovation Funding (SE, £2.6m) Northern Innovation Hub (HIE, £1.3m)	
Knowledge Flows	Innovation Vouchers (SFC/HIE, £0.62m)	University Innovation Fund (SFC, £15.8m)	Innovation Centres (SFC/SE/HIE, £14.1m)
Innovation Development	R&D Grants (SE/HIE, £17.8m) SMART (SE, £7m) By Design Grant (SE, £0.9m) Aquaculture Fund (HIE, £0.32m)	Innovation Project Support (SE, £4.8m)	
Application & Exploitation		IP Audit (SE, £0.26m)	

As it is the individual agencies that have responsibility for gathering and reporting performance data, the section that follows provides an account of the data collection methods employed by each of the agencies in relation to the programmes/interventions set out above.

As already noted, some of these interventions/projects could sit within other categories and/or overlap – this therefore represents a best fit framework.

4.2 Scottish Funding Council

Introduction

As noted above, SFC provides funding and support to universities and colleges in Scotland. Its primary function in the innovation system relate to supporting research capability and activity in higher education (HE) and supporting and encouraging engagement between HE, Further Education (FE) and external actors in the innovation system (e.g. firms, public sector agencies etc.) for the purposes of advancing innovation.

Research Excellence Grant

The Research Excellence Grant (REG) is a formula-based funding model designed to:

- support excellence wherever it is found in the research base;
- develop and enhance research in Scottish universities to ensure Scotland remains globally competitive and attractive to the best researchers;
- recognise and reward the effective translation of research ‘impact’ as measured by the Research Excellence Framework (REF)²¹, including effective business support by universities;
- uphold the principles of the dual support system, including contributions to the full economic costs from Research Council, charity, European and other research income to retain confidence in the Scottish university research base; and
- address SFC’s responsibilities to support the personal, professional and career development of researchers.

The formula for the funding combines a score to reflect the quality of institutions’ research with scores based on their success in securing

²¹ [Research Excellence Framework \(REF\)](#)

research income from different sources. The quality score is informed by the REF (see below).

Institutions have considerable autonomy in relation to how the REG funding can be used, and may invest in infrastructure and staff that support research activity, as well as directly into research projects. At present there is no detailed account of how REG funding is used by institutions (Scotland-wide or across individual institutions), as these data are not collected or reported to SFC in this way.

SFC does have access to sources of data on HE income and expenditure both through the Transparent Approach to Costing (TRAC) data and HESA's HE Income and Expenditure datasets. Together these provide a rich account of HE finances, but do not directly identify how REG funding has been used.

The primary means through which SFC assesses the value of the REG is through the UK REF.

The first REF was run in 2014 and replaced the previous Research Assessment Exercise (RAE). It is a UK-wide system for assessing research in higher education institutions and is conducted jointly by all four UK higher education funding bodies.

Given the scale of the REF it is conducted every seven years with the next originally scheduled for 2021. This has subsequently been delayed as a result of the Covid-19 pandemic.

Institutions provide submissions to the REF based on individual academic discipline area (Units of Assessment) in which they provide information about research active staff and research activity and outputs. Panels of experts in individual academic subject areas then assess institutions' research submissions under three broad headings:

- research outputs – the quality of research publications and other forms of research output;

- impact – the benefits delivered to the economy, society, culture, public policy or services, health, the environment or quality of life; and
- research environment – the vitality and sustainability of the research environment, including the contribution to the wider discipline or research base.

The assessment of **research outputs** focuses on originality, significance and rigour and includes consideration of the academic outputs of research activity such as written outputs (journal articles, books, book chapters, conference presentations etc.), physical artefacts (e.g. devices, materials, products etc.), digital artefacts, exhibitions and performances and other.

This accounts for 60% of the total REF rating for the Unit of Assessment with an institution.

The assessment of **impacts** is probably of greatest interest to the current study as this is where the wider effects of research activity are considered.

Impact is defined in this context as an effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia (REF 2021).

Impact also includes the reduction or prevention of harm, risk, cost or other negative effects, but does not include impact in terms of the advancement of knowledge or impacts on students or staff.

Institutions provide case study examples of research impacts, which are largely narrative (and qualitative). They may include more quantitative impact measures (such as creation of spin out companies and employment) and there are moves towards standardising these.

The impact case studies provide useful accounts of how academic research can deliver wider social benefits (and can be used to infer

whether the Theory of Change is accurate/relevant). However, they only provide a narrow cross-section of the impacts that may arise from specific research activity. They also do not provide aggregate figures for, say, the economic impact of research activity in any given year. Therefore, while the REF does provide the funding bodies with a means of assessing the performance of UK higher education research, it does not measure the impacts of the totality of that research activity. Thus, it is true to say that we do not have direct measures of how the REF is spent by the funded institutions, nor of the impacts of that expenditure. Based on this system, it is therefore not possible to determine the return on this investment other than in terms of research income generated from other sources and the outputs of the REF.

[University Innovation Fund](#)

The University Innovation Fund (UIF) is also a formula-based fund designed to support knowledge exchange (KE) and innovation activities in HE institutions. The purpose of the UIF is stated as follows:

“Scotland’s universities are a critical part in our innovation system. The University Innovation Fund (UIF) is a contribution, in support of the broad range of knowledge based activity and services through which our universities collaborate with each other and the wider world to stimulate economic, cultural, and social benefits. It ensures that our universities are supported to evolve and deliver their services in line with Scotland’s priorities, including the outcomes in the National Performance Framework, and Climate Emergency. It is allocated on the basis of commitment to continuous improvement, working in partnership where appropriate.”²²

The grant comprises two elements:

²² [University Innovation Fund \(UIF\)](#)

- the Platform Grant: a flat level grant of £250K (to be adjusted for inflation) which is to be matched by the HEIs (with the exception of small specialist institutions) and invested into core infrastructure that supports innovation and KE; and
- the formulaic UIF grant: based on institution's performance in the 2015/16 KE Metrics (see below). This is currently under review, as discussed below.

The primary mechanism for determining allocations for the UIF (which accounts for c.60% of the total funding provided through the UIF) is based on the KE Metrics that SFC collects from institutions. These gather data on the total income for each institution across a number of activity categories, including: research grants and contracts (split by UK Government and public sector, industry and commercial), consultancy, licences, CPD, enterprise schemes, translational awards, venturing and outreach.

The KE Metrics do not collect any information on how the UIF monies are spent, but institutions are required to specify this within the Outcome Agreements provided to SFC each year.

There is also a specific UIF submission required of each institution to detail how they propose to use the findings and what the expected outcomes will be.

The UIF is currently being calculated on the basis of 2015/16 KE Metrics and work is underway to review the scheme and its funding method. Of specific relevance here, the proposal is to move away from the collection of the KE Metrics in favour of using the UK-wide **Higher Education Business and Community Interaction Survey (HE-BCI)**²³ administered by Research England (institutions are required to complete this survey as a condition of UIF funding).

²³ [Higher Education Business and Community Interaction Survey \(HE-BCI\)](#)

The HE-BCI is a more comprehensive dataset that collects information on institutions' income by activity (collaborative research, contract research, consultancy, CPD, intellectual property (IP), facilities and equipment, regeneration and development) and by partner type (SMEs, large businesses, public and third sector). It also provides data on the scale of activities including numbers of IP disclosures, patents and licences, numbers of spin-out and staff start-up companies, and the turnover and employment within these new firms, and the (qualitative) benefits from regeneration activities.

Finally, the survey also provides data on wider public engagement activities such as lectures, exhibitions and performances (numbers and attendances).

As such, the HE-BCI is certainly a useful source of data on universities' external engagement and KE activities and is one way in which their contribution to the innovation system can be assessed. However, it has some limitations.

First, the outcomes that it reported are not tied to specific investments. Thus, UIF investments could not be said to lead directly to these outcomes, as other sources of investment will also contribute (not least research funding). Secondly, the HE-BCI data does not track the impacts of these KE activities on participating organisations (e.g. firms) and simply presents a snap shot of activity (based on the individual firms that completed the survey and provided data - which may change in a given year). As this is a primary source of economic (and other) impacts arising from higher education's innovation activities, this is a major gap in the available data.

[Innovation Centres Programme](#)

SFC established the Innovation Centres (IC) Programme²⁴ in 2012 and has since funded (in partnership with the enterprise agencies)

²⁴ [Innovation Centres \(IC\) Programme](#)

eight ICs. The Programme aims to support transformational collaboration between universities and businesses, to enhance innovation and entrepreneurship, and to support economic growth, particularly, but not exclusively, in Scotland's priority sectors.

The Vision for Innovation Centres is as follows "Using the Scottish university infrastructure, human resources and research excellence as a platform for collaborations across the whole of Scotland, ICs will create sustainable and internationally ambitious open communities of university staff, research institutes, businesses and others to deliver economic growth and wider benefits for Scotland."²⁵

The Centres each have different structures and activities, but all have a focus on collaborative R&D between universities and industry and on the development of high-level skills in their specific fields (data science, biotechnology, sensors, digital health, precision medicine, construction, and aquaculture).

The Programme is now into its second phase, and each IC is required to provide regular (quarterly) reports to the funding partners. These reports each vary slightly in style and format, but all combine a narrative report on progress and activities with a more quantitative update using an agreed Monitoring and Evaluation Framework (MEF) for the Programme.

The MEF was revised in 2018 following recommendations made in the review of the first phase conducted by Professor Graeme Reid.

The revised MEF was developed using a logic model approach and specifies indicators in four categories:

- Inputs: quarterly income and expenditure (split by source);
- Activities: including measures of the number of new, continuing and completed collaborative innovation projects; business

²⁵ Partners Memorandum of Understanding.

engagements; number and type of businesses engaged; HEIs involved in collaborative projects; events and attendances; and individuals involved in learning activities (mainly masters courses developed by the ICs in partnership with HEIs) -reported quarterly;

- Outputs: including measures of follow-on from collaborative projects (e.g. signposting, follow on projects and commercialisation); new products, processes and business models developed as a result of collaborative projects; research income for HEIs as a result of projects; and individuals gaining new qualifications. These are reported quarterly; and
- Outcomes/ Impacts: including jobs, turnover and GVA impacts arising from IC activities. These are reported annually.

The MEF provides a clear means of tracking the activities and impacts of the Programme against a logical structure. However, our understanding is that there are some inconsistencies in how the measures are being interpreted and reported by different Centres, and in the mechanisms used to collect the required data. For example, different accounting systems and practices used by the Centres direct the reporting of financial measures in different ways, and there are different methods used to collect impact data from supported firms, including some that use forecast data, and others that rely on assumptions about the attribution of wider sector growth to the activities of the Centre.

It should be noted here that the Programme was always intended to be a long term intervention and that the full impacts would take many years to materialise. As the revised MEF was introduced for Phase 2 of the Programme, the extent of prior tracking of companies supported in Phase 1 is not clear (although here was a previous MEF and also an external impact evaluation).

It is also not clear that the IC Programme MEF can track backwards to identify, for example, where research funding may have contributed in the past to the creation of new knowledge (or IP) that has subsequently informed the collaborative innovation projects supported by the Centres.

[Innovation Vouchers](#)

The Innovation Vouchers scheme is funded by SFC and administered by Interface. It provides small amounts of funding in the form of a voucher that an organisation can use to ‘buy’ academic time or input from a university to support an innovation project. The value of a Standard Innovation Voucher is between £1,000 and £5,000, which covers the academic project costs and is paid directly to the university or college.

Vouchers are awarded to support projects which are innovative (e.g. a novel/pioneering idea) and lead to either new products, services, processes, or an innovative workplace business process/practise that will benefit the company, the academic institution, and the Scottish economy.

As well as administering the scheme, Interface also provides ongoing monitoring data to track uptake and progress. Interface’s monitoring systems are robust and are completed with considerable diligence²⁶. This includes a final report²⁷ at the end of each project which seeks impact data as well as a follow up survey 6 months later to track impacts. This report details the outcomes from the project and any next steps that will be taken to progress the work undertaken.

²⁶ We have conducted a number of evaluations of Interface services and have always found the monitoring data to be robust and comprehensive.

²⁷ [A full version of Interfaces Final Report](#)

It should be noted that one of the current weaknesses in the system is that the data from final reports is not yet automated into the CRM system, although this is an action in progress.

The following impact performance data is gathered (achieved at 6 months post project completion and forecasted over the next 12 months):

- number of new/improved products;
- number of new/improved processes;
- number of new/improved services;
- number of new/safeguarded jobs;
- increase in company turnover;
- increase in company profit;
- increase in productivity;
- increase in exports;
- company investment in further R&D – Value (£); and
- does the company have an ongoing relationship with HE/ FE.

While Interface gathers a range of relevant impact data, again, there are limitations to the data collection for this scheme. Most obviously, Interface does not have the resources to undertake longer term tracking of companies beyond six months post support. Also, the next step for beneficiary companies is often a follow-on voucher or support from a programme like Knowledge Transfer Partnerships (both common next step routes for companies after the initial voucher project).

As such, the impacts directly attributable to the Innovation Vouchers will be harder to distinguish from those arising from follow on support.

This is not a challenge that is unique to the Innovation Vouchers scheme and is discussed further below.

HIE, SE and SFC also provide funding for follow-on vouchers to support follow up activities. In addition to the data collected by Interface for SFC, HIE also collects additional impact data on:

- the number of clients engaged in knowledge exchange activities;
- the number of clients engaged in R&D activities;
- the number of academic collaborations completed; and
- increase in turnover as a result of KE projects.

