# Evaluation of the Grant for Research and Development & Smart (UK)

## 1. Introduction

This case study presents a review of the *Evaluation of [the] Grant for Research and Development & Smart (2009)*.[1] This evaluation is an economic impact assessment of an innovation support measure that started life known as Smart in 1998, although it was renamed in 2003, rather prosaically, as the Grant for Research and Development (GRD). The scheme provides grants to Small and Medium-sized Enterprises (SMEs) to cover part of the costs of carrying out in-house research and innovation projects. It does not receive ERDF co-funding.

The rationale behind the GRD scheme is that SMEs frequently don't have sufficient access to capital to be able to finance otherwise promising development projects. This may because they do not have a long credit history and so little is known about them, or it may be because their small size makes them seem to be a risky investment. Either way, repercussions of this market failure results in less innovation happening at the national level than the optimum required to create growth in the UK economy.

It has a variety of different grants sizes, starting at only £20,000 but going all the way up to £500,000. The scheme has invested roughly £30 million a year since it began, with a total investment of around £240 million, granted through more than 4,200 awards in the 8-year period under review.

The evaluation is interesting because it addresses a large-scale national innovation support measure that has been running long enough for the anticipated impact on innovation and economic growth to be revealed. Moreover, the scale and importance of the scheme warranted a comprehensive evaluation using advanced statistical techniques to test whether it has been effective.

The scale of the scheme meant that the best way to capture the full extent of its economic impact was to use a large-scale telephone survey. The systematic and comprehensive collection of economic benefits made the work amenable to econometric techniques designed to model the skewed distribution of benefits arising from a portfolio of single-company investments in research and innovation.

## 2. Description of the evaluated measure

The original SMART scheme was conceived by the Department for Trade and Industry, mirroring a similar scheme that had been running successfully in the US for more than a decade. As the Grant for R&D, the scheme was relaunched by the renamed industry ministry, the Department for Innovation, Universities and Skills (DIUS) as a national scheme that was delivered locally by the nine English Regional Development Agencies (RDAs). This meant that the Terms of reference was designed by DIUS but was actually managed by one of the RDAs (the one in London.)

DIUS and the London Development Agency (LDA) ran a competitive tender and ultimately decided to award the work to PACEC, an economic consultancy with close ties to the University of Cambridge and an enviable reputation in carrying out policy studies and evaluations. In addition to this, PACEC had past experience of the GRD scheme, having carried out the two preceding evaluations.

[1] The report is available to download at www.bis.gov.uk/files/file52026.pdf.

The evaluation was commissioned against the backdrop of two important political decisions, the first concerned the place of GRD within the country's wider business support portfolio,[2] and the second concerned the need to gather evidence of the impact of the RDAs.[3]

The immediate objective of the GRD scheme was to provide SMEs with the capital they required to develop innovative products and processes in order to increase the productivity and profitability of assisted SMEs and increase the number of successful high growth firms in the UK, which contribute to an innovative enterprise climate.

The scheme also had the intermediate objectives of improving the overall innovation performance of the SME sector and the amount of technology take-up and adaptation that occurs in England. The scheme's longer-term objectives were to help SMEs overcome their reluctance to engage in risky research both by sharing in the costs and by helping to build recognition of the importance of R&D.

There were four types of grant available in recognition of the different phases in the typical cycle of new product development:[4]

- **Micro Projects** are grants for up to £20,000 to enable small enterprises with up to 10 employees to develop modest prototypes for new products or processes.
- **Research Projects** are grants of up to £100,000 to enable medium-sized enterprises of no more than 50 employees to do planned research or critical investigation lasting between 6 and 18 months, to develop new scientific or technical knowledge that may be useful in developing new products or processes.
- **Development Projects** are grants of up to £250,000 to enable enterprises with less than 250 employees do industrial research into pre-production prototypes of new products or processes.
- **Exceptional Projects** are grants of up to £500,000 for enterprises with less than 250 employees to do technology developments that may have higher costs, but have potentially strategic importance such as bringing wider economic benefits to the region and strengthening the technological or industrial sector. These grants are not available in every region.

