

Interim Evaluation of Grant for R&D and Strategic Options Assessment of Company-led R&D Support

A Report to Invest Northern Ireland



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Executive Summary

1. Company-led R&D is recognised as a key driver of economic growth. Through enabling the development and commercialisation of new products, processes and services, company-led R&D leads to direct economic benefits, competitiveness and productivity improvement.
2. Northern Ireland has traditionally underperformed relative to national and international comparators in levels of investment in company-led R&D. As a key mechanism to address this challenge, the Invest NI Grant for R&D programme provides a public grant subsidy (matched by private investment), to tackle the risks and uncertainties, and finance gaps, that prevent optimal levels of business investment in R&D. Delivered since 2009, the GRD programme is the principal programme through which Invest NI seeks to support company-led R&D.
3. SQW, working with Qa Research, was commissioned by Invest NI to undertake:
 - **an Interim Evaluation of the GRD programme** over 2013-2020, including assessments of the impact and processes of implementation of the programme; this drew on a telephone survey of c.150 supported companies, in-depth interviews with supported companies, and primary research with programme partners and stakeholders.
 - **a Strategic Options Assessment of support for company-led R&D in the future**, considering how best to optimise the resources available through the programme to maximise outcomes and impacts considering the evolving policy and funding landscape.

Interim Evaluation

Key findings ...

4. **The impact evaluation findings are positive, suggesting a substantive economic and wider impact at this point, and a strong return on investment for public funding.**
5. The programme responded directly to a long-term strategic imperative to drive-up company-led R&D investment, and was consistently well-aligned to the policy agenda at both NI and UK levels. Overall, with over 1,240 awards made and approved expenditure of £232m in grant funding from Invest NI matched to £622m planned investment from beneficiaries, the programme also addressed successfully market and other failures that limited non-subsidised R&D investment including risk, the relative costs of R&D compared to other business priorities, and funding gaps.
6. Consistent with its overall aims and objectives, the programme has delivered very positive results in supporting technology progression and the introduction of new products and services to the market: primary evidence collected for the evaluation, and Invest NI Post Project Evaluations (PPEs), both indicate that most GRD Awards lead to the commercialisation of a new product or service, which can subsequently generate sales.

7. The programme has also delivered wider benefits for supported companies including improved R&D capabilities, and enhanced skills and understanding. There is also evidence of spillover effects to the broader business base, particularly via Collaborative Awards.
8. A range of quantitative estimates of impact to date from GRD Awards have been identified, reflecting the programme's breadth and scope, and the time-paths to impact from R&D. The analysis included 'scaling-up' the findings from samples of surveyed companies and PPEs to the population, and complementary econometric analysis, comparing outcomes across companies exposed to different levels of support, whilst controlling for factors influencing outcomes. Headline metrics are presented in Figure 1 below.
9. As shown, the turnover and GVA impact estimates vary (with the estimates of additionality applied a key factor driving variation), but they point consistently to a substantive GVA contribution, via sales of products/services developed and commercialised as a result of the programme. Further, the findings indicate positive value for money with the return on investment estimates reaching £4 of GVA for every £1 invested. Given the programme's scale, the diversity of projects supported, and risks inherent in R&D, this is an encouraging result, with further benefits highly likely to be realised in the future.
10. The estimates presented in Figure 1 are based on estimates of sales generated as a result of GRD Awards as the key route to quantified impact for the programme, and do not account for important but non-quantifiable wider benefits identified in the evaluation such as knowledge transfer, skills enhancement, and supply chain effects. It is also important to note that these estimates are based on information about projects supported over the whole evaluation period (July 2013 – March 2020). A sub-set of projects completed by the end of December 2017 (which have had at least three years to accrue the benefits) were analysed separately (for robustness purposes). These findings are presented further in the report.

Figure 1: Key impact and value for money metrics for single-company GRD Awards to date (i.e. realised by March 2020)

Metric	Lower estimate		Upper estimate
Scaling-up analysis			
Gross turnover generated	£551m	➔	£845m
Net turnover generated	£312m	➔	£834m
Net GVA generated	£130m	➔	£315m
Return on Investment	1.63	➔	3.96

Source: SQW analysis

11. Underpinning these positive data, high additionality overall was found, with over half of turnover effects estimated to be additional (based on survey evidence). Additionality is often related to the timing of outcomes, and to a lesser extent their scale; so, whilst some of the activity supported by GRD would likely have been delivered in any case, and some of the outcomes would have been realised, they would have been later or at a smaller scale.

12. Econometric analysis found no 'optimal' value of support, rather, a positive linear relationship, and no set of observable characteristics which could be used to target support to projects/companies that can be expected to be 'more successful' were identified. However, receipt of other Invest NI support does appear to be important in enabling higher benefits, and associated with an increase in the probability of a positive commercialisation outcome.
13. Collaborative Awards can generate similar quantitative benefits to GRD Awards. However, in many cases these projects are fundamentally 'different', involving support for research centres, platforms and programmes which are likely to lead to substantive benefits but over the longer-term and in different ways. Crucially, the collaboration process itself can add value and generate benefits including in relation to enhanced networks, knowledge sharing, and supporting on-going R&D activities and relationships. Support for collaborative R&D was recognised as an important part of the overall programme offer by strategic consultees.
14. Project Definition Awards also play an important role, and are valued by stakeholders and those responsible for working with companies as a key initial route into R&D activities. Project Definition Awards lead to improved capacity, and have supported companies to secure a range of funding, including but not limited to, the GRD programme.
15. **The programme has been well-delivered by Invest NI, led by the dedicated Programme Team and supported by the wider Invest NI delivery and management structure.**
16. The evaluation identified high rates of satisfaction amongst supported companies with the GRD process, and Invest NI teams involved in projects. This said, the evaluation found some concerns around the systems and level of administration associated the programme from both beneficiary and delivery-side perspectives, and some concerns over the capacity and level of resource in the Programme Team.
17. The observed complexity of the programme has been associated with its funding and approval model under the European Commission's R&D&I framework and single State Aid notification. There is a case for considering how the administration of the programme can be streamlined to support effective delivery, and de-risk issues related to data, monitoring and evaluation.

... and key recommendations

18. **Subject to strategic policy decisions and resource availability on specific forms of intervention, the function performed by the GRD programme should continue; the high-level purpose should remain to de-risk R&D investment, leading to projects that deliver economic impacts.** Other recommendations include:
 - Invest NI should develop a formal Theory of Change for the programme, including a separate and distinct element for 'strategic projects', and clearly define the rationale, objectives and selection criteria for such projects.
 - Invest NI should consider establishing mechanisms to better enable an assessment of other finance considered by companies in the application and assessment process.

- Invest NI should look to reduce the level of 'repeated support' (Project Definition to GRD/Collaborative Award excepted).
- Invest NI should track linkages between GRD projects undertaken by the same company to enable quantification of cumulative benefits.
- Invest NI should further improve consistency of monitoring and PPE data through automation that would seek to minimise manual input.

PART 1: Interim Evaluation of Grant for R&D

1. Introduction

- 1.1** SQW Ltd (SQW), working with Qa Research, was commissioned by Invest NI in September 2020 to undertake an interim evaluation of the Grant for R&D Programme. The interim evaluation covers grants awarded by the programme over the July 2013 – March 2020 period. This report sets out the findings from the evaluation. The Client Steering Group for the evaluation comprised representatives from Invest NI and the Department for Economy.

About the programme

- 1.2** The Grant for R&D (GRD) programme seeks to address the long-standing challenges of increasing Business Expenditure on R&D (BERD) as a proportion of Gross Value Added (GVA) in Northern Ireland (NI) and to increase the number of companies involved in R&D. Through supporting company-led R&D, the programme aims to enable companies to develop and commercialise new products, processes and services, ultimately leading to competitiveness and productivity improvement, and direct economic growth benefits.
- 1.3** The programme is open to Invest NI client-managed manufacturing and internationally tradable service companies located within NI, as well as NI-based Research Institutes and Universities. The programme is also open to Foreign Direct Investment (FDI) companies wishing to carry out world-class R&D in NI. The programme supports both SMEs and large companies, with different levels of support intensity, and is 'always open' with applications considered by Invest NI at any time in the year.
- 1.4** Three activity-types are supported through the programme:
- **GRD Awards** – providing grant assistance to single companies to deliver R&D projects focused on industrial research and/or experimental development activities; GRD Awards account for the majority of projects and grant funding offered by the programme
 - **Collaborative R&D Awards** – providing grant assistance to industrial research and/or experimental development projects involving at least two partners, which often includes collaboration between companies and NI-universities
 - **Project Definition Awards** – providing grant assistance for firms to undertake early-stage scoping work to consider the feasibility of a project in advance of an application for a full GRD Award (or other form of innovation funding).
- 1.5** The programme supports projects of varying sizes through GRD Awards and Collaborative Awards; the vast majority of awards involve grant funding of less than £100,000, but the programme also supports larger projects including major strategic projects with grant funding in excess of £1m (in one case in the evaluation period, £12m). The programme committed £232m to over 1,200 projects started between July 2013 and March 2020, delivered by over 700 organisations.

The evaluation

Purpose and scope

1.6 The purpose of the evaluation study is to provide:

- an assessment of **the impact of the GRD programme** including considering its strategic position and role; the nature and scale of benefits generated for different types of beneficiaries (both quantitative and qualitative); the attribution and additionality of these benefits; wider economic benefits and spillover effects; and the net impact, value for money (VfM) and Return on Investment (RoI) realised at this interim stage
- an assessment of **the processes of implementation of the GRD programme**, including their effectiveness and how these have influenced impacts; and whether any improvements can be made; in both cases taking into account the level of resource available for programme management over the evaluation period.

1.7 Within this overall context, the evaluation was also tasked with considering several key themes to inform future policy debates and decision-making, specifically:

- what can be learned from those projects led by companies that did and did not commercialise their intended products/services/processes
- any evidence that the GRD programme has led to productivity benefits and how this has been realised
- how the programme compares to other similar interventions elsewhere.

1.8 The findings of the evaluation will inform the Strategic Options Assessment, providing evidence on how, going forward Invest NI can optimise the resources available for supporting company-led R&D support, in order to maximise outcomes and impacts, and delivery against key policy priorities at NI and UK levels.

Methodology

Sources of evidence

1.9 Six core sources of evidence have informed the evaluation:

- **Monitoring data and programme documents.** The core evidence base was data provided by the GRD programme team covering offers over the evaluation period. The data included information on individual projects including the type of project (GRD Award, Collaborative Award, Project Definition), the timing and value of offer and total project costs, project duration, and headline characteristics of the awardee organisation (including company size, ownership status, sector, location and whether the company was

new to R&D at the time of the offer¹). For 449 projects used for in-depth quantitative analysis (as discussed further in the report) information on whether the project was experimental development, industrial research or a combination of the two was also available.² Data was also provided on the value of other Invest NI support secured by beneficiaries of the programme, including (amongst others) Selective Financial Assistance, other Innovation & Technology supports, and Trade support over the evaluation period. Programme guidelines and operational materials were also provided to inform research design and the assessment of processes.

- **PPE data.** A Post Project Evaluation (PPE) is undertaken by or on behalf of Invest NI for each GRD Award, normally three years after completion of the project. Quantitative evidence from the PPEs of projects completed by August 2017 was provided to the study team. This included information on 344 projects, and covered for each data on: projected (gross) sales drawn from the initial project application; actual (gross) sales realised at the point of the PPE (and their location³); commercialisation ‘success rate’ based on a comparison of the projected and actual sales; an estimate of additionality (at 0%, 25%, 50%, 75% or 100%); and an estimate of net sales and GVA realised by adjusting the gross data by the estimate of additionality (with GVA based on applying a sales/GVA ratio for the relevant sector). The PPE dataset also includes for each project a ratio for net GVA realised per £ of offer value and grant paid.
- **Survey of beneficiaries.** A survey was completed by telephone (lasting on average 20 minutes) with 149 companies that secured a GRD Award (n=127) or Project Definition Award (n=22). The survey covered topics including: the R&D experience of the company prior to their engagement with the programme; the reason for approaching GRD and any other options considered; project progress and commercialisation (where relevant); and the effects of support including sales and employment and wider innovation and capability benefits; and the counterfactual (i.e. what would have happened if a GRD grant had not been awarded). The survey also covered programme processes and captured data to inform analysis on company characteristics.⁴ The survey focused on single GRD/Project Definition Awards; where companies had been involved in multiple projects, a random project was selected to maintain the sample’s representativeness in relation to the distribution of treatment level and timing.
- **In-depth interviews with beneficiaries.** Interviews were completed with 27 beneficiaries, of which: 16 were completed with beneficiaries supported by Collaborative Awards with the interview seeking to probe in particular on the nature and benefits of the collaboration in the delivery of the R&D activity; and 11 were completed with

¹ According to the definition provided in the programme’s operating guidelines i.e. the firm is an SME that had not been supported by Grant for R&D within the 5 years prior to securing an offer.

² This data was not available for all projects as it had to be manually compiled based on documentation submitted during the application process.

³ NI, Great Britain, Republic of Ireland, Elsewhere.

⁴ Questions on the effects of Covid-19 were also included in the survey to provide wider insight for Invest NI on the effects of the pandemic on supported companies at the point of the survey between November 2020 and February 2021. This evidence is not described in this report, with the results provided separately to Invest NI.

beneficiaries involved in multiple GRD projects, with the interview seeking to probe on the relationship and links between projects both direct and indirect.

- **On-line survey of Client and Technology Executives.** 59 responses were received to an online survey from individuals responsible for progressing, appraising, approving, and monitoring GRD projects at any point in the evaluation period. The survey covered questions related both to engagement with supported organisations, and the management and delivery processes relevant to the programme.
- **Interviews with senior-level programme partners and stakeholders.** Nine consultations were completed with individuals from across the R&D, innovation and business development landscape in NI whose activities involved strategic or operational exposure to the programme. The consultations covered perspective on the rationale for, effectiveness of, and outcomes from, the programme in the evaluation period, including alignment with the wider innovation/business support landscape.

Analytical approaches and methods

Survey sample

- 1.10** This evaluation of the GRD programme was delivered in parallel to evaluations of Selective Financial Assistance (SFA) and International Business activities, and Invest NI requested that the same companies should not be contacted more than once i.e. each company would only be surveyed in relation to one of the scheme/interventions subject to evaluation. This is important as most companies supported by the GRD programme over the evaluation period also secured support from SFA and/or International Business activities.
- 1.11** To ensure that there was a sufficient sample across each of the surveys, of the 624 companies considered for the GRD survey, more than 130 companies were allocated randomly to these other surveys. This left an allocation of approximately 490 companies for the GRD survey. Statistical analysis⁵ was undertaken of this group, which indicated that the sample was representative of the full population.⁶ This provides confidence that the allocation process is unlikely to have led to any systematic variation or bias in companies contacted for the survey.
- 1.12** The ‘allocation’ was reviewed by Invest NI to ensure that a ‘live’ contact was available. This process identified approximately 70 organisations that should be excluded. In around half of these cases, this was because the business supported was no longer trading, and in around a quarter of cases the GRD project identified to be the focus of the survey did not progress (including where this involved an overseas company). The remainder of cases included a range of explanations, including in a handful of cases where the Invest NI Client Executive

⁵ Pearson Chi2, Fisher exact, t-test and Kolmogorov Smirnov tests covering variables including: project type (PD, R&D, collaborative), project length, project status (completed / not completed), firm size and sector, project start date, grant size, and % of costs covered by the grant.

⁶ 729 firms secured a GRD offer over the evaluation period, however at the time of survey design the list of GRD projects did not contain information on 105 businesses which was added later. The tests to determine whether the survey allocation was representative of the programme population was carried out using updated data on all beneficiaries.

advised that owing to very significant challenges to the business owing to COVID-19, they should not be contacted at this time.

- 1.13** This left approximately 420 companies, with 40 excluded from the survey to provide a sample for the in-depth interviews, leading to a target group of approximately 380 companies for the survey. As noted above, 149 companies were surveyed, providing a **response rate of 40%** and **the margin of error of up to 7.5 percentage points**.⁷
- 1.14** The degree to which the survey sample was representative of the programme population was assessed using formal statistical tests and descriptive analysis as set out in detail in Annex A. Overall the survey sample was well matched to the population. This provides confidence in estimating the impact of the programme to date from the survey despite challenges with setting up and undertaking fieldwork during Covid-19.
- 1.15** There are two points to note in relation to the survey sample: First, the survey was slightly underrepresenting projects undertaken by large and non-NI companies (these two characteristics were highly correlated in the programme population). However, results of our econometric analysis (discussed in more detail in Section 7) failed to suggest that external ownership and size of beneficiaries have a statistically significant effect on outcomes which cannot be explained by other factors. This provided reassurance that the results in relation to impact of the programme based on the survey sample were valid.
- 1.16** Second, the survey captured a relatively larger number of more recent projects than observed in the programme population. On the one hand, this reduced the influence of any ‘memory decay’ in responses provided by beneficiaries. On the other hand, more recent projects have had less time to realise the benefits. Given that recent projects are substantially underrepresented in the PPE sample (by design), we triangulated the evidence from both data sources to provide an accurate representation of the programme’s impacts.

Quantitative analysis

- 1.17** Quantitative analysis has been undertaken, drawing on the beneficiary survey and the PPE data. This has involved three tiers of analysis, each of which has focused particularly on the commercialisation and sales/GVA effects of support:
- **descriptive analysis of the samples** i.e. of the 149 beneficiaries surveyed and 344 PPEs; this includes analysis of ‘self-reported’ impact and additionality in the survey sample and the equivalent PPE evidence
 - **scaling-up analysis**, applying the findings from the samples of the survey and PPE groups to the programme population, adjusting as appropriate for any variation in

⁷ One percentage point is a unit for the arithmetic difference between two percentages. For example, an increase from 50% to 55% is a 5 percentage points increase, but a 10% increase in the value that is being measured. A margin of error of 7.5 p.p. means that 50% of the survey sample reported a benefit, for example successfully achieving commercial sales of a product, we can be 95% confident that the true proportion that would be observed in the whole population lies between 42.5% and 57.5%. The margin of error is the largest when proportions or responses are close to 50%.

characteristics/support; this provides estimate of the net impacts of the programme in terms of sales and GVA which can be used in assessing VfM and RoI

- **econometric analysis of the samples**, applying a range of models (see Table 1-1 below) which belong to the class of ‘dose-response’ analysis that seek to estimate the effect of the programme by comparing outcomes across companies exposed to different levels of support, using those which received less support as a ‘quasi-comparison’ group for those which received more support; this provides a second and different set of perspectives on impact and VfM and RoI, and wider insight into key variables and factors that may be associated with programme outcomes.

Table 1-1: Econometric models

Model	Coverage and purpose
Linear dose-response model	<ul style="list-style-type: none"> • This model estimates the average effect of an additional pound of GRD investment on outcomes, controlling for project/business characteristics. • The model produces an easily interpretable result representing the average effect across all levels of support e.g. £1 of additional GRD funding on average leads to £X of additional sales.
Cerulli dose-response model	<ul style="list-style-type: none"> • This model estimates the differences in the outcomes for beneficiaries exposed to different levels of treatment. • This enables us to distinguish between the effects of additional GRD funding at different levels of support, and whether there is an ‘optimal’ level of support (in terms of sales and commercialisation outcomes)
Logit dose-response model	<ul style="list-style-type: none"> • This model estimates the probability of success (commercialisation of product/service) based on the level of support and other project and business characteristics. • This provides insight into which characteristics of GRD projects are closely associated with commercialisation success/failure

Source: SQW

1.18 Four important points are noted regarding the quantitative analysis. First, the evaluation considers the population of projects that started within the evaluation period, i.e. between July 2013 and March 2020. No projects that started later than March 2020 were considered, however at the time of the evaluation some of the projects were ‘live’. The scaling up analysis was carried out on a sub-sample of the programme’s population that included projects that: a) started before March 2020, b) were completed no later than December 2020 (as ongoing projects with later completion dates were deemed to be too recent for quantification of impact).⁸

1.19 Second, the scaling-up and econometric analyses provides different perspectives on impacts and VfM and RoI which can be triangulated to provide an integrated view, but which cannot be directly compared. The crucial distinction between the two approaches is that whilst they both rely on the same source evidence (i.e. the survey sample and PPE evidence respectively), the econometric analysis explicitly seeks to control (via statistical methods) for the range of

⁸ All return-on-investment figures presented further in the report always compare benefits generated by projects to grant costs associated with the subsample of projects being considered, not the costs of the whole programme.

factors that may influence programme outcomes, and involves formal testing of statistical significance of results.

1.20 Third, there are important differences in the research methods, coverage, and timing of the survey and PPE evidence. For example, the assessment of additionality in the PPEs is based on the application of a point estimate at 25% intervals and accounts for deadweight only, whereas the survey-based analysis seeks to provide a more fine-grained assessment, considering issues of partial additionality (e.g. timing, quality, scale), and substitution and displacement effects. The PPE evidence was also collected on a rolling basis (three years follow project closure) over the evaluation period, whereas the survey was completed at a specific point in time in late-2020/early 2021. This means we would not expect the results from the survey and PPE to be the same; this applies to all three tiers of analysis. This said, we have also undertaken analysis to compare the aggregate effects of the group of companies that fall within both the survey and PPE group as a validation check.

1.21 Fourth, and drawing on the above, it is noted explicitly that the quantitative analysis is multi-faceted, the evidence is not straightforward or simple, and there is not one 'single figure' that is the 'right answer' in terms of the additionality, impact, and RoI of the programme at this interim stage. Indeed, a single focus would be potentially very misleading given the breadth and variation of treatment by the programme (with projects ranging very significantly in terms of their scale, duration, distance to market, and sector), and the nature of company-led R&D which is often iterative, uncertain and complex. This said, clarity and accessibility of findings is important, and we have provided a synthesis of the key findings and an integrated assessment of the evidence from the range of perspectives, providing clear conclusions on programme additionality, impact, and RoI. Further, this report contains the key findings, with the detailed underpinning evidence (and details of the methodology) in Annex A.

Wider analysis and synthesise

1.22 The quantitative and qualitative evidence have been brought together to provide the synthesised assessment of impact and process as required by the Terms of Reference. A number of points are highlighted regarding the analysis:

- Evidence from consultations with beneficiaries involved in Collaborative Awards and multiple projects have been analysed qualitatively, and form an important element of the overall evidence base, with the key findings set out throughout the report. Data from the qualitative consultations has not been included in the quantitative analysis, however, results are presented where relevant. In this context it is noted that the evidence from beneficiaries involved in multiple projects from the qualitative interviews was consistent with the survey evidence, and these projects are included in the scaling-up analysis. Collaborative projects are not included in the quantitative analysis reflecting their very different nature, which in some cases involve support for long-term strategic partnerships and research infrastructures (these projects are not covered by the PPEs within the evaluation period or the survey). However, quantitative evidence generated in

the consultations and wider evidence on additionality is presented, reflecting the importance of Collaborative Awards to the programme (accounting for 26% of funding).

- In most cases, the findings from the survey related to Project Definition Awards has been analysed and presented separately, to ensure that the very different scale and nature of activities does not skew the overall results (particularly in relation to outcomes and impacts). Specific evidence on the role of Project Definition Awards is presented, however, it is noted that the sample size here is modest (n=22), reflecting the modest scale of funding relevant to this element of the programme (3%). Where evidence from beneficiaries with Project Definition Awards is included, this is set out explicitly.

Challenges

1.23 It is highlighted that the evaluation was delivered during a period dominated by the COVID 19 pandemic. In practical terms this meant that all meetings, interviews and engagement with the Steering Group and programme team were carried out online. Further, there were some modest delays associated with agreeing to fieldwork and management of survey samples with other evaluations (as set out above). This led to the research being pushed back, with draft reporting in July 2021, and final reporting in October 2021.

1.24 From an analytical evaluation perspective, the direct and indirect impact of the pandemic on business performance, R&D activity and investment plans may be pronounced. This had the potential to impact on the evaluation in two main ways:

- **Response rates and the representativeness of the survey sample:** as noted above, the response rate to the survey was 40%, which is considered reasonable. The situation regarding the pandemic was not commonly cited as a reason for non-participation where beneficiaries refused to participate, and only a small number had closed owing to the pandemic (with a small number also excluded from the contact database, as noted above). It is not known if some companies refused to respond to the survey owing to the pandemic, and whether this may have led to any systematic bias in the survey sample (with implications for the results). However, as noted above, the survey sample is representative of the population overall, meaning that we are confident that this does not appear to be a substantive issue.
- **Influence on evidence and feedback provided:** there was a risk that the prevailing situation may have influenced the feedback secured on the programme, even where this was not directly impacted by Covid-19. To address this issue as far as practical, it was agreed with Invest NI that seeking to gather data from businesses on their 'current' and 'anticipated' performance and prospects was not appropriate or meaningful. Therefore the beneficiary survey sought to gather evidence on the effects of the programme realised by March 2020 prior to the main period of disruption caused by the Covid-19 pandemic. It was also agreed that the survey would not seek to quantify the expected future effects (for example in terms of sales effects) of the GRD support given the inherent uncertainty

in markets at this time (with the further complication of a change in exporting and important rules owing to EU Exit also impacting on potential future sales).