Discussion

Measuring the impacts of research investment is challenging for a number of reasons:

- as discussed in Section 2, research funding is driven by objectives relating as much (if not more) to the advancement of knowledge as to economic, social and environmental benefit through innovation. As such, a substantial (and currently unknowable) proportion of the REG will support research that is unlikely to feed into the innovation system;
- the processes through which academic knowledge eventually feed into innovation projects can be long and convoluted, and may involve multiple forms of additional investment and support;
- the principle that universities are autonomous bodies with control over their own finances means that they may use research funding as they see fit so long as it is contributing to their research performance (as assessed by the REF). As a result, SFC does not have detailed information on the activities supported by REG funding; and

- SFC operates within a UK-wide system for research funding, and the principle means of assessing research performance remains the REF. While the REF does take account of impacts (25% of overall ratings) it does not link impacts to investments, and is based only a very small sample of research activities. It cannot, therefore, provide a measure of return on investment for research funding.

Therefore, under the current arrangements, it is not possible to determine with any accuracy or consistency, the return on investment (economic or otherwise) from the Research Excellence Grant. To do so would require a means of tracking research outputs/impacts over potentially very long time horizons. Such a system would then be required to identify research outputs that are subsequently used in innovation processes.

This, however, is only a part of the picture. Knowledge Exchange is fundamentally people-based, and the value that higher education contributes to innovation projects is often through the tacit knowledge of academic staff. It is difficult to identify a means through which this may be tracked other than through identified support programmes (such as Knowledge Transfer Partnerships, for example).

SFC's support for innovation related activities also presents a mixed picture regarding measurement. The UIF is paid directly to universities and there are four main sources of evidence:

- University Outcome Agreements, which are largely narrative and set out what the institution intends to do rather than what has been achieved;
- UIF submissions, which are again an ex-ante assessment of what the funding will achieve and do not provide a means of assessing impacts;

- SFC's KE Metrics, which have not been collected for some time and are currently under review; and
- the HE-BCI, which is UK-wide and does provide useful data on universities' KE activities.

Of these, the HE-BCI is the most useful in assessing the returns to innovation support, but suffers from the following limitations:

- impact data is limited. It provides good data on HEI's activities and income to the institutions, but far less on wider impacts within beneficiary companies;
- recorded impacts are not directly attributable to any specific support or investment, but are more generally attributable to the activities of institutions however funded; and
- while it records the extent of interactions with businesses, the survey does not categorise businesses by their location. It is therefore not possible to identify how many Scottish (or even UK) businesses have been supported.

Thus, determining the returns from the UIF is also not possible under current arrangements.

The situation regarding Innovation Centres and the Innovation Vouchers scheme is somewhat different. Both programmes have defined measures, including impact measures, and systems in place for collecting relevant data. It is possible, at least in theory, to provide some assessment of the impacts arising from these programmes, albeit with some caveats regarding the quality and consistency of the impact data.

4.3 Scottish Enterprise

SE Measurement Framework

SE's strategy, *Building Scotland's Future Today*²⁸, is driven by the Scottish Government's economic agenda as set out in the Programme for Government, Economic Action Plan and Enterprise and Skills Strategic Board Strategic Plan. The strategy places considerable emphasis on international competitiveness and R&D and innovation as a key driver.

The organisation's progress against its strategic priorities is measured through a defined set of targets and performance measures based around five key priority outcomes:

1. planned new/protected jobs paying at least the real living wage;
2. planned R&D investment (businesses and sectors);
3. planned capital investment (businesses and sectors);
4. growth funding raised by supported businesses; and
5. planned international export sales.

These headline measures are supplemented by a number of supporting measures, many of which relate to, or can be aligned to innovation:

SE Supporting Measures

- number of R&D jobs
- number of high value added jobs
- number of new innovation active companies
- planned sales from innovation;

²⁸[SE strategic Framework](#)

- | | |
|---|--|
| <ul style="list-style-type: none"> • R&D investment leverage ratio (SE investment to non-SE) | <ul style="list-style-type: none"> • number of collaborations (businesses to business and business to academia) |
| <ul style="list-style-type: none"> • R&D investment by inward investors | <ul style="list-style-type: none"> • number of academic spin outs and start-ups |
| <ul style="list-style-type: none"> • R&D investment attracted from Innovate UK, EU, etc. | <ul style="list-style-type: none"> • planned international export sales from innovation |
| <ul style="list-style-type: none"> • collaborative R&D funds from other sources | <ul style="list-style-type: none"> • number of new products/ services launched in international markets |
| <ul style="list-style-type: none"> • R&D investment attracted to sector assets | |

SE's activities are expected to contribute to these measures, but the framework includes the flexibility to add project specific measures. It is worth noting that many of the impact measures are based on forecasts (e.g. 'planned sales from innovation') rather than actual measures.

This may reflect both the timescales from support to impact, which can be lengthy for innovation support, and the practical challenges in tracking companies over time. Forecast data (as discussed below) is collected at the application stage for the main innovation grant programmes, but actual impact data are often also based on estimated future impacts (which may be subject to unknown levels of optimism bias).

SE also conducts periodic evaluation of its programmes (quantitative and case study based), and these exercises tend to produce more robust estimates of impact, albeit within the evaluation period.

This approach therefore seeks to use historical data and feedback on past performance to test the Theory of Change (i.e. did they achieve the desired change and impact that they intended at the outset).

The main limitation with this approach is that, while the grant management system processes claims (and therefore collects some data) on a quarterly basis during delivery of the project, without regular tracking of performance beyond project end dates, SE is unable to accurately assess the ongoing impact of their interventions until such time as an evaluation is conducted. More specific issues are addressed below in relation to the selected support programmes.

It is also worth noting that the evaluations tend to be somewhat ad-hoc in their timing, and are subject to wide variation in method.

R&D Grants

The R&D Grants Programme is designed to address and alleviate commercial and technical risk for companies undertaking R&D projects, and is also a useful stimulus in attracting inward investment projects. The programme supports projects that will lead to innovative new products, processes, and services to improve company competitiveness and benefit the Scottish economy. Lasting between 6 and 36 months, projects must be based in Scotland and must be new, as the grant will not cover routine or periodic changes made to products, processes and services. The amount of funding offered is at the discretion of SE and can cover up to 50% of project costs. The value of grants awarded ranges widely from c £25K to £7m²⁹.

At the application stage, companies are required to provide details and milestones for the project for which they are seeking funding along with evidence of match funding – this is followed up via the grant management team. They are also asked about employment in the company (R&D and non-R&D jobs) and complete an economic impact

²⁹ *Qualitative Review and Analysis of SE's Large Grant Programmes*, EKOS (2019)

template in which they provide forecasts of the likely employment and sales (turnover) impacts of the project.

During the life of the funded project, the grant management process collects regular data on project expenditure and progress against milestones and project objectives.

Beneficiary companies are also required to complete a Project Monitoring form on completion of the project. This provides an account of the project's success or otherwise and of the extent to which it achieved its objectives. It also seeks information on any job creation/ protection and turnover attributable to the project, any disposal of intellectual assets (e.g. licences) and a qualitative account of the impact of the project on the company's growth.

The collection of these data at the point of project completion means that in many cases the full impacts arising from the R&D activities will not yet be apparent. SE does undertake some limited follow up 18 months post completion (although the timing of this can vary) to gather further impact data, but this is with only a small sample of supported firms. Also, 18 months remains, in many cases, too early for impacts to be identified. For example, SE evaluation evidence identifies that across a range of R&D and innovation projects, the 'impact profile' shows that the majority of impacts are generated in years 8 to 10 post the start of the project (SE measures the impact of support over a 10 year period)³⁰. This 'time-lag' in terms of generating impact is supported by wider case study evidence which identifies that "development of basic scientific research and its findings and implementation in commercialisable products may be very long"³¹.

The result is that the main impact reporting for the R&D Grants Programme is based on planned/ forecast impacts – mainly jobs and

³⁰ [Evaluation of SE R&D Grant Programme](#)

³¹ [The Economic Significance of the UK Science Base, UK-IRC](#)

turnover. Data on R&D investments (e.g. investment leveraged by SE funding) are based on actual figures, and the project monitoring will also capture R&D jobs created directly through the projects.

Work on impacts is also undertaken through periodic evaluation and the collection of case studies of supported companies. It can, however, remain challenging, even in evaluation studies to assess longer term impacts, particularly if the original support was some time in the past. Changes in company personnel, lack of corporate memory and complications with attributing benefit to a specific intervention are all common issues.

[SMART Grants \(SMART: SCOTLAND\)](#)

Similar to the R&D Grants, the purpose of SMART: SCOTLAND is to alleviate commercial and technological risk for SMEs seeking to undertake early stage R&D and funding is available for feasibility studies and R&D projects that have a potential commercial application.

For feasibility studies lasting between 6 and 18 months, a maximum grant of £100,000 is available, and for development projects lasting between 6 and 36 months, a maximum grant of £600,000 is available.

Applicants must be an SME, university spin-out or start up with an operational base in Scotland, and projects should exhibit a significant advance in technological innovation and technical challenge. SMART grants are available to businesses that operate in both the SE and HIE regions (and also the South of Scotland under the new agency).

Data collection processes for SMART are similar to those for R&D Grants. The application form collects data on employment within the applicant firm and also on the employment and turnover gains expected as a result of the funded project. Again, a Project Completion Monitoring form is issued 18 months post project which collects information on some early commercialisation outcomes (mainly qualitative) and expected future impacts. However, SMART

supports early stage R&D and the impacts attributable to these projects will in most cases be many years in the future, and may also require subsequent support and numerous rounds of investment (seed funding, Venture Capital, series investment) to realise. This makes attribution of eventual benefit to the original support more difficult and complex. The early stage nature of the project also means that some may not progress at all, although the knowledge gained may be subsequently diffused.

The extended timeframe for realising impacts therefore suggests a need for longer term tracking, but there is a lack of clarity about who is responsible for this and to what extent SE has sufficient resources to support such an approach (and also how proportionate is this to the scale of the investment). There are also issues with personnel change within the assisted firms, and lack of corporate memory, particularly for grants that are more than a few years old.

The result of all of these factors is that there is little consistent tracking of impacts beyond the project completion stage and for SMART (where grants are smaller scale) there are issues with the reliability of the project completion returns.

This means that reporting of impacts from SMART is again based mainly on forecast jobs and turnover growth. The exception here is the leverage of private sector investment (which itself may directly support employment).

By Design Grants

The By Design grant provides funding to companies to help design and develop new products and services. The fund was developed to stimulate Scottish companies' engagement with design innovation, and to contribute to SE's 'innovation active' figure (definition below). It

is part of a cross-border collaborative project with Interreg and User Factor³².

The grant can support up to 70% of the total eligible project costs, up to a maximum grant of £5,000.

Prospective applicants are asked to complete a By Design Application. This includes baseline information on the company (sector, turnover employees), details of the project to be supported and forecast benefits as follows:

- new products/ services to be developed;
- improved products/ services;
- new markets to be entered;
- additional profits;
- increased competitiveness;
- additional sales;
- value of expected sales as a direct result of the project; and
- number of expected new jobs as a direct result of the project.

On completion of the project, the client is asked to complete a project closing report. The data capture is recorded as part of SE's published measures. The relevant measures are outlined below:

- planned R&D investment (reported as an estimate and entered against the project at the start following receipt of the client's signed contract agreeing to support);
- planned sales from innovation. This is estimated project turnover over 3 years - recorded as an estimate on the Business Support Application, and reported as a published measure on project close as an 'expected' figure; and

³² [User Factor](#)

- planned international sales from this project over 3 years. This is recorded as an estimate on the Business Support Application, and reported as a published measure on project close as an 'expected' figure.

Innovation Project Support

Innovation Project Support grants are intended to support all forms of innovation project work aimed at creating, developing or preparing new products, processes or services for commercialisation. This grant is discretionary and is only available by referral from an SE Innovation advisor.

There are two levels of Innovation project support:

- Level 1 covers 70% of eligible project costs up to value of £5,000; and
- Level 2 is for follow-on support which covers 30% of eligible project costs up to a maximum £20,000. The grant may assist businesses that are undertaking innovation projects of £30,000 - £70,000. The innovation project must comprise activities related to the design and development of a new product or service, which the business will seek to commercialise.

Most applicant companies will have previously received one of the smaller innovation (Level 1) grants (up to £5k of support).

Applicants complete a Business Support Application Form, which captures basic company information (turnover and employment etc.) and forecast/ planned impacts as follows:

- total forecast increase in turnover as a result of the project (split by international and domestic turnover);
- total forecast increase in jobs – split by those paying at least the living wage and high value jobs (salary in excess of £40,275);

- total forecast jobs safeguarded (split as above);
- planned R&D investment; and
- planned capital investment.

On completion, beneficiary firms complete a project completion form and this gathers the same data as described above for the By Design Grants.

In addition to the above, SE also captures data on all 'new' companies engaging with innovation across a wide range of products and services in SE, including By Design and Innovation Project Support.

These are companies who are receiving a product or service the first time over a 3-year period. This figure is reported on a monthly basis as part of a management report.

[Workplace Innovation Support](#)

SE's Workplace Innovation Support provides around 900 companies each year with support, advice and best practice guidance on how to engage employees and improve productivity. The support comprises different elements including, one-to-one tailored advice and support training and development programmes, seminars and self-help guides to enable companies to implement changes in working practices to improve productivity.

SE collects a range of data to assess the performance and impacts of the Workplace Innovation Support. Impact measures are as follows:

- increased turnover;
- employee numbers;
- jobs safeguarded;
- absenteeism;
- staff retention;

- sales; and
- savings.