## 3. Designing the evaluation study

The Terms of Reference was drafted by the DIUS team and comprised an overarching set of questions, timetable and budget. The questions asked were:

- Has the programme met its **target outputs**? For example, has it genuinely encouraged technological innovation in SMEs? Do they have better access to private finance than they did before?
- What is the **long-term impact** of the programme? E.g. Has the project succeeded in changing the behaviour of SMEs? How have the supported

[2] In the mid-2000s, the UK government concluded there were too many business support measures, and a decision was taken to reduce the confusion through a Business Support Simplification Programme (BSSP). The ambition was to reduce the 3,000 or so measures to no more than 100. The criteria for inclusion were essentially twofold: a demonstrable and important market failure and an evidently effective response.

[3] Impact of RDA spending: Main Report (March 2009), by PWC for the Department for Business, Enterprise & Regulatory Reform (BERR). This meta-analysis examined more than 100 evaluations of business-related programmes covering more than £1 billion in public expenditure.

[4] There are three types of grant presently, which are: proof of market (<£25K, 60%), proof of concept (<£100K, 60%) and prototyping (<£250K, 35%).

businesses developed? Is there evidence of regional variation in this respect? Does the grant help SMEs exploit cutting-edge science?

- Is the programme still **relevant**? Does the scheme address real needs and align with the RDA's Regional Economic Strategies? Has it genuinely helped to address market failures?
- Is the scheme **cost-effective** and what is its **economic impact**? Does the scheme represent good value for money? Which project types offer the best value for money?

The main focus of the evaluation was therefore to assess the impacts of the scheme in terms of how it had changed the 'innovation' behaviour of the assisted firms and commercial outcomes and how effective the scheme had been in terms of its wider objectives to correct for certain market failures in the investment attitudes of small businesses. It also assessed the relevance of the scheme by looking at whether there was still an economic argument to be made in terms of a market failure in the supply of finance. The management of the scheme was rightly considered to be out of scope because of the large-scale of the scheme: several smaller and more operational evaluations were run at the same time by the Regional Development Agencies.

There was no explicit necessity to run the evaluation as the next set of changes to the scheme were already in the pipeline, so any recommendations would not be able feed into them.[5] However, it was felt that an evaluation was needed in order to collect new evidence on the efficiency of the scheme, which could be used to petition the government for funding, because there is a stipulation that all schemes of its kind must be regularly evaluated.[6]

Once the Terms of reference had been outlined, the programme management team had the data needs of the evaluation checked with their in-house economists, who determined what kind of sample sizes would be needed from each region in order to arrive at sufficiently robust results to assess the success of the programme. The DIUS then liaised with the RDAs to ensure that they brought their records fully up to date. This meant checking that no records were missing so that a complete contact list of businesses had been prepared before the release of the tender and was ready to be given to the winning contractor.

Because the scheme is ultimately run and managed by the regional agencies, once the Terms of Reference had been finalised by DIUS they were handed over to the London Development Agency (LDA), who represented all nine RDAs during the evaluation and took over the process of running the tender exercise and contract management. However, the DIUS policy team and economists remained actively involved in managing the evaluation through their presence on the steering committee.

The evaluation took around seven months to carry out and the budget was just under £100,000 (€120,000). This is arguably a rather small budget and tight timetable, given the methodologically challenging nature of the evaluation questions and the size of the scheme (£30 million a year, 8 years, 4,200 awards).

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[5] The scheme's offer had only very recently been redesigned following consultation with business and the delivery teams, resulting in the addition of 'Micro projects,' which were small grants of £20,000 to enable businesses to do feasibility studies and the maximum grant allowance for exceptional projects had been increased to £500,000.

[6] All schemes that fell under the Business Support Simplification Programme (BSSP), as described in footnote 4, must be regularly reviewed to ensure that the rationale for the scheme or programme remains relevant to current business circumstances. It was widely perceived within DIUS and the RDAs that the scheme was highly successful. Nonetheless, it was important to have a more current evaluation done, as the scheme had not been evaluated since 2001, to check that the scheme was in fact delivering good value for money and to provide new evidence to make a substantiated case to the government for continued support of the scheme.