- 1.25** Three other challenges are noted. First, the evaluation draws on ‘self-reported’ survey data, which may be inaccurate if respondents have difficulty recalling the information, and/or if they are overly optimistic or pessimistic about how the programme benefitted them, or if they misunderstand the question. Conventionally, for an intervention of the scale of GRD, an evaluation would seek to include analysis based on comparing results of beneficiaries to a ‘comparison group’ of non-supported businesses. This could include unsuccessful applicants, or similar businesses in the wider population that have not been supported. However, the former is not possible for GRD (there are very few unsuccessful applicants owing to the delivery modes), and the latter was not considered appropriate or viable for the evaluation; through participation in GRD, supported companies are already or seeking to be R&D-active and secondary data-sets contain no/very limited evidence on R&D activity/engagement; the risk is that the performance of supported companies is compared to ones that are not similar in their propensity to engage in R&D, which is a key driver of growth.
- 1.26** Second, there is some risk of memory decay amongst beneficiaries, delivery partners, and stakeholders. The evaluation covered the period 2013-2020, requiring individuals to think back around up to eight years to when they were first involved and to provide information about changes which have occurred over the subsequent years. Whilst the evaluators are confident in the integrity of the evidence gathered, the generic risk of memory decay, and the specific risk of more recent experience being the more roundly reported, should be noted.
- 1.27** Third, there is an issue on time-paths to impacts. The survey evidence on effects of GRD on sales (and employment) focused on those that had been realised to March 2020. However, there can be long time-paths to impact for R&D projects, meaning that more recent projects may not yet have realised the full benefits of support. Analysis at this interim stage is therefore likely to underestimate the full long-term contribution of the programme. Further, as noted above, given the very uncertain economic context (particularly in relation to Covid-19), it was agreed with Invest NI that the survey would not seek to estimate future effects based on projected/anticipated sales. To seek to mitigate this issue in a proportionate and meaningful way, additional indicative and exploratory work as part of the scaling-up analysis has been undertaken to estimate the potential benefits for projects supported later in the evaluation period assuming that on average the benefits will follow the same trends as for projects which were completed earlier. This is separate to the ‘core analysis’ focused on realised impacts, however, it helps to provide a broader assessment of the potential contribution of projects funded over the evaluation period at this interim evaluation stage.
- 1.28** Finally, analysis of the PPE and monitoring data revealed some inconsistencies between datasets. These were mainly due to errors occurring when data is manually transferred to the PPE dataset and in most cases were resolved in consultation with the delivery team.

Evaluation report structure

1.29 The remainder of Part 1 is structured as follows:

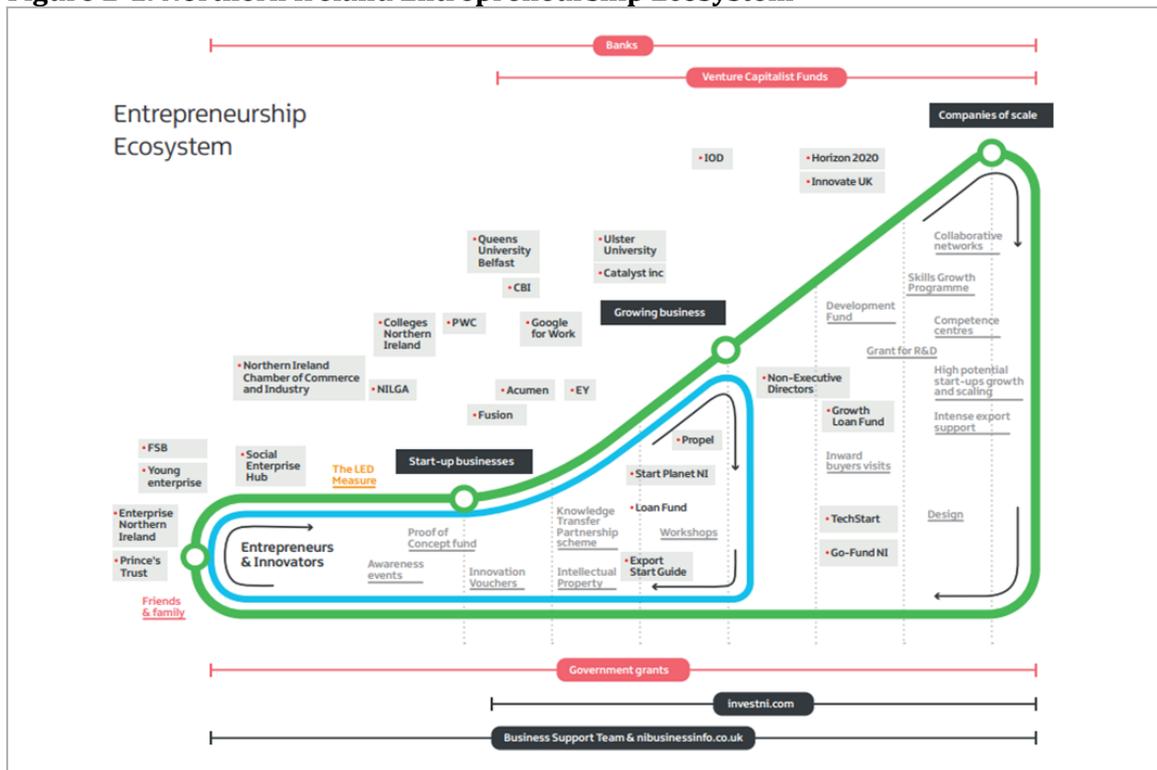
- Strategic context and programme profile
- Assessment of rationale and objectives
- Assessment of inputs and activities
- Outputs and outcomes
- Additionality and contribution
- Impacts and value for money
- Evaluation conclusions and recommendations.

2. Strategic context and programme profile

Strategic context

- 2.1** The GRD programme seeks to address under-investment by NI businesses in R&D. In rationale terms the programme aims, by using a public grant subsidy (matched to private investment), to tackle issues around risk and uncertainty, and gaps in the availability of private finance, that prevent optimal levels of investment in R&D across the NI business base. This recognises that R&D investment plays a key role in driving up productivity and the development of new products, processes and services, and that NI has traditionally had low levels of business expenditure and engagement in R&D relative to national and international comparators.
- 2.2** The programme was initially launched in 2009, bringing together under one single programme a range of separate interventions supporting company-led R&D investment. The programme therefore represents a very long-standing intervention in the NI R&D and business support landscape. Since the launch of the programme in 2009, and over the evaluation period for this interim evaluation (2013-20), the programme was covered by the European Commission's R&D&I framework and a single State Aid notification governed its use as an umbrella scheme.
- 2.3** As the framework sets the objectives and scope of the NI scheme, the programme was not required to go through the formal economic appraisal or casework approval process relevant for other Invest NI interventions. This provided Invest NI with considerable flexibility in the application of GRD funding to companies, within the parameters of the R&D&I framework. Further whilst there were some modest changes to scheme model over the evaluation period – for example related to the level of support for Project Definition Awards and to seek to improve the application and monitoring process – overall, the programme provided considerable continuity of focus and approach.
- 2.4** Importantly, the programme sits within a broader suite of interventions seeking to support innovation, competitiveness improvement and productivity in NI. This includes other Invest NI schemes that form part of the 'R&D escalator' focused explicitly on R&D activities including the Innovation Vouchers Scheme which provides support to encourage SMEs to innovation for the first time with the knowledge base, and Competence Centres which seek to promote economic growth by bringing together universities, research institutes and innovative businesses to carry out strategic collaborative research in areas with a direct industrial focus.
- 2.5** More broadly, the programme forms part of the 'Northern Ireland Entrepreneurship Ecosystem' which covers wider supports led by Invest NI and other actors to support businesses across all stages of development. The position of the programme in this ecosystem is shown in Figure 2-1 below. However, the programme is by some distance the most significant source of grant funding for R&D activity specifically.

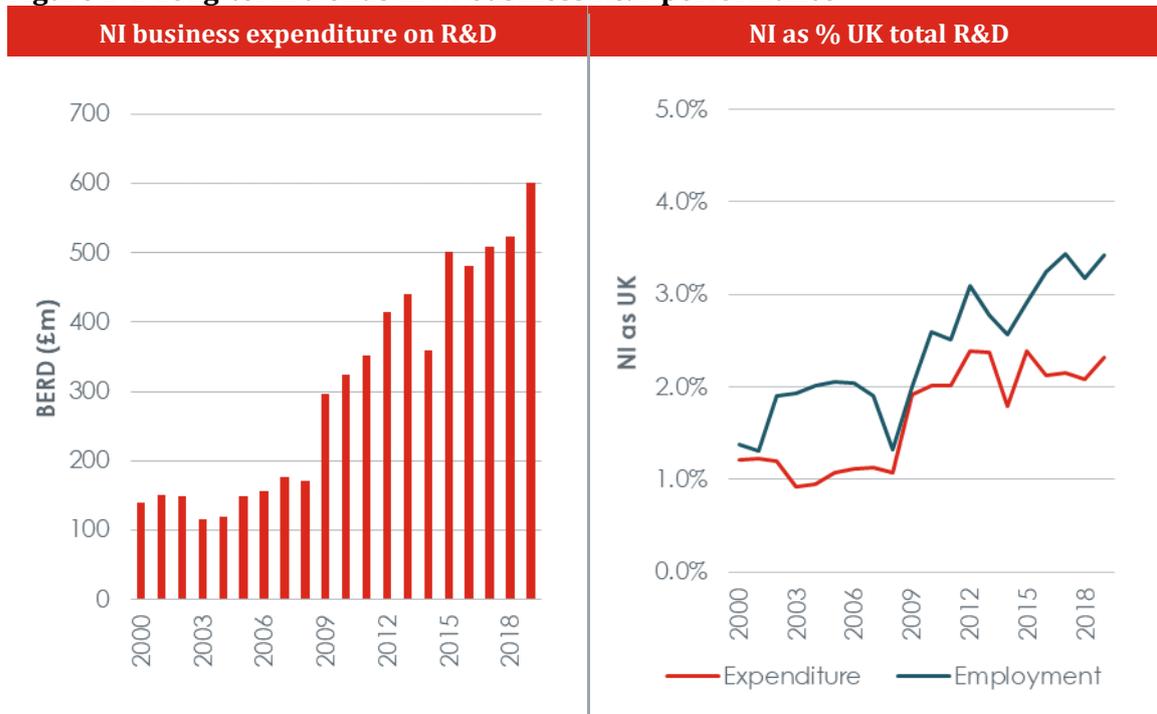
Figure 2-1: Northern Ireland Entrepreneurship Ecosystem



Source: Invest NI (2017) Business Strategy 2017-2021

2.6 In this context, it is notable that over the long-term, NI's performance in relation to business investment and employment in R&D investment has been very strong in aggregate terms, as illustrated in Figure 2-2 below.

Figure 2-2 Long-term trends in NI business R&D performance



Source: Business enterprise research and development, UK: 2019

- 2.7** This positive long-term trend is reflected in data that indicated that in 2018, in-house R&D expenditure by business equated to 1.4% of GVA, a level equal to the UK average, and NI ranked fifth out of twelve UK regions.⁹
- 2.8** However, there has been a long-term recognition that company-led R&D investment is heavily concentrated in a small number of companies, with a need to engage wider pool of businesses in R&D investment: indeed, latest data for 2019 indicated that almost three quarters of business spend was by the highest spending 10% of R&D companies, and the ten biggest spending companies accounted for around one-third of all business R&D spend.¹⁰
- 2.9** Reflecting this, getting more companies to invest in R&D, and particularly SMEs, had been a long-term policy goal, and was a core focus of the investing Innovation Strategy for Northern Ireland launched in 2014 early in the evaluation period. The strategy also established raising total R&D expenditure to £1.2bn in 2025 as a long-term goal, and raising total business expenditure on R&D as a % of GVA to 1.8% by 2020 (from 1.6% at the point of the strategy) as a medium-term target.¹¹
- 2.10** These goals provided the headline strategic context for the delivery of the programme over the evaluation period. How effectively the programme has aligned and worked with other supports to help deliver against this ambition, is discussed later in this report.

Programme Logic Model

- 2.11** Against this headline context, a detailed logic model for the programme is set out below, moving from the strategic context and rationale, through to objectives, inputs and activities, and on to the intended benefits in terms of outputs, outcomes and impacts.
- 2.12** Three points are noted in relation to the logic model:
- First the programme has evolved over the evaluation period including in relation to expenditure limits for types of projects, application processes, and delivery protocols (e.g. the extent to which projects are able to start 'at risk'). The Logic Model does *not* seek to capture these changes. Rather, it provides an overall framework for the evaluation against which the changes in emphasis, delivery, and (potentially) impact can be assessed.
 - Second, in practice there will be significant variation in the time-paths to impact of R&D activity, including in relation to the commercialisation of new products and services, or the implementation of new processes. The R&D activity supported may be non-linear and adapt, with diverse routes to market¹². This reflects that the activities supported by the programme are varied and complex, across sectors, business size, and by stage of development.

⁹ Research and Development Activity in Northern Ireland, Statistical bulletin, December 2020 (see [here](#))

¹⁰ Research and Development Activity in Northern Ireland, Statistical bulletin, December 2020 (see [here](#))

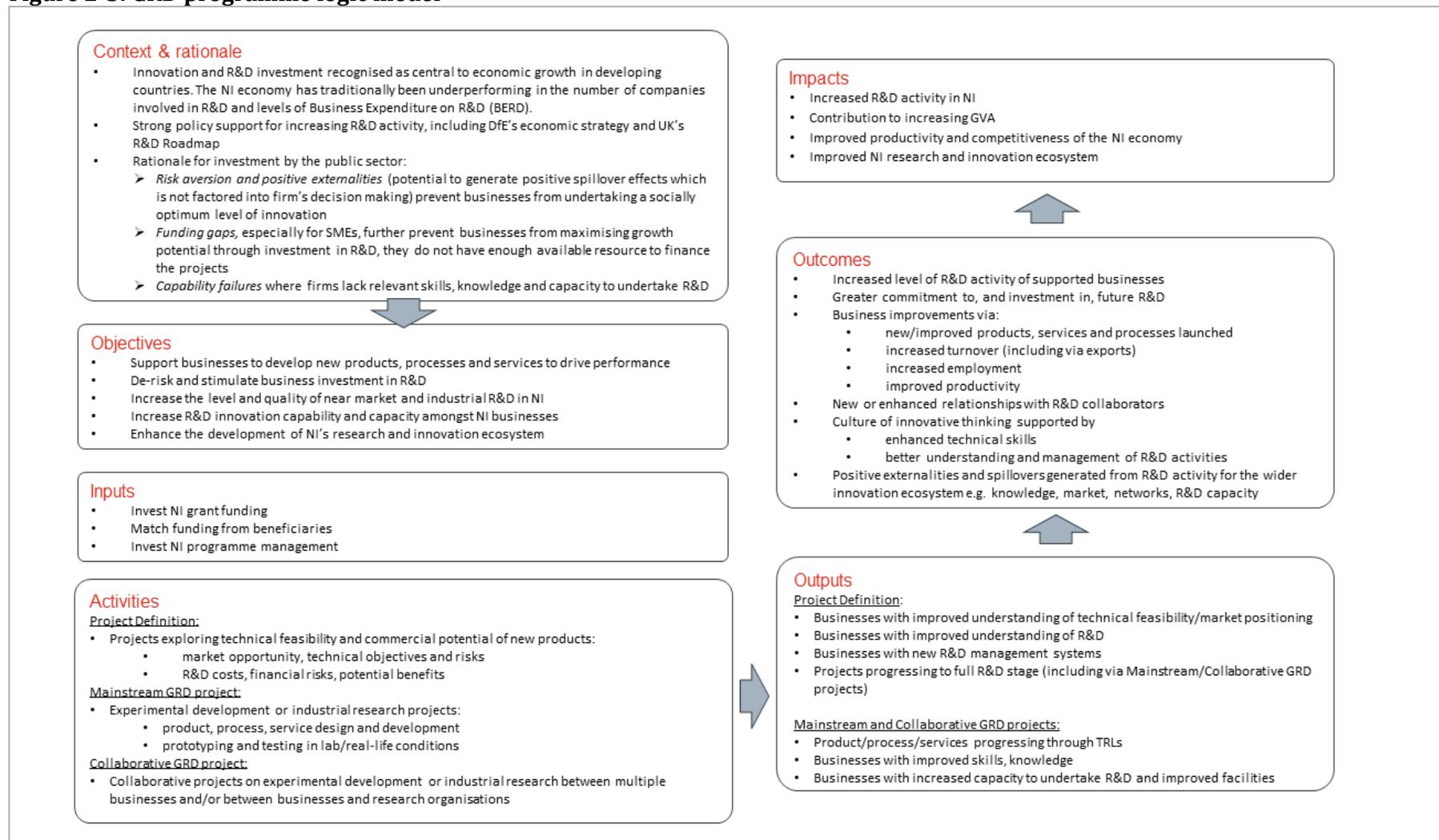
¹¹ Innovation Strategy for Northern Ireland 2014-2025

¹² e.g. directly via supply chains of project partners, via licensing/selling new products/services in the market.

- Third, scoping consultations for the evaluation highlighted the important ‘strategic’ role of the programme, over and above its core purpose to support increased business investment in R&D and commercialisation. This ‘strategic’ contribution – e.g. enhancing the development of the wider Northern Ireland research and innovation ecosystem, including through new and enhanced partnerships and networks, supporting the development of sector strengths and emerging sectoral or spatial ‘clusters’, and spill-over effects for the wider business base and research and innovation community.

2.13 The logic model is tested throughout this report, including the strength of the rationale (based on evidence from beneficiaries), and the extent to which the expected outputs, outcomes have been generated, and impacts realised, informing an assessment of value for money.

Figure 2-3: GRD programme logic model



Source: SQW, based on GRD documentation and scoping consultations

Programme profile

Awards

2.14 The programme supported 1,243 projects started during the evaluation period. As set out in Table 2-1, GRD Awards accounted for the majority of offers.

Table 2-1: Awards by type over the full evaluation period (July 2013 – March 2020)

	Number of awards	Proportion of awards
GRD	877	71%
Collaborative	61	5%
Project Definition	305	25%

Source: Invest NI monitoring data

2.15 The number of awards varied over time, reflecting different levels of demand from the business base for support. The feedback from consultations suggested that the downward trend in recent years can partly be attributed to the uncertainty associated with EU Exit as the delivery team observed a slowdown in the rate of applications after the referendum.

Table 2-2: Awards by type by year

	GRD	Collaborative	Project Definition
2013/14	140	12	41
2014/15	183	8	69
2015/16	162	17	51
2016/17	131	8	58
2017/18	114	3	25
2018/19	88	8	26
2019/20	59	5	35

Source: Invest NI monitoring data

Value of Awards

2.16 The 1,243 awards received offers of £232m in grant funding from Invest NI. The split of award offer value, mean and median offer values for the three project types are set out in Table 2-3. It is notable that Project Definition Awards, though representing a quarter of all awards, accounted for just 3% of the aggregate value of offers over the evaluation period, reflecting their average value and purpose.

Table 2-3: Award values over the full evaluation period (July 2013 – March 2020)

	Value of award	Proportion of total award	Mean award value	Median award value
GRD Awards	£165.1m	71%	£188,308	£48,800
Collaborative	£60.9m*	26%	£1.1m*	£339,428*
Project Definition	£5.9m	3%	£19,202	£14,788

Notes: Data for collaborative awards excludes six projects where the information was not available.

Source: Invest NI monitoring data

- 2.17** The data above highlight the difference between the GRD Awards and Collaborative Awards, which are on average larger. However, there was also significant variation within both groups, and it is important to recognise that a limited number of very large awards – both GRD Awards and Collaborative Awards – accounted for a high proportion of the total offer value. Notably, the 20 largest awards (each with an offer value of approximately £2m or more, including four of £9m or over), accounted for 46% of all awards (£105.6m);¹³ put another way, across the evaluation, approaching half of the total value of offer was made to under 2% of projects. This very skewed distribution of funding is an important characteristic of the programme.
- 2.18** The value of offers over time is set out in Table 2-4. The reduction in the total value is broadly consistent with the reducing number of offers over time, discussed above. In overall terms, the programme was a smaller intervention toward the close of the evaluation period than in the middle of it. However, even with this reduction, in 2019/20, GRD offers valued approximately £16.5m.

Table 2-4: Awards value by type by year

	GRD	Collaborative	Project Definition
2013/14	£12,529,907	£3,450,269	£953,464
2014/15	£30,123,666	£5,473,515	£1,295,211
2015/16	£21,580,746	£11,834,305	£825,132
2016/17	£28,795,803	£19,731,751	£1,104,675
2017/18	£35,456,082	£9,220,292	£630,979
2018/19	£25,246,417	£6,650,849	£479,003
2019/20	£11,413,856	£4,560,786	£568,056

Notes: Data for collaborative awards excludes 6 projects where the information was not available.

Source: Invest NI monitoring data

- 2.19** The average (mean) value of offer for GRD Awards and Collaborative Awards varied across the evaluation period. However, this is driven by very large awards discussed above, which skew data for individual years. For GRD Awards specifically, excluding the small number of

¹³ Only three of these awards were received by organisations appearing only once in the 'top 20' list. Most of the organisations awarded these large grants were involved in two 'top 20' projects.

projects with an offer of approximately £2m or more (n=11), the average offer was between £90-140k each year (with the exception of 2018/19 when the average increased to c.£175k).

Single and multiple awards

2.20 Companies are eligible to secure multiple awards, including where a Project Definition Award leads on to a GRD Award or Collaborative Award. As such, the 1,243 awards in the evaluation period were *not* awarded to 1,243 separate companies. The data indicate that the 1,243 projects were undertaken by 729 separate organisations (including universities/research institutions). Companies with single awards (that is only one award in the period) accounted for 36% of the awards, with 276 companies with multiple awards (that is more than one award in the period) accounting for 64% of the awards.

2.21 Of the 276 companies that secured multiple awards most (163 of the 276) secured two awards, with 113 securing three or more. Looking at GRD Awards specifically (reflecting they account for a majority of funding and offers, and that progress from a Project Definition Award to a GRD Award is an important element of the programme), 171 companies secured two or more awards in the evaluation period, accounting for offer values of £106m (71% of the total for all GRD Awards). Repeat support for (separate) GRD Awards was therefore an important characteristic of the programme over the evaluation period. Three other points are noted:

- **There is some evidence suggesting that companies are using Project Definition Awards to inform full R&D projects supported by GRD Awards.** Data provided by Invest NI does not set out explicitly the relationship (if any) between Project Definition and GRD/Collaborative Awards; as such, it is not possible to comment specifically on how many Project Definition Awards have led to GRD/Collaborative Awards. However, of the 729 companies supported, 123 (17%) secured both Project Definition Awards and GRD/Collaborative Awards in the evaluation period (accounting for 352 projects in total). For 60% of these 123 companies (n=74), the start date of their (first) Project Definition Award was before the start date of their (first) GRD/Collaborative Award. It is not possible to identify if in all cases the former informed the latter, however, the data does indicate that companies are commonly securing Project Definition Awards in advance of GRD/Collaborative Awards. This said, 40% of companies securing multiple award types started their (first) Project Definition Award after starting their (first) GRD/Collaborative Award, indicating companies are seeking support for a range of different R&D activities. The evidence on the relationship between Project Definition Award and later stage awards from the beneficiary survey are discussed later in this report.
- **A group of companies secured a very high number of awards in the evaluation period,** even when considering the period spans seven years and it is natural to expect some level of repeat support given the relatively limited population of R&D active companies in NI. This included one that secured more than 20 GRD Awards, and five securing five or more GRD Awards (two of which secured Project Definition Awards). Issues related to the need for support and additionality are discussed later in this report,

however, this type of multiple assistance to some companies (including in some cases a large number of small individual awards) is higher than might reasonably be expected.

- **The two NI-based universities secured a large number of awards (41).** In most cases these were Project Definition Awards or Collaborative Awards.