However, other, more specific measures (which may be more subjective in nature) are also collected via evaluation forms. These are:

- improved workforce skills;
- enhanced employee representative participation;
- improved performance, pay and reward;
- diverse and inclusive work practices developed;
- improved organisational design;
- enhanced workplace culture;
- improved workspace design;
- improved integration of technology, data and automation;
- enhanced flexibility in working practices;
- improved team performance;
- employee engagement level (including motivation); and
- leadership and management potential (including succession planning)

These measures are specific to the nature of the support and the focus on employee engagement and working practices. However, some may be more useful than others as measures of innovation support. Clearly employee productivity will contribute to business success but establishing what exactly constitutes “innovation in working practices” may be less straightforward and open to broad interpretation.

The data are collected via an evaluation form distributed to supported firms. The firms then identify which of the impacts and benefits above they have experienced as a result of the support received.

IP Audit

IP Audits are offered through both SE and HIE (although funded by the intellectual Property Office) and allows for an IP audit professional to come in and independently assess a business's IP assets (e.g. patents, Trademarks, copyright, designs, etc.) with a view to supporting the development of an IP management plan or strategy. The support often forms part of a wider package of Innovation support, including SMART Scotland, Innovation R&D or market entry assistance. The audit provides advice and guidance towards identifying and maximising the value of IP, for example, if IP protection is significant to the development and commercialisation of the product/service. The support is generally targeted at growth businesses and the costs are £3,000 per audit (with businesses expected to contribute £500).

On receipt of the IP audit report the business will also be offered dedicated follow up support from their nominated contact. The nominated contact will discuss the report's recommendations and work with them to identify next steps and priorities in respect of their IP.

The application asks for very basic details regarding business background and the scope and focus for the IP audit and the expected actions/benefits.

Follow up occurs post-completion and is focused on whether businesses plan on taking forward recommendations in the audit report – there does not appear to be any formal monitoring undertaken.

A short evaluation is completed every year (via an online survey of beneficiaries) and asks businesses to outline the main impacts and benefits.

Past evaluations have shown that businesses identified the following impacts:

- identified new business opportunities – for example through licensing or franchising;
- secured more business;
- filed/registered a trade mark;
- reviewed their business terms and conditions; and
- identified confidential information – trade secrets or other commercial information.

The data gathered can be useful in terms of identifying drivers of innovation, however, this is not collected in any systematic manner.

Partnership Projects

SE is a partner, along with SFC and HIE, in both the Innovation Centres Programme and the Innovation Vouchers scheme (like HIE, SE contributes to Advanced Vouchers).

As described above, the primary data collection mechanisms for the Innovation Centres programme is the MEF, and SE was involved in its development. In addition, SE has also been working with the Centres on the development of a Project Log.

The Project Log gathers some additional detail on new projects, those that are ongoing and those that are completed. It seeks information on the scope/nature of projects, costs and timescales, as well as forecasts (for new and ongoing projects) of the expected launch date for a new product or service and the anticipated impacts in terms of jobs created and safeguarded.

For competed projects, ICs have to provide updated information on the performance of the project against the initial estimates and actual job created/ safeguarded figures.

The log also breaks the employment impacts (forecast and actual) into high value and R&D jobs, and for completed projects also seeks information on carbon reduction impacts, although a specific measure for that has not yet been agreed.

The Project Log was prepared and planned for launch in March 2020, but has been delayed as a result of the Covid-19 pandemic.

SE is also a partner in the Bayes Centre, Edinburgh University's innovation hub for Data Science and Artificial Intelligence. The Bayes Centre is part of the Data-Driven Innovation (DDI) Programme within the Edinburgh and South East Scotland City-Region Deal and combines research, education, innovation and tech entrepreneurship within a multidisciplinary environment.

The Bayes Innovation Programme has a straightforward measurement framework based around six objectives:

- attracting corporate R&D teams to establish a presence in or near Bayes;
- securing new jobs by attracting these corporates;
- attracting additional high growth ventures
- supporting investment in high growth companies;
- generating revenue to support research, innovation and entrepreneurship; and
- delivering a business case outlining a larger follow-on project.

There are also two additional tracking measures supporting the third and fourth objectives of creating high growth ventures and high growth companies. These are:

- creating additional jobs over a 12 month period (linked to objective 3); and
- creating additional jobs (linked to objective 4).

Each of these measures is defined with targets, and the framework specifies a data collection process and the supporting evidence required to verify the data.

Summary

Overall, the SE monitoring is consistent across the breadth of innovation project and programme activity that they support and provides a number of relevant metrics to gather business specific innovation impacts. In this sense, it can be considered relatively comprehensive and provides a range of relevant quantified metrics to assess impact

That said, there are opportunities to improve the approach, and these are summarised below.

The SE systems rely on planned and forecast data to assess and measure impact, and there is little in the way of structured follow-up to track progress (limited number of follow-ups post completion at 18 months).

As noted, the agency undertakes (either internally or through external suppliers) evaluations and case study reviews of its innovation support, however, these are done on an ad hoc basis and the feedback gathered through beneficiary engagement may be subject to errors/inconsistencies due to timescales elapsed, or change in personnel within the supported company. Evaluation is therefore not a reliable substitution for ongoing monitoring.

Timescales – much of SE’s own evidence points to a notable time-lag between innovation support and the eventual creation/realisation of impacts and benefits. For example, any sales or turnover impacts

attributed to support may be predicated on the firm launching a new product or process which may take years to develop/launch and even longer to generate a positive financial return.

An evaluation of the large R&D programme identified that the majority of quantifiable impacts (increased turnover and jobs) occurred in later years³³ – data gathered at the application and post completion stage is unlikely to reflect this time lag (and in our experience having evaluated numerous SE innovation projects/programmes, underestimates the extent of the time lag).

Attribution – this is a key issue and while not a unique challenge to SE, companies can access support multiple times and through multiple products. This makes it challenging to disaggregate impacts/benefits, and also to assess the total impact of the support. For example, a company seeking to bring a new product to market could access SMART funding for the feasibility element and various other subsequent grant awards e.g. R&D to support future product development and funding to attend trade shows to identify new markets/customers, etc.

The SE systems are designed to capture the impacts/benefits of specific/individual awards and do not take account of other support provision (including private investment) as firms move through the innovation journey. This can be further complicated with changes in staffing across supported companies and corporate memory – with companies unable to differentiate between the impacts/benefits of the individual awards (i.e. the data being collected may be subject to inconsistencies).

It is therefore unclear as to what extent impacts/benefits can be directly attributed to the support, although to some extent this is an evaluation question in measuring/attributing the gross and net effects.

³³ [Evaluation of SE R&D Grant Programme](#)

As noted, SE periodically commission evaluation studies either by programme or thematically.

4.4 Highlands and Islands Enterprise

HIE Measurement Framework

HIE's Strategy and Vision³⁴ (2019 - 21) sets out the Agency's commitment to developing a vibrant rural economy but with a focus on community development supporting both people and place.

In common with SE, HIE has a defined measurement system for capturing data to report against its published targets and assess the impacts of its services and activities. This measurement system is aligned to the National Performance Framework and is driven by the priorities of the Scottish Economic Strategy as well as HIE's own strategy and operating plans.

The system is designed to capture both expected outputs and impacts (i.e. forecasts prior to support) and actual outputs and impacts. All of HIE's innovation-related interventions sit within this framework.

The framework is broadly hierarchical in structure with a range of primary measures sitting at the top. It is these measures against which HIE sets targets and these tend to be general rather than innovation-specific.

Nonetheless, impact measures such as jobs created and/ or sustained, increase in turnover and increase in export sales are all relevant impact measures for innovation activities.

Moving down the hierarchy there is a range of supporting measures, some of which are more innovation-specific, such as number of R&D jobs, number of high value jobs, innovation active companies and number of clients engaged in R&D activity.

³⁴ [HIE's Strategy and Vision](#)

Further, under the heading of ‘business’ the framework also identifies more specific measures including the following (all of which could be considered relevant to innovation support).

HIE Supporting Measures

- number of academic knowledge transfer projects complete
- number of clients engaged in knowledge transfer activities
- number of clients engaged in R&D activities
- number of clients implementing change management
- number of clients implementing improved working practices
- number of new licenses
- number of new markets entered;
- number of new patents
- number of new products/ processes developed;
- number of new spin-outs

Finally, HIE also has a series of tracking measures in the form of ‘ladders’ which track progress in five areas – international trade, innovation, digital maturity, business values and social enterprise capacity. The innovation ladder comprises five stages – chance, intent, active, embedded and evolving – each of which assess the extent of commitment to, and action on, innovation within organisations. These measures are primarily used with account managed companies and organisations with which HIE has an ongoing relationship thereby allowing this kind of tracking over time.

All of HIE's activities are measured via this framework although there is the option to include further project specific measures as required.

R&D Grants

Similar to SE, HIE also distributes R&D grants. As described above, applicant businesses are required to provide details of the R&D project and how the funding will be used along with plans for commercialisation and forecasts of the potential economic impacts. The measures used to assess progress and performance are contained within the HIE Measurement Framework and include:

- number of businesses engaged in R&D activity;
- business expenditure on research and development (BERD);
- number of R&D jobs created;
- increase in turnover.

For larger grants (>£100K) HIE collects actual impact data from the beneficiary companies and seeks some form of evidence to verify claims (similar to the processes used for Regional Selective Assistance grants). This is not usually required for smaller grants.

Northern Innovation Hub

The Northern Innovation Hub (NIH) is part of the Inverness City-Region City Deal programme and comprises a range of projects and interventions aimed at developing innovative capacity within the Inverness City-Region. Projects include support for business innovation, skills and training and networking across key sectors such as food and drink, life sciences, tourism and creative industries.

Performance measures are defined for each project element and reported on a quarterly basis through a dashboard which summarises spend and benefits against targets.

In relation to project benefits, many of the reported measures are activities or immediate outputs. These include measures such as:

- numbers of events held;
- numbers of companies participating and/ or attending events;
- numbers of businesses using collaborative space (and as tenants);
- individuals accessing training or placements; and
- businesses participating in training courses.

One project element (Impact30 – a business support programme) has identified impact measures in the form of jobs created and additional turnover, but these are forecasts at this stage. Actual data will be collected later in the project lifespan at agreed milestones.

As the NIH is part of the City Deal Programme, and is part funded by the UK and Scottish Governments, there will be a requirement to report against economic impact targets (through the Monitoring Assurance Framework). It is, however, still too early in the life of the project for this data collection to have taken place.

[Innovation Vouchers](#)

Data collection for the Innovation Vouchers programme is discussed above in the section relating to SFC interventions. However, in common with SE, HIE has contributed additional funding to supporting Advanced Vouchers. In addition to the data reported by Interface, HIE also undertakes its own data capture for this investment which tracks:

- number of clients engaged in knowledge transfer activities;
- number of clients engaged in R&D activities;
- number of academic collaborations completed; and
- increase in turnover.

These measures are all included within the HIE Measurement Framework. It should be noted that HIE will no longer be funding this programme forthwith.

[Innovation Centres Programme](#)

Along with SFC and SE, HIE is a partner in the Innovation Centres Programme with a particular involvement in the Scottish Aquaculture Innovation Centre (SAIC), reflecting the importance of the aquaculture industry to the HIE region.

There is little in the way of additional performance measurement beyond that which is described above as provided through the Innovation Centres' MEF reports.

[Aquaculture Fund](#)

The Aquaculture Fund is a small fund supporting R&D and training for aquaculture innovation projects. Again, performance reporting is aligned to the HIE Measurement Framework and tracks:

- number of R&D jobs created;
- number of new products/ services commercialised;
- increase in turnover;
- export sales;
- jobs created; and
- jobs created in fragile areas.

[Other Areas of Activity](#)

Again in common with SE, HIE will contribute to innovation related outcomes and impacts through more general support services, in particular through account management. As such, these outcomes may not always be attributed to innovation-related expenditure.

Thus, while HIE can report against broad innovation-related outcomes and impact such as new products and services created/commercialised, R&D jobs and BERD, a proportion of these impacts may arise from general rather than innovation-related support.

HIE also raised the issue of wider infrastructure and its role in supporting innovation, with UHI Inverness Campus as an example. These investments are not captured within the current scope of innovation support yet may make a contribution to innovation performance through the development of company and R&D facilities, for example, digital infrastructure could be considered another example.

Summary

Like SE, HIE has a defined measurement framework against which projects and programmes report. Partnership projects and those with third party funding, such as those in the Inverness City Deal or the Innovation Centres Programme may have specific measurement frameworks agreed by the partners, and defined reporting protocols. These tend to be based on logic model structures and include useful and valid measures of innovation. Issues are most likely to arise in the measurement of impacts, particularly if projects are long term in nature, requiring tracking of beneficiary firms over time. Lengthy timescales are typical in innovation support, and there is a need to consider the resource requirements of longer term tracking.

As noted earlier, even where there are well-defined measurement frameworks (e.g. Innovation Centres) issues with the consistency of data collection and reporting practice remain.

This is partly due to differing interpretations of the measures, and partly due to the practical challenges of collecting reliable data for companies, particularly relating to historic support.

Comparing HIE's approach to that of SE, it seems that HIE's overarching measurement framework contains more in the way of detailed measures of innovation activity e.g. companies involved in knowledge transfer activities. In some places, the agencies are measuring similar things, but expressed in different ways. For example, SE measures the 'number of collaborations (businesses to business and business to academia)', and HIE measures 'number of clients engaged in knowledge transfer activities'. Given the cross-cutting nature of the enterprise agencies objectives and activities, this therefore suggests there is some scope for greater consistency and alignment in terms of collecting and reporting performance data (considered later in this paper).