# 4. Implementing the evaluation: methodology and process

## 4.1 Collecting the evidence

PACEC were selected to conduct the evaluation through a restricted invitation to tender wherein DIUS had drawn up a shortlist of around 10 consultancies and academic research groups with experience of carrying out economic impact assessments in the research and innovation field. Ultimately PACEC won the work based on a combination of demonstrable expertise and price (thanks in part to their experience carrying out the previous SMART evaluation, in 2001). PACEC also have their own in-house team capable of running large-scale telephone surveys, which gives them an advantage over other consultancies that have to out-source this work.

The process of evaluating the GRD scheme began with an inception and planning stage. The evaluator worked closely with the steering group to identify the correct policy documents, to decide who would be interviewed and to agree on what the main focus of the evaluation should be.

The next step was to undertake desk research to enable PACEC to come to grips with the necessary policy documents relevant to the scheme and the evolving policy framework. It also enabled PACEC to compile management information on applicants and approval rates and to compile background information about the RDAs, such as their regional economic and innovation strategies and any relevant evaluations that might have been carried out at the regional level.

The bulk of the evidence collected was in the form of survey data collected via computer aided telephone interviews (CATI). PACEC estimated that they needed a sample of around 700 respondents to represent the wider population of award winners. The sample was developed iteratively by the CATI team so that there were approximately 24 interviews per UK region and per scheme (GRD and Smart). Within this sample, 384 businesses were drawn at random, while the remaining businesses were also selected at random, but in such as a way as to ensure there were at least 24 businesses in each category. In the event, PACEC consulted 659 businesses.

Furthermore, PACEC calculated that in order to have a robust counterfactual sample, they would need to contact between 200-250 matched businesses drawn from the failed applications in order to have a large enough sample to make the econometrics meaningful. They succeeded in securing interviews with 191 firms, with a minimum of 20 businesses from each of the nine English regions and a minimum of 40 businesses that had applied for each of the four types of award (£20,00 through to £500,000).

The choice to select the counterfactual sample from the non-beneficiary firms enabled PACEC to find firms with innovative projects that the firm's believed would be eligible for funding, and that had similar characteristics to the beneficiary firms. Matching SMEs would have been very hard to find any other way. If there were any systematic differences between the two groups (as we would expect there to be, as one group failed and the other did not) then it makes sense to deal with this using statistical techniques during the analysis stage.

PACEC designed two, slightly different surveys that depended on whether the interviewees were beneficiaries or non-beneficiaries. However, they addressed the same topics:

- The survey opened with **basic information** about what region and industry the business was in, how many employees the business had, how much turnover it had and what type of award it received, etc.
- It then sought to **characterise** the business with questions such as what its innovation objectives were, whether it collaborated or networked with other hi-tech firms or HEIs, etc.
- It asked what intermediate **outputs** had been realised as a result of participating in the scheme, such as whether the scheme had helped to strengthen an

'innovation culture' in the beneficiary firms or whether the project had resulted in a new technology.

- It also included questions to help to uncover **whether the scheme filled a genuine gap in access to finance**, by asking questions like whether the business sought alternative forms of funding before it made the application, and whether the business used alternative forms of funding after the project started. It also asked failed applicants whether they had undertaken their projects anyway, and if so whether the timing and scale of the project had been affected at all.
- The survey also asked questions relating to the **wider effects** of the scheme. For example, it asked what impact the project had had on the customers, suppliers and competitors of the business. It asked questions regarding the spatial and sectoral markets for sales of the products of the project (in order to analyse where the benefits of the project were accruing) as well as what kinds of goods, services and materials the business purchased. It also asked what effect on its competitors it would have if the business ceased trading.
- Finally, it asked for **open-ended feedback** on the key features of the Smart/ GRD scheme and its delivery and whether there was room for any improvements.

Follow-up interviews were conducted on a sub-sample of 40 businesses that had reported particularly successful and technologically interesting projects. The follow-up interviews were designed to obtain more detailed information on the nature and extent of the economic benefits. These interviews sought to take account of the highly skewed distribution of returns to any portfolio of investments in innovation projects, recognising that the majority of beneficiaries would not have seen especially interesting or profitable results. The expectation is that a minority of very successful projects should more than satisfy the return on investment ambitions for the portfolio overall. These semi-structured interviews also enabled PACEC to obtain more insight about how the GRD scheme adds value to innovation projects.