Characteristics of supported companies

2.22 Headline characteristics of companies supported by the programme are set out in Table 2-5.

Table 2-5: Headline characteristics of supported companies¹⁴

	Number of companies	Share of companies
Size		
Micro	319	44%
Small	209	29%
Medium	91	12%
Large	110	15%
Ownership status		
Externally owned	120	16%
Locally owned	609	84%
Sector		
Manufacturing	329	45%
Information & Communication	211	29%
Professional/Scientific/Technical	61	8%
Other	128	18%

Source: Invest NI monitoring data

2.23 Three points are highlighted from these data:

- Approaching half of all supported companies were classified as ‘micro’ when they were first supported by the programme; this is consistent with the underpinning rationale, given that these companies may be less likely to be able to afford or access finance to undertake R&D activity than larger firms. This said, medium and large sized companies accounted for over a quarter of supported companies over the evaluation period.
- In a high majority of cases, companies were locally owned, although the programme also supported over 100 externally owned firms, reflecting its role in supporting inward investors to locate or retain R&D activity in NI (discussed subsequently in the report).
- Manufacturing and ICT companies were the most common sectors amongst supported companies: this is not unexpected given the importance of these sectors to the NI economy and the R&D-intensive nature of activity in these sectors and significant growth

¹⁴ This includes universities and research institutes

over the evaluation period. However, a range of other sectors were also supported, reflecting the flexible and open nature of the programme; the role of the programme in supporting key sectors and cluster-development was an important theme in the evaluation, and is discussed subsequently in the report.

2.24 Data was also provided on whether businesses were ‘new to R&D’ at the time they started each project; according to the definition adopted by Invest NI ‘new to R&D’ companies are those that have not been supported by the GRD programme in the five years prior to award. Overall, 38% of projects were undertaken by companies ‘new to R&D’ using this definition. As may be expected, this varied by business size, with businesses that carried out 57% of projects undertaken by micro companies (n=254 awards) identified as new to R&D at that time, compared to 15% for large firms (n=42).

Value of offer by company characteristics

2.25 Data on the value of award offers by company characteristics is set out in Table 2-5 below.

Table 2-6: Value of award offers by company characteristics

	Total offer value (£k)	Share of offer value	Average offer value (£k)
Size			
Micro	26,997	12%	60.5
Small	22,950	10%	68.7
Medium	23,880	10%	142.1
Large	158,098	68%	535.9
Ownership status			
Externally owned	93,740	40%	409.3
Locally owned	138,185	60%	136.3
Sector			
Manufacturing	104,366	45%	178.7
Information & Communication	56,837	25%	167.2
Professional/Scientific/Technical	24,971	11%	254.8
Other	45,752	20%	207.0

Source: Invest NI monitoring data

2.26 Four points are highlighted from these data:

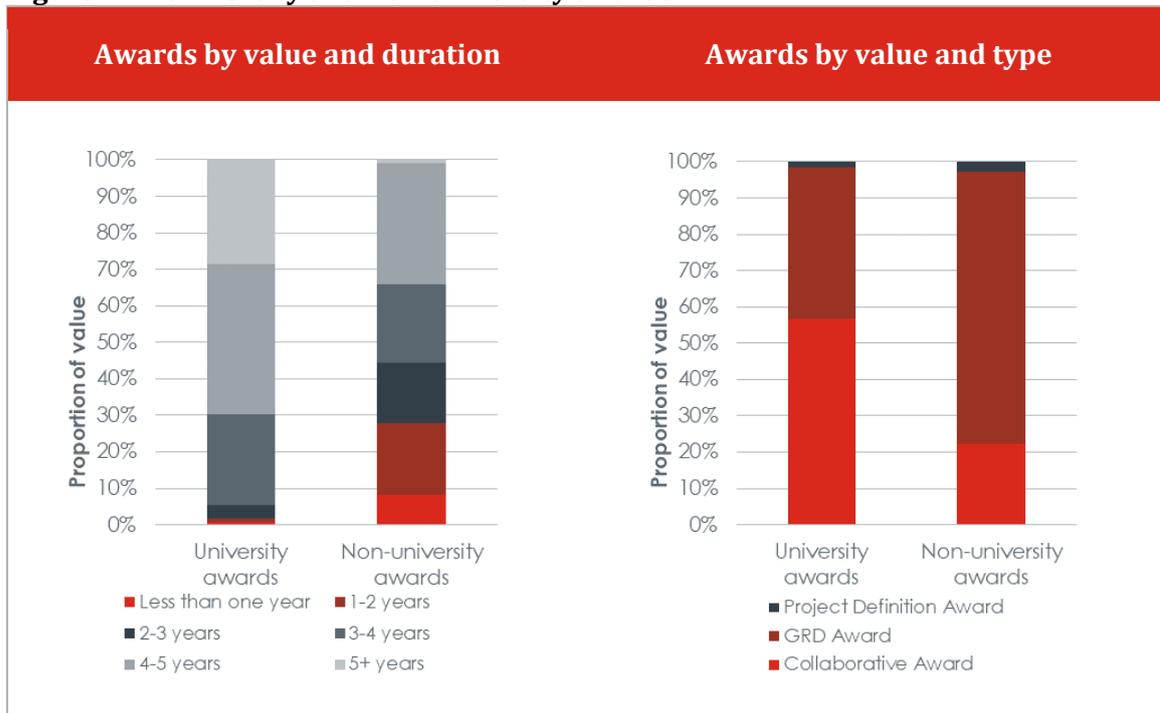
- Whilst large companies made up 15% of all companies supported over the evaluation period, they accounted for over two thirds (68%) of the total offer value, with average offer values very substantially higher than smaller companies. Large companies seeking higher value of support is not unexpected, and the trend is evident for GRD and Collaborative Awards. Large firms accounted for 84% of award value for Collaborative Awards, with modest participation in collaborative projects by smaller companies.

- Although still representing under half of the offer value, externally owned firms secured offer values that were on average substantially higher than locally owned firms. This is closely linked with the point on size above, with externally owned firms accounting for over half of the large companies supported (compared to 16% of all companies). Interestingly the average offer value was broadly consistent between externally and locally owned large firms (at around £500k in both bases).
- The average offer value did not vary markedly across sectors, although it was somewhat higher for Professional/Scientific/Technical. Education is included within 'Other', and incorporates awards to Universities, some of which are very large (see below).
- There was some variation across the evaluation period on these profiles with large companies and externally-owned companies at times more or less important to the offer values in individual years. This is not unexpected given the scale of some of the projects supported influencing data in individual years. However, it also highlights the flexibility in the programme, which has allowed Invest NI to respond to different levels of demand at different times. Indeed, the flexibility and the resulting breadth and variety of activity support by the programme is a crucial characteristic, as discussed in more detail below.

University awards

2.27 As discussed above, the two NI-based universities secured a large number of awards (41), and together accounted for offers worth £27.4m, 12% of the total across the evaluation period. However, the profile of awards to universities was very different to non-university awards, both in terms of the duration of activity, and the award type, as shown below.

Figure 2-4: University and non-university awards



Source: Invest NI monitoring data

3. Assessment of rationale and objectives

Rationale

- 3.1** With no programme-level appraisal and casework process necessary, there is no formal articulation of its underpinning rationale for the programme over the evaluation period. However, as illustrated in the Logic Model in Section 2, drawing on review of programme documents and evaluation scoping consultations, key arguments include:
- a need to deliver against key strategic policy priorities and agendas which recognise the critical role of R&D investment and innovation to economic performance and growth
 - well-established market failures related to the risk and uncertainties associated with investment in R&D – including ‘externalities’ where the benefits are perceived to flow to others and cannot be captured in full thereby reducing levels of investment – and issues in relation to the availability of finance
 - the need to address capability failures, where companies lack the skills, knowledge and capacity to undertake R&D.
- 3.2** These issues have been tested with programme partners and stakeholders, and beneficiaries. Overall, the evaluation evidence suggests that there was a strong rationale for intervention in the programme from both a strategic and market-failure perspective. That said, given the breadth of the programme’s focus, and the way in which it has been delivered practically on the ground, there is a need for the rationale to be more clearly articulated and tested going forward, including in relation to the different issues in play for different R&D activity-types.

Perspectives from partners and stakeholders

- 3.3** The rationale for the programme was consistently recognised by partners and stakeholders engaged in the evaluation, both those within Invest NI itself and in the wider innovation landscape. This may not be unexpected, however, five (in some cases closely related) themes emerged from the research in relation to the rationale which are important.
- 3.4** First, there was a **consistent recognition of the strong strategic alignment of the programme to the broader policy landscape in NI**. Despite the considerable change in the policy agenda over 2013-2020, there has been a consistent and increasing emphasis on the core role of innovation in NI’s economic development strategies. This trend has been reflected in: the Programme for Government 2011-2015¹⁵ that committed to achieving sustainable economic growth by improving competitiveness and encouraging a stronger and more export-driven private sector, including through encouraging innovation; the Northern Ireland Economic Strategy 2012¹⁶ that set the overarching goal of improving economic competitiveness and identified the need to stimulate innovation, R&D, and creativity; the

¹⁵ See [NI Executive \(2011\) Programme for Government 2011-2015](#)

¹⁶ See [NI Executive \(2012\) Northern Ireland Economic Strategy – Priorities for Sustainable Growth and Prosperity](#)

Innovation Strategy from 2014, as discussed in Section 2, with specific targets established around business R&D investment; the Draft Programme for Government Framework 2016-2021 that highlighted the importance of innovation as a key driver of the economy and recognised the need for a broadening base of businesses engaged in innovation and R&D¹⁷; and the draft Industrial Strategy ‘Economy 2030’ that outlined a plan to build “*a globally competitive economy*” based around five priority pillars for growth, including “*accelerating innovation and research*” and included a specific raise to raise annual expenditure on R&D by 2030.¹⁸ Overall, the focus on driving-up levels of engagement and investment in R&D as a key mechanism to improve innovation performance and delivery economic growth has arguably strengthened over time, both supported by and enhancing the case for, the programme.

- 3.5 Second, the strategic role of the programme in delivering against and supporting a range of other policy priorities was recognised.** This included in relation to attracting and retaining foreign direct investment (FDI), including high-valued added FDI as expressed in the draft Industrial Strategy ‘Economy 2030’, and the earlier Economic Strategy 2012; enhancing levels of knowledge exchange and collaboration between businesses and the NI research base; and supporting the development of specific sectors or clusters in the economy. The extent to which the programme has in practice delivered against these other agendas is discussed later in the report. However, its strategic position alongside other more focused and tailored interventions was seen as important by stakeholders.
- 3.6 Third, the programme was seen as an important part of the ‘mix’ of support available to companies from Invest NI.** In this respect, and consistent with the ecosystem in Section 2, the programme is seen to play a mutually reinforcing role alongside other interventions, not as a ‘standalone’. Whilst this leads to challenges in attribution (as discussed later in this report), from a strategic perspective, the programme’s role alongside other mechanisms is important. This relationship to other interventions is highlighted in performance data provided by Invest NI, with a very high proportion of companies supported by GRD over the evaluation period also receiving other forms of support from Invest NI. In this context, nearly all of the Client/Technology Executives that completed the online survey described the strategic alignment between the GRD programme and other INI support as good or very good.
- 3.7 Fourth, the programme was seen as an important demonstrator of Invest NI and DfE’s commitment to R&D investment.** That is, the scale, profile and continuity of the programme was in itself playing a potentially important role, in line with the policy agenda in NI and broader trends across the UK. An important element of this was that as a non-competitive and non sector-specific intervention *focused specifically on R&D investment*, the programme was seen to have provided a genuinely distinctive and ‘unique’ offering to companies, which could be used alongside other support mechanisms.
- 3.8 Fifth, strategic partners and stakeholders recognised the market failures associated with R&D investment set out in the Logic Model.** This included a particular focus on risk aversion, and the importance of the programme in providing finance to de-risk projects, both

¹⁷ See [NI Executive \(2016\) Draft Programme for Government Framework 2016-2021](#)

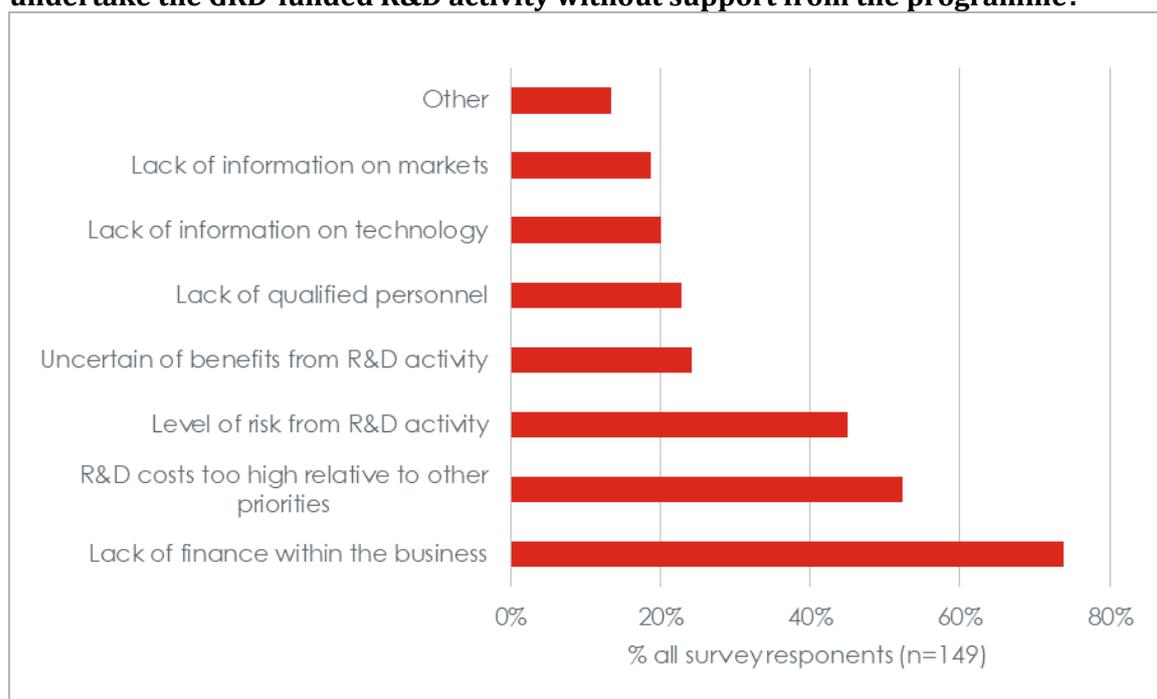
¹⁸ See [Department for the Economy \(2017\) Economy 2030: A consultation on an Industrial Strategy for Northern Ireland](#)

for SMEs and large firms. The value of Project Definition awards to address capability issues for new and small firms in particular was also highlighted as important.

Perspectives from companies

- 3.9** The evidence from companies is well-aligned with the partner and stakeholder perspectives in relation to the barriers/issues that prevent firms from taking forward R&D activity without support, thereby providing a rationale for public sector intervention. However, the evidence on rationale from a company perspective is not straightforward, particularly in relation to the extent to which other sources of finance have been considered.
- 3.10** Turning first to the survey of companies, the reasons that respondents gave for why they did not undertake the programme-funded activity without support is consistent with the rationale for the programme set out in the Logic Model. As shown in Figure 3-1, the reasons most commonly centred around a lack of finance within the business to fund the activity, the high relative costs of R&D, and the level of risk associated with the R&D activity. Note this data includes *all* survey respondents, and respondents could identify multiple barriers.

Figure 3-1: Response to: Which of these, if any, were the reasons why you did not undertake the GRD-funded R&D activity without support from the programme?



Source: SQW analysis of beneficiary survey

- 3.11** The issues/barriers preventing project progress identified by respondents were consistent by firm size, with one key exception. As shown below, large and medium sizes firms were significantly¹⁹ less likely to report that a lack of finance was an issue than micro/small firms.

¹⁹ Significant at 1% using a two-sample z-test

This is not unexpected, and highlights the additional issues faced by micro and small firms in seeking to progress R&D activities with more limited overall financial resource.

Table 3-1: Response to: Which of these, if any, were the reasons why you did not undertake the GRD-funded R&D activity without support from the programme?

	Large / Medium (n=35)	Micro/small (n=114)
Lack of finance within the business	51%	81%
R&D costs too high relative to other priorities	54%	52%
Lack of qualified personnel	20%	24%
Lack of information on technology	26%	18%
Lack of information on markets	20%	18%
Uncertain of benefits from R&D activity	23%	25%
Level of risk from R&D activity	40%	46%

Source: SQW analysis of beneficiary survey

3.12 Issues related to funding gaps and the level of risk associated with planned R&D activities were also raised as the key issues preventing project progress in the qualitative interviews with companies involved in multiple projects and Collaborative Awards. A number of broader themes also emerged from these consultations:

- first, for several of the large firms, a key issue was ‘making the case’ for NI as the location for R&D investment, with financial support seen as necessary to compete against other centres of investment internationally; this issue was also identified by consultees in relation to the role of the programme in securing internationally mobile R&D investments
- second, for Collaborative Awards, key barriers identified included the lack of in-house expertise and facilities which were seen as core to the case for a collaborative approach
- third, and again for Collaborative Awards, the qualitative interviews identified the presence of co-ordination failures between the research base and industry, and in some cases specific research infrastructure gaps that could not be filled by any single institution or partner; this highlights the range of project activities supported by the programme, addressing quite different failures and notably the difference between some of the very large strategic projects, and single-company GRD Awards.

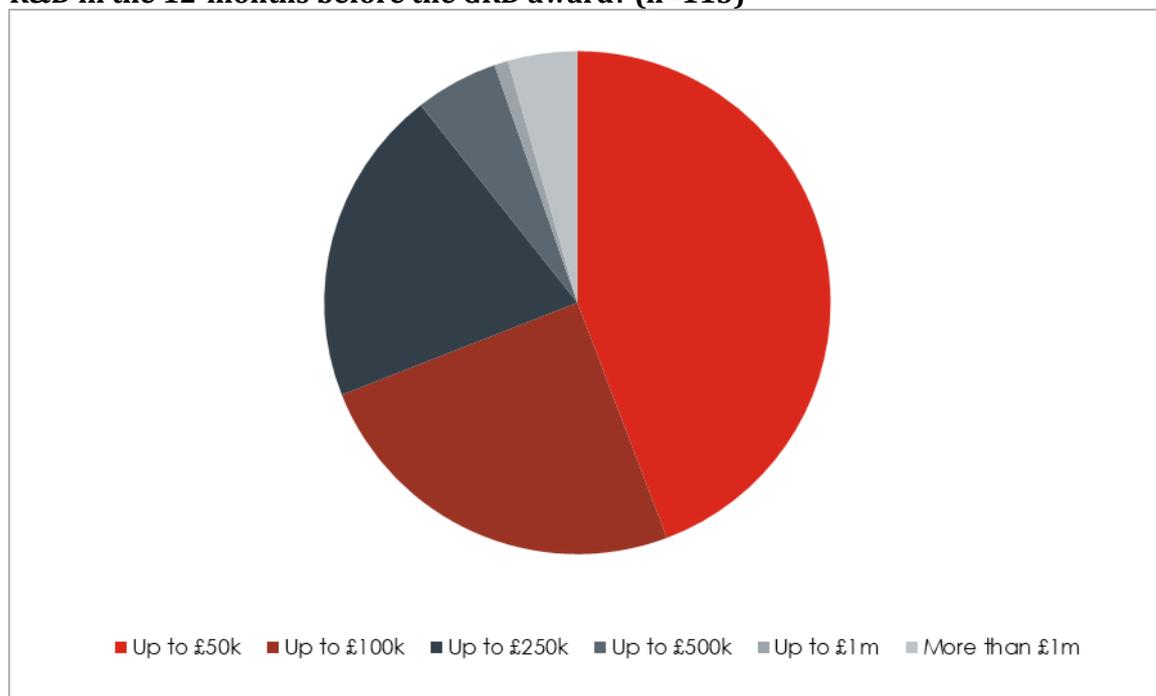
3.13 The evidence above indicates a generally strong alignment between the case for the programme and the barriers/issues faced by businesses. However, the primary research with businesses also identified two issues in relation to the underpinning rationale for the provision of financial support for R&D activity through the programme.

3.14 First, in the beneficiary survey, 79% of respondents indicated that they had invested in R&D before their initial application to the programme, with this level increasing to 86% of medium/large firms. This investment was in most cases related to the development of new or improved products (90% of the 118 companies that indicated pre-programme R&D

investment), but investment in new or improved services and processes was also common (25% and 35%, n=118). Further, the scale of investment in R&D prior to the programme was in some cases significant; as shown in Figure 3-2, approaching a third of companies that provided data on R&D investment in the 12-months prior to the award covered by the survey reported this was £100k or more, with some companies reporting investment of over £1m.

- 3.15** We note that the proportion of surveyed businesses that had not previously invested into R&D (21%) is lower than the proportion of ‘new to R&D’ projects according to the monitoring data referenced above (38%). This reflects the variation in the coverage and definitions used: notably, the Invest NI definition takes into account *previous GRD support* only, whereas the survey question sought to capture broader innovation and R&D activity, including but not confined to activity funded through the programme. The latter therefore provides a broader perspective on whether businesses had previously invested in R&D, with or without public co-investment.

Figure 3-2: Response to: How much of your own funds did your business invest in R&D in the 12-months before the GRD award? (n=113)



Source: SQW analysis of beneficiary survey

- 3.16** The programme can support companies that have previously engaged in R&D (and experience may help in realising benefits), and it is not limited to those that are new to R&D only. However, the level of pre-programme engagement and investment in R&D does raise a question on whether in all cases the funding provided by the programme was needed. In this context it is noted that the evidence from the survey varies to the monitoring data from Invest NI, which is not entirely unexpected (for the reasons outlined above). However, both the survey and monitoring data indicate that the programme has routinely supported businesses with a track-record of R&D engagement, suggesting that the barriers identified in the Logic Model may be less pronounced than anticipated.

3.17 Second, and related to this, the survey evidence suggests that a high share of companies supported by the programme did not consider other forms of finance to progress their R&D activity. Specifically, of the 149 companies surveyed, 48% indicated they had considered other forms of finance prior to applying to the programme, but 49% indicated they had not.

3.18 Looking into this data in more detail:

- Of the companies that *had* considered other forms of finance (n=71), their own funds, bank loans/overdrafts, and external equity finance (e.g. business angel, venture capital) were the most common sources considered, each identified by around 40% of companies.
- Of the companies that *had not* considered other forms of finance (n=73), the most common explanation was they were not aware of other sources of funding (45%), with a notable minority indicating that they expected other sources of funding would involve higher costs than support from the programme (25%). Around 20% of this group also identified they did not know *how* to apply for other sources of funding/complicated application process or that they did not consider other sources owing to Invest NI's reputation or an existing relationship with Invest NI.

3.19 The proportion of companies that had considered other forms of finance did not vary by scale of GRD award. However, micro-sized companies were *more likely* to consider other forms of finance for the R&D activity than medium/large firms (at 55% and 34% respectively²⁰). This could be partly due to differences in the decision-making chains and procedures: budgets and suitable sources of funding in large companies are often determined by a separate department within the organisation or by a parent company.

3.20 The implications of these data are not straightforward. On the one hand, the companies that did not consider other forms of finance and cited a lack of knowledge of other funding sources align strongly with the information failures set out in the Logic Model. Further, around half of companies surveyed considered other forms of finance, and this being largely from the private sector (internal or external), suggests that the programme is commonly approached only after other potential market finance has been considered. Further, for some companies, the issue may be more one of internal resource allocation on R&D, rather than the ability to access external funding. However, on the other hand, with around half of projects awarded to companies that have not considered other ways of financing the specific R&D activity prior to approaching the programme (as suggested by the survey), it is hard to be certain whether in all cases support from the programme was required. In many cases it may have been, however, there is some uncertainty in relation to the genuine need across all projects. The effects of this will be reflected in the additionality of outcomes, considered later in the report.

3.21 However, this theme was also raised in the wider research, with some concerns expressed that owing to the longevity, scale and nature of the programme, it may have come to be seen as an 'accessible' source of repeat funding for R&D activities by some businesses. This view is shown in the data related to 'repeat support' e.g. c.60 companies secured three or more GRD

²⁰ Significant at 5% using a two-sample z-test

Awards in the evaluation period, and over 100 secured three or more of all award-types (i.e. including Project Definition and Collaborative Awards).

3.22 This may also be linked to the programme delivery model where there is very little explicit evidence of ‘rejection’ of applications: project applications are developed alongside Invest NI Executives, and the evidence from the evaluation suggests that applications are not taken to the assessment stage unless there is a strong confidence they will be supported. Further, there is no formal requirement for applications to demonstrate that other sources of funding have been considered, sought or why this is not the case.