Wider Comments

It is clear that none of the agencies have developed frameworks for the specific goal/purpose of measuring and monitoring the impact of their investments in innovation support.

Most have included additional measures within existing (often long established) frameworks designed to measure wider agency targets/objectives. These frameworks are necessarily quite high level and too broad to offer a detailed account of the impacts of innovation support.

As noted throughout, there are numerous challenges with regards to accurately and consistently reporting the benefits/impacts of innovation e.g. timescales to impact, attribution, failures, fluidity within the innovation journey, etc. While these challenges remain, a more specific framework for measuring innovation can at least partly address these. Interestingly, the Innovation Centres (which is a collaboration across the three agencies) demonstrates the closest alignment with the conceptual Framework and was designed with the sole purpose of tracking and reporting innovation activity. However, as

noted, implementing this monitoring Framework has not come without its challenges.

This is considered further below at **Section 5** which provides a high level mapping of the agencies against the conceptual framework.

5. Mapping of Indicators

The sections above have presented the detail on the three agencies current approaches, process and systems used to measure the benefits and impacts generated through innovation spend/investment (across specific interventions that are broadly representatives of the wider innovation support landscape).

The section below provides a high level mapping across the three agencies' current approaches to performance monitoring/measurement against the conceptual model and indicator frameworks presented in **Sections 2** and **3**. This is not intended to be a comprehensive review and will provide a 'snapshot' of the relative strengths and gaps/weakness of the current approaches.

We have prepared a Green Amber Red (GAR) assessment based on the following:

- Green – the processes currently in place have strong alignment with the conceptual framework and are gathering and reporting a range of relevant data;
- Amber - the processes currently in place have alignment with the conceptual framework, however there are gaps either in terms of the indicator data (what is being gathered) or the data collection process (e.g. forecast data, timescales, attribution or inconsistencies); and
- Red - the processes currently in place are not gathering or reporting against the indicators outlined within the conceptual framework and/or there are challenges with data collection.

Table 5.1: Knowledge Creation

	Type of Project / Programme		
	Investment	Capacity Building	Infrastructure
Conceptual Model Indicators	Research Excellence Grant (SFC, £237.8m)		
Inputs			
HE research income (total and by source)	G		
No of research active staff	A		
BERD	G		
GERD	G		
Activities			
No of research projects	R		
Investment by HEIs in research capacity/ infrastructure	A		
Quality of HE research	A		
Outputs			
Publications	A		
Impacts			
REF Impact Measures	A		
REF Outcomes (e.g. ratings)	G		

Table 5.2: Innovation Capacity

	Type of Project / Programme			
	Investment	Capacity Building		Infrastructure
Conceptual Model Indicators		Workplace Innovation Funding (SE, £2.6m)	Northern Innovation Hub (HIE, £1.3m)	
Inputs				
Investment in capacity building		G	A	
Activities				
No of capacity building projects		G	A	
Outputs				
Firms undertaking innovation leadership development		G	G	
Firms undertaking innovation capacity building support		G	G	
Impacts				
No of new innovation active firms		A	A	
Increase in (business/firm) productivity		R	R	

Table 5.3: Knowledge Flows and Diffusion

	Type of Project / Programme		
	Investment	Capacity Building	Infrastructure
Conceptual Model Indicators	Innovation Vouchers (SFC/ HIE, £0.62m)	University Innovation Fund (SFC, £15.8m)	Innovation Centres (SFC/SE/HIE, £14.1m)
Inputs			
Investment in knowledge flows/diffusion	G	A	G
Investment in collaborative R&D (companies)	G	A	G
Activities			
No. of collaborative research projects	G	A	G
No. of contract research projects	R	A	G
Outputs			
Income from collaborative and contract research	A	A	A
No of firms participating in collaborative R&D	G	A	A
No of HEIs involved in HE/ industry collaborative projects	G	A	A
IP registrations (patents, disclosures, licences)	A	A	A
No of firms licensing technologies from HEIs	A	A	A
No of new products/processes/services developed	G	R	A
Impacts			
R&D jobs created/safeguarded	A	R	G
Spin outs/ spin ins	R	R	A
Sales from new products/processes/services developed	A	R	G
Increase in (business/firm) productivity	R	R	R

Table 5.4: Innovation Development

	Type of Project / Programme					
	Investment				Capacity Building	Infrastructure
Conceptual Model Indicators	R&D Grants (SE/ HIE, £17.8m)	SMART (SE, £7m)	By Design Grant (SE, £0.9m)	Aquaculture Fund (HIE, £0.32m)	Innovation Project Support (SE, £4.8m)	
Inputs						
Investment in innovation development	G	G	G	A	G	
Leveraged industry investment in innovation projects	G	G	G	A	G	
Activities						
Feasibility studies	G	G	G	G	R	
Proof of concept projects	G	G	G	G	R	
R&D projects	G	G	G	G	A	
Product development	G	G	G	G	R	
No of business to business collaborative projects	A	A	R	R	R	
Outputs						
No of new products/processes/services developed	G	G	G	G	G	
IP registrations (patents, disclosures, licences)	A	A	A	R	A	
Follow on investment in R&D	A	A	R	R	G	
Impacts						
R&D jobs created/safeguarded	A	A	R	A	G	
R&D FDI	A	A	R	R	G	
Sales from new products/processes/services developed	A	A	G	R	G	
Increase in (business/firm) productivity	R	R	R	R	R	

Table 5.5: Application & Exploitation

	Type of Project / Programme		
	Investment	Capacity Building	Infrastructure
Conceptual Model Indicators		IP Audit (SE, £0.26m)	
Inputs			
Investment in application and exploitation		A	
Activities			
No of IP Audits		G	
No of projects taking innovations to market		A	
Outputs			
No of firms taking new products/processes/services to market		A	
No of new products/processes/services launched on the market		A	
IP registrations (patents, disclosures, licences)		G	
Impacts			
R&D jobs created/safeguarded		A	
Sales from new products/processes/services developed		A	
Increase in (business/firm) productivity		R	

While only comprising a high level review, **Tables 5.1 - 5.6** reinforce the consistent message in the preceding sections that data collection is variable across the agencies and inconsistent across individual projects/programmes.

Specifically, we would note that the collection and reporting processes for gathering data on the inputs to innovation (which are mainly financial), and to a lesser extent, the activities that are supported, are relatively robust across the cross-section of programmes/projects that were reviewed.

However, if we look at the output/outcome and impact data being captured and reported, current approaches are not able to accurately and consistently capture and report performance across the agencies. One of the key findings is that, across all the projects/programmes there is no data being gathered or reported with regards to increasing productivity. As noted, a key strategic objective for Government is for Scotland to be within the top quartile of OECD countries in terms of productivity (and equality, wellbeing and sustainability), and investing in innovation is one of the mechanisms to help achieve this. Given this focus, it would therefore be reasonable that some consideration to capturing and measuring the impact on productivity would be appropriate. How this is done/achieved accurately and consistently is a more difficult question to answer.

Based on all the review work and discussions with stakeholders, it is worth highlighting that at the individual project/programme level some of the current systems/processes would only require relatively minor adjustment to strengthen their practice to monitoring, whilst across others there are some notable gaps that would require more fundamental revision.

Looking at the current practice of the three agencies, it is fair to say that while we have a relatively good understanding and evidence base

for what activities the investment and inputs into innovation are delivering, we have less detail and evidence for the outputs and longer term impacts. We are therefore unable to test and validate whether our theory of change for innovation holds true or assess the entirety and extent of the returns that might be delivered. This is not to say that the theory of change is not valid – just that the current methods and approaches do not gather and report the relevant data to robustly assess.

This last point is particularly salient. As noted in the upfront section, the Enterprise and Skills Analytical Unit identified that the purpose of innovation is to generate a positive change (“*new ways of combining existing (and/or new) resources to **better address** existing (and/or new) needs*”).

In the context of providing investment to the three agencies this is with a clear focus on using innovation as a driver for economic growth and productivity. The available performance monitoring data evidence does not provide a sufficiently clear assessment of the extent to which the investments made are delivering against these objectives.

6. Conclusions and Recommendations

6.1 Introduction

The objectives of the current study were to:

- Identify the baseline data and methods required to better evaluate innovation support interventions in terms of both short and longer term outputs and impacts on the Scottish economy;
- Review the existing data and methods used by the agencies to monitor and evaluate innovation support activities; and
- Make recommendations for new approaches that will address gaps in current data collection and encourage consistent measurement and evaluation across all agencies.

It is important to be clear that the ultimate aim here is to improve the means of measuring and evidencing the impacts of innovation support rather than to improve ways of measuring innovation more generally across the economy and society.

This is an important distinction, and introduces the notion of attribution. Macro changes in wider innovation performance, however measured, cannot easily be attributed to the effects of specific support interventions. Instead, what is required is a more specific set of measures that can track more directly the impacts of various support mechanisms.

6.2 Issues and Considerations

Our work has identified a number of issues to be considered when seeking to develop a more consistent and complete approach to measuring the impact of innovation support. These are discussed below.

Definitions

As noted earlier, the definition of innovation provided by ESAU is purposely broad and inclusive. However, this allowed considerable debate across the agencies as to what constitutes innovation support, and therefore which programme and activities should be included. The study proceeded on the basis of a pre-agreed list of support activities, some of which are changing or are dis-continued.

As such, in order to support any future implementation of a revised monitoring framework there is a need to develop a clear definition of what constitutes innovation support (the definition of innovation itself having already been agreed for the purposes of this work). In particular, some of the programmes included within this review may be discontinued and new or different programmes may replace them. The agencies will need further guidance and clarification as to what is within and outwith the scope of assessment/ measurement.

Attribution

Perhaps the single biggest challenge is in attributing changes in innovation performance to specific support interventions. This is particularly the case where companies may have received multiple forms of support for a single innovation project at different stages of its development (as with innovation grants for example). This is also very difficult where academic knowledge may be a crucial input to a successful innovation, but is subsequently developed through multiple interactions and support before reaching application in the economy or society. Attributing eventual impacts back to the original investment in research that generated the crucial knowledge is therefore complex. There is also a need to understand what resources might be required to enable better tracking of these effects.

To a large extent, it may be necessary to live with some imperfection in relation to attribution, and to fill gaps and address possible double counting with informed assumptions. Here prior evaluation evidence may be useful, and we return to this below.

Timescales

There is enormous variation across the innovation landscape in the time it takes for an initial idea to reach successful application. In some cases this may be relatively quick, particularly where speed to market would confer competitive advantage. However, in many cases, and in most evaluations of innovation support that we have seen, the timescales between original support and eventual economic impact are long (five to ten years) and frequently underestimated. The time it takes for new understanding developed through academic research to find market application can be longer still.

Indeed, some realism is required about when a new approach to measurement could be expected to deliver useful impact data, as different interventions will produce impacts in different timescales.

Thus, of the various investments made into different forms of innovation support in any particular year, some may produce impacts within, say, 3 – 5 years, while others may take more than ten years to show impacts.

This is a complicating factor, and will need to be borne in mind when interpreting and reporting the results.

Current Measures

Across the three agencies, there is a plethora of innovation-related measures and indicators being collected in different ways. Many are similar, but expressed in slightly different terms, and there is an opportunity to refine these into a more consistent set of common measures (as we have proposed in the framework). This does not

preclude other measures being collected as required and/or other approaches by the individual agencies e.g. case studies and periodical evaluations.

There is also a degree of reliance on forecast measures of future impact. While some data on actual impacts are collected, this is not always consistent, nor within the realistic timescales over which impacts may be realised. In other words, where there is follow-up data collection to gather actual impacts this is often undertaken too soon for these impacts to have been produced. Although as noted, there may be practical and resource considerations for longer term tracking.

Resources

There is a trade-off between the need to consistently gather robust and detailed performance data and the resources available to support this process – monitoring should be proportionate to the scale of the investments. While some in the agencies recognised the value of longer term tracking to gather actual impact data, they noted that resources could be a constraint and deployment needs to be proportionate to the scale of the investment. The key question here is whether this is a function of scarcity of resources or their allocation (i.e. resources not being prioritised in this way).

Academic Research and the Role of Universities

As already discussed, there are some issues arising from the inclusion of investment in academic research within the overall definition of innovation support. While this is wholly consistent with the role of HE in the innovation process, it does raise specific measurement issues.

Research in the UK is assessed through the Research Excellence Framework (REF) and, by virtue of the dual support system and the

national and international nature of the academic market, it would be extremely problematic for Scottish HEIs to withdraw from this process in favour of an alternative approach.

Universities are also autonomous bodies and as such make their own decisions about how to use their funds. Tracking expenditure and activity relating to specific funding can be difficult, particularly in relating to the REG and the UIF.

Global measures of innovation such as those reported in the HE BCI survey are useful but lack detail in crucial aspects (e.g. the location of businesses supported, the impacts of the support) and are not attributable to specific investments or support.

University contributions to innovation appear to be better captured where they are delivered through specific knowledge exchange projects and programmes (such as Innovation Centres).

Many HEIs have limited systems for gathering data on their interactions with industry. Previous research for Creative Scotland and the Scottish Funding Council into the role of HE in innovation in the creative industries³⁵ found few universities had detailed records of their interactions with external organisations. Through Edinburgh Innovations, the University of Edinburgh has been developing a CRM system to track its relationships with external partners with a view to being able to identify both the extent of the institution's engagement with specific firms and the impacts of that engagement. Although still a work in progress, this offers some potential to enhance the data that universities may be able to provide regarding the impacts of their activities on innovation performance.