Finally, a survey was conducted of regional stakeholders. This survey asked the organisations to explain what their role was, and then characterise what their involvement with the Smart / GRD scheme was like. It also asked a series of questions about what kind of impact they thought the Smart / GRD had on beneficiary SMEs, and how this could be improved. In London, the stakeholders were also asked to compare Smart / GRD to other innovation policies and their impacts.

## 4.2 Analysis

Once the evidence base was complete, PACEC could undertake a systematic analysis of the scheme. There were three major ways that the information was processed:

- Firstly, the majority of the questions in the Terms of Reference could be answered using **simple descriptive statistics**, which illustrated what proportion of the respondents answered which questions. This presented important summary information that could be interpreted directly. For example, which region were beneficiary SMEs most likely to be successful in, or what proportion of failed applicants found funding via another route.
- Secondly, the **full economic impacts** of the Smart / GRD scheme were calculated using a set of guidelines called the Impact Evaluation Framework (IEF). The IEF is a framework developed by economic consultants for the British government, which was mandatory for innovation evaluations throughout most of the 2000s.[7] These guidelines require the analysts to start with the observable

[7] The Terms of Reference required proposers to draw up proposals with a methodology that was in line with the ministry's Impact Evaluation Framework (IEF), which is a standard evaluation methodology

change to jobs and turnover (gross, direct effects), and then require adjustments to be made for possible negative effects, such as the crowding out of private sector investment or displacement of other existing commercial activity (net direct effects attributable to the measure). The guidelines also require analysts to account for any possible positive effects, such as the benefits of additional employees spending their wages within the region or the additional for other companies in the regional or national supply chains (net direct and indirect effects).

- Finally, a **two-stage econometric analysis** was conducted in order to determine the extent to which the scheme had been successful in causing the supported businesses to grow, in terms of employment and turnover, as compared with the counterfactual population. This econometric calculation fed back into the preceding analysis, and the adjustment of the estimates of gross direct benefits with the estimated deadweight effect.

The first way the information was processed was using **simple descriptive statistics**, which are an important way to present the survey data so that the reader can easily interpret the results. These descriptive statistics usually take the form of the proportion of firms that answered a question, such as what region most beneficiary firms came from, or proportion of applicants failed. Comparative statistics are also important, such as the proportion of applicants that were successful in one region compared to the proportion of applicants that were successful in another. These quantitative findings were supplemented by interview evidence and qualitative observations drawn by PACEC during the evaluation, and were used to explain the survey findings.

The second way the information was processed was to work out what the **full economic impacts** of the Smart / GRD scheme had been. These impacts were calculated in line with the guidelines in the Impact Evaluation Framework (IEF).

The evidence used for the first stage of the analysis came predominantly in the form of survey responses from the beneficiary firms. The firms were asked what observable changes had occurred to their gross turnover and number of employees since receiving project funding. One reason why this impact cannot be interpreted alone is because there may be other important factors affecting the impact of the scheme. For example, assisted firms may show higher profits at the expense of existing businesses in the region that work in the same industry. If this was the case then the scheme would be simply be displacing existing business and this effect should be deducted from the gross observed change. This kind of evidence is calculated by asking the assisted firms if they believe that other firms in the region may be in direct competition with them, as there are not many other ways to collect this kind of information. Once all of these additional effects are taken into account, then the analysis arrives at the net effect of the scheme on the SME's turnover and employment figures.

A second important reason why the changes that had occurred to the beneficiary's turnover cannot be interpreted alone is that these firms were selected non-randomly because they looked as though they had promising innovative projects. It is therefore likely that they would have exhibited some growth even in the absence of financial assistance. This problem is overcome by using evidence from non-beneficiary firms, who are used as a control group. The net effect of the change in turnover and employees is calculated for the non-beneficiary firms and is subtracted from the change in turnover and employees of the beneficiary firms.