Reflections on the rationale

3.23 Taken together, and drawing on the range of perspectives and issues, the evaluation suggests that the overall strategic rationale for the programme was strong at the outset, and has remained so over time. Indeed, the case for the programme has arguably strengthened in line with an increasing policy focus on R&D investment and its role in supporting innovation. Importantly, the evidence from beneficiaries suggests that the programme addressed issues in relation to risk, uncertainty and capacity that prevented R&D activity.

3.24 However, the evidence from companies does suggest that testing more fully the need for public sector finance at a project-level would be appropriate going forward, to ensure that the funding provided by the programme is genuinely needed in all cases and is addressing the issues and barriers preventing R&D, and not substituting for private investment, which at present is not evidenced fully. Further, the evaluation also suggests that the failures and issues that the programme is seeking to address are varied, notably between large-scale ‘strategic’ projects – which are often collaborative in nature – and single-company led R&D ‘project-focused’ activities. Both are important and valid, but they are different, and mean different things in terms of targeting, outcomes, and strategic positioning in the future.

Objectives

3.25 As set out in the Logic Model, the objectives of the programme were to:

- de-risk and stimulate business investment in R&D
- increase the level and quality of near market and industrial R&D in NI
- support businesses to develop new products/processes/services to drive performance
- increase R&D innovation capability and capacity amongst NI businesses
- enhance the development of NI’s research and innovation ecosystem

3.26 It is important to recognise that the objectives are wide-ranging and it is worth noting that Grant for R&D is a principal contributor to progress against organisational level targets set out in Invest NI’s business plans, which primarily focus on increasing the level of investment

in R&D.²¹ However, over and above those targets, there is no formal articulation of SMART objectives at the *programme* level, again linked to the on-going approval for the programme under the European Commission's R&D&I framework. The advantage of this is that the programme can be flexible, and evolve in terms of what it is seeing to achieve, including in line with policy imperatives. However, there are also risks, with the potential for a lack of clarity on specifically what it is the programme is seeking to achieve, and the balance and potential trade-offs between different elements of the strategic objectives set out above. For example, there may be a trade-off between seeking to achieve new products, processes and services, and broader R&D innovation capability and capacity which may not yield short-term or immediate effects, but lead to more sustainable benefits over the longer-term.

3.27 Further, there is arguably some ambiguity over whether the programme is seeking to increase the aggregate level of R&D activity and investment in NI (which may be realised mainly by supporting existing R&D active businesses to do more, and which is the focus of the organisational level targets set out in Invest NI's business plans), or support more businesses to engage in R&D activity (even where the scale of this may be modest). These are not mutually exclusive, and the evidence suggests that over the evaluation period, the programme sought effectively to do both. As discussed in Section 2, the key challenge for NI over the past decade has been less related to the aggregate volume of R&D investment, and more the distribution and concentration of this in a relatively modest number of large firms. Greater clarity on the role of the programme in this context will be important.

3.28 However, consultations with partners and stakeholders for the evaluation suggested that the breadth and flexibility of the objectives of the programme was a strength. The ability of the programme to support firms 'across the innovation escalator' was seen as important, recognising that market failures and funding gaps can be evident at different stages in company growth and development. The importance of the range of objectives was also recognised by Client/Technology Executives. As shown in Table 3-2 below, when asked to identify the key objectives of the programme, whilst 'Supporting the development of new and innovative products, processes and services' was most commonly cited as very important, increasing R&D capacity and business competitiveness were also very widely identified.

Table 3-2: Client/Technology Executive perspectives on objectives (n=59)

	Very important	Important	Not important
Increasing business spending on R&D	22	25	2
Increasing R&D capacity: knowledge and skills	35	15	-
Supporting the development of new and innovative products, processes and services	43	6	-
Improving business productivity	22	24	3

²¹ It should be noted that other forms of Invest NI support can also contribute towards those targets.

	Very important	Important	Not important
Increasing business competitiveness	36	14	-

Source: SQW analysis of Client/Technology Executive survey

3.29 Client/Technology Executives were also asked to identify any other key objectives. A key theme was embedding R&D and innovation culture/capacity, seeking to leverage the investment in sustainable and changing practice going forward. Some examples included:

“Providing people-centred support (i.e. not necessarily financial) to help them to change their mindset about their capabilities and what they can achieve. A lot of the work is around convincing companies they can achieve it, even if they are small, locally owned businesses; it's about confidence building and giving them support to take a risk in doing new things.”

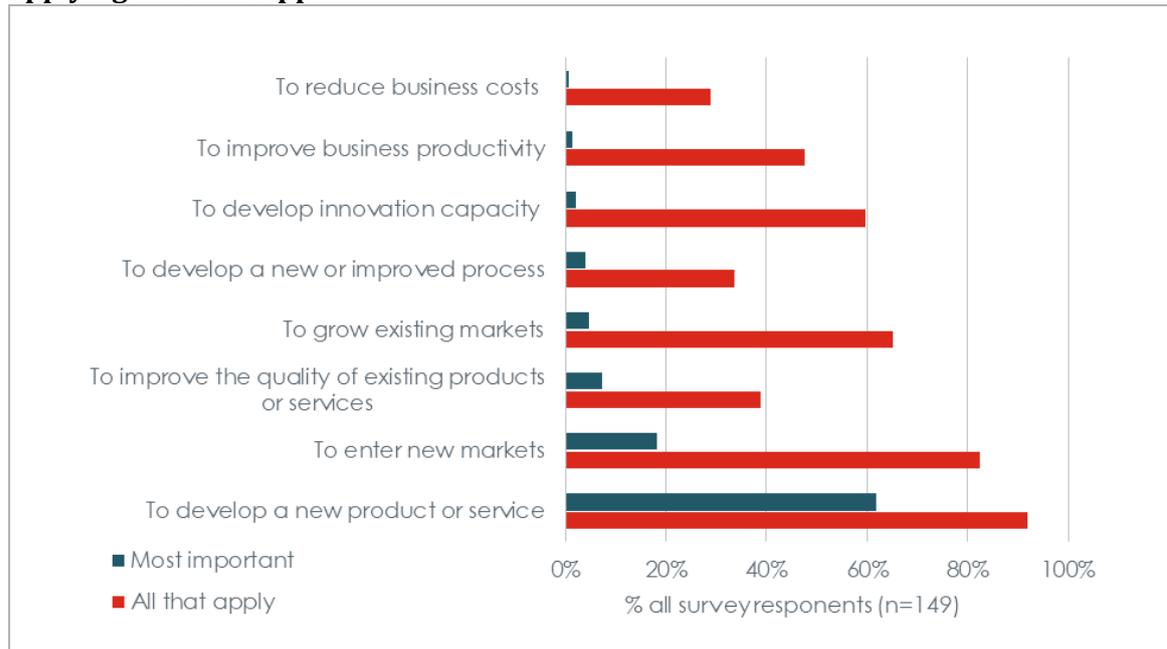
“Driving a culture of innovation within the business”

“Increasing the level of innovation and institutionalising an innovation-led thought process in a company and the NI society; innovation being market-led R&D.”

3.30 This theme of the role of the programme in supporting enhanced innovation capacity was also recognised by companies, and identified by 60% of companies in the beneficiary survey as a motivation for applying to GRD. However, the beneficiary survey and qualitative consultations both demonstrated that whilst wider objectives are important, the programme is fundamentally from a business perspective about supporting the development of new products/services. As shown in Figure 3-3, for 60% of surveyed beneficiaries this was the ‘most important’ motivation for applying, this was consistent by business size and sector.

3.31 This said, entering new markets was the ‘most important’ motivation for approaching 20% of companies surveyed and this was also a motivation for over 80% of companies, which is linked to the development of new products/services. Further, the survey demonstrates the varied ways in which companies hope to benefit from their engagement in the programme.

Figure 3-3: Response to: Which of the following describes your initial motivation for applying for GRD support?



Source: SQW analysis of beneficiary survey

- 3.32** Reflecting the range of objectives, the qualitative interviews also indicated that enhancing and sustaining existing R&D partnerships and relationships, or creating new ones, was an important motivation for engagement in the programme in relation to Collaborative Awards.
- 3.33** In most cases covered in the qualitative interviews, the case for a collaborative project was principally owing to the specific needs of the R&D opportunity, with partners providing the necessary expertise, equipment, or capacity (in terms of time/resource). However, within this context, developing new relationships or enhancing existing ones was important, particularly for projects involving collaborations between industry and the research base.

4. Assessment of inputs and activities

- 4.1** The programme profile covering the number and value of offers was set out in Section 2. This section considers in more detail five issues: actual programme expenditure in terms of grant paid; the nature of activity delivered by projects and the extent to which these appear to align to the rationale and objective of the programme; the extent to which activities have been delivered as anticipated and projects have met their objectives; the relationship of programme activities to other support mechanisms, particularly other Invest NI supports; and the effectiveness of the delivery of the programme by Invest NI.

Programme expenditure

- 4.2** As of December 2020, actual programme expenditure (i.e. the value of grant paid out to those companies that secured offers) associated with projects initiated during the evaluation period and completed by December 2020 was £149m, equivalent to 64% of the offer value (of £232m). Expenditure by award type is set out in Table 4-1.

Table 4-1: Expenditure by award type

	Offer value (£m)	Paid out (£m)	Proportion paid out
GRD Awards	165.15	103.96	63%
Collaborative Awards	60.92	40.04	66%
Project Definition Awards	5.86	5.01	86%

Source: Invest NI monitoring data

- 4.3** The higher rate of expenditure for Project Definition Awards reflects their shorter delivery period, and this is also reflected in the rate of expenditure for projects approved over the evaluation period. As may be expected, the rate of expenditure was higher for those awards approved earlier in the period, with just 17% of offer value paid out by December 2020 for projects approved in 2019/20.

Table 4-2: Expenditure by year of award offer

	Offer value (£m)	Paid out (£m)	Proportion paid out
2013/14	16.93	14.24	84%
2014/15	36.89	32.99	89%
2015/16	34.24	27.85	81%
2016/17	49.63	33.33	67%
2017/18	45.31	24.53	54%
2018/19	32.38	13.20	41%
2019/20	16.54	2.86	17%

Source: Invest NI monitoring data

- 4.4** It is notable that the rate of expenditure was lower for large companies at 60% than for smaller companies. This reflects that large companies are more likely to be involved in long-term projects (accounting for c.90% of the value of offers for projects with a duration of 3+ years). The rate of expenditure was also higher for NI-owned firms (70%) than externally-owned firms (56%), again reflecting that externally-owned firms were, in relative terms, more commonly involved in longer-term projects. However, it is worth noting that, as discussed in more detail below, econometric analysis did not identify any statistically significant effects that would link these differences to variation in project performance or return on investment.
- 4.5** We also note that the £232m of GRD funding committed over the evaluation period leveraged £622m of committed matched funding from supported organisations²² which is a significant contribution to NI's BERD.

Nature of activities delivered

- 4.6** Consistent with the flexibility of the programme, and the considerable variation in the scale of projects both across award-types and (in the case of GRD Awards and Collaborative Awards) within award types, the evaluation research demonstrated the breadth and variety of activity supported, which includes activities with different routes and time-paths to impacts. However, within this diversity of activity, for each of the Award type, the evidence indicates that the activities delivered are in line with the expectations.
- 4.7** For GRD Awards, as set out in Table 4-3, the survey indicates that nearly all projects involved product/service/process design and development, with a high majority undertaking prototyping and piloting in real-life operating conditions. It is also notable that nearly three-quarters of surveyed companies indicated their GRD Award involved project scoping/definition activities. This may reflect companies seeking to accelerate the development of the R&D opportunity through delivering activities that could potentially be delivered via a Project Definition Award within a GRD Award. Further, there may be additional scoping/definition issues as activity is delivered.

Table 4-3: Activities within GRD Awards

Project scoping/definition activities (e.g. defining market opportunity, technical objectives and risks etc.)	73%
Product/service/process design and development	94%
Prototyping and testing in laboratory conditions	67%
Prototyping and piloting in real-life operating conditions	80%

Source: SQW analysis of beneficiary survey

- 4.8** Companies that had secured a GRD Award were also asked to assess the overall risk-level associated with the project at the start of the GRD funded activity. Across the full survey

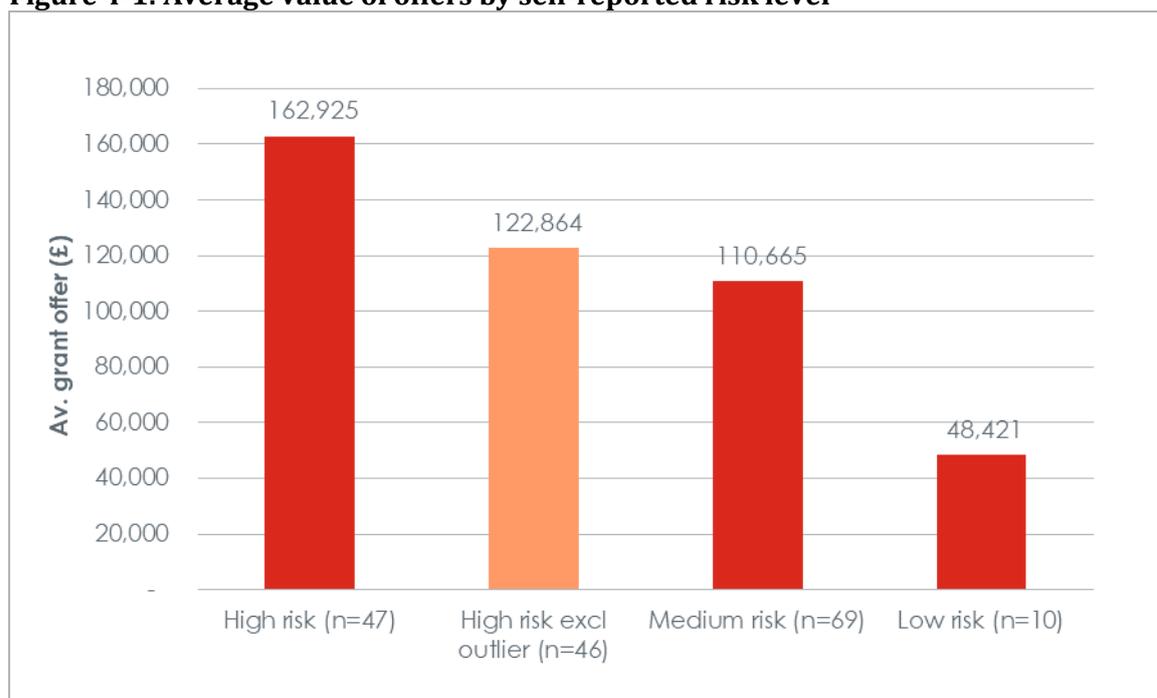
²² On average GRD's contribution towards eligible project costs was 36%.

sample: 38% indicated their project was 'high risk', 54% indicated their project was 'medium risk', and 8% indicated their project was 'low risk'. The modest proportion that indicated the project was 'low risk' is a positive finding, suggests that the programme has supported projects that required public support to de-risk investment.

4.9 Interestingly, the findings were consistent in terms of company size, sector, ownership status and new to R&D/not new status. Further, and reflecting on the discussion above, there was no evidence that the (self-reported) risk level was different for those companies that had or had not considered other firms of finance.

4.10 However, as may be expected there does appear to be a relationship between the scale of the offer value and the level of self-reported risk, particularly between 'low' risk project on the one hand and 'medium/high' risk projects on the other. Data on the average grant offer value for the (self-defined) risk groups are set out below; this includes data for the 'high risk' category including and excluding one company with a high average offer value (over 40% higher than other projects). When this company is excluded the difference between the average offer value between 'high risk' and 'medium risk' is modest, although evident.

Figure 4-1: Average value of offers by self-reported risk level



Source: SQW analysis of beneficiary survey

4.11 For Collaborative Awards, two key themes emerged from the qualitative research:

- First, linked to the discussion above regarding objectives, in most cases, the projects built on existing partnerships, and were often formed via bilateral/personal relationships, which included 'follow-on' activity from earlier GRD awards that now required further external expertise.

- Second, the programme has supported a range of different project models and types; the evidence indicates that there is no ‘typical’ Collaborative Award. The examples covered in the qualitative research ranged both in their scale and structure, and included
 - long-term industrial and academic partnerships, which involved establishing ‘research platforms’
 - business-led projects, with a modest-level of academic inputs
 - academic-led projects, with modest-level business inputs.

4.12 The breadth of activity-types delivered by the Collaborative Award is not unexpected, and reflects the programme flexibility and scope. This said, the qualitative research highlighted that through Collaborative Awards, the programme is supporting activities that are in many ways very distinct from ‘company-led R&D’ activity which is the fundamental purpose of the programme. Greater clarity going forward on this distinction may be important, to help inform programme strategy and prioritisation. We consider this issue in more detail in the Strategic Option Assessment.

4.13 For Project Definition Awards, the beneficiary survey captured data on the nature of activity for the 22 relevant companies. The sample size here is modest (reflecting that the survey prioritised GRD Awards given the relative scale of expenditure/activity). However, as set out in Table 4-4, the nature of activity was consistent with expectations, with nearly all companies indicating the activity included defining technical objectives and risks, and costs and potential benefits.

Table 4-4: Activities within Project Definition Awards

	No. respondents
Scientific and/or technical literature review	12
Defining the market opportunity	15
Defining the technical objectives and risks	21
Defining the costs of the R&D and understanding the financial implications	19
Determining the potential benefits	19
Retaining or employing staff	11

Source: SQW analysis of beneficiary survey

Evidence on project delivery

4.14 The programme is supporting R&D that is inherently uncertain and risky. Project failure, delays and changes are to be expected; indeed, if these were not evident to some extent, this might suggest that the programme was not supporting sufficiently risky projects. To provide insight on the extent to which activities have been delivered as anticipated, the beneficiary survey and qualitative interviews sought to gather evidence on whether project objectives have been met, as perceived by beneficiaries.

4.15 The beneficiary survey, that focused on GRD Awards and Project Definition Awards, suggested that in most cases project objectives had been met to some extent. Specifically, for those projects that were completed at the point of the survey (n=110):

- 61% of respondents stated that project objectives had been met ‘in full’
- 39% of respondents stated that project objectives had been met ‘in part’

4.16 Interestingly, the proportion of companies reporting that their objectives had been met ‘in full’ was higher for those that also secured other awards from the programme in the evaluation period than those that had not, at 69% and 52% respectively (n=58 and n=52)²³. The qualitative research provides some possible explanations for this including learning from success and failure of other projects, and the development of staff capabilities and confidence through multiple awards. However, it is also noted that this may reflect that those firms that realise their objectives are more likely to seek more support subsequently.

4.17 Delivery against objectives was not associated with offer value or duration of award, and there was no consistent relationship by firm size. However, manufacturing companies were significantly *less* likely to report that all their objectives had been achieved ‘in full’, compared to non-manufacturing companies: 47% and 74% respectively (n=53 and n=57)²⁴; the reasons for this are not clear from the survey data.

4.18 Considering Collaborative Awards, the overall progress against project objectives was also generally strong from those organisations consulted. As may be expected, the collaborative nature of activity was associated with some challenges in delivery, however, these were generally seen by consultees as being proportionate and reasonable given the benefits from engagement with other partners and access to their wider expertise and knowledge.

4.19 Some challenges were identified in relation to industry-academic collaboration, where different expectations, drivers and behaviours between those working in industry and academics were identified in some cases, in the words of one (industry) consultee, “*industry and academia generally operate in different environments with different end goals*”. This includes issues on agreement of IP ownership/rights, and varied priorities on academic time. Further, projects involving industrial collaboration also identified some initial challenges around partnerships, however, these were addressed. Some examples of feedback included:

“Getting access to the right academic at the right time was challenging because the academics have teaching commitments”

“There was an initial challenge of agreeing to do this [project] as a collaboration as all the companies were competitors and therefore sharing expertise goes against business principles. However after some discussions, all companies were on board.”

²³ Significant at 10% using a two-sample z-test

²⁴ Significant at 1% using a two-sample z-test

4.20 Notwithstanding these challenges, across the 15 consultations with organisations involved in Collaborative Awards, the collaborative element was consistently regarded positively, and was seen as important in realising project delivery and progress. Although the level and nature of collaborative varied – in some cases with collaborators undertaking very defined roles in projects, and others where the activity was more integrated on an on-going basis – the value of the collaboration was recognised consistently. Some examples of feedback included:

“The collaborative nature on this project was critical to the success. This project would not have reached a successful trial stage without collaboration ... [each partner] had their own expertise which they brought to the project”

“The collaboration was really important as each partner had their own expertise knowledge that they brought to the project and could not be done individually.”

The collaboration “was very important to the project ... it was a 50/50 effort.”

Alignment with other support for R&D and business development

4.21 As noted above, a high majority of companies supported by the programme over the evaluation period received other forms of support from Invest NI. Data was provided for the evaluators on other forms of support secured since 2011-12 covering 85% of the companies supported by the programme (n=623).²⁵ The period covered by this additional dataset is longer than the evaluation period and information from the ‘extra’ years was used in the evaluation as an earlier instance of Invest NI support could have an effect on GRD-funded activities undertaken during the evaluation period.²⁶

4.22 Nearly all (94%) of the companies where data was available had secured other forms of support from Invest NI since 2011-12, either before, alongside or after support from the GRD programme (data on the timing of each other form of support was not available). Even though the lack of information on the timings limited our ability to conclusively determine which element of support was the main driver in each case, as we discuss in more detail below, these ‘packages’ of support were demonstrated through econometric analysis to play an important role in contributing to the scale of realised benefits. Reflecting the range of Invest NI supports, the data was provided by broad groupings covering different forms of financial and non-financial support.

4.23 The most common sources of other support received are set out in Table 4-5: 64% of companies secured trade support (and when considering NI-owned firms only the proportion increases to 67%), and over half secured other ‘Innovation & Technology’ financial support, and/or Selective Financial Assistance.

²⁵ As mentioned previously, a number of additional beneficiaries was identified at a later stage in the evaluation.

²⁶ It is also noted that the data provided by Invest NI did not disaggregate the timing of other support, meaning it was not possible to exclude support prior to the evaluation period.

Table 4-5: Other forms of support secured by GRD beneficiaries

	Proportion of companies securing other support (n=623)
Trade (Non-Financial)	64%
Innovation & Technology (Financial)	56%
Selective Financial Assistance (Financial)	51%
GAP (Financial)	48%
Innovation & Technology (Non-Financial)	47%
Skills (Financial)	47%
Other R&D (Financial)	35%
VC Fund (Financial)	20%
Other (Financial)	19%

Source: Analysis of Invest NI data

4.24 The scale of the other financial support secured is significant, around £203m. Over half of this (around £110m) was accounted for by Selective Financial Assistance, which is Invest NI's main mechanism for providing direct financial support to businesses to secure increased private sector investment and employment growth.

4.25 Over half of the financial support provided to GRD beneficiaries from other Invest NI support went to large firms, around £115m in total. However, as shown in Table 4-6, companies of all sizes supported by the programme also secured other Invest NI financial support, with a consistent relationship between size and the average value of other financial support secured. Reflecting the focus of the programme the Table also sets out the average 'Other R&D' financial support secured. This highlights the very significant level of other financial support for R&D secured by large firms, before, alongside or after GRD at around £250k on average.