³⁵ *Higher Education and Innovation in the Creative Industries*, EKOS (2017) for Creative Scotland and the Scottish Funding Council

6.3 Gaps

As set out in **Section 5**, there are some significant gaps in the data that are currently collected to measure the impacts of innovation support. These are as follows:

- there is no information to detail how funding to universities for research and innovation activities is being used. This includes both the REG and the UIF;
- the REF provides quality ratings and useful information on research outputs, but is based on self-selected samples from institutions, and does not provide consistent measures of the totality of research activity, research outputs, or the uses to which new knowledge may be put;
- unless delivered as part of specific projects or programmes (e.g. Innovation Centres) the impacts of universities' interactions with external organisations are not captured. There are some data on the extent of these interactions, but not on their impacts;
- while the enterprise agencies have fairly well developed measurement frameworks and data collection processes, there are issues with differences in definition and terminology (of measures), use of forecast rather than actual data, and incomplete data due to limitations in data collection processes or poor responses to requests for data from assisted companies;
- there is a lack of long term tracking of companies in receipt of innovation support to assess the impacts. This is a particularly significant gap in light of the well-documented long term nature of returns to innovation activity; and
- there is limited attempt to capture the extent of failure across the innovation system.

6.4 Summary Conclusions

The implicit question at heart of the study is whether or not it is possible to measure the impacts of Scotland's current investments in innovation support. On the basis of current approaches and measurement practice, such an assessment is not possible, for the following reasons:

- there are significant gaps where either data are not collected at all, or the available data are not sufficiently robust or complete;
- measures are sometimes inconsistent in their definition across different agencies, even if similar in general meaning;
- the attributional links between investments and impacts are not always clear, and there is reliance in some places on global measures of innovation performance (such as those in the HE BCI for universities or BERD for the wider economy) which cannot always be attributed to specific support or investment;
- there is considerable potential for double counting of impacts where companies have received multiple forms of support;
- impact data (e.g. turnover and employment gains) are frequently based on forecast rather than actual data; and
- the long timescales between intervention and impact in innovation projects are such that impacts are not always captured by existing data collection methods as longer term tracking is limited.

Given this, the follow up question is whether or not it is possible to improve and adapt our processes to ensure a consistent and evidence driven approach that will enable better assessment of the impacts of innovation support. To this, the answer is a cautious yes, but with some caveats.

A 'perfect' system does not exist and any new approach will have to make some assumptions. Each of the five domains of innovation outlined in the conceptual model are necessary components of an innovation system (linear or otherwise). However, the ways in which each links to the others are complex, and may not always conform to existing measures of success e.g. patents do not always lead to new products (and may even hinder access to technology). Instead, the assumption that progress in each will contribute to the whole may have to suffice.

Moving to a new approach will also require the full support and cooperation of the three agencies and likely also the universities. It may also have resource implications for these organisations and may take some time to establish.

All stakeholders should be realistic about timescales. It will be many years before a clear assessment of the impacts of innovation support can be produced. The reasons for this have been extensively covered in this report.

6.5 Recommendations for a New Approach

The proposed frameworks of measures for each of the five domains are presented below. We have then provided recommendations for implementation, including the implications for the agencies and stakeholders.

For this paper the measures have been kept deliberately 'high level' and will require further detailed consideration, updating and refinement with the input of the three agencies, Scottish Government and partners.

Proposed Measures Framework

Table 6.1: Knowledge Creation - Proposed Measures

	Sources	Comment
Input Measures		
HE Research Income: <ul style="list-style-type: none"> • UK Govt/ public agencies • Industry • Other 	HE BCI Survey (HESA – under review) SFC KE Metrics (under review) TRAC HE Income and Expenditure (HESA)	Retain as now
Number of research active staff in HEIs	Research Excellence Framework (REF) University Data HESA HE Staff data	SFC to ask HEIs to provide total number of research active staff by Unit of Assessment (annual)
Number of research students (postgraduate)	HESA Student Data	Retain as now
Business Enterprise on Research and Development (BERD)	Scottish Government via Office for National Statistics (UK)	Retain as now
Gross Expenditure on Research and Development (GERD)	Scottish Government via Office for National Statistics (UK)	Retain as now
Activity Measures		
Investment by HEIs in research capacity/ infrastructure	University data	SFC to request data from universities to account for use of REG and UIF monies
Number of HE research projects	Research Excellence Framework (REF) University Data	SFC to ask HEIs to provide total number of research

		projects by Unit of Assessment (annual)
Quality of HE research	Research Excellence Framework (REF)	Retain as now
Output Measures		
No of academic research publications (including peer reviewed journals, books and book chapters and conference presentations)	Research Excellence Framework (REF)	Retain as now
No. of bids for funding submitted	UKRI	Under development ³⁶
Success rate of research proposals	UKRI	Under development
No. of researcher FTE posts funded in Scotland	Universities / HE BCI data	Under development
Impact Measures		
HE Research Quality Ratings	Research Excellence Framework (REF)	Retain as now
HE Research Impacts	Research Excellence Framework (REF) HE BCI data	Retain as now

³⁶ Work is underway within Scottish Government to review the measures for university research

Table 6.2: Innovation Capacity - Proposed Measures

	Sources	Details
Input Measures		
Investment in innovation capacity building activities	Agency data on project expenditure	Retain as now
Activity Measures		
Number of innovation capacity building programmes	Agency data on project expenditure	Retain as now
Output Measures		
No of firms participating in innovation capacity building programmes <ul style="list-style-type: none"> • Sectors • SMEs/ large companies 	Agency data on programmes	Retain as now with splits to be agreed
No of firms participating in leadership development programmes <ul style="list-style-type: none"> • Sectors • SMEs/ large companies 	Agency data on programmes	Retain as now with splits to be agreed
Impact Measures		
No of new innovation active firms	EU Community Innovation Survey (economy-wide and not for specific support programmes) HIE innovation ladder (uses different measures) SE programme monitoring data	Bi-annual (?) Retain as now but align measures across SE/ HIE

Increase in firm productivity	Agency data required	Agencies to gather data from beneficiary firms
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Table 6.3: Knowledge Diffusion - Proposed Measures

	Sources	Details
Input Measures		
Investment in knowledge flows/ diffusion activities/ projects	Agency data on project expenditure	Needs to be collated across agencies
Investment in collaborative R&D (companies)	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies and with beneficiary firms
Activity Measures		
No of HE/ Industry collaborative projects	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies and measures aligned
No of business to business collaborative projects	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies and measures aligned
Output Measures		

No of firms involved in collaborative R&D/ innovation projects	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies and measures aligned
No of HEIs involved in HE/ industry collaborative projects	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
HE income from collaborative and contract research	HE BCI Survey (HESA – under review) SFC KE Metrics (under review)	Retain as now
IP registrations (patents, disclosures, licences)	HE BCI Survey (HESA – under review) Agency data required	Retain as now Agencies to collect data from beneficiary firms
No of firms licensing technologies from HEIs	Agency and project data collected through ongoing monitoring University data	Data collection to be improved across agencies SFC to ask HEIs to provide data
No of new products/ processes/ services developed	Agency and project data collected through ongoing monitoring University data	Data collection to be improved across agencies SFC to ask HEIs to provide data (recognising that product development may occur after HE involvement)
Impact Measures		
R&D jobs created/ safeguarded	Agency and project data collected through ongoing monitoring University data	Data collection to be improved across agencies SFC to ask HEIs to provide data (recognising that

		impacts may occur after HE involvement)
No of academic spin-outs	HE BCI Survey (HESA – under review)	Retain as now
Sales from new products/ processes/ services developed	Agency and project data collected through ongoing monitoring University data	Data collection to be improved across agencies SFC to ask HEIs to provide data (recognising that impacts may occur after HE involvement)
Increase in firm productivity	Agency data required	Agencies to gather data from beneficiary firms

Table 6.4: Innovation Development - Proposed Measures

	Sources	Details
Input Measures		

Investment in innovation development projects	Agency data on project expenditure	Needs to be collated across agencies
Leveraged industry investment in innovation projects	Agency monitoring data	Needs to be collated across agencies
Activity Measures		
No of innovation projects: <ul style="list-style-type: none"> • Feasibility studies • Proof of concept • R&D/ Large R&D • Product development 	Agency monitoring data	Needs to be collated across agencies Measures to be aligned
No of business to business collaborative projects	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies and measures aligned
Output Measures		
No of new products/ processes/ services developed	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
IP registrations (patents, disclosures, licences)	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
Follow on investment in R&D	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
Impact Measures		
R&D jobs created/ safeguarded	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies, including longer term tracking
R&D FDI	Agency data	Ad-hoc

Sales from new products/ processes/ services developed	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
Increase in firm productivity	Agency data required	Agencies to gather data from beneficiary firms

Table 6.5: Application and Exploitation - Proposed Measures

	Sources	Details
Input Measures		
Investment in application and exploitation (e.g. marketing new product, export promotion, IP protection etc.)	Some agency and project data collected through ongoing monitoring	Ongoing
Activity Measures		
No of IP Audits	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
No of projects taking innovations to market	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
Output Measures		
No of firms taking new products/ processes/ services to market	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
No of new products/ processes/ services launched on the market	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
IP registrations (patents, disclosures, licences)	HE BCI Survey (HESA – under review) Agency and project data collected through ongoing monitoring	Annual survey of HEIs Data collection to be improved across agencies

Impact Measures		
R&D jobs created/ safeguarded	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies, including longer term tracking
Sales from new products/ processes/ services developed	Agency and project data collected through ongoing monitoring	Data collection to be improved across agencies
Increase in firm productivity	Agency data required	Agencies to gather data from beneficiary firms

Wider Impacts

The ultimate impacts of innovation support will be economic, social and environmental. The measures framework above focusses mainly on economic impacts, but three main areas remain to be considered:

- **Failure:** as noted, it is to be expected that projects will fail or be discontinued at different stages on the journey towards application. Indeed, this may not always be a negative outcome, as innovation development may provide evidence that a particular technology or approach will not work, thereby saving further wasted investment. However, at present there are no data to quantify the failure rate across different parts of the innovation system, and this may be worth further consideration and definition of “failure”;
- **Social Impacts:** many innovations will deliver social as well as economic benefits. Advances in healthcare and treatment, for example, would be expected to result in public health and quality of life benefits. However, the potential range of the social impacts is very broad indeed, and defining and capturing these within a single measurement framework would be a significant undertaking. Nonetheless, the potential for social impact should also be considered, particularly in relation to developing measures that align to the Scottish Government National Performance Framework and the ESSB’s Strategic Performance Framework; and
- **Environmental Impacts:** as climate change becomes an increasingly urgent global policy concern, so the focus on measuring the environmental impacts of innovation will increase. Green technologies will be an area of growth, but the expectation is that more and more of the wider economy will work to reduce carbon impacts towards a net zero economy. Work is underway

within the enterprise agencies (and partners such as Zero Waste Scotland) to develop ways of measuring the environmental impacts of projects and programmes, and this should in turn inform the innovation measurement work.

Recommendations

Before setting out the next steps, there is a need to consider the cost and benefits of implementing a new approach and framework to measure the impacts of innovation support.

On the one hand, as things stand, it is not possible to measure the impact of investment in innovation support in Scotland. Wider evidence on the benefits of R&D spend (e.g. OECD and Innovate UK) can help provide a rationale for investment and programme evaluation can assess the impact of some interventions (and inform action to improve delivery), but the overall impact of c £349m of annual expenditure is not known.

On the other hand, it is clear that developing a more robust and credible way of collecting the data necessary to allow this assessment will require investment of time and resources on the part of the agencies and their partners. Even then, the results will remain subject to numerous assumptions and likely issues with data quality, and it will be many years until the framework produces the anticipated outputs.

There is therefore a decision to be made about the value of making the investment of time (and money) to establish a new approach.

This notwithstanding, the steps necessary to take forward the proposed framework are discussed below.

At a high level, there are implications for each of the agencies as follows:

Scottish Funding Council

The REF and the HE BCI are both useful data sources, along with others such as HE Staff data, TRAC and HE Income and Expenditure data, but are all general rather than specifically tied to particular investments. Thus, what is proposed is some further data collection to supplement these sources and address current data gaps. It should be noted that SFC is currently undertaking a wider review of 'Coherent Provision and Sustainability' which includes consideration of funding, operations and accountability frameworks³⁷. This piece of work should be considered as complementary to this study and may start to identify solutions to some of the challenges set out.

In particular, SFC should seek to gather data from HEIs on:

- the specific use of REG and UIF monies against defined categories of expenditure (these could relate to infrastructure, research activity and staff, for example);
- more global measures of research activity and resources including the number (and nature) of active research projects and research active staff (although HE Staff data may suffice for the latter);
- the number and location of businesses and other external organisations with which they engage (this could be captured in the HE BCI and could be an issue to input into the HESA review process); and
- engage with and support the universities to collect data on the impacts of their innovation activities (the University of Edinburgh's CRM project may be a useful case study example here). In particular, where a university is working with a company on an innovation project that is not supported by other innovation support programmes then the impacts of this work should be captured.

³⁷ [SFC call for evidence](#)

Where the project is supported elsewhere (e.g. through an Innovation Centre) then these impacts should already be captured.

Enterprise Agencies

While there are numerous more detailed issues to work through, for the enterprise agencies three overarching principles should be considered:

- there is a need to adopt a consistent set of measures between the agencies such that data collection and reporting can be more aligned. The framework above provides initial suggestions and many of the existing measures collected by the agencies are similar to those specified above. However, changing the definitions of some measures may have implications for the enterprise agencies' current measurement frameworks³⁸;
- there should be greater commitment to longer term tracking of assisted firms to assess impacts over time (applied proportionately to the scale of investments). This is particularly important for innovation support where timescale can be lengthy; and
- data collection should move from reliance on forecasts to actual impact data – which will require the longer term tracking noted above.