One of the problems with this way of calculating the total impact, although it is very thorough and is the accepted way to calculate economic impact in government organisations across the UK, is that the method for calculating the difference between

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developed in 2004/05 by DTI economists in collaboration with the Treasury and several economic consultancies. The IEF guidelines can be found at www.bis.gov.uk/files/file54095.pdf.

the treatment and control group does not correct for selection bias. Another issue is that there is no indication of how *accurate* the answer is, the way there would be if a statistical correlation were found.

The evaluation methodology overcame this problem by comparing the answer obtained using the IEF guidelines to the answer obtained using an econometric regression. An econometric regression is a statistical technique that is used to find whether one variable (or set of variables) has an effect on another variable. In this case, the regression was used to find out whether receiving the Smart / GRD grant made firms more likely to grow in terms of turnover and number of employees.

Once again, as with the IEF methodology, it was not enough simply to see whether the firms that received the grant grew, because they were probably going to anyway, or they would not have applied for the grant. Instead, it was important to use the data from non-beneficiary firms so that the regression could estimate how much *more* likely the firms were to grow, than the ones that had not received a grant.

This brings us back to the problem of selection bias. The basic problem is that the firms that won the grants may have certain predictable characteristics that made them predisposed to be chosen by the panel awarding the grants. For example, it may be that the panel tended to choose firms that were older, because they had a more established track record in making innovative projects work. If this was the case (and it is likely that it is because there must have been some differences between the two sets of firms if the panel were applying any kind of criteria) then this would bias the results of the regression, which was comparing the firms that won the award with the control group, because the two sets of firms would not really be similar.

The way that PACEC overcame this problem was to run a 'preliminary' regression that identified what kinds of factors made the firms beneficiary firms more likely to be selected. This was done by testing various different variables such as how old the firms were, how many employees the firms were, where the firms were located etc. Once the preliminary regression had identified these factors that made the two sets of firms different, it could remove them from the final regression so that there was no bias in the final results. This method is called the 'two-stage Heckman selection model.'

The report found that over the lifetime of the scheme 4,200 grants were made, summing to a total value of £239 million, resulting in 6,000 and 9,000 net additional jobs and between £400 million and £600 million net additional Gross Value Added (GVA) (without and with multiplier effects respectively) or over 2.5bn cumulatively. It also found that supported businesses enjoyed a range of other business performance effects and that in general, the scheme did help businesses become more 'successful.'

## 5. Effectiveness and efficiency of evaluation

Overall, this was an extremely thorough and well executed evaluation. The Terms of Reference were clearly written and all of the questions were realistic and achievable, within the proposed approach and timetable. The government placed a contract with a highly-regarded economic consultancy, which had the expertise and the capacity to carry out the evaluation on time and to budget, and their analysis used methods that were tried and tested and produced robust results.

As we have seen, the focus of the evaluation was on the economic impact and relevance of the scheme, rather than on the running of the scheme or on operational matters. This was entirely appropriate because the scheme was being evaluated at the national level. Smaller, regional evaluations were run alongside the national evaluation, which were in closer contact with the individual Regional Development Agencies that ran the scheme and had a stronger focus on the management on the scheme. It was also appropriate because the scheme had the clear objective of stimulating innovation and ultimately economic growth, which meant that this type of impact was easily observable and amenable to statistical testing.

Given that the focus of the evaluation was economic, it made sense, and was also mandatory, to use the IEF guidelines. These are basic guidelines that ensure that all the necessary factors are taken into account when calculating the full economic impact, and not just the change beneficiary firms experience after receiving a grant, which would be an overestimate of the real effect. Examples of other factors that should be taken into account are other businesses in the region that may become less profitable or innovative because they are now in competition with firms that are in receipt of a grant.

Because the scheme was a national scheme that had been running for over a decade, it was also possible to test whether firms that had received the grant were more likely to grow in terms of turnover and number of employees than firms that had not. Using two different methods for testing the economic impact of the Smart GRD scheme made the results much more robust. On the one hand, using econometrics to test whether beneficiary firms were more likely to grow counteracted some of the methodological problems inherent in using the simpler IEF guidelines. These included the problem of selection bias where firms in the control group may have been predisposed to be less successful and innovative than the firms that won the award.