Table 4-6: Average value of other Invest NI financial support secured by GRD companies by size-band

	All other support	Other R&D support
Micro (n=256)	75,462	4,351
Small (n=182)	147,300	8,244
Medium (n=76)	503,970	13,310
Large (n=93)	1,241,756	252,250

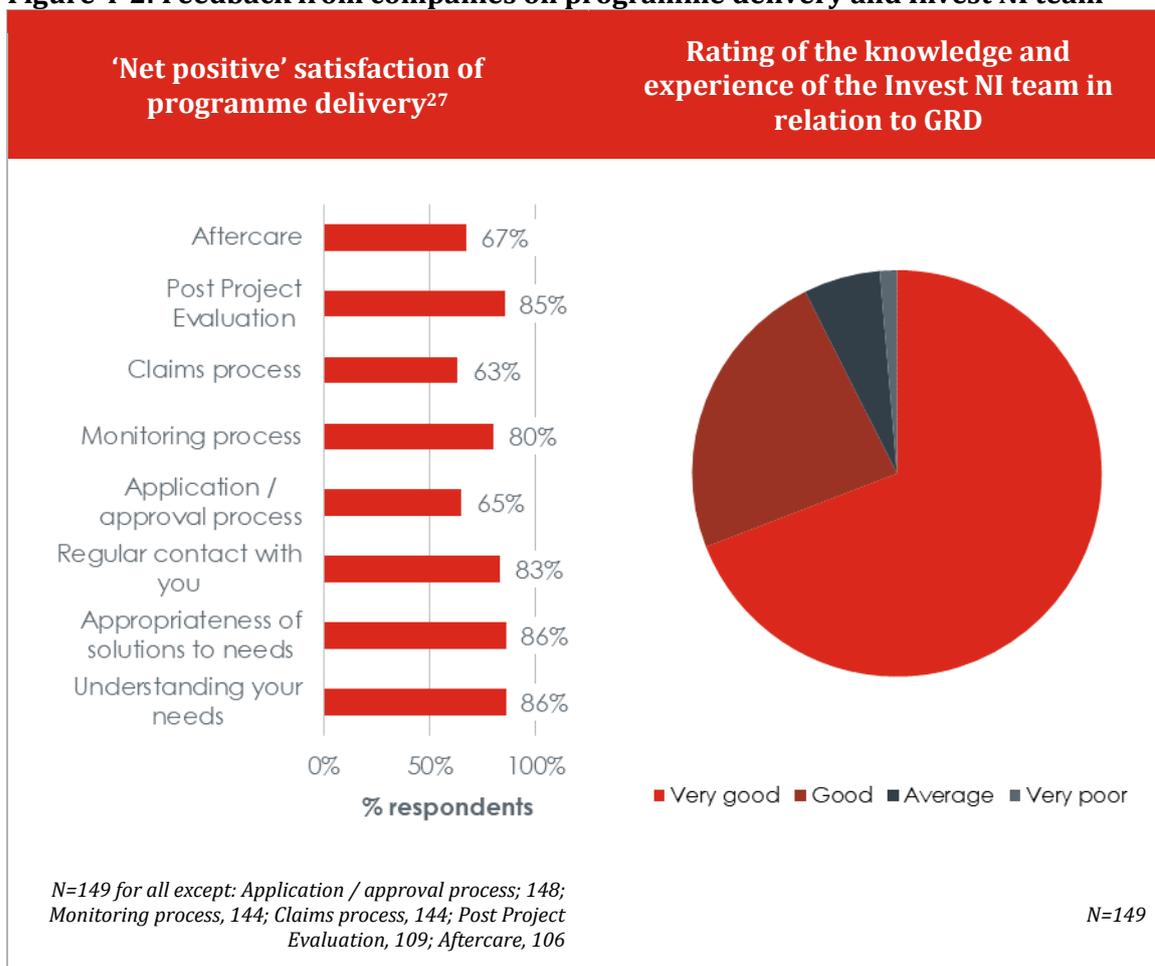
Source: Analysis of Invest NI data

4.26 The implications of this other support for attribution and additionality are considered in a subsequent section of this report. However at this point it is highlighted that the data suggest the programme is nearly in all cases part of a broader mix of Invest NI support to companies.

Programme delivery perspectives

- 4.27** Finally for this section, we consider the evidence on the effectiveness of the delivery of the programme by Invest NI, drawing on perspectives from those involved in programme governance/management/delivery and beneficiaries. Overall, the findings are positive, suggesting that the programme has been well-managed overall over the evaluation period.
- 4.28** The feedback from companies supported via the survey was particularly encouraging. As shown below, satisfaction across different elements of programme delivery were consistently high, and the knowledge and expertise of the Invest NI team that companies worked with in relation to GRD was regarded as ‘very good’ by over two-thirds of survey respondents.

Figure 4-2: Feedback from companies on programme delivery and Invest NI team

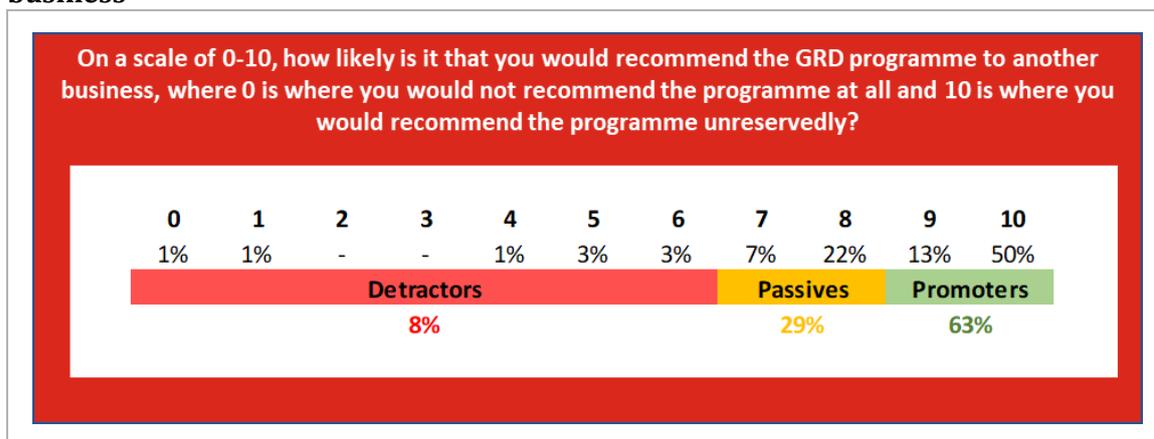


Source: SQW analysis of beneficiary survey

- 4.29** Further, when asked how likely it was that they would recommend the programme to another business, the findings were very positive, as shown in Figure 4-3 below.

²⁷ The net positive result has been calculated by subtracting the proportion of respondents that stated they were 'Fairly dissatisfied' or 'Very dissatisfied' from those that stated they were 'Very satisfied' or 'Fairly satisfied'.

Figure 4-3: Feedback from companies on recommending the programme to another business



Source: SQW analysis of beneficiary survey

- 4.30** Levels of satisfaction with the application/approval and claims processes were lower than for other programme components. This may be expected, given the requirements in terms of time for companies to engage in these processes. However, when asked what changes they would make to the programme, the most consistent feedback from companies was for a more transparent or flexible claims process and a simplification of the application process. The aftercare offer was also less positive, which likely reflects the extent to which the Programme team has the resource to engage with projects post-completion (see discussion below).
- 4.31** Further, the wider evaluation evidence also indicates some concerns regarding the systems associated with the programme over the evaluation period. For example, whilst the overall feedback from Client/Technology Executives on the delivery of the programme was positive, the complexity of the scheme criteria, approvals process and process for determining the award amount were regarded less positively.
- 4.32** Linked to this, there was a consistent recognition from those involved in the management and oversight of the programme that the level of administration was very significant. This includes processes associated with project development, project approval, monitoring and data management, and the delivery or management of Post Project Evaluations. For some, the volume of casework and claims processing was limiting the potential of the Programme Team to engage in strategic and value-adding activities with businesses, and more widely across the innovation landscape.
- 4.33** An important factor here was the concerns over the capacity and level of resource in the Programme Team given the scale of the programme, with on average more than 180 projects approved each year, and the complexity of the requirements around approvals and monitoring owing in part to the delivery of the programme under the R&I Framework (and State Aid rules).
- 4.34** These issues were addressed to some extent through the introduction of changes to programme management systems including moving to an online application process for Project Definition Awards, a new application process for GRD Awards and Collaborative

Awards, and new Programme Operating Guidelines in 2018. The evidence suggests that these capacity challenges have not impacted adversely on the performance of the programme from a business perspective, as reflected in the positive results above. However, there is a case for considering how the administration of the programme can be streamlined to support effective delivery, and de-risk issues related to monitoring, data management and evaluation.

4.35 In this context, three final points are noted:

- First, despite the considerable resource that is allocated to Post Project Evaluations – with all GRD Awards subject to a PPE three years after completions – the evidence indicates that these are not currently being used as consistently as they could be to support continual programme improvement. For example, around half of the Client/Technology Executives that responded to the online survey indicated that they never or infrequently reviewed PPEs of GRD projects over the evaluation period.²⁸
- Second, it is noted that in completing the evaluation some challenges were faced in accessing comprehensive data on supported projects, with no single repository of relevant information in digital format available. Accessing key information was therefore very time consuming for the Programme Team, and in some cases comprehensive data on important issues was not available. For example, the category of projects by Experimental Development / Industrial Research was not available for all projects. Further, as noted above, there is currently no systematic tracking of projects from Project Definition to GRD/Collaborative Award. The current Programme Team have a very strong understanding of the programme coverage, rules and regulations, however, reliance on individuals is inherently risky. In this context, keeping the Programme Operating Guidelines up to date is vital for ensuring continuity after any changes to staffing (especially unforeseen), while digitalisation and automation of linkages between datasets with project records would further contribute to more robust and resilient monitoring mechanisms.
- Third, as discussed above there is currently no formal depiction of the programme's rationale, objectives and anticipated outputs, outcomes and impact, over and above organisational level targets set out in the business plan, which would be routinely developed as part of an appraisal/casework process, and which would help to inform programme monitoring systems and processes. It was not within the scope of this evaluation to undertake a detailed audit of the management information processes and system. However, the evaluation does suggest that a more consistent and formal approach to strategic programme management is required, which would also inform operational management including information management and monitoring.

²⁸ 22 of 45 respondents to the question

5. Outputs and outcomes

Coverage

- 5.1** This section sets out the outputs and outcomes of GRD based on the feedback from the survey of beneficiaries, qualitative consultations, and wider primary research. The outputs and outcomes are set out for GRD Awards, Collaborative Awards and Project Definition Awards separately, alongside wider strategic outcomes. The data presented in this section are gross; they have not been adjusted for additionality, which is discussed in the subsequent section.

GRD Awards

- 5.2** The evidence on outputs and outcomes for GRD Awards is drawn principally from the survey of beneficiaries, with 127 responses with a GRD Award. Data from Invest NI PPEs is also presented related to commercialisation outcomes and quantitative effects.

Progression through TRLs

- 5.3** As discussed in Section 3, the development of new products/services was the core motivation for applying to the programme for a high majority of businesses. An important leading indicator on progress against this intent is progressing the R&D project through stages of commercialisation. To provide evidence on this, the survey asked respondents to estimate the Technology Readiness Level (TRL)²⁹ of their project concept/idea before the programme and either when the GRD-funded activity finished (for completed projects) or at the point of the survey (for on-going projects). The following classifications/descriptions were used:

- TRL 1: Basic principles observed and reported
- TRL 2: Technology concept and/or application formulated
- TRL 3: Proof of concept
- TRL 4: Basic technological components integrated to establish they will work together
- TRL 5: Testing technology in a simulated environment
- TRL 6: Testing prototype in a simulated operational environment
- TRL 7: Prototype demonstration in an operational environment
- TRL 8: Technology proven to work under expected conditions, further developmental testing/evaluation
- TRL 9: Technology proven

²⁹ TRLs are described as a "technology management tool that provides a measurement to assess the maturity of evolving technology" by UK Government. For example, see [here](#)

5.4 The results are in Table 5-1. The data indicate the programme has successfully supported projects to progress through TRLs, with nearly all respondents reporting technology progression. Notably, over half reported technology progression of five to seven TRLs (e.g. from TRL 2 to TRL 7 or TRL 9). The average number of levels progressed was higher for projects with a GRD Award of over £50k (at 4.6 levels) than under £50k (at 3.7 levels).

Table 5-1: Technology development of GRD awards (n=126)

TRL before project	TRL at the end of the project or currently								
	TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
TRL1			2			4	4	9	5
TRL2			1		4	3	10	7	16
TRL3			1		1	4	5	7	9
TRL4						1	1	6	5
TRL5							1	1	1
TRL6							2	1	1
TRL7								1	3
TRL8							1		6
TRL9									3

SQW survey analysis

5.5 The data are summarised in Table 5-2 which sets out the proportion of projects at each TRL stage at the start of the funded activity and at the end/currently for on-going projects. Consistent with the aims and objectives of the programme, the survey evidence indicates a substantial shift in the technology readiness of projects, with approaching 40% at 'TRL 9: Technology proven' stage overall (and 44% if only completed projects are considered).

Table 5-2: Proportion of projects at each TRL, by the start & end (/currently) (n=126)

TRL	Start	End/Now
TRL1	19%	0%
TRL2	33%	0%
TRL3	21%	3%
TRL4	10%	0%
TRL5	2%	4%
TRL6	3%	10%
TRL7	3%	19%
TRL8	6%	25%
TRL9	2%	39%

Source: SQW survey analysis

5.6 The progress that projects claim to have moved through the TRLs is perhaps surprising, particularly given the early-stage nature of many; with around half of projects reported by

companies to involve concepts/technologies at TRL 1 or 2 prior to the GRD funded-activity. However, this does reflect the commercial imperative behind GRD Awards, with beneficiaries seeking to develop new products/services and enter either existing or new markets, and the scale of investment.

Commercialisation outcomes

- 5.7** Consistent with the positive findings on technology progression, the survey also provides encouraging evidence on commercialisation outcomes for completed GRD Awards. As shown in Table 5-3, of the 109 beneficiaries surveyed with a completed GRD Award, over half (58%) indicated that the R&D was complete and had been commercialised/implemented.

Table 5-3: Commercialisation of projects once GRD activity is completed, (n=109)

Commercialisation stage	% of projects
R&D is complete and now commercialised/implemented	58%
R&D is complete, but not yet commercialised/implemented	17%
R&D activity is continuing	12%
The R&D has been halted, but may be progressed in the future	10%
The R&D has been halted, and will not be progressed in the future	3%

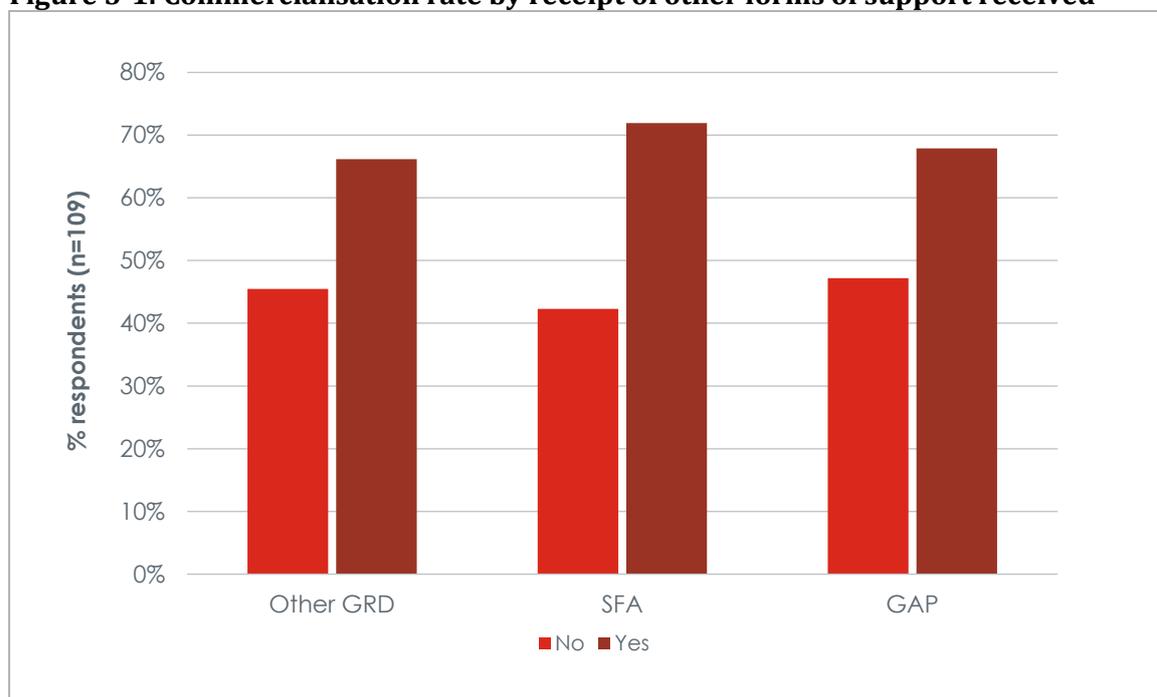
Source: SQW beneficiary survey analysis

- 5.8** In nearly all cases (62 of the 63 respondents), the commercialisation was of a new or improved product/service. The introduction of new or significantly improved processes was also evident, in 18 of the 63 cases (mainly manufacturing companies).
- 5.9** The proportion of respondents that had commercialised/implemented their R&D was consistent across beneficiary and project characteristics, with no significant variation for example by sector, size or project scale, duration and self-reported risk level. However, the level of commercialisation for the GRD Award covered by the survey was higher for those respondents that had secured other forms of support. The variation between those respondents that had and had not secured other GRD Awards (including Project Definition and Collaborative Awards), SFA and GAP support is set out in Figure 5-1. The variation in the commercialisation rate between those that had and had not received other support is statistically significant in all three cases.³⁰
- 5.10** This finding is perhaps not unexpected. In relation to the relationship to other GRD awards, the qualitative research with companies that had secured multiple awards in the evaluation period provides some explanations. The research indicates the existence of both direct and indirect links between projects, with the commercial outcomes from one project allowing companies to fund next stage of project pathway for other R&D activities, and the learning and experience from projects often being shared across teams, helping to manage and identify risks supporting effective project outcomes. These processes may also be relevant for SFA

³⁰ Using a two-sample z-test: Other GRD significant at 5%; SFA significant at 1%; GAP significant at 5%

and GAP awards. However, there are important implications for the attribution and additionality of the programme, which are considered in Section 6.

Figure 5-1: Commercialisation rate by receipt of other forms of support received



Source: SQW beneficiary survey analysis

- 5.11** Two other points are noted. First, of those respondents that indicated the R&D is complete, but not yet commercialised/implemented, or that the R&D activity is continuing (n=32), the high majority (29 of 32) do anticipate that they will introduce a new or significantly improved products or service to the market in the future, and 9 expected to introduce a new or significantly improved process. This is encouraging, although it does limit learning opportunities on “what does not work” in commercialisation from the survey evidence.
- 5.12** Second, the survey evidence suggested that the programme was helping firms to understand where there is *not* a market for a potential product/service/process. As set out above, 13% of beneficiaries with completed projects stated that the R&D project had been halted. Whilst this may not initially appear as a positive outcome (and there may be a range of reasons why projects were not progressed unrelated to the programme), this may lead to efficiency effects if this is preventing companies from investing additional resources in ideas or concepts that are not technically viable or do not have commercial potential, and/or where market conditions are not appropriate. Indeed, whilst the sample size is small, of the 14 companies where the R&D had been halted, four stated this was because the R&D demonstrated that the project idea was not commercially viable, with five citing external economic and business conditions.

Effects on business behaviours and capabilities

- 5.13** Further to commercialisation outcomes, and reflecting the objective of the programme to increase R&D innovation capability and capacity amongst supported companies, the survey indicated that a range of positive effects on behaviours and capacities have been generated. As shown in Table 5-4, around 90% of beneficiary survey respondents stated that the GRD Award had led to improved staff skills/knowledge, and/or an improved management or understanding of R&D processes. Given that most beneficiaries surveyed had engaged in R&D activity prior to the programme, this is a positive finding. The programme also appears to be having an effect on improved networks and connections for companies with the research community, which was evident for over half of cases; this is important in terms of the wider contribution of the programme to the NI innovation ecosystem.
- 5.14** GRD Awards appears to be having a modest effect on reducing business costs, with half of respondents reporting that they do not expect any effects here. Reducing business costs is not a core focus of the programme, and given the modest focus on new/improved process development this is not unexpected. However, self-reported effects on overall business productivity are more positive, identified by over half of survey respondents.

Table 5-4: Business behaviour and capability outcomes (n=127)

Outcome	Experienced already	Expect to experience in future	Have not and will not experience
Improved staff skills/knowledge	91%	5%	5%
Improved management / understanding of R&D processes	87%	4%	8%
Improved understanding of market position and opportunities	83%	6%	10%
Improved networks and connections with research community	62%	10%	27%
Reduced business costs	25%	24%	49%
Improved overall business productivity	56%	17%	26%

Source: SQW survey analysis

Innovation measures and wider outcomes

- 5.15** The survey of beneficiaries also sought to identify the extent to which GRD Awards have led to the achievement of tangible innovation outputs such as patents/other forms of IP and licences, funding, and influenced R&D investment. The findings are set out in Table 5-5. It is notable that over a quarter of beneficiaries reported that the GRD Award had led them to apply for/secure IP or patents, and a further 20% expect this to occur in the future. The survey therefore suggests that the programme is supporting the filing of new patents, and if projects progress as expected, around half of participants consider that the programme will have led to a patent or other forms of IP. This is an encouraging finding, particularly as patents/other forms of IP may not be appropriate, relevant, or timely in all cases.

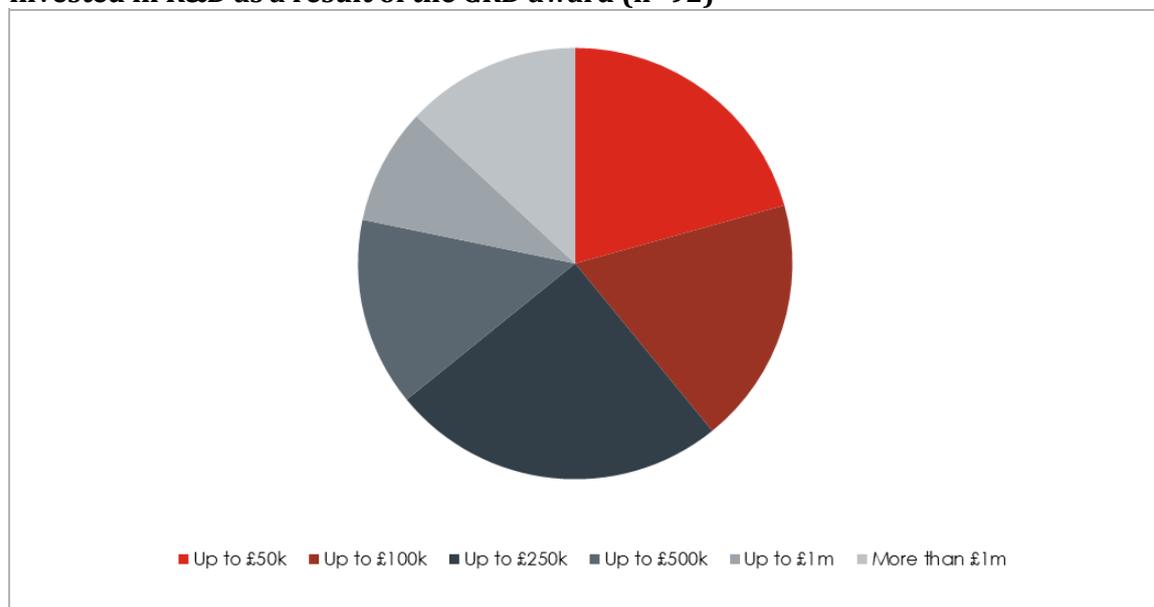
Table 5-5: Innovation capability outcomes, (n=127)

Outcome	Experienced already	Expect to experience in future	Have not and will not experience
Patent applications/award/IPR registrations	28%	20%	48%
Licensing deals	17%	30%	50%
Secured public innovation funding	23%	13%	57%
Increased business investment in R&D	74%	15%	11%

Source: SQW beneficiary survey analysis

- 5.16** For respondents that identified they had secured other public innovation funding as a result of the GRD Award (n=29), the most common source was Innovate UK, evident for 15 companies. This is important in the context of the current focus of the '10X Economy - an economic vision for a decade of innovation' where a key focus is better positioning NI-based businesses to compete for UK-level innovation funding. The survey suggests that the GRD Award can play an important role here, where companies require further follow-on funding.³¹
- 5.17** For respondents that identified they had increased their businesses investment in R&D as a result of the GRD Award (n=94), the scale of this varied substantially, as set out in Figure 5-2.

Figure 5-2: Response to: How much more of your own funds has your business invested in R&D as a result of the GRD award (n=92)



Source: SQW beneficiary survey analysis

- 5.18** It is notable that although there was some relationship between company size and the level of additional R&D investment (with medium/large companies accounting for a higher proportion of investment of over £500k than up to £500k), large-scale investments in R&D of

³¹ According to the survey results, 33% of recipients of Project Definition Awards that are currently preparing a bid for further funding are considering alternative public sector sources (not Invest NI), however, the sample is too small to generalise this finding to the programme population (n=2 out of 6).

over £500k were also reported by some micro and small companies, suggesting that the programme contributes to increasing BERD across the whole spectrum of supported businesses.

Quantitative outcomes

5.19 As set out in the Logic Model, anticipated outcomes of the programme include increased employment and turnover effects in supported firms. The survey of beneficiaries sought to provide evidence on the employment and turnover effects realised by March 2020. Evidence on the proportion of increased turnover that comes from export markets was also sought.

5.20 It is important to recognise that whilst routes and time-paths to market will vary by sector and company, generally we might expect that companies with GRD Awards earlier in the evaluation period are more likely to have realised benefits than those supported in later years. This said, there may be interim sales which occur sooner. The data therefore covers all companies surveyed, with trends by timing identified where these are evident.