Other Stakeholders

Implementing a new approach will have implications for other stakeholders and actors within the innovation landscape. Most obviously, the universities have a key role to play in collecting data that can more accurately demonstrate their contribution to innovation performance (again the Edinburgh CRM project will be a useful example here). This includes more detailed recording of research

³⁸ For example, feedback identifies that SE measurement framework (2020/21) will no longer capture and report R&D jobs separately.

outputs and their uses, tracking interactions with external organisations and collecting data on the impacts of these interactions (again over time). This has obvious resource implications for the universities.

Similarly, other actors in the innovation system (for example, Innovation Centres, Interface etc.) should also seek to improve data collection to include longer term tracking of impacts and collection of actual rather than forecast or estimated impacts.

A more robust approach to monitoring will also have implications for businesses in receipt of innovation support who will have to collate and report performance data in the required format. Issues of proportionality will need to be considered here, but it seems reasonable that firms receiving significant levels of public investment and support should be required to account for the impacts of that support.

Finally, there is also a question about who should be responsible for collating and reporting data on innovation support for the Enterprise and Skills Strategic Board.

Next Steps

The next steps in taking forward the new framework would be as follows:

- further engagement with the three agencies to define in more detail the specific measures within the framework and scope out the various data collection methods – this might also extend to wider partners and stakeholders;
- agree and develop a data governance model that identifies roles and responsibilities including responsibility for the co-ordination of the data collection and reporting processes;

- develop a common reporting format (template) for the agencies to input data on an annual basis; and
- develop data collection processes (including arrangements for longer term tracking) and allocate necessary resources to support; and begin data collection to establish a baseline position for Year 1.

It is worth noting that some of these actions could be implemented with limited impact on resources. These include:

- developing a consistent set of measures and common reporting template across the agencies; and
- establishing agreed data collection processes and timeframes across eth agencies.

Implementing new data collection processes may then require the allocation of resources and this is a decision to be made by the agencies and the ESSB.

Appendix A: Innovation Activity by Agency

This Appendix provides the detail, including; objectives, expenditure, deliverables and intended beneficiaries across all the innovation programmes/projects/schemes delivered across the three agencies (as defined by Scottish Government).

Table A1: SE Innovation Interventions

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Large R&D Awards	Support companies to: grow their business by development of new products, processes or services in Scotland. Increase the levels of BERD in Scotland, address gap Scotland's: leading OECD nations BERD Gap. Greater contribution to a company's turnover through the products launched, processes implemented, or services delivered. More recent focus on jobs that pay living wage	£26.7m	Funding for R&D projects aimed at the creation of new products, processes or services.	Financially viable SMEs, Large Companies or Consortiums Companies Based in or planning to locate in Scotland– different intervention rates based on size. Projects must be financially viable, significant innovation with commercial prospects, which can't go ahead, or would be much smaller or take much longer without the grant. End products must not have known adverse

				<p>effects to environment/society.</p> <p>More recent focus on companies with fair working practices (e.g. living wage, zero hours contracts, etc.).</p>
R & D Grant (Under £100K)		£4.9m	R&D projects aimed at the creation of new products, processes or services. It can also be used towards a Feasibility Study – this support is only available to large companies as a precursor to applying for a full R&D grant application where the project is deemed to carry too much risk to embark upon without this pre-research.	Account Managed Companies (76)

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
By Design Grant	Stimulating R&D activity	£940k	External consultancy to help design new products and services or to help improve the design of existing products and services. This can include the design of packaging. 70% Fixed Intervention Rate.	NRM companies (312)
Make It to Market	Stimulating R&D activity	£72k	External consultancy to undertake technical/market/financial and other relevant studies/investigations into the feasibility or technical aspects of an innovation project for overseas markets e.g. Business Model, Collaboration, IP/Intellectual Assets position, and product development. 70% Fixed Intervention Rate.	NRM companies (29)
Winning Through Innovation Workshops	Introducing them to innovation concepts, stimulate interest and connect companies to follow-on innovation support.	£3.4k	1 to few engagements with groups of companies, introducing them to innovation concepts, stimulate interest and connect companies to follow-on innovation support. May be delivered by topic experts.	NRM, DRM sector Specific and/or cross-sector 55

IP Specialists	Support companies to manage IP, with a view to increasing company profits.	£260k	Advice and guidance to, protect new innovations and developments, manage confidentiality, contracts and ownership, Identify and value assets, go to market, Strengthen and protect brand, and develop international IP strategy	
Seek and Solve R&D Grant	Seek & Solve is designed to support company to achieve business growth through selling new products, processes or services that will be developed in an eligible R&D project with meaningful input from a potential customer.		The potential customer contribution may be in cash or cash equivalent e.g. staff time, access to facilities etc.	Companies operating commercially, or planning to, in the SE area – preference for SMEs. Companies with formal agreement with potential customer to contribute min 20% total R&D project costs.

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
INT532 ScotGrad Innovation Support	<p>Encourage business to employ young people, and see value of graduates while graduates get 1st step in their careers and incentive to stay in HIE/Scotland</p> <p>Support companies to deliver innovative projects via graduate skills (often digital, internationalisation or product development.)</p>	£198k	Employ a graduate or student to deliver a specific project for their business. Projects are up to 12 months	<p>Scotland-wide programme operated by HIE and Scottish Enterprise</p> <p>Graduates, Students, Account Managed Businesses (28)</p>
SMART	Assist SMEs to research, develop and exploit new, technically innovative, products and processes with good commercial potential.	£7m	<p>2x project supported</p> <p>Technical and Commercial Feasibility Studies (up to 70% for co.'s with <50 employees and a turnover of ≤€10mand 60% for co.'s with <250 employees and a turnover of ≤ €50m. Maximum grant is £100,000.</p>	SMEs, SE and HIE areas. Companies with appropriate level of technological innovation & Risks and R&D challenge, commercial potential and market demand, exploitation prospects, management abilities

			Research and Development Grant 35% of up to a maximum grant of £600,000 to develop a pre-production prototype of a new product or process.	and project team, financial viability, additionality, intellectual property rights and wider aspects.
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Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Innovation Project Support		£4.7m	<p>External consultancy covering feasibility, research and technical expertise/advice. This will take the company to the point where it is able to make an informed decision on whether to invest further and proceed to Project Implementation. Fixed Intervention Rate 70%.</p> <p>Support for Market Research</p> <p>Support for Innovation Development</p> <p>Support for Market Launch Preparation</p> <p>Support for Development Innovation Culture</p> <p>Intervention Rate 40%</p>	<p>DRM and NRM</p> <p>(370)</p>
Innovation Services Expert	improve the chances of success for a company's innovation project and the	£205k	2 days external consultancy – 100% funded by SE (ace-to-face meetings, consultation, desk research, facilitation	Mainly NRM companies, some DRM through other

<p>growth performance of that supported company, through a better planned and researched innovation project focused on the crucial 'Front end of Innovation'.</p>		<p>of meetings/workshops, development and presentation of plans/spreadsheets)</p>	<p>development projects (171)</p>
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Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
SE/RSE Enterprise Fellowships	Aims to create new companies (mainly spin-outs) which have good growth potential, of which many are hoped to be high growth, and will go on to access further support from SE as well as leveraging further investment from elsewhere to support this growth. Giving fellows the skills to set up a business is also hoped to create serial entrepreneurs and wider benefits beyond the target project.	£718k	Delivered by the Royal Society of Edinburgh with SE funding: one year's salary expert training in entrepreneurship access to mentors	Researchers and innovators w/ promising technology-based business ideas. Beneficiaries may be spin-outs, some of which may be high growth.
SDT265 Offshore Wind Expert Support/ Expert Support – Energy Market (Module)	Help companies consider and build diversification strategies to enable them win business in the Energy Markets sector. It focuses on identifying and exploring	£12k	consultancy support for market analysis and technical due diligence. Phase 1 - 100% funding for up to 2 days	Open to all companies (including pre-revenue). Not open to Individuals

	potentially profitable revenue streams for the business as well as a review of the most effective and efficient route forward.		Phase 2 - 50% for up to 4 days support Production of company specific report/ presentation to help achieve market objectives.	Markets can include Offshore Wind, Nuclear Decommissioning, Low Carbon Heat, Water and Energy Systems/Storage.(18)
Companies of Scale		£222k	A range of specialist support, tailored to need. Interventions include Executive Education Strategic Retreats (one-to-many), Masterclasses, networking events and tailored One-to-One support/learning journeys.	primarily for Scaling Account companies
Employer Engagement (Masterclasses & Workshops)		£31k		(445)

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Workplace & Organisation Development Review/ Organisational and Workplace Innovation Review (OWI Review)	The review aims identify priority Organisation and Workplace Innovation actions to support delivery of client's business plan, overcome barriers to growth, etc. Informs development projects w/ SE Account Plan, and helps develop the business plan, and growth of the business.	£301k	Diagnostic tool covers various aspects of organisational and workplace innovation development including leadership and management capability, organisational culture, employee engagement, roles and responsibilities, performance management, skills gaps, succession planning, youth training planning and place (enhancing workspaces and use of technology). Output = report w/ action plan relating to business strategy and growth objectives.	Staff from the chief executive to operational and shop-floor staff across all skills areas. (91)
Workplace Innovation Funding (NRM)	Embed and support Workplace Innovation	£133k	Supports NRM projects centred around the following themes: People – Motivating staff beyond pay and supporting learning and development. Place – Improving or maintaining a positive workplace culture, creatively	(44)

			<p>using physical space, creating time to innovate and integrating technology.</p> <p>Practice – Supporting work practices to become fair, responsible and improve productivity.</p>	
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Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Workplace Innovation Funding (AM)	<p>embed and support Workplace Innovation via:</p> <p>Improved leadership abilities to direct change</p> <p>Giving confidence and capability to supervisors to lead their teams and deliver productivity gains</p> <p>Fair and inclusive practices which drive employee engagement and result in growth</p>	£2.45m	<p>3 sub products:</p> <p>Leadership Development Support (leadership team or individuals) - develop senior managers, directors, CEOs or MDs to enable strategic change leading to growth.</p> <p>Management Development Support Development first line supervisors and managers.</p> <p>Workplace Organisation Support to Embed fair and progressive workplace practices, develop the culture, increase employee engagement and address skills barriers to growth.</p>	(181)
Consortium Expert Support	Use of consortium model to promote risk-sharing in new projects, allow access to larger or higher quality markets, cost savings by	£24k	Up to 2.5 days of consultant time to help groups of businesses or business people form a new entity which, by achieving scale, helps them improve their individual performance.	Existing businesses from all industries (where SE believes there is, or is likely to be, an advantage to

	collective purchasing, sharing facilities or services, and other operational / motivational benefits. Enable businesses of varying types and sizes to work together toward an agreed purpose, on a shared and equal basis.			businesses working collaboratively. For DRM businesses, it must be linked to a Development Project (10)
Leadership for Growth Programme (AM)	Improve confidence and capability of leaders and accelerate business growth	£39k	Up to seven 1 day workshops incorporating practical and theoretical based learning covering comprise of personal assessments linking with business objectives to create an action plan, run over 6-8 months. Option of mentoring. Afterwards beneficiaries should implement a strategic business project. . .	AM Companies/Growth Pipeline (128)
Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Leadership Essentials	Improve confidence and capability of leader's and stimulate ambition		Workshops run over a period of 2 months. Participants undertake a personal diagnostic assessment, up to 5 1/2 day workshops incorporating practical and theoretical based learning	NRM Companies

			followed by a strategic business project.	
Training Plus	<p>Increasing the attractiveness of Scotland as a location for investment;</p> <p>Raising the competitiveness of businesses operating in Scotland and overcome barriers to growth;</p> <p>Influence training to a higher standard than would have been possible without support.</p> <p>It should be delivered in partnership between SDI, CG & I&E Services</p>	£4.7m	Funding to support training to develop the skills of staff, create a skilled, trained and adaptable workforce and labour market responsive to economic change.	
Managing People for Growth programme	Raise awareness of good people management and educate managers to understand their role, identifying and delivering people management solutions which will enable	£12k	One to many product focussed on people management skills development. Include 6 days with the participants to cover the key learning outcomes and a ½ day feedback/review session topics will include, The Role of a Manager and	All companies (472)

	the growth of the business. Encourage managers to adopt new thinking, behaviours, habits and understanding that link to the strategic goals of the business, potentially leading to a positive impact on profit and increased productivity.		Setting Goals, Managing Individual Performance to Build High Performing Teams, Communication, Influencing & Assertiveness Skills, Coaching & Delegation, Dealing with Conflict & Difficult People, Change Management & Innovation.	
Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Scottish Co- Investment Fund	Address to address weaknesses in the supply of risk capital to high growth companies via SIB funding matched by accredited co-investment partners.	£280k	Match co-investment partners up to 50% of total funding, from £10,000 up to £1.5m, for deals of £20,000 to £10m	Investment can be made in companies from start-up, early-stage to expanding businesses seeking to develop products and/or markets. 62
High Growth Spinout Programme	Commercialisation of leading-edge technologies and creating growth within a new start-up or existing Scottish company of £5 million turnover or	£1.75m	Champion and Support for: Commercialising your research and innovation, Market assessment, IP protection, Building a commercial team, Company formation	Scotland's universities, research institutes and NHS Boards, though development of pre-commercial projects which must

	commercial investment of £10 million within five years			demonstrate potential for high growth High growth companies originating from this support
HGV Development Support		£316k	Provides grant assistance to contribute towards project costs associated with business development/ start-up during the pre-sales period, and also consultancy/ external expertise procured for agreed tasks in support of the growth of the client company. This covers, but is not restricted to, strategy, business planning, corporate finance, intellectual property, specific technical expertise or marketing expertise.	High growth companies (52)
HGV Advisor Support	support acceleration of growth and achievement of milestones towards investor and commercial attraction whilst engaged with Company Growth's High Growth Ventures team and the High Growth Spin-Out programme	£525k	Fully funded mentoring/advisory support via supplier as advisor relationship designed.	High growth companies (61)