Employment

5.21 The self-reported survey data suggest that GRD Awards have had a positive effect on employment levels for around half of supported companies: of those companies that provided a response (n=120), 49% stated that employment increased as a result of the GRD Award, 48% that there was no change, and a small number reporting a reduction in employment.

5.22 The proportion of companies indicating positive employment effects was consistent by sector, and there was no relationship between those companies that were new to R&D/not new to R&D (as defined by Invest NI) and employment effects. However, there were some significant variations across characteristics:

- micro-sized companies were *less* likely to report employment effects than small/medium/large companies, at 39% and 58% respectively
- companies with GRD Awards of less than £50k were *less* likely to report employment effects than companies with awards over £50k, at 40% and 64% respectively
- companies with SFA, GAP and other GRD Awards were *more* likely to report employment effects than companies without these other forms of support respectively.

5.23 Companies with GRD projects with an expected duration of less than a year were significantly more likely to report employment effects than those with projects with an expected duration of over two years. This does not appear to be related to the timing of the support, with no consistent trend in relation to the timing of the project. This may reflect that shorter projects are closer to market and able to realise employment outcomes in the short-term.

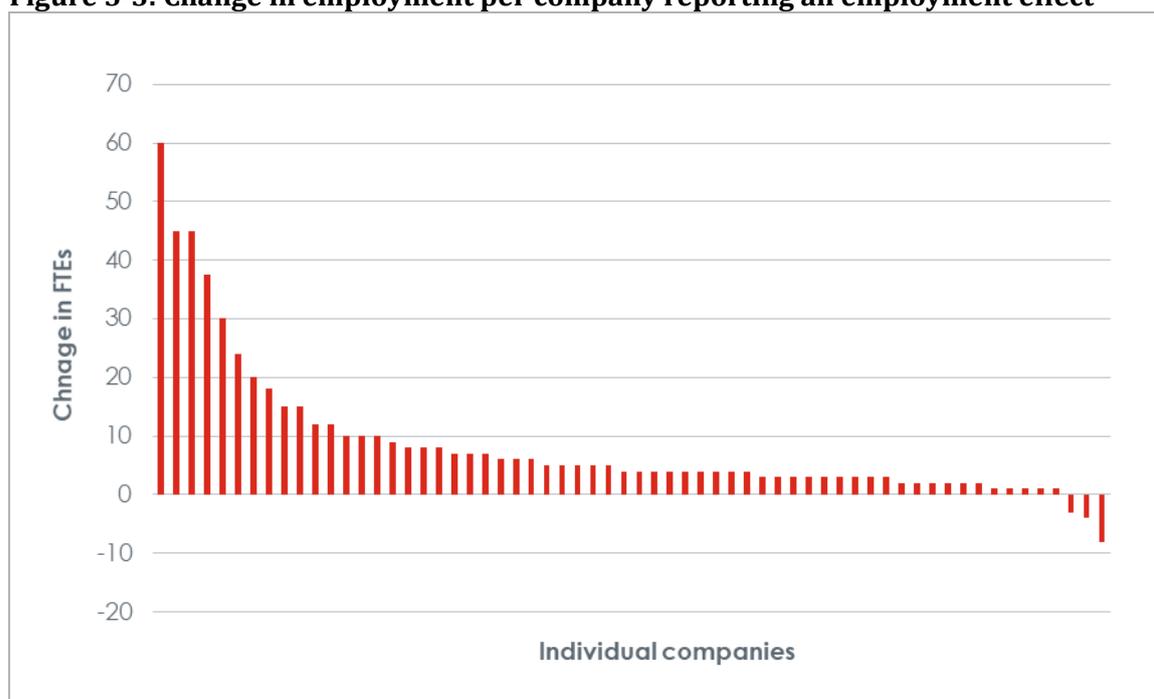
5.24 The scale of employment change (gross) is set out in Table 5-6. The data indicate that on average those companies reporting employment effects had 8.5 more employees by March 2020 as a result of the GRD Award (with a median of 4.0).

Table 5-6: Average employment effects

	Number of companies	Aggregate effect
Employment 'higher because of GRD'	59	540.5
Employment 'lower because of GRD'	3	-15
Total change (aggregate)		525.5
Average change per company (n=62) - mean		8.5
Median change per company (n=62)		4.0

Source: SQW beneficiary survey analysis

5.25 The range of employment effects is set out in Figure 5-3, for those companies that reported a change owing to the GRD Award. It can be seen that the range is quite substantial, from a reduction of eight employees, up to an increase of 60 employees (the latter a large manufacturing company). This is consistent with the variation of the programme and the nature of R&D support which can lead to a wide distribution of effects at an individual company level, and survey suggests that the scale and nature of employment effects is therefore quite varied across the beneficiary cohort.

Figure 5-3: Change in employment per company reporting an employment effect

Source: SQW beneficiary survey analysis

5.26 In this context, it is noted that the average (mean) effect was higher for medium/large firms at 18.5 employees compared to micro and small companies, at 3.7 and 5.2 respectively. Companies in the ICT sector also reported lower levels of employment change than other sectors (at 5.0 employees). Interestingly, although support from other GRD Awards and SFA was associated with a higher proportion of companies reporting employment effects, the scale of the effect where realised was similar.

Turnover

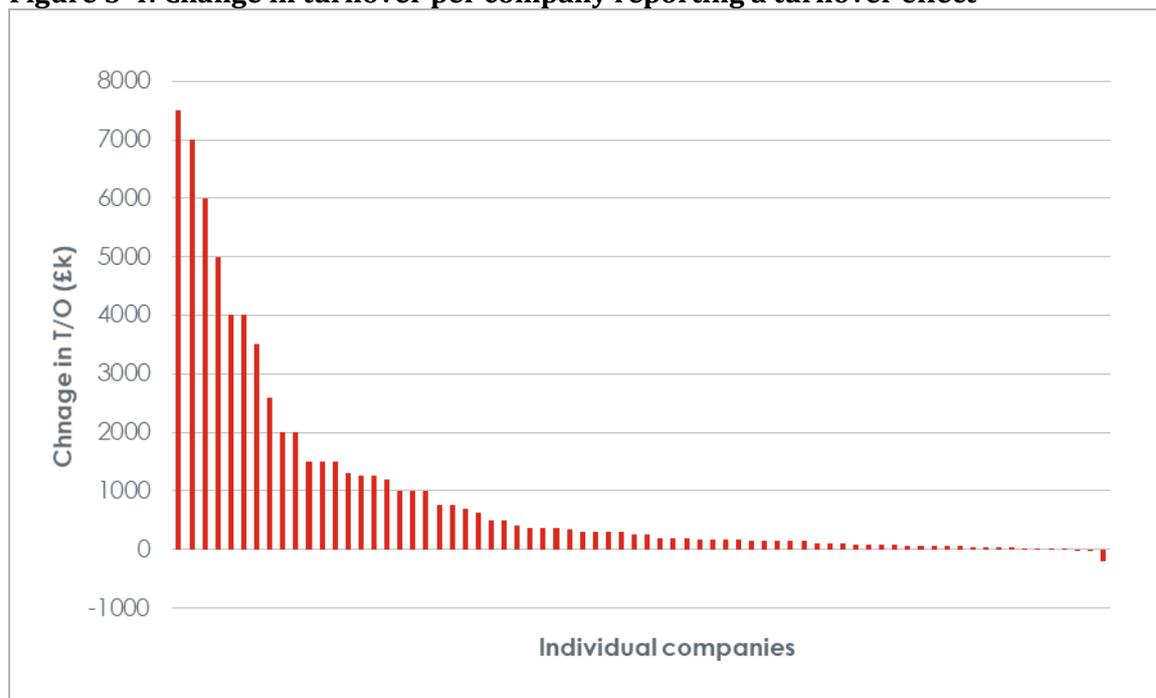
- 5.27** The self-reported survey data suggest that GRD Awards have had a positive effect on turnover levels for around 60% of supported companies: of those companies that provided a response (n=121), 61% stated that turnover had increased as a result of the GRD Award, and 36% that there was no change in turnover, with a small number reporting a reduction in turnover.
- 5.28** The proportion of companies indicating positive turnover effects was consistent by sector, and there was no relationship between those companies that were new to R&D/not new to R&D (as defined by Invest NI) and turnover effects. There was also no variation between companies with GRD Awards of less than £50k and more than £50k in turnover effects.
- 5.29** However, there were some significant variations across characteristics: small companies were *more* likely to report turnover effects than other company sizes, at 82% for small companies and 53% on average for other sizes combined; and companies with SFA, GAP and other GRD Awards were *more* likely to report turnover effects than companies without these other forms of support respectively. Interestingly there was no variation in terms of project duration, and there was also no consistent pattern by the timing of support, with companies supported by a GRD Award in later years reporting turnover effects.
- 5.30** The scale of turnover change (gross) is set out in Table 5-7. The data indicate that on average those companies reporting this effect had turnover around £920k higher by March 2020 as a result of the GRD Award (with a median of £250k).

Table 5-7: Average turnover effects

	Number of companies	Aggregate effect
Turnover 'higher because of GRD'	69	66,658,999
Turnover 'lower because of GRD'	3	-249,000
Total change (aggregate)		66,409,999
Average change per company (n=62) – mean		922,361
Median change per company (n=62)		250,000

Source: SQW beneficiary survey analysis Note: data excludes one outlier

- 5.31** The range of turnover effects is set out in Figure 5-4, for those companies that reported a change owing to the GRD Award. Again, the distribution is consistent with the anticipated skewed effects of R&D activity. In this context, it is noted that the average (mean) effect was higher for medium/large firms at £2.4m compared to micro and small companies, at £440k and £785k respectively. Companies in the ICT sector also reported higher levels of turnover change than other sectors (at £1.2m).

Figure 5-4: Change in turnover per company reporting a turnover effect

Source: SQW beneficiary survey analysis

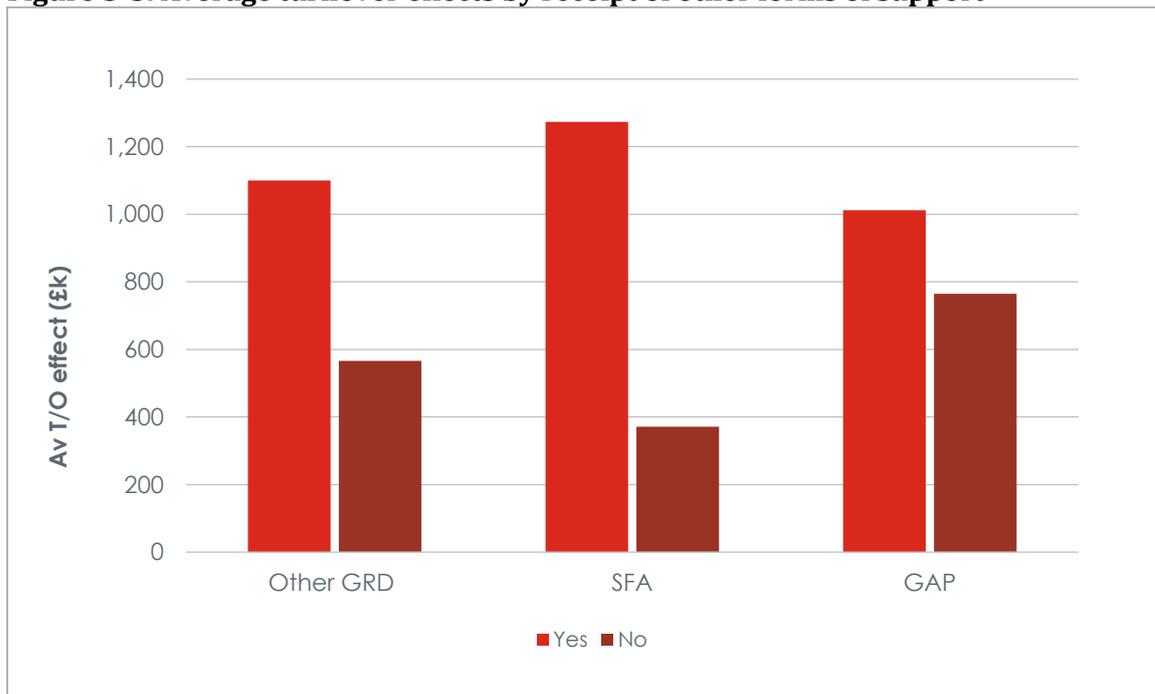
5.32 Table 5-8 presents the sales breakdown by markets as reported by the survey respondents who identified a turnover effect. The figures reflect the export-oriented nature of Invest NI clients and GRD's aim to increase international competitiveness (as set out in the logic model) with only 14% of sales taking place in Northern Ireland and almost half the revenue generated in export markets (46% including Republic of Ireland and other international markets).

Table 5-8: Average share of achieved sales by markets

Market	Average reported share of sales
Northern Ireland	14%
Rest of the UK	41%
Republic of Ireland	11%
Other international markets	35%

Source: SQW beneficiary survey analysis

5.33 Unlike employment, where other support was not associated with higher absolute effects, in the case of turnover, there was a clear relationship. As shown below, the average gross turnover effect was substantially higher for those companies with Other GRD Awards, SFA and GAP support compared to those without this other support. This again highlights the role of GRD Awards as part of a broader suite of support provided to companies by Invest NI.

Figure 5-5: Average turnover effects by receipt of other forms of support

Source: SQW beneficiary survey analysis

Collaborative Awards

- 5.34** The qualitative research with organisations involved in Collaborative Awards indicated that similar commercial and quantitative benefits can be, and have been, realised from this aspect of the programme. In some cases, the nature of benefits was very similar to the evidence from the GRD Awards, with project activity leading to technology progression, the commercialisation of a new product, and direct quantifiable benefits in terms of sales, although consultees found it challenging to provide specific quantification of effects.
- 5.35** However, reflecting the varied scale and nature of Collaborative Awards, some of which are long-term and focused on establishing research platforms or ‘centres’, and involving multiple different elements, the routes to impact are more complex, long-term and indirect. The potential of these projects is very significant; however, quantitative benefits are likely to be realised over the longer-term, and potentially via indirect mechanism. For example, one of the projects consulted involved establishing a facility to enable SMEs to undertake testing activities to support the development of new products, where the commercial benefits will be realised for SME partners. A second project consulted involved the establishment of research centres that focused on enhancing a company’s understanding of underpinning technologies and processes through collaboration with academic partners, including via student placements, secondments, and research projects; the focus was not on the development of specific new products/services. Collaborative Awards of this nature are very distinct from the wider programme, although they provide an important contribution to the wider R&D capacity and infrastructure in NI.

5.36 In this context, the consultation identified examples of Collaborative Awards leading to formal academic outputs (realised or anticipated) in terms of academic papers/journal articles. Whilst it was recognised that this was not the primary focus – even for academic partners, as reported or observed – it was identified as an important driver for engagement and benefit for academic collaborators. The qualitative evidence also identified a range of benefits that are common for organisations involved in Collaborative Awards. Benefits included:

- **Knowledge development** through knowledge sharing between partners in the R&D delivery and management process (e.g. during regular progress meetings). One interesting finding was that knowledge development was seen to be particularly important for small firms, with the Collaborative Awards enabling small firms to access the expertise and knowledge from partners that would not otherwise be available
- **Reputational and network benefits.** This included a range of related mechanisms including enhanced profile for academic working with industry partners, and vice versa, and access to the networks and relationships of partners
- **Post-project collaborative activity** which directly or indirectly linked to the Collaborative Award funded by the programme e.g. via the continuation or application of the research generated by the original project in follow-on activities.

Project Definition Awards

5.37 The findings from the beneficiary survey in relation to the outputs and outcomes of Project Definition Awards were positive in terms of the effects on the business. For example, of the 22 companies surveyed, all either agreed strongly (15) or agreed (7) that the Project Definition Award contributed to enhancing project definition capabilities within their business. Further, as shown in Table 5-9, in most cases companies reported that the Project Definition Award had led to improved staff skills/knowledge, improved management/understanding of R&D processes, and an increased likelihood to invest in R&D.

Table 5-9: Outcomes from Project Definition Award (n=22)

Outcome	Experienced already	Expect to experience in future	Have not and will not experience
Improved staff skills/knowledge	16	3	3
Improved management / understanding of R&D processes	18	2	2
Increased likelihood to invest in R&D	16	3	2

Source: SQW beneficiary survey analysis

5.38 However, the survey also suggests that the outcomes of Project Definition Awards vary in terms of the specific effects on the project covered. Of the 22 Project Definition awards covered, in 10 cases the project had been halted (owing to issues including lack of finance, external economic conditions and commercial/technical viability). Of the projects that had

progressed (n=12), one had been awarded a GRD Award, five had progressed with other sources of funding (including the companies own funds), and in six cases a subsequent bid for further funding was being developed/assessed, which was a GRD Award in four cases.

- 5.39** Although the sample size is small, and so care must be taken into reading too much into the data, the survey does indicate that the effects of Project Definition Awards can vary. The awards are helping companies to halt activities where these may not be viable, as well as leading into subsequent R&D activity funded via the programme or other sources.

Spillovers

- 5.40** In-depth interviews with organisations involved in Collaborative projects and those that secured multiple GRD Awards provided evidence of **substantial spillover effects from GRD-funded activities** (i.e. benefits occurring to other economic agents) that further contribute to cluster development, supply chain improvements, knowledge accumulation and lead to better business performance of a wider cohort of NI firms.
- 5.41** The qualitative nature of the evidence, varying time-paths to impact and complexity of ways in which the effects diffuse through supply chains and the wider economy (that are often project-specific) make quantification of spillover effects challenging, and this was not attempted within the evaluation. However, the gathered information gave an indication of the main groups of spillover beneficiaries and the most typical transmission mechanisms allowing us to conclude that **positive spillovers are common and significant from the programme**. To provide a note of caution on this finding, we note the evidence underpinning this conclusion comes from the larger projects, often strategic in nature. Further, the evidence draws on the *perceptions* of beneficiaries regarding if/how spillovers have been realised (i.e. observed effects on others), this has not been tested/calibrated with external organisations.
- 5.42** These points noted, we highlight the following three key findings in relation to spillovers:
- The groups of spillover beneficiaries most commonly identified by the interviewees include **customers/clients and suppliers**. Notably, **competitors** were also suggested to benefit from GRD-funded activities via spillover effects, more often from large-scale GRD Awards than from Collaborative activities.
 - There is evidence that benefits routinely flow back and forth between **partners on Collaborative projects**. Although these are not formally considered to be spillover effects, such ‘feedback loops’ should be regarded as an important benefit from GRD as they can compound direct benefits and amplify the programme’s impact.
 - Market spillovers from development of new products and services and taking them to market are likely, including e.g. positive health outcomes, lower levels of cyber crime, reduction in waste and related environmental benefits, improved availability of finance for innovative businesses etc.

5.43 The most direct benefits for **customers and clients** were perceived by beneficiaries to be realised via: **a) improvements in quality of existing products or services, b) reduction in prices, and c) from introduction of new technologies.** When GRD beneficiaries are B2B organisations, their clients are also seen to benefit from new market opportunities as they can widen their portfolio by introducing complementary products, offer higher-quality, cheaper solutions and enter previously unreachable markets.

5.44 Somewhat less common for customers, but nevertheless important, there are knowledge accumulation effects especially when they get involved in a consultation process that allows the GRD beneficiary to tailor the product to market needs and the clients to think through their requirements.

5.45 The **knowledge and skills accumulation effects** are much more substantial **for suppliers**, as they often get involved in consultations that allow them to be able to develop and deliver intermediate inputs required for the GRD-funded projects. Notably, there was evidence that in some cases GRD Awards contributed to **development of a new supply chain:**

“We could not design and build all the components of the product in-house. So we engaged with specialist vendors in order to complete the R&D activity, and passed on the technical requirements to the supply chain so that the suppliers could develop the necessary components. There was close interaction between all parties which resulted in effectively a new supply chain for the product.”

5.46 There are also **direct financial benefits for suppliers** to companies delivering GRD projects, as demand for their products increases. This effect can emerge during the research stage of GRD projects, and is likely to increase if and when new products and services supported by the project are commercialised and reach the market. At that stage, demand from the GRD beneficiary stabilises at a commercial production level, and there may be extra demand from consumers of the final product who may need parts for maintenance and servicing.

5.47 In addition to creating new supply chains involving existing businesses, GRD projects, particularly university-industry collaborations and large strategic awards, can also lead to **spin-out companies** that seek to fill in gaps in the market that were identified during R&D, attract FDI, and contribute to further cluster development and NI’s reputation as world leaders in particular sectors.

“Over the years the project resulted in c. ten spin-outs that attracted FDI and made existing inward investors to do more R&D in Belfast”.

5.48 Collaborators benefit the most from knowledge ‘feedback loops’ and access to **partners’ facilities** which can result in: a) research publications and improved understanding of the industry needs by academics, b) stronger R&D and production capabilities in the industry, and c) a larger pool of employees with relevant skills developed both through GRD project work and *course work* at universities that integrated lessons from

GRD-funded R&D into their teaching. The latter also has positive implications for the overall skill level of NI workforce over the longer-term.

5.49 The evidence suggests that **competitors** of GRD beneficiaries can also benefit from GRD-funded activities as they **gain knowledge about new technologies from research publications and/or copy the final product**. At the same time GRD beneficiaries are still likely to have the edge over the competition either because of the additional knowledge gained through the R&D that cannot be acquired without going through the same process or because their intellectual property is protected by patents and confidentiality agreements. Therefore, they are likely to additionally benefit from a faster growing market and better performing supply chains fuelled by the competition (even though occasionally negative effects such as losing staff to a rival company may occur).

5.50 All of the effects described above result in economy-level benefits that come directly from development of new technologies: e.g. better production efficiency, reduced waste and emissions, improved international reputation and competitiveness, better performing supply chains etc. In addition to this, in some cases GRD projects have led to economy-wide benefits not directly related to the R&D activities, rather owing to commercialisation and engagement activities associated with the project. For example in one case, there was evidence of perceived benefits related to improving access to finance for the wider NI-business base:

“NI businesses do not have a history of working with international Venture Capital to fund projects in this area. We have been in conversations with these international investors to support our trials. This has introduced these investors to the NI innovation ecosystem for the first time which may improve access to finance for other innovative firms in NI”

5.51 Overall, the evidence suggests that both Collaborative and GRD Awards can lead to substantial spillover effects. These effects contribute to the overall impact of the programme and should not be overlooked, albeit it was not possible to quantify these effects within this evaluation.

5.52 We note that an attempt to capture these effects more fully, and potentially quantify them, could be undertaken through a separate in-depth study focussed on Collaborative and strategic GRD Awards that would take into account the varying time-paths and routes to impact as well as project-specific channels of diffusion of the effects through the economy. Invest NI have already initiated this process by appointing independent consultants to undertake post-project evaluation of large awards. However, in our view, developing and utilising a common (but flexible) framework for these evaluations would allow to capture spillovers in a consistent way. This, in turn, would make it possible to obtain a more accurate estimate of the programme’s impact.

Wider strategic perspectives

5.53 Finally for this section, three high-level themes emerged from the consultations with partners and stakeholders which are important in considering overall programme outputs/outcomes:

- first, there was a consistent view that **the programme has played an important role in raising the profile, capacity, and position of R&D in NI through its activities**, including though some of the large-scale high profile collaborative projects involving NI's universities, and support to large inward investors and indigenous firms; this 'demonstration effect' was recognised as hard to evidence formally, but important in enhancing NI's reputation as a place for R&D investment
- second, and related to this, **the importance of the programme to supporting and enabling knowledge exchange from NI's universities was recognised**; as discussed above, the projects involving universities are (overall) quite different to the 'core' GRD Award focus of the programme, however, the scale of funding involved (with over £27m of offer value to projected led by universities in the evaluation period) was seen as an important contributor to the knowledge exchange and wider industrial engagement activities undertaken at both Queen's and Ulster
- third, **perspectives were more mixed in relation to the perceived 'success' of the programme in driving collaborative R&D behaviours and cluster/sector development**; whilst specific examples of benefits were identified in both cases, there was also a view that owing to the scale and breadth of the programme, and its long-term commitment to providing an 'open' service offer to businesses, these specific intents may have been less prominent than they could have been; we return to this issue in the Strategic Options Assessment.