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
HGV Early Team Development	support companies to acquire new expertise critical to building the investment proposition. The focus is on ensuring that an investable team is in place.	£98k	Grant assistance to contribute towards recruitment and salary costs or fees of early team members identified as critical to building investor confidence	High growth companies
Succession Expert Support		£82k	Specialist support to business owners facing succession issues/options (e.g. MBO, EBO, family transfer, flotation and trade sale) with an expert adviser. - Stage 1 provides up to 1 day advisor input Stage 2 - 2 days more support for investigating employee ownership option.	DRM companies – linked to a Development Project and where AM and SE/CDS Specialist agree it is appropriate. (37)
Cyber Security and Resilience				
Bayes Technology Centre (Edinburgh University)	Bayes Innovation Programme (Bayes IP) Project A is the initial phase of a new University of	Approval of project of £5.7m in 2018	identify, engage and successfully build new collaborative partnerships	corporate R&D groups academics

	Edinburgh (UoE) led programme that will focus on company engagement and entrepreneurship to generate new strategic corporate collaborations, create and scale high growth ventures, attract new investment and deliver economic benefit through Data Driven Innovation (DDI).	of which SE (£2.75m)	develop the Engage Invest Exploit programme to strengthen existing and build new relationships with the investor community in Scotland	
Data Driven Innovation projects	Various (see link)			

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Scottish Manufacturing Advisory Service (SMAS)	Encourage companies to improve competitiveness, by engaging workforce in supporting innovation and the adoption of new processes and technology.		Operational Review to identify areas for potential improvement, cost savings, efficiencies, etc. and plan to improve Manufacturing 4.0 review Business Improvement Academy Identify supply chain opps via supply chain diagnostic tool	
CAN DO Innovation Challenge Fund	Identify innovation challenges in Scotland's public sector and explore creative solutions with businesses, e.g. to overcome operational challenges, improve service quality, reduce costs, etc.		100% of funding to support the development of innovative solutions Up to 100% funding to find and develop solutions with innovative businesses	Public Sector Organisations (including unis and charities) Businesses

	Boost Scotland's innovation and economic development performance			
Open Innovation Marketplace			Support collaboration by providing a portal/network to connect companies and agencies with a challenge to those with the skills and expertise to solve the challenges	

Table A2: SFC Innovation Interventions

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Industry/ Academia Links Fund (formerly SEEKIT)	To build connections between academia and industry in areas relevant to Scottish Government priorities. IALF is included as a priority area in the Can Do Innovation Action Plan.	£2,268k	Allocated on a project basis, I-ALF supports a wide range of activities linked to building innovation infrastructure, changing culture/raising ambitions and leveraging additional funding through projects targeting UK Industrial Strategy Challenge Funding (or similar). Funded projects include FitWork, Centre of Excellence in Decommissioning & Late Life, Converge Challenge Programme, and Venture Fest Can Do Innovation Summit. College innovation is currently awarded through I-ALF (see below).	University/college staff, businesses and wider society through delivery of outcomes that will enable Scotland to become more productive, economically prosperous and inclusive.
Knowledge Transfer Partnerships (KTP)	Knowledge Transfer Partnerships (KTP) creates a dynamic three-way collaboration between a business or not	£1.5m from Scottish Government to support additional	There are about 90 KTPs in Scotland currently, these are just a few examples.	The unique collaboration formed by a Knowledge Transfer Partnership is designed to be mutually

<p>for profit organisation, a UK university or research organisation, and a suitably qualified graduate to help realise a strategic innovation project, bring about transformative change and embed new capability.</p> <p>For those KTP funded by the SFC, wealth creation and social impact are important considerations and the public sector, charities and not-for-profit organisations are also eligible.</p>	<p>KTP activity in Scotland. This level of funding has been provided by the SG for many years.</p> <p>Anecdotally for every £1.0m of SFC Grant £1.8m is leveraged from other Grant Sponsors</p>	<p>The types of activity supported by KTP are well publicised on the KTP website.</p> <p>http://ktp.innovateuk.org/</p>	<p>beneficial to all three partners:</p> <ul style="list-style-type: none"> • A business or not for profit organisation: driving innovation, increasing productivity and improving business performance • A research organisation or university: creating business-relevant teaching, research and publishing opportunities • A suitably qualified graduate (the Associate): providing a rewarding employment opportunity and the chance to apply academic knowledge to real world business challenges
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Strategic Funds KE (now called non-core programme funds)	<p>SFC also makes targeted, time-limited investments to support national priorities in Scotland’s colleges and universities.</p> <p>In FY18/19 – Interface, IVs, and ICs were funded in this way.</p> <p>No fixed budget.</p>	<p>KE projects:</p> <p>Quality Improvement Health - SISCC £406k</p> <p>National Coordination Centre for Public Engagement £14k</p> <p>SFC/Creative Scotland Partnership for the Creative Industries £23k</p> <p>Knowledge Exchange Partnership Programme (H&I) £94k</p> <p>Centre for Fiscal and Budget Analysis £7k</p>		
Interface	Connecting businesses to universities and colleges	£778k	Brokerage service. Companies are assisted to find the most suitable academic partner to help them solve a problem/challenge.	SMEs and academic staff participating in collaborative activities.
Global Challenges Research Fund (Overseas Development Assistance)	<p>Formula funding to support Research to address the Sustainable Development Goals in DAC nations. (Complements the competitive GCRF grants managed via UKRI.)</p>	£10,279,379 (ODA)	Impact –focused research; fieldwork to establish datasets; testing of prototypes; developing human and organisational capacity to undertake research; establishment of science partnerships; research studentships. All research work to be co-designed and delivered with partner organisations in DAC nations.	DAC nations. (Benefits to Scotland must be a secondary consideration.)

<p>Innovation Voucher scheme</p>	<p>Encourage first time collaborations between businesses and universities and colleges</p>	<p>£542k</p>	<p>A standard innovation voucher offers £5k of academic buy out support matched by companies in kind contribution. This scheme supports the development of innovative new products, services or processes where they cannot be de delivered commercially.</p> <p>Advanced Innovation Vouchers offer larger grants of up to £20k matched by company through cash and in kind.</p>	<p>Companies benefit from the further development of a novel product, service or process and hopefully from the establishment of a long term relationship with a university or college and all its potential support functions.</p> <p>Universities and colleges benefit specially on collaborative projects and receive ‘a perpetual, irrevocable, worldwide non-exclusive royalty free licence to use the Foreground IP for the purposes of academic research, teaching and collaboration, including any collaboration with third parties’</p> <p>Academic sectors benefit from a gradual improvement of attitudes of businesses towards</p>
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				them and a greater understanding of the benefits of working with academia.
University Innovation Fund	<p>The University Innovation Fund (UIF) incentivises universities to work collaboratively to design and adopt innovative new approaches to exploiting the research base that will lead to a significant positive change in Scotland's already good economic performance.</p> <p>Equivalent funding streams in the UK are Higher Education Innovation Fund (HEIF) in England, Research Wales Innovation Fund (RWIF) in Wales, and HEIF in Northern Ireland.</p>	<p>£15,897k (please note this funding is allocated on an Academic Year (AY) basis and is normally £13.5M per AY. The UIF was given a one-off uplift in AY2018/19)</p>	<p>The UIF model consists of two elements: the Platform Grant and the Outcome Grant.</p> <p>The Platform Grant (£250K) represents a baseline contribution towards maintaining each university's knowledge exchange and innovation activities. This element can be used at the institution's discretion to support maintenance of core staff and activities, support activities (such as public and cultural engagement) as well as staff development and the development of policies and practice.</p> <p>The second element of the UIF, the Outcome Grant, is distributed on the basis of satisfactory contribution to the delivery of seven national outcomes aligned with the Scottish Government's economic strategy, with universities working collaboratively where appropriate.</p>	University staff, general public, businesses.

			The Grant is used by universities to support a wide range of commercialisation, knowledge exchange, public engagement and other activities aimed at delivering the UIF outcomes.	
College Innovation Fund (pilot)	<p>The College Innovation Fund (pilot) is piloting different funding mechanisms to support innovation through college/business collaboration. In the period being discussed here the pilot comprised:</p> <p>College Innovation Vouchers – objectives similar to IV programme set out above</p> <p>College Innovation Accelerator Funding (CIAF)</p> <p><i>Project of scale - FUTUREquipped</i></p>	<p>Future Equipped £108k</p> <p>CIAF £4k</p> <p>College Innovation Vouchers £35k</p> <p>(funded from IALF – don't double count)</p>	<p>The College Innovation Fund (pilot) is piloting different funding mechanisms to support innovation through college/business collaboration.</p> <p>The largest project to date and supported during the period in question is FUTUREquipped - https://www.forthvalley.ac.uk/news-events/futureequipped-finalists-in-scottish-life-sciences-awards/</p>	College capacity and staff, students, businesses

Research Pools	To maintain administrative structures for research pools - establishing a critical mass of excellent research in those disciplines in Scotland, in order to compete effectively for funding, research staff and doctoral students both nationally and internationally.	£940k	Funding supports the central, collaborative functions of research pools. Models vary between pools, however, in the main funding supports a Director, administrative functions, a graduate school (central activities not, except in a few cases, studentships) and some activities such as workshops, Distinguished Visitors Programmes (DVPs), summer schools, conferences.	Researchers, Research students
Core Grants (REG)	Securing the undertaking of research in the Scottish university sector. Universities must use Research Excellence Grant (REG) funding for research purposes only; targeting their REG allocations predominantly on world-leading and internationally excellent research.	£237,807k	Provision of staff, facilities, consumables and support services (including university administration) for exploratory research. Contribution to full economic costs of Dual Support funders' research projects.	Universities, researchers
Innovation Centres Programme	Innovation Centres bring the expertise and capabilities of Scotland's universities, research institutes, colleges and	£13,924k	In FY18/19 there were 8 ICs with a multitude of delivery models. All are industry-led (this includes NHS and health outcomes for DHI and PMS-IC). Most have skills programmes	The IC programme is tasked with demonstrating economic impact for Scotland by benefitting companies

<p>businesses, to address industry demand led opportunities that support growth of the Scottish economy. Innovation Centres support transformational opportunities for industry and work collaboratively to develop Scotland as a world-leading entrepreneurial and innovative nation.</p>	<p>(MSC places and PhDs). All are tasked with challenging and inspiring the Scottish research base to bring industry problems to them to be solved. Phase 2 has led to re-emphasis of ICs in playing a supportive role in helping Scottish businesses and universities win competitively won research funding for Scotland. They are tasked with leveraging their own resources to make best possible use of UKRI funding (ISCF, SiPF, Sector Deals, IUK, Research Councils etc.) and other sources (H2020 etc.)</p>	<p>working with the academic base and more directly with ICs and other businesses. There are many more benefits to such a wide-ranging programme including the health outcomes of two specific ICs and the improvements to the skills base of universities and future workforce.</p> <p>The IC programme partners are considering how best to measure other benefits/contributions such as 'climate' and 'well-being economy'</p>
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Table A3: HIE Innovation Interventions

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries						
Co-Innovate	The strategic aim of the programme is to increase the proportion of SMEs in the HIE region (and SE, Northern Ireland, REp of Ireland) and micro-businesses involved in cross-border R&I collaboration across the eligible regions from 22 per cent to 33 per cent.	£195,000	<table border="1"> <tr> <td data-bbox="1077 560 1597 596">Workshop Clients -176</td> </tr> <tr> <td data-bbox="1077 596 1597 671">Business Status Reviews - 60 (BSRs)</td> </tr> <tr> <td data-bbox="1077 671 1597 708">Innovation Audits (IAs) - 60</td> </tr> <tr> <td data-bbox="1077 708 1597 783">10 days Consulting, 100% Programme Funded - 12</td> </tr> <tr> <td data-bbox="1077 783 1597 858">12 month academic R&D projects - 8</td> </tr> <tr> <td data-bbox="1077 858 1597 975">Cross Border R&D B2B or Cluster Collaboration Projects (0.5 cluster, 2 B2B projects)</td> </tr> </table>	Workshop Clients -176	Business Status Reviews - 60 (BSRs)	Innovation Audits (IAs) - 60	10 days Consulting, 100% Programme Funded - 12	12 month academic R&D projects - 8	Cross Border R&D B2B or Cluster Collaboration Projects (0.5 cluster, 2 B2B projects)	176 SMEs in the HIE allocated region
Workshop Clients -176										
Business Status Reviews - 60 (BSRs)										
Innovation Audits (IAs) - 60										
10 days Consulting, 100% Programme Funded - 12										
12 month academic R&D projects - 8										
Cross Border R&D B2B or Cluster Collaboration Projects (0.5 cluster, 2 B2B projects)										
Accelerating Aquaculture Innovation Fund	This targeted pilot programme focuses specifically on accelerating the latter stages of the innovation journey, critically optimising the commercial exploitation of new products and processes, both upstream and downstream (industry	£311,816 - Programme closed to applications September 2019	Generally, funding awards will be at a maximum of 50% intervention. Therefore, the company must be able to demonstrate that they are able to meet a minimum 50% cash contribution to the project, in addition to any associated in-kind contributions. Projects from £25,000 to £1m in total project size will be considered.	Helping companies in the HIE region who are part of the supply chain to Aquaculture. £1m funding available. TRL level 5-9						

<p>relevant demonstration to system test and launch in an operational environment). As indicated in table 1, this element of the programme will operate across technology readiness (TRL) levels 5 to 9, as a near-to-market support mechanism designed to enable products and services to fully enter the market.</p>			
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Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
R & D Grant (HIE)	Increase R&D capacity in the region's business base (through increased business expenditure on R&D), leading to increased productivity and export	£1,265,683 paid out to businesses in 2019/20	Grant funding to businesses under GBER Article 25. Intervention rate up to 70% depending on the size of the business, the type of activity (experimental development or industrial research) and the economic impact case	Businesses of all sizes in the Highlands and Islands. *Note: SMART: SCOTLAND is a type of R&D grant across the whole of Scotland but administered by Scottish Enterprise.
Small Innovation Grant Scheme	Increasing the number of innovation active businesses in the Highlands and Islands. Supporting the development of new to the firm and new to the market products and services.	£82,065	Grants of up to £15,000 which must be used to help commercialise a product, service or process being developed by the business.	The HIE Small Business Innovation Grant scheme is aimed at helping companies in the Highlands and Islands (H&Is) that have been identified through the Innovate Your Business programme or account management as having an innovation project that would benefit from funding to help commercialise a product, process or service. Target of 17 small innovation grants awarded per annum.