6. Additionality and contribution

Purpose and approach

- 6.1** A key question for any impact evaluation is to establish the extent to which outcomes realised by beneficiaries are *additional* by examining the counterfactual scenario i.e. ‘what would have happened to outcomes in the absence of the programme’? This enables an estimate of the *net* impact and is particularly important when support is characterised by long and varied paths to impacts and the programme is a part of a wider landscape of available support.
- 6.2** This section sets out our findings on the additionality associated with identified outcomes and relative contribution of GRD support in achieving these outcomes compared to other factors affecting the beneficiaries. A more detailed description of the methodology, including all assumptions used in additionality and impact analyses can be found in **Error! Reference source not found.**
- 6.3** The primary sources of information for additionality assessment were: **a) the beneficiary survey, b) PPE data.** Issues of additionality were also covered via in-depth interviews with beneficiaries supported by Collaborative Awards and that secured multiple GRD Awards (to provide a complementary qualitative perspective on additionality, including in relation to ‘strategic’ projects), and in consultations with stakeholders and the Client/Technical Executive survey to provide further informed perspectives from those working with firms delivering projects and involved in the oversight and strategic management of GRD.
- 6.4** This range of perspectives alongside the survey and PPE evidence is important in order to provide an integrated view of additionality, including considering the potential for response bias (where respondents to the survey may have had a ‘better’ or ‘different’ experience than those that did not complete the survey) and optimism and pessimism biases (where the effects of GRD may be over- or under-stated in hindsight) in the survey sample and PPEs.
- 6.5** We emphasise two important points on the additionality and impact analysis (the latter covered in the next section). First, the **information available from the survey and PPE data was analysed independently.** When a project was in both samples, the net benefits were derived from gross figures based on additionality data presented in each dataset separately.
- 6.6** Second, there were **substantial differences in the level of detail and coverage of additionality between the PPE and survey samples.** The PPEs sample includes a categorical assessment of additionality (0%, 25%, 50%, 75%, 100%) which considers deadweight only (the share of benefits that would have occurred in absence of support). This does not take into account substitution (i.e. where supported activity may have substituted other activities) and displacement (i.e. where supported business may be displacing economic activity from non-supported businesses).³² The project level additionality estimated based on

³² The additionality estimate in the PPE does take into account time, scale and quality additionality and is adjusted downward when the beneficiary is also supported through SFA (approximately at the same time) and if the project substantially exceeds expectations.

the survey sample took into account deadweight as well as substitution and displacement. The deadweight calculation also included 'partial' additionality related to the scale and timing of achieved benefits.

Descriptive analysis of survey evidence on additionality

Deadweight

- 6.7** Table 6-1 presents the headline findings on deadweight, partial and full self-reported additionality from the survey sample. Note that this includes responses from companies that secured GRD Awards and Project Definition Awards.

Table 6-1: Self-reported additionality and deadweight from the survey

If you had not received the award, which of the following would have happened? N=149	%	Type of additionality
We definitely would not have achieved the same outcomes	27%	Full additionality
We probably would not have achieved the same outcomes	33%	
We would have achieved the same outcomes, but not as quickly	34%	Partial additionality (multiple possible)
We would have achieved the same outcomes, but not at the same scale	14%	
We would have achieved the outcomes, but at a lower quality	11%	
We would have achieved the outcomes anyway , at the same speed, scale and quality	1%	Deadweight

Source: SQW.

- 6.8** The findings are positive. **60% of survey respondents** with varying level of certainty **indicated full additionality** i.e. that they would not have achieved the same benefits without GRD support. Note, this 60% was evident for companies with GRD Awards only (i.e. excluding Project Definition Awards), and the overall responses were consistent to the full sample.
- 6.9** As often observed with business support programmes, partial additionality was also common, particularly in terms of timing, with more than a third of the respondents reporting that GRD brought benefits forward. Full self-reported deadweight was very low, just 1% of the sample.
- 6.10** A more detailed breakdown of responses on partial additionality reveals that:
- for respondents that identified timing additionality (n=50), a sizeable minority (almost 30%) indicated that the benefits would have been delayed by more than two years. This acceleration is particularly important for R&D projects as seizing the opportunity and beating competitors to market can to a large extent define whether the project is a success.
 - for respondents that identified scale additionality (n=21), more than 60% stated that without GRD less than half of the benefits would have been realised

- for respondents reporting quality additionality (n=16), the most common effects of GRD were associated with improvements in reliability of technology and generating greater knowledge.

Substitution

6.11 In the context of estimating additionality, substitution refers to whether involvement in GRD-supported projects limits beneficiaries' ability to engage in other business development activities. The survey evidence suggests a modest degree of substitution – the vast majority (more than 80%) of respondents, did not think they had not been able to engage in other activities because of GRD. However, a small minority of surveyed beneficiaries (5%) signalled a 'substantial' negative effect of GRD on their engagement in other activities.

Displacement

6.12 Displacement assesses the extent to which the benefits of an intervention amongst the target group takes away benefits from non-participants – in the case of GRD, displacement would occur where the products/services/processes enabled by GRD support take market share away from existing unsupported firms in Northern Ireland.

6.13 Evidence on displacement is based on self-reported information on two factors:

- Location of sales, with sales outside of NI assumed to be non-displacing: the average proportion of GRD beneficiaries' sales accounted for by customers in NI was approximately 20%, with almost half of the sample making less than 5% of their sales in NI. Note that these figures do not take into account the volume/scale of sales
- Whether these NI sales would be taken by competitors were the firm to cease trading (under normal market conditions, not during Covid-19 pandemic): almost 60% of surveyed businesses stated that they believed none of their sales would be taken, 26% that some of the sales would be taken and 14% that all of their sales would be taken by competitors if they were to close.

6.14 These two factors have been combined to identify a displacement value for each survey respondent. The average level of displacement estimated across the survey sample was approximately 8% i.e. less than a tenth of the sales would be taken by NI-based competitors. This low level of displacement reflects the nature of GRD as it supports largely export-oriented companies developing new products, services and processes.³³

³³ The PPE data also contained the information on location of sales, but without an indication whether NI sales could be taken up by competitors making estimation of displacement infeasible. It is also noted that a low level of displacement is consistent with the findings of the previous evaluation of the programme, where an 11% displacement average value was reported.

Quantitative analysis of additionality

- 6.15** For the quantitative analysis of self-reported additionality based on the survey data, metrics for Deadweight, Substitution and Displacement were developed at the level of each respondent to the business survey. These were then combined to arrive at a project-level additionality ratio in the range between 0 (fully non-additional) where beneficiaries stated that they would have achieved similar business outcomes anyway, at the same speed, scale and quality, through to 1 (full additionality) where none of the business outcomes would have been realised without GRD.³⁴ The project-level additionality in the PPE data was taken as reported, and as mentioned above it does not account for substitution and displacement.
- 6.16** Table 6-2 presents the average additionality levels observed in the survey and PPE sample. In considering the table, note that:
- the 'Average of ratios' represent the average of the individual project-level data. This does not consider the relative scale of gross benefits (i.e. it simply averages the additionality ratios estimated for each project in the PPE data and survey respectively)
 - the 'Net to gross ratio in the sample' is derived by applying the project-level additionality ratio to gross data for each project individually, aggregating the resulting net data to the sample level, and comparing it to the gross aggregate benefits (in terms of turnover, GVA and employment) observed in the sample.
- 6.17** Note that the data are for companies with GRD Awards only (as Project Definition Awards are not included in the PPE and data was not collected on turnover/employment effects of Project Definition Awards³⁵).

Table 6-2: Project-level additionality and net to gross ratio of benefits observed in the Survey and PPE

Ratio	Survey	PPE
Average additionality ratio	62%	86%
Net to gross ratio in the sample		
Turnover/GVA	53%	98%
Employment	61%	

Source: SQW

- 6.18** The variation between the 'average of ratios' and 'Net to gross ratio in the sample' are due to the differences in commercialisation rates and scale of effects across sectors and projects. For example, a project with high additionality may not commercialise whereas a project with a lower additionality ratio may yield substantial benefits which will contribute to the ratio of net to gross benefits being lower than the average additionality. Similarly, where businesses reported different scales of gross effects, the application to net will have different effects on

³⁴ A detailed description of the procedure used to arrive to the project-level additionality ratios as well as the average non-deadweight, non-displacement and non-substitution ratios observed in the survey sample are presented in **Error! Reference source not found.**

³⁵ The equivalent figure to the 'average additionality ratio' for PPE was very similar, at 63%

the aggregate picture e.g. a business reporting £100k of gross turnover and additionality of 0.5 (i.e. net turnover of £50k) will influence the overall net to gross ratio in the sample more than a business that reported £5k of gross turnover, even where it had a high additionality of 0.9 (£4.5k net turnover).

- 6.19** Overall, based on this analysis of survey and PPE data, our assessment is that the **additionality of GRD Awards is 'high'**. However, we highlight that the net to gross ratio in the PPE sample is 98%. In other words **nearly all benefits achieved by supported projects are assumed to be fully additional in the PPE data. In our view, this is unlikely to be a realistic level of additionality, both given the findings of the survey, and wider long-term evidence on R&D and business support interventions.**

Evidence on additionality from other sources

- 6.20** The evidence from the in-depth consultations with beneficiaries of Collaborative and multiple GRD Awards also found evidence of high additionality. Notably, 21 out of 27 consultees suggested that the project(s) in focus of discussion likely would not have gone forward without GRD support, and therefore the outcomes would not have been generated, due to either lack of resources or high level of risk or both. In the remaining six cases the interviewees reported time and quality additionality linked to a greater scale of impact.

“Likely that the product would have been inferior, developed with less resources and less profitable, with development taking longer, and not able to exploit the same commercial opportunities as an early mover”.

- 6.21** Evidence from interviews with beneficiaries of Collaborative Awards revealed that in certain cases in absence of GRD support the collaboration with existing partners would have continued even if the specific project would not have taken place; this is not unexpected given that in many cases the Collaborative Awards built on existing partnerships and relationships. However in addition to allowing the project to go forward the Award also facilitated the creation of new research connections for current and future collaborations highlighting the programmes additionality in enhancing both business and sector-level R&D capabilities.

“The project activity would not have happened because it would have been too risky and too costly for us to take forward. Outcomes of improved platform for R&D and improved networks wouldn't have happened without the project. We would have continued to work with our core, existing academic partners, but we wouldn't have built links with other academics”.

- 6.22** Further, qualitative feedback on additionality supported the role of the GRD programme in securing mobile projects which could be taken elsewhere. Importantly this applied not only to projects proposed by large international companies but to innovative early-stage businesses. This highlights the role and additionality of GRD in helping to: a) establish, enhance, maintain and promote sector and cluster strengths in NI, and b) ensure the R&D activity is driven by businesses of all sizes rather than a small number of large organisations.

“Development [in this area] is expensive, long term and risky. We could not afford to pay for the programme without GRD support.”

6.23 Consistent with the view of beneficiaries in the survey, the survey of Technology/Client Executives suggested a low level of deadweight with respondents on average reporting that fewer than one in ten of the projects they worked on would have gone ahead in the same form, with approximately half of the projects being regarded as fully additional, and the remainder benefiting from accelerated progress, larger scale or improved quality. The findings are summarised in Table 6-3. Further, considering the nature of outcomes realised by projects, the role of the programme in supporting the appointment of staff to deliver R&D activity was a key theme that emerged from the Technology/Client Executives on why projects were different because of GRD.

Table 6-3: Additionality assessment based on TE/CE survey

Thinking about the projects you worked on, in your opinion what would have happened in the absence of GRD?	Average % of projects
... definitely not have gone ahead	28%
... probably not have gone ahead	26%
... have gone ahead but in a different form (i.e. later, at a smaller scale, to a lower quality)	55%
... have gone ahead anyway in the same form	9%

Source: SQW Note: based on 46 responses. The figures do not sum to 100% because they represent the averages by category across respondents. The figures sum to 100% in each individual response but not when the averages by response are considered.

6.24 Interviews with stakeholders including those involved in the strategic oversight of GRD revealed that there is a clear understanding that the benefits from the programme are not and cannot be fully additional. However, all interviewees shared the view that the programme has generated additional impacts, supporting outcomes that would have been unlikely to have been realised without support. The programme was seen as particularly critical for SMEs given the prevalence of market failures and finance gaps. For example, one consultee noted:

“Perhaps with the exception of some large companies who already understand the importance of R&D, the programme is vital. It is very difficult to give a precise estimate for the additionality, but I wouldn’t be surprised if it was as high as 75%”.

6.25 The perspectives from the CE survey and stakeholder interviews presented above are by their nature less direct than those reported directly by GRD beneficiaries in the survey, and also during the PPE process. However, they provide a broader view on additionality of GRD beyond how it applies to a particular project or beneficiary organisation. Overall, these alternative perspectives corroborate the findings from the beneficiary survey that the **GRD programme delivers high levels of additionality** across the different types of awards by: a) addressing the key market failures around riskiness and costs of R&D, and b) facilitating realisation of greater benefits through speeding up the R&D, contributing to improved quality of project outputs and enabling greater research and knowledge creation.

Contribution

6.26 In addition to considering GRDs additionality, we also examined its *contribution* relative to other factors that may have influenced the outcomes reported by the beneficiaries. Our assessment of contribution was underpinned by:

- information on other developments in the business and externally taking place alongside the GRD-supported project reported in the beneficiary survey
- econometric analysis of factors associated with successfully bringing the product, service or process to market (achieving commercial sales), which is discussed in more detail in the following section.

6.27 The top three developments happening alongside GRD-funded projects which could influence the scale of realised benefits reported by the beneficiaries were: a) new business plan or strategy (63%), b) purchase of new equipment (58%) and c) changes in levels of market/cluster demand (58%). The level of detail of responses did not allow us to investigate whether the first two factors were directly or indirectly related to securing a GRD Award, however the third factor is external and potentially critical for a project's success, highlighting the importance of GRDs timing additionality.

6.28 The results of econometric analysis (discussed in detail in section 7) suggest that one of the factors consistently associated with greater chances of success among GRD supported projects is access to other complementary support from Invest NI (e.g. through Selective Financial Assistance, Growth Accelerator Programme and other mechanisms). The evidence indicates that projects undertaken by beneficiaries accessing other support may be as much as one and a half or two times more likely to succeed. This highlights the role of balanced, rounded complementary support for achieving success, and importance of alignment within the suite of mechanisms used by Invest NI to support their client-managed firms.

6.29 Overall, our interpretation of the beneficiary feedback and econometrics results is that other factors such as market conditions, activities undertaken by business and additional support received alongside GRD-supported R&D projects also played an important role in generating the benefits alongside GRD. This is to be expected, and highlights the complex relationship between specific R&D activities (supported by the programme), and wider business development. The inter-relationship to other forms of Invest NI support is also consistent with the increasing focus by the agency on seeking to provide an 'integrated' offer. Further, whilst other factors and support clearly matter for outcomes, the findings also suggest that the R&D activity that was supported through GRD would very regularly not have been progressed in that scale, form, or timing without the programme in the first place, and sometimes not at all. Therefore, although once underway other factors have been important for outcomes to be realised, these outcomes do derive in large part from the initial investment made through the programme, and would not have been realised to the same extent without it.

7. Impacts and value for money

- 7.1** This section outlines our approach to quantifying the interim net impact of GRD in terms of turnover, GVA and employment created by supported projects and presents the results of our analysis. The findings underpinned our assessment of the programme's value for money, which is also discussed, and informed the development of potential strategic options for the future of the programme set out in Part 2 of this report. A more detailed description of all steps in the analysis including any assumptions made is presented in **Error! Reference source not found.**

Overview of the approach to impact analysis

- 7.2** We attempted to quantify the net impact of Grant for R&D by extrapolating the scale of benefits generated by the projects for which we had evidence on commercialisation and business outcomes from (i) the beneficiary survey and (ii) Post Project Evaluations (PPEs) to the full programme population. Note that both analyses (based on survey and PPE evidence respectively) were undertaken *separately* and focused on GRD Awards only, they did *not* include Collaborative Awards (which are not covered by PPEs or the survey) or Project Definition Awards (which are not covered by PPEs in the evaluation period, and have been excluded from survey impact analysis). Perspectives on impacts generated by Collaborative Awards are discussed separately later in this section.
- 7.3** This '**scaling up**' approach was **complemented by separate formal econometric analysis** which allowed us to assess the influence of a wide range of project and business characteristics on achieved outcomes. We note that the 'scaling up' analysis did not consider any potential cumulative effects from multiple GRD Awards by the same company. However, such effects were controlled for in econometric analysis of programme impacts.
- 7.4** The impact analysis considered the following core business-level outcomes: **(a) turnover (b) Gross Value Added (GVA) and (c) employment**. In recognition that job creation is not the primary objective of the programme, **the analysis was focussed particularly on turnover and GVA**. The econometric analysis also considered commercialisation outcomes (that is whether a business did or did not commercialise a product/service/process as a result of the programme) and progression from a Project Definition Award to a GRD Award; note this is the one element of the economic analysis that did include evidence from the companies surveyed with a Project Definition Award.
- 7.5** **The evaluation focused on impacts achieved to date** by projects completed by end of 2020 calendar year (this is a subsample of the programme which includes 817 of the 1,243 GRD projects started during the evaluation period).³⁶ The beneficiary survey asked for the evidence of outcomes achieved to March 2020. Due to the particular sensitivity of topics around business performance and expectations about the future during Covid-19 pandemic,

³⁶ The reasons for selecting this particular cut-off are explained in detail in **Error! Reference source not found.**

data on expected benefits was not collected. The PPE data focused on impacts achieved at the point of the PPE (which vary).

- 7.6** However, to reflect the length of time-paths to impacts, and to provide an indication of the potential longer-term impact of more recent projects captured by the survey (which may not have had enough time for the full benefits to be accrued), we undertook **indicative and exploratory analysis that involved predicting the expected benefits** for projects completed over 2018-2020 **based on the scale of benefits observed in projects which were completed before 2018**. This information was used to provide an **additional estimate of the programme’s potential impact over the longer-term**, assuming that on average the benefits for more recent projects will follow the same trends as for projects which were completed earlier. Below we refer to this exercise as **Scenario A** in the sensitivity analysis.³⁷ To further test the sensitivity of the impact and value for money estimates, we also considered impacts based on the projects completed by end of 2017 only (**Scenario B**).
- 7.7** The findings of the ‘scaling up’ and econometric analyses using survey and PPE data have been triangulated and further interrogated to understand the sources of any differences in results. Table 7-1 summarises our approach to quantitative analysis of the programme’s impact.

Table 7-1: Types of quantitative analysis undertaken to estimate impact of GRD

Analysis	Sample	
	Survey	PPE
Core analysis		
Scaling up of observed benefits to programme population	✓	✓
	↓	↓
	Single-point Impact and VfM estimates	
Econometric analysis	✓	✓
Triangulation of evidence to support impact and VfM estimates	✓	✓
Sensitivity analysis		
Scenario A: projecting expected benefits	✓	
Scenario B: considering projects completed by end of 2017	✓	✓
	↓	↓
	Triangulated range of Impact and VfM estimates	

Source: SQW

³⁷ Scenario A is not exactly the same as forecasting the benefits expected over the next three years for each project (this was not possible due to challenges around collecting the necessary data during the pandemic), however it does assume the level of benefits observed in project that have had **at least three years** since completion will apply to more recent projects. In our view, this is a reasonable estimate of future expected benefits from more recent projects (subject to a fairly strong assumption that the trends will not change).

- 7.8** Overall, although complicated and varied reflecting the different evidence sources and analytical methods employed, the results all point in a consistent and positive direction, suggesting a substantive net GVA impact and positive position on value for money for the programme at this interim evaluation point.
- 7.9** In summary, we found that **over the evaluation period (July 2013–March 2020) GRD Awards generated between £130m and £315m of additional net Gross Value Added (GVA). These figures correspond to £1.63 (survey estimate) – £3.96 (PPE estimate) of additional net GVA generated by £1 of grant money paid out.** When, for illustrative purposes, the (arguably) more realistic levels of additionality observed from the survey are applied to the PPE sample gross impacts, the respective estimate reduces to £2.18 of generated net GVA per £1 of GRD.
- 7.10** The results of the analysis of potential expected benefits for projects completed since 2018 suggest that those projects may generate an additional £27m of net GVA over the next few years providing an indicative revised estimate of £1.97 net GVA per £1 of grant based on survey evidence, when expected impacts are taken into account.

Estimates of net impact from ‘scaling up’

Approach

- 7.11** The estimation of net impact of GRD Awards using the ‘scaling up’ approach was undertaken in four steps set out in Table 7-2.

Table 7-2: Steps in estimating impact of GRD Awards using the ‘scaling up’ approach

Step	Explanation
1. Calculate the average gross effect generated by a GRD Award project	<ul style="list-style-type: none"> Outcomes of interest: turnover, GVA and employment GVA conversion was undertaken at the project level using SIC-specific ratios
2. Calculate the average net effect generated by a GRD Award project	<ul style="list-style-type: none"> The net effect is calculated at the project level using self-reported data on additionality available in the survey and PPE samples (as described in section 6)
3. Scale up the impact to the programme population	<ul style="list-style-type: none"> Achieved through multiplying the effects generated by the average projects by the number of projects in the programme population and commercialisation rate observed in the samples The scaling up process reflects the differences in commercialisation rates by sectors Outliers excluded from scaling up and added to the overall estimate of the programme’s impact.³⁸
4. Sensitivity checks	<ul style="list-style-type: none"> Primary objective is to reflect the variation in time necessary for the effects to come through

³⁸ Outliers were defined as projects with reported benefits that are five standard deviations away from the average. This approach ensures that these successful projects are included in the estimate of the overall impact of the programme but should not be assumed to be systematic. The chosen threshold guaranteed that only a small number of ‘true’ outliers were excluded from scaling up.

Step	Explanation
	<ul style="list-style-type: none"> • The 'main case' estimate considers benefits generated to date by projects completed by end of 2020 • Two additional estimates: <ul style="list-style-type: none"> ➢ Scenario A: projects completed by end of 2020 with projects completed in 2018 onwards assumed to reach the same scale of benefits as project completed by the end of 2017 ➢ Scenario B: projects completed by end of 2017

Source: SQW

7.12 Our impact analysis took into account the sectoral composition of the programme and the differences in the average scale of generated benefits and commercialisation rates across sectors. To ensure consistency across various strands of work (i.e. scaling up, econometric and descriptive analysis) and meaningfulness of econometric estimates, which can be sensitive to particularly small groups of observations, sectors were grouped into larger categories: 'Manufacturing', 'ICT' and 'Other'. The categories were selected to represent the most common sectors observed in the programme population and at the same time provide groups of comparable sizes.

Impact estimates

7.13 Table 7-3 - Table 7-4 present the results of the first two steps in the analysis – the average gross and net benefits observed in the survey and PPE samples.

Table 7-3: Average gross and net benefits observed in the survey sample

	Manufacturing	ICT	Other	Full sample
Turnover				
Average gross benefit	£1,050k	£1,287k	£551k	£966k
Average net benefit	£591k	£711k	£362k	£554k
GVA				
Average gross benefit	£314k	£825k	£283k	£434k
Average net benefit	£162k	£448k	£180k	£239k
Employment				
Average gross benefit	8	7	10	9
Average net benefit	5	4	6	6

Note: figures exclude one outlier in terms of turnover benefits and four outliers on employment benefits. Source: SQW

Table 7-4: Average gross and net benefits observed in the PPE sample

	Manufacturing	ICT	Other	Full sample
Turnover				
Average gross benefit	£1,707k	£998k	£975k	£1,392k
Average net benefit	£1,691k	£984k	£939k	£1,373k
GVA				

	Manufacturing	ICT	Other	Full sample
Average gross benefit	£538k	£565k	£496k	£538k
Average net benefit	£533k	£557k	£477k	£530k

Note: figure exclude one outlier. Source: SQW

- 7.14** Two key messages are highlighted from this data. First, the **average gross benefits observed in the survey sample and PPE are quite similar**, particularly considering the breadth of the programme, variation associated with R&D activity, and difference in the derivation of the samples. Notably, the average gross GVA estimates are within 25% at c. £430k and £540k for the survey and PPE data respectively. The variation here can be, at least partly, explained by the survey sample including businesses with more recent GRD Awards (53%, 67 out of 127 had an end date in 2018 or later). This issue is addressed in the sensitivity analysis, discussed below.
- 7.15** Second, however, the difference in average net benefits is substantial, estimated to be c.£240k in the survey analysis, and c.£530k in the PPE analysis. This reflects the very different additionality estimates derived from the evaluation survey and provided by the PPEs as discussed above. Given the nearly 'full' additionality assumed in the PPEs, the net GVA effect from the PPE evidence is not materially different to the gross effect. By contrast, the survey evidence involves a material transition from gross to net average GVA effects, from £430k to £240k.
- 7.16** Table 7-5 presents the estimated impacts scaled up to the programme population (817 GRD Awards completed by the end of 2020).

Table 7-5: Estimated impact of main-stage GRD projects. Benefits realised to March 2020.

	Survey			PPE	
	Turnover	GVA	Employment	Turnover	GVA
Gross impact	£551m	£239m	3.1k	£845m	£320m
Net impact	£312m	£130m	2.0k	£834m	£315m

Source: SQW

- 7.17** As discussed above, the principal factor driving the variation between the survey and PPE evidence is additionality. If for illustrative purposes, we apply the average final survey-based additionality ratio³⁹ to the gross GVA data from the PPE evidence, the net GVA effect would be £174m. **This would provide a range of net GVA estimate of between £130m-£174m with a mid-point of £152m.**

Scenario findings

- 7.18** The results of our analysis of Scenario A, which estimates the scale of benefits yet to be realised by recent projects based on historical performance of projects completed at least

³⁹ Including the benefits generated by outliers

three years ago drawing on the survey evidence, are presented in Table 7-6. The analysis suggests an additional £27m of net GVA, an uplift of around 20% on the analysis of benefits realised to March 2020 (£157m vs £130m).⁴⁰

Table 7-6: Sensitivity analysis, Scenario A: programme impact estimates

	Total estimated impact under Scenario A			Projected expected benefits		
	Turnover	GVA	Empl.	Turnover	GVA	Empl.
Gross impact	£654m	£289m	3k	£103m	£50m	62
Net impact	£369m	£157m	2k	£57m	£27m	38

Source: SQW

Value for Money assessment

- 7.19** The impact estimates obtained through the scaling up exercise described above underpinned an assessment of Value for Money, focused specifically on estimating 'Return on Investment' (RoI) for GRD Awards started since July 2013 and completed by end of 2020.
- 7.20** The costs considered in this analysis are also a partial view of the costs of the programme, covering grant payments only. The analysis does not include costs associated with programme delivery. This reflects that the impact estimates cover the benefits generated by GRD Awards, whereas programme delivery costs include Collaborative and PD Awards.
- 7.21** Data on paid out grant values was provided by Invest NI and covered payments to December 2020. The tables below demonstrate the grant paid out to projects completed by end of 2020, the estimated net GVA generated, and the resulting net GVA/£ spent ratio. Table 7-7 presents our 'main case' estimates, reflecting the benefits generated to March 2020, while Table 7-8 presents the results of the sensitivity analysis Scenarios A and B.

Table 7-7: Estimate of GVA/£ spent

	Survey	PPE
Net GVA	£130m	£315m
Grant paid out	£80m	£80m
Net GVA/£ spent	1.63	3.96

Source: SQW

⁴⁰ The estimate of the programme impact based on scaling up to a smaller sub-population of projects completed by the end of 2017 (Scenario B) are presented in the following subsection and **Error! Reference source not found..** As the estimate is based on a smaller number of projects it yields as lower estimate for the aggregate impact of the programme which is not directly comparable to the results presented in Table 7-5 - Table 7-6. However, we consider those estimated in the value for money assessment discussed below.

Table 7-8: Sensitivity analysis. Estimates of GVA/£ spent including the projected expected benefits for projects completed since 2018 (Scenario A) and considering only projects completed by the end of 2017 (Scenario B)

	Scenario A	Scenario B	
	Survey	Survey	PPE
Net GVA	£157m	£79m	£195m
Grant paid out	£80m	£30m	£30m
Net GVA/£ spent	1.97	2.66	6.59

Source: SQW

7.22 As emphasised above, **the single main source of difference in the estimates between the samples is the levels of reported additionality.** If for illustrative purposes we apply the average final survey additionality ratio to the gross benefits reported in the PPE dataset, the net GVA/£spent ratio is 2.18 in the core analysis considering all projects completed by the end of 2020 and 3.62 under sensitivity Scenario B.

7.23 Overall the analysis suggests strong impact additionality and RoI of GRD Awards. Our main case estimate of RoI based on survey data is 1.63 based on the benefits achieved to March 2020. This increases to 1.97 in further exploratory analysis when potential future benefits are considered. The RoI estimates from the PPE data are higher, reflecting principally the very high level of additionality assumed in the underpinning dataset.

7.24 Considering the differences in: a) additionality assumptions between the samples, b) the composition of the samples and the degree to which they represent the programme population, and c) the natural variation in the composition of the programme in terms of project characteristics, including scale and duration; in our view the estimates obtained during the analysis should be seen as the range of potential RoI for the programme, providing a lower and upper bound, there is no one 'true' RoI estimate. Further, the data derived from the scaling-up needs to be triangulated with the econometric findings, set out below.

Econometric analysis of impacts

Approach

7.25 Formal econometric analysis of survey and PPE data allows the findings to be explored further, by isolating the effects of individual business and project characteristics on achieved outcomes. Data from both samples was analysed separately using three types of models, all of which belong to the class of '**dose-response**' models. They estimate the effect of the programme by comparing the outcomes across the beneficiaries exposed to different levels of support, using those which received less support as a 'quasi-comparison' group for those which received more support.

7.26 Econometric analysis focused on the following outcomes of interest: **a) the level of achieved net sales** (a continuous measure), and **b) project 'success'** i.e. achieving a commercialised

outcome for GRD Awards or, in the survey sample, progressing towards a main-stage project (or securing alternative funding) for Project Definition awards (a binary measure).

- 7.27** The three dose-response models used in the analysis were: a linear regression dose-response model; the non-linear dose-response model suggested by Cerulli (2012)⁴¹; a logit dose-response model.
- 7.28 The linear dose-response model** allowed us to estimate the average effect of an additional pound of GRD investment on net sales, controlling for project and business characteristics. This model provides an easily interpretable result representing the average effect of additional spending across all levels of support.
- 7.29 The Cerulli (2012) model** allowed us to further analyse the differences in the outcomes for beneficiaries exposed to different levels of treatment. This analysis looked beyond the average effect of additional support, and tested whether there is an ‘optimal’ size of GRD Award. This also allowed us to assess the precision of the estimates of the effects at different levels of support, an important factor given that larger awards are less common, and the overall effect could be statistically insignificant only because of the uncertainty around the outcomes for larger projects.
- 7.30 The Logit model** focussed on estimating the probability of success based on the level of support and other project and business characteristics and was aimed at determining the factors associated with ‘success’ in commercialisation from GRD Awards (or progress to a GRD Award for Project Definition Award beneficiaries).
- 7.31** In determining whether a variable has a statistically significant effect **we used the 10% level of statistical significance**. In other words we allowed ourselves to be wrong with probability of no more than 10% when concluding that the effect was present. The decision to use this level rather than a 5% level of significance reflects the uncertainty and natural variation in outcomes that characterise R&D activities, which make it more challenging to detect the effect using statistical techniques.
- 7.32** Below we present the key findings from econometric analysis. Further details including the list of explanatory variables used in each model and detailed estimation outputs are presented in **Error! Reference source not found.**

Key findings from econometric analysis

- 7.33** The main objective of econometric analysis was to isolate the effect of GRD support on realised outcomes from the effects of other project and business characteristics. The results of fitting a linear model suggested that controlling for other variables on average an extra **£1 of GRD Award is associated with £4 (survey estimate) to £5 (PPE estimate) of achieved**

⁴¹ Giovanni Cerulli, 2012. "A continuous treatment model for estimating a Dose Response Function under endogeneity and heterogeneous response to observable confounders: Description and implementation via the Stata module "ctreat," CERIS Working Paper 201218, Institute for Economic Research on Firms and Growth - Moncalieri (TO) ITALY -NOW- Research Institute on Sustainable Economic Growth - Moncalieri (TO) ITALY.

net sales. This relationship is observed across the full range of supported projects and is not driven by outliers.

- 7.34** Although the data cannot be compared directly reflecting the different methods employed, this finding is broadly consistent with the results of ‘scaling up’ and the value for money assessment presented above suggesting that on average each pound of GRD grant is associated with £1.76 – £2.2 of net GVA generated by supported projects.⁴²
- 7.35** The estimated effects of other project characteristics varied between the samples reflecting the wide range of supported projects, differences in sample composition and relatively modest sizes of both samples (the survey sample especially). One consistent finding was **the importance of complementary support for enabling higher levels of benefits.** For example, businesses that also receive SFA support tend to achieve higher levels of net sales from GRD projects than those that do not (on average by £350k - £400k).
- 7.36** This finding was further confirmed by the results obtained from the logit model. Based on historical data we observed that **complementary support** in the form of SFA or GAP awards or other GRD projects (including Project Definition Awards) **is associated with a substantial increase in the probability of achieving a positive outcome.** On average, **projects undertaken by organisations exposed to other types of support were 10 to 30 percentage points more likely to ‘succeed’.** In certain cases this is equivalent to doubling the chances of success. This finding is consistent across both survey and PPE samples.⁴³
- 7.37** It is important to note that our estimates **of the effects of additional complementary support on predicted probabilities of success should not be interpreted as causal.** They reflect correlations between characteristics and positive outcomes based on historical data, but they do not imply that offering a business more support will necessarily lead to a change in outcomes of their R&D.
- 7.38** This finding ties in with the point on *contribution* of GRD to the realised benefits relative to other factors discussed in Section 6 and suggests that, whilst the programme is important in achieving outcomes, other support schemes available to Invest NI clients may also play an important role in enabling those benefits *alongside* GRD.
- 7.39** Our analysis of potential non-linear relationship between grant size and achieved net sales indicated **that there is not enough evidence to suggest an optimal amount of support, suggesting a positive linear relationship,** consistent with the findings from the linear models presented above.
- 7.40** Looking across the analysed models we conclude there is no clear set of observable characteristics which could be used to target the support at *the operational level*⁴⁴ towards projects that can be expected to be more successful, neither is there is a specific level of

⁴² These figures were obtained by multiplying the estimated effect on net sales reported above by 0.44 – the average GVA/turnover ratio in the survey and PPE samples.

⁴³ As a robustness check we undertook the analysis excluding Project Definition Awards. This did not affect the results. Therefore, our findings are valid for the combined sample of GRD and project definition awards as well as for GRD Award only. Due to the small sample size, a separate analysis considering only project definition awards could not be performed.

⁴⁴ We discuss strategic targeting in line with evolving policy landscape in part 2 of this report.

support associated with higher benefits. This is expected given the uncertainty and risk inherent to R&D.

7.41 However, there is clear and consistent evidence that complementarity of various types of support matters. These findings were taken into account when considering a range of strategic options for the programme going forward, which are set out and discussed in Part 2.

Benchmarking

7.42 There is limited recent evidence available to enable direct quantitative benchmarking of the impact and value for money analysis, and care must be taken in making direct comparisons to other periods and programmes, including from evaluations where different research methods have been used. In this context it is noted that recent evaluations of Enterprise Scotland R&D Grants and the Enterprise Ireland Research, Development and Innovation Programme did not provide RoI estimates.

7.43 This said, two points are noted:

- first, the findings compare favourably to the previous evaluation of the programme from 2014 that reported a RoI of £0.20 GVA benefit realised for every £1 assistance, with the majority of benefits still to be realised at the point of this earlier work (which focused on awards over the January 2009 to June 2013 period)
- second, an evaluation of Innovate UK's Smart Awards⁴⁵ (R&D grants for SMEs) estimated a RoI of 2.8:1 - 3.4:1 for awards in 2011/12-2012/13, based on self-reported analysis (excluding economic multipliers, consistent with the analysis above); importantly, this RoI of Smart grants estimate included expected as well as realised effects.

7.44 Caution is required in drawing too much from these comparisons. However, the comparison to the earlier evaluation does demonstrate the progress made by the programme in realising quantitative impacts. Further, the programme appears to be broadly in line with wider evidence on the RoI of R&D grants (with RoI estimates in the range of 1.6:1 to 2.7:1 using the survey evidence for this programme), particularly given this does not include any anticipated future GVA impacts owing to the uncertainty associated with the effects of COVID-19.

Evidence on impact of Collaborative Awards

7.45 The evidence on impacts generated by Collaborative Awards was collected during in-depth interviews with beneficiaries. As demonstrated in Section 2, Collaborative Awards tend to be larger than GRD Awards, reflecting their long-term nature and broader strategic objectives which often go beyond developing a new product or service and are aimed at increasing the sector or cluster capability and capacity to undertake cutting-edge R&D.

7.46 At this point in time, the evidence on direct impacts in the form of achieved sales and generated GVA is more limited than for GRD Awards. Achieved gross sales reported by

⁴⁵ See [Smart funding: assessment of impact and evaluation of processes](#)

interview participants ranged between approximately £200k and £3.8m. These figures are broadly in line with the scale of benefits observed among non-collaborative GRD awards as reported above. However, projects discussed in over half of the consultations were ongoing or had not yet commercialised (e.g. were at the stage of trials or required further R&D). Therefore, the scale of the impact is likely to increase as more projects come to completion.

- 7.47** The evidence suggests a limited direct impact of Collaborative Awards on further investment into R&D by the beneficiaries with only a few interviewees reporting this effect (without specifying the scale) to date. However, this was to be expected as large organisations involved in Collaborative Awards tend to undertake continuous R&D and **the impact of GRD support is indirect through supporting long-term research collaborations and sequences of projects which are funded through a range of sources and mechanisms.**
- 7.48** The importance of networking and collaboration effects in stimulating further R&D, developing clusters and expertise and contributing to improved research and innovation R&D ecosystem in NI was emphasised in several interviews.

“[As a result of Collaborative Award] we enhanced our networks by engaging with academics from disciplines we wouldn’t usually engage with. We further broadened our network when we were introduced to external parties those academics collaborate with. This has led to conversations about future R&D projects”.

“We are committed to Northern Ireland. This collaborative project helps to develop NI’s [...] infrastructure and so will support our future activities”.

- 7.49** Being often focused ‘on the long game’ and re-positioning of Northern Ireland for business-led R&D, collaborative projects gave some of the longest and varied paths to impact. The evidence we gathered suggests that the parts of the Logic Model and Theory of Change that reflect collaborative activities are being borne out in practice. However, at this interim stage, in our view, it is not possible to reliably quantify the impacts of collaborative projects at the programme level. This reflects both the limited number of observations as well as uniqueness of each ‘strategic’ project. Moreover we highlight that currently Collaborative Awards are commonly collaborations between industry and academia with some projects having a large research component. Assessing additionality and attribution for such projects will be particularly challenging at a subsequent final evaluation stage. The potential approaches for this should be considered by the programme team, including the scope for some in-depth, detailed case-based project-level evaluation, potentially employing theory-based methods reflecting the complex routes to impact and multiple explanatory factors, as recommended in the Magenta Book (HM Treasury evaluation guidance).⁴⁶

⁴⁶ [The Magenta Book - GOV.UK \(www.gov.uk\)](http://www.gov.uk)

8. Evaluation conclusions and recommendations

- 8.1** In headline terms, the findings of the interim evaluation are positive. The GRD programme responds to a well-established and long-standing strategic imperative to drive-up levels of R&D investment in NI, it has a well-established rationale to address market and other failures that prevent companies from taking forward projects, and it has delivered very positive results in terms of technology progression and the introduction of new products and services to the market. Importantly, both the new evidence collected for the evaluation, and the evidence collected by Invest NI for PPEs, suggest that most GRD Awards lead to the commercialisation of a new product or service, which subsequently generates sales.
- 8.2** Alongside the direct benefits in terms of new products and services, the evaluation also indicates that wider benefits are realised for supported companies related to improved capability to undertake R&D, including enhanced skills and understanding. The self-reported evidence on productivity is also encouraging, with over half of companies surveyed reporting their overall business productivity had improved as a result of the GRD Award.
- 8.3** This self-reported evidence on productivity is reflected in the quantitative analysis which indicates that the programme has supported the generation of significant net sales and GVA effects, and there has also been a material contribution to employment in NI.
- 8.4** A range of estimates of the scale of the impact have been identified through the evaluation analysis, reflecting both the breadth and scope of the programme, and seeking to exploit the range of evidence on performance through Invest NI PPEs, alongside survey evidence. The estimates which in our view best represent the likely scale of impacts from ‘scaling-up’ results from the samples of the survey and PPEs to the population of companies supported by GRD Awards, suggesting that the programme generated net GVA of between £130m-£174m by March 2020. The range increases to £315m if unadjusted⁴⁷ PPE evidence is used.
- 8.5** The scale of GVA impact is therefore very significant, even when considering the lower end of the range, and suggests that Return on Investment (RoI) is positive. The value of grant paid out for GRD Awards was £80m, suggesting that at least £1.63 of GVA has been generated to date for every £1 grant paid. Using unadjusted PPE evidence the RoI is higher, at £3.96.
- 8.6** The key factor influencing the variation in the findings of the ‘scaling-up’ analysis between the survey-based data and the PPE-based data is the level of additionality associated with the programme. Overall, additionality is considered to be high, at over 60% on average, and over 50% when considering gross to net turnover effects specifically (based on survey evidence).
- 8.7** However, the survey suggests an important element of the additionality of the programme is related to the timing of outcomes, and to a lesser extent the scale of outcomes. Put another way, whilst the survey suggests that some of the activity associated would have been

⁴⁷ By ‘unadjusted’ we mean when the additionality factors from the PPE dataset are used, rather than if the additionality ratios obtained from the survey data were applied to the PPE dataset. For a more detailed discussion of the methodology see **Error! Reference source not found.**

delivered in any case, and some of the outcomes would have been realised, they would commonly have been later or at a smaller scale. The importance of this partial additionality is not reflected in PPE data, where outcomes are estimated to be essentially fully additional.

- 8.8** Complementing the ‘scaling-up’ analysis, econometric analysis suggests that controlling for other variables on average £1 of GRD Award is associated with £4 (survey estimate) to £5 (PPE estimate) of achieved net sales, and also a positive GVA return on investment compared to the grant paid.
- 8.9** Taken together, although the specific estimates vary, all of the evidence from the evaluation points to a positive picture for GRD Awards in terms of value for money, with the RoI estimates generally in the region of around £2-3 to £1. Given the scale of the programme, the diversity of projects supported, and the inherent risk in R&D activities, this is an encouraging finding at this interim stage, although it is noted that the data are based in all cases on self-reported evidence.
- 8.10** The econometric analysis also provides some useful learning on whether there are characteristics that might explain how and why benefits have been realised. The analysis indicated that there is *not* enough evidence to suggest an optimal value of support (rather, a positive linear relationship was found), and looking across the analysed models there is no clear set of observable characteristics which could be used to target the support towards projects that can be expected to be ‘more successful’. Neither econometric nor survey analysis could provide sufficient evidence on “what does not work”: the statistical modelling did not identify any clear patterns associated with barriers to commercialisation, whilst the absolute majority of non-commercialised projects covered by the survey still expect to bring a new product, service or process to market, which is partly due to long time-paths to impact.
- 8.11** Interestingly, however, there appears to be a relationship between the receipt of other complementary Invest NI support and higher levels of benefits: companies that also received SFA support tend to achieve higher levels of net sales from GRD Awards than those that do not (on average by £350k - £400k), and other support was also found to be associated with a substantial increase in the probability of achieving a positive commercialisation outcome.
- 8.12** The quantitative analysis set out above focuses on the GRD Awards. Collaborative and Project Definition Awards are also important components of the programme, with the former accounting for a quarter of the total offer value. The evidence indicates that Collaborative Awards have generated in some cases similar quantitative benefits to GRD Awards. However, in many cases these projects are also fundamentally ‘different’, involving support for research centres, platforms and programmes which are likely to lead to substantive benefits but over the longer-term and in different ways. This aspect of the programme was seen as important by strategic consultees, however, it is addressing a different set of issues, and this needs to be recognised fully when considering the future of the programme, and wider support. There was evidence that the collaboration itself can add value and generate benefits including in relation to enhanced networks, knowledge, and on-going R&D activities.

8.13 Project Definition Awards, though representing a modest component of the programme costs also play an important role, and are valued by stakeholders and those responsible for working with companies as an important initial route into R&D activities. The survey evidence suggests Project Definition Awards lead to improved capacity, and support companies to secure a range of funding, including but not limited to, the GRD programme.

8.14 The evaluation suggests that the programme has been well-delivered by Invest NI. There were high rates of satisfaction amongst supported companies with the GRD process, and the Invest NI teams involved in the programme. This said, the evaluation did identify some concerns around the systems and level of administration associated the programme from both beneficiary and delivery-side perspectives. Whilst some changes were implemented in 2018 to seek to address these issues including a more streamlined application process, some issues remain. However, in part the complexity of the programme is associated with its funding and approval model under the European Commission's R&D&I framework and single State Aid notification.

8.15 The evaluation also identified some concerns over the capacity and level of resource in the Programme Team given the scale and complexity of the programme. The evaluation evidence suggests that resource challenges have not impacted adversely on the performance of the programme from a business perspective, as reflected in the positive findings reported above. However, there is a case for considering how the administration of the programme can be streamlined to support effective delivery, and de-risk issues related to monitoring, data management and evaluation.

8.16 Four final conclusions are noted:

- First, a high share of companies supported by the programme with GRD Awards do *not* appear to have considered other forms of finance to progress their R&D activity. As such, whether the funding provided by the programme is genuinely needed in all cases and is addressing the issues and barriers preventing R&D, and not substituting for private investment, is not evidenced fully. This is likely to influence overall additionality, which was high, but arguably could have been higher. Notwithstanding the need for the programme to de-risk R&D activity, given potential budgetary constraints going forward, this should be addressed in order to enhance additionality and maximise impact.
- Second, multiple assistance to companies is an important characteristic of the programme. In most cases this is two awards, and appears reasonable overall. However, some companies secured a very high number of awards in the evaluation period, and this type of multiple assistance (including in some cases a very large number of small individual awards) is more prominent than might reasonably be expected.
- Third, there is considerable scope to improve the programme's approach to data management, with challenges faced in the evaluation accessing comprehensive data on supported projects, and no single repository of relevant information in digital format.

- Fourth, owing to the programme's funding model and context, there was no formal depiction of the rationale, objectives and anticipated outputs, outcomes and impact of the programme specifically, within the context of its role as a major contributor to the organisational-level targets for R&D investment set out in Invest NI business plans over the evaluation period. This led to some ambiguity over what GRD was seeking to achieve, which is also influenced by the very significant range of activities delivered, in terms of size, scope, technology stage and industrial/academic balance. This flexibility was welcomed by stakeholders and beneficiaries, but there was scope for greater clarity.

Recommendations

8.17 Strategic perspectives on Invest NI support for company-led R&D are considered in Part 2. However, considering the implications of the evaluation for the GRD Programme specifically, the following Evaluation Recommendations (ERs) are made.

ER1: Reflecting the positive findings of the evaluation, and subject to strategic policy decisions and resource availability on specific forms of intervention, the function performed by the GRD Programme should continue. The high-level purpose should remain to de-risk R&D investment, leading to projects that deliver economic impacts.

ER2: Invest NI should develop a formal Theory of Change for the programme, including a separate and distinct element for 'strategic projects', and clearly define the rationale, objectives and selection criteria for such projects within the programme's operating guidelines. The Theory of Change should include a discrete set of SMART objectives for GRD to provide clarity on its intended outcomes and impacts.

ER3: The delivery of PPEs for previously funded projects should continue. However, Invest NI should consider recalibrating the criteria and approach used to estimate project-level additionality to arrive at more realistic values. Resource permitting, Invest NI should also consider applying the new criteria retrospectively to PPEs from within the current programme period, ensuring consistency in the data available to inform the final evaluation.

ER4: Invest NI should consider establishing mechanisms to better enable an assessment of other finance considered by companies in the application and assessment process. This could include requiring further information, evidence, or statements, and this should be applied consistently and robustly to drive-up additionality and impact.

ER5: Invest NI should consider broadening the definition of 'new to R&D' to reflect wider, not solely Invest NI-supported, R&D activities, which should be used instead of or alongside the indicator that focuses previous GRD support. This will provide a more accurate representation of the programme's effect on business engagement in R&D and innovation.

ER6: Invest NI should look to reduce the level of 'repeated support' (Project Definition to GRD/Collaborative Award excepted), particularly for companies that have previously secured awards. A hard and fast rule is not proposed, however, common repeat support with

companies securing three, four, or more awards in the space of a single Invest NI Business Strategy period should be actively discouraged and avoided.

ER7: Invest NI should track linkages between GRD projects undertaken by the same company to enable quantification of cumulative benefits. This would include tracking the progress of Project Definition Awards to GRD Awards or Collaborative Awards.

ER8: Invest NI should further improve consistency of monitoring and PPE data through automation that would seek to minimise manual input when data needs to be transferred between different databases.

ER9: Invest NI should consider undertaking detailed project-level evaluations (separate to the PPE process) for large-scale Collaborative Awards, and relevant 'strategic' GRD Awards, reflecting the complex and extended routes and time-paths to impact, and multiple explanatory factors. We acknowledge that Invest NI has appointed independent consultants to carry out post-project evaluations of large awards. In our view, these evaluations could benefit from using a common but flexible evaluation framework that would allow to capture spillovers and wider benefits in a consistent way, making it possible to obtain a more accurate estimate of the programme's impact.

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