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Scot Grad Student Placement	ScotGrad aims to deliver placement projects which are linked to HIE's own key priorities of innovation, internationalisation, process improvement, product development and digital opportunities to support an organisation's growth ambitions. For social enterprises and for businesses in fragile areas, the programme assists sustainability, diversification and growth.	£33,274	Project specific placements of up to 12 weeks induration focused around innovation, internationalisation, process improvement, product development and digital opportunities to support an organisation's growth ambitions.	Beneficiaries are organisations developing or planning to develop an innovative new product, service or process and hold ambitious plans for growth. SMEs and Social Enterprises across the Highlands and Islands, predominantly account managed by HIE.

Scot Grad - Social Business Graduate Placement Programme	Social Business strand of the graduate programme supported placements that enhanced the sustainability of not for profit organisations with a community focus, whilst delivering a product or service.	This no longer runs as a separate programme. It was incorporated into the Graduate Placement Programme below in 2018.	N/A	N/A
Scot Grad- Graduate Placement	ScotGrad aims to deliver placement projects linked to HIE's own key priorities of innovation, internationalisation, process improvement, product development and digital opportunities to support an organisation's growth ambitions. For social enterprises and for businesses in fragile areas, the programme assists sustainability, diversification and growth.	£304,815	Project specific placements from 3 to 12 months in duration focused around innovation, internationalisation, process improvement, product development and digital opportunities to support an organisation's growth ambitions.	SMEs and Social Enterprises across the Highlands and Islands, predominantly account managed by HIE.

Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
The Innovation Centre programme- HIE	The Data Lab Innovation Centre have established a hub in Inverness and recruited a Business Development Executive.	£250,000	The Data Lab are focussed on delivering their priorities across the region: data innovation projects; developing skills and talent and community building events.	Businesses, wider public sector, academic/research institutions.
MIT ILP	HIE's membership of Massachusetts Institute of Technology (MIT)'s Industrial Liaison Programme (ILP) provides access to world class conferences and events, webinars, reports, research, facilities and expertise to both staff and businesses in our region.	£65,000	HIE staff and businesses can register on the members' area of the MIT website and gain access to a suite of online resources as well as access to conferences, events and similar at a discounted rate for members of ILP. HIE has a dedicated member of staff at MIT who will discuss the requirements of staff and/or businesses and facilitate access to the expertise, research or contacts that is sought. This member of MIT staff will also support HIE staff to organise learning journeys for groups of companies or bespoke meetings for individual businesses. HIE's membership of ILP also provides	MIT's Industrial Liaison Programme is a membership service that is open and accessible to all agencies, businesses and individuals wishing to access the extensive research, resources and expertise available at MIT. HIE has approval from its Board to maintain its membership of ILP until 2020.

			access to other members, many of which are leading global businesses.	
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Project/ Programme	Objectives	Annual cost (last financial year 2018/19)	Type of activities delivered	Expected Beneficiaries
Innovation advisor support	<p>Increasing the number of innovation active businesses in the Highlands and Islands.</p> <p>Supporting the development of new to the firm and to the market products and services.</p>	£164,435	<p>Innovation support service delivered by HIE's in-house innovation team specialists. Each member has a sector specialisation and can assist Account Managed businesses with an innovation project or issue with bespoke advisory support. Support can come in the form of simple early stage advice, Intellectual Property assistance, funding support and signposting to relevant contacts and agency bodies who can advance enquiries if HIE is unable to adequately support to the level required.</p>	<p>HIE Account Managed Clients. Target to support 100 unique clients across the account management portfolio per annum.</p>
Advanced Innovation Voucher Scheme	<p>The project contributes to the ambition of The Scotland Can Do Framework and HIE's operating plan and highlights the importance</p>	£63,048.17	<p>Interface connects businesses to the right academic expertise for increased innovation leading to the creation and development of new products, services and processes; http://www.interface-online.org.uk/</p>	<p>4 organisations in HIE region funded.</p>

	<p>and ambition that is attached to innovation. The aims of these plans are to measure performance in areas listed below.</p> <ul style="list-style-type: none"> • Becoming a world-leading entrepreneurial and innovative nation: • Increase the number of businesses. • Increase research and development spending. • Improve knowledge exchange from university research. 		<p>With established connections in each of Scotland's 23 universities and research institutions, Interface is able to identify the right expertise, the best technologies and the most relevant facilities and equipment to solve any number of business challenges.</p> <p>The Interface team works with businesses to develop their ideas, helping to translate them into dynamic briefs for academics or student projects.</p> <p>The free and impartial service has helped hundreds of organisations to become more competitive enabling them to increase their profits, maximise their export potential and ultimately become more sustainable.</p> <p>Interface can also help organisations access a range of funding options to offset the cost of their project; http://www.interface-online.org.uk/how-we-can-help/funding</p> <p>With Interface's dedicated Highlands and Islands business engagement</p>	
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			<p>team on the ground, based within HIE, they can help businesses wherever they are, whatever their need – for more information visit http://www.interface-online.org.uk/how-we-can-help</p>	
Innovate Your Business	<p>The Innovate Your Business programme is delivered on behalf of HIE by True North Innovation Ltd to non-account managed clients. Account managed clients are supported by HIE’s innovation team. Objective to support 170 unique businesses per annum.</p> <p>Increasing the number of innovation active businesses in the Highlands and Islands.</p> <p>Supporting the development of new to the firm and new to the market products and services.</p>	£49,522	<p>The IYB programme is part of HIE Innovation Service and aims to increase the numbers of non-account managed innovating businesses in the region. Those businesses that are supported throughout the IYB programme may subsequently feed into HIEs internally delivered innovation service for continued support if considered pipeline for account management.</p> <p>The IYB programme consists of:</p> <ul style="list-style-type: none"> • Innovation Enquiry Service – enquiries are made on-line via the HIE website or Find Business Support portal. These are followed up by a call from the IYB contractor offering up to 4 hours of initial support 	Target of 170 unique businesses per annum supported through the Innovate Your Business programme.

			<ul style="list-style-type: none"> • Advanced Support – Up to 2 days of support in total. • Innovation Workshops <p>Grant Advice - signposting to appropriate sources of funding and where appropriate support to work up a HIE small innovation grant application</p>	
Northern Innovation Hub	<p>The support on offer through the Northern Innovation Hub is diverse, yet linked by the umbrella themes of Young People, Growth, and Sectors and Place.</p> <p>Young People Support is available for small to medium sized enterprises across all sectors through a range of projects</p> <p>Growth By providing targeted support to businesses, we will ensure economic resilience which will</p>	£1.3m	<p>Tourism: Digital Tourism Programme: D1. Tune into Tourism webinars /podcasts</p> <ul style="list-style-type: none"> • Digital Tourism Think Tank • Digital Skills Academy <p>Adventure Tourism Programme – to be launched this year</p> <p>Young Entrepreneurs Programme: IMPACT30</p> <p>Life Sciences Programme:</p> <ul style="list-style-type: none"> • Pathfinder Accelerator • NEXUS co-working space <p>Technology Placements Programme (Graduates and Students)</p> <p>Coding Academy: CodeClan Highlands</p>	<p>SMEs across the Highland Council area, from start-ups through to businesses of growth</p> <p>Output Number of Enterprises receiving modest support to develop innovative products, services or processes</p> <p>Project totals (unique enterprises) Tourism - 300 enterprises Creative Industries – 545 enterprises Total 845 enterprises</p>

	<p>benefit a wide range of individuals and companies across the region.</p> <p>Sectors and Place Support is particularly available to businesses working across life sciences, tourism, food and drink and the creative industries.</p>		<p>Creative Industries Programme: XpoNorth Digital</p> <p>Food & Drink Programme:</p> <ul style="list-style-type: none"> Highland Food & Drink Innovation Network <p>Food & Drink Technology Hub</p>	<p>Output Number of Enterprises receiving considerable support to develop innovative products, services or processes</p> <p>Project totals (unique enterprises) Life Sciences - 46 enterprises Tourism - 30 enterprises Food and Drink - 75 enterprises Creative Industries – 175 Total 326 enterprises</p> <p>Output Number of Enterprises receiving intensive support to develop innovative products, services or processes</p> <p>Project totals (unique enterprises) Life Sciences - 170 enterprises Tourism - 100 enterprises Technology Placements - 100 enterprises 30 under 30 - 210 enterprises Food and Drink - 30 enterprises Creative Industries – 15 enterprises</p>
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				<p>Total 625 enterprises</p> <p>Output Number of enterprises cooperating with research institutions</p> <p>Project totals (unique enterprises) Life Sciences - 20 Enterprises Food and Drink - 10 enterprises</p> <p>Total 30 enterprises</p>
Make Innovation Happen Collaboration Fund	<p>The aim of the fund was to encourage a culture of collaborative innovation by addressing KEY opportunities or challenges in the Food and Drink sector.</p> <p>The core focus of the fund was exclusively around achieving an innovation outcome of scale, addressing a key food & drink opportunity or challenge in line with the objectives of the Scotland</p>	<p>£23,160</p> <p>The programme closed to applications on 31 March 2020</p>	<p>The Make Innovation Happen Collaboration Fund will help projects that address a key opportunity or challenge in the Food and Drink Industry to:</p> <ul style="list-style-type: none"> • Improve competitiveness in the sector • Benefit the Scottish economy <p>Projects typically last 6 to 36 months, and the grant can cover up to 50% of the project costs. Grants in the region of £25-40k.</p> <p>The grant will not cover an individual business, there needs to be a min of two businesses where there is a win,</p>	<p>The principal requirement is that the projects represent a collaborative relationship between a group of companies or a group of organisations and if appropriate a Scottish HEI or research facility. (min of two businesses in the collaboration)</p> <ul style="list-style-type: none"> • F&D Companies must be registered in Scotland or be able to demonstrate that its principal business operation is based here.

	Food & Drink Strategy. £650k of funding		win for both parties. Routine or periodic changes made to products, processes or services are also ineligible, even if such changes may represent improvements.	<ul style="list-style-type: none"> • Open to all businesses within the F&D supply chain from farm to fork and sea to shelf. The scheme is targeted at Small to Medium sized Enterprises (SMEs), but larger companies may form part of the collaboration for grant funding. If the lead Industrial partner is not an SME then additional information on the impact of the proposed project on the SME supply chain will be required prior to the submission of an application.
DisruptAqua	The NPA programme contributes to and aligns with the Europe 2020 Strategy, national and regional policies and development strategies, macro regional and sea basin strategies, and other programmes in the geographical area. The programme's vision is to assist in the generation of vibrant, competitive and	£776.15 Programme runs to 31 October 2021	Over a period of 18 months, existing research methodology (Nofima and HIE through an existing SEFARI fellowship) will be tested through engagement with businesses (HIE and Iceland Ocean Cluster). This collaborative and co-operative learning will aim to investigate: The application potential of disruptive technologies for seafood producers in the NPAP region, including an analysis of which supply chain links	Using existing research and recognised methodology, this project will test through engagement with businesses, in a collaborative and co-operative learning culture, investigate and define: Technical and business model process innovation to adopt blockchain technologies including implementation costs and longer-term benefits;

	<p>sustainable communities, by harnessing innovation, expanding the capacity for entrepreneurship and maximising the unique growth initiatives and opportunities of the Northern and Arctic.</p>		<p>the technologies are more, or less, suitable for; What technical and business model process innovation would be required by businesses to adopt respective technologies including implementation costs and longer-term benefits; The interface between current system and data; Challenge related to missing or unconnected data and how that would limit the overall benefits; Pros and cons of blockchain-based system compared to traditional traceability; Blockchain technologies that would build consumer trust and in turn value; Visualisation of success.</p>	<p>The interface between current system and data; Challenge related to missing or unconnected data and how that would limit the overall benefits to the seafood industry</p> <p>On completion of the project we expect to have positive examples of exemplar use of disruptive technologies that can be showcased across the partner territories to raise awareness and provide drivers of change in the seafood industry.</p>
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