On the other hand, the IEF method gives a much 'fuller' answer, in terms of understanding issues such as whether other businesses in the region are being displaced by the scheme, or whether firms have access to other forms of finance which would mean they do not need to rely on the Smart / GRD grant. These other factors are extremely important for understanding whether the scheme is filling the function that it is supposed to and whether it is still relevant. It was therefore useful to have both methods in play.

The data collection methods were appropriate for the task. Given the large numbers of firms that had to be contacted (700 responses from among more than 3,000 grantholders selected at random and 200 unsuccessful applicants) it was entirely appropriate to use a survey. This ensured that the evaluation method sufficiently represented the scheme in all regions of the UK and across both types of award (Smart and GRD). It also meant that the sample of firms contacted was large enough to make the econometrics meaningful.

It was also appropriate for PACEC to conduct in-depth interviews with 40 of the award-winning businesses that were particularly successful or had particularly interesting or innovative projects. This was clearly a non-random sample of interviews and so would not give a flavour of how the 'average' firm experienced the scheme, but this was useful because innovative projects are notorious for their 'skewed' returns: only the top few percent of any sample of innovative projects is likely to give a high return. By interviewing only the most successful projects, PACEC were able to understand what factors had been important for those successful few firms and could use this experience to draw lessons for future iterations of the scheme.

Finally, the evaluation was well executed. It took around seven months to carry out and the budget was just under £100,000. This is arguably a rather small budget and tight timetable, given the methodologically challenging nature of the evaluation questions and the size of the scheme (£30 million a year, 8 years, 4,200 awards).

## 6. Conclusions and lessons learned

Overall, the *Evaluation of Grant for Research and Development and Smart* was a thorough investigation into the impacts of the Smart / GRD scheme and its relevance to the UK economy. PACEC have chosen to use sensible, well-proven methods appropriate to the task, with few limitations that were not outside the scope of the Terms of Reference.

The dual use of both the IEF guidelines to test the wider economic impact of the scheme and the use of econometrics to more narrowly estimate the impact the scheme

had on firm growth, mutually reinforced each other and made the final conclusions more robust.

This approach could serve as an excellent example for future evaluations to follow, bearing in mind that there were two key characteristics that made this method viable. The first of these was that the scheme had the clear objectives to foster innovative projects in SMEs and to make those SMEs more profitable. This meant that both the IEF and the econometric methods could easily find and test whether these economic objectives had been met.

The second reason is that the scheme yielded a large enough sample size. This was not just in terms of the way it affected a large number of firms across regions within England, which meant that there was a sufficient amount of diversity between the firms to be reasonably confident in the results, but also because it had also been running for over a decade. This is important because the effects of investments in innovative projects do not usually manifest for many years, and could not be picked up otherwise.

If this evaluation was to be used an example, one of the highlights of the evaluation was its rigorous approach to the econometric exercise, in particular its use of the two-stage Heckman selection model, which is a well-tried and tested method if selection bias is suspected in the control group.

Given the objectives of the scheme, the economic focus of the evaluation was entirely appropriate. One possible limitation of the questions posed in the Terms of Reference was that they did not attempt to estimate the size of knowledge spillovers. It would have been appropriate to test for these because they were an economic objective of the scheme, and it would have made sense to attempt to answer this question at the national level.

However, it is important to point out that this was not a shortcoming of the methodology employed to answer the questions posed – it was a shortcoming of the scope of the evaluation. To estimate knowledge spillovers, although appropriate, would have required a very different methodology, and could arguably form the basis of a separate evaluation.

In summary, the *Evaluation of Grant for Research and Development and Smart* serves as a good example for other evaluators who want to conduct a similar evaluation into the economic impact of a scheme that provides 'direct financial support for innovation activities' (schemes that provide support for R&D and demonstrator projects through grants). The survey is a good template for collecting descriptive information such what kinds of firms are applying for the fund and how the scheme has helped their innovative projects. It is also a good template for collecting information for feeding into an assessment of the full economic impact of the scheme, especially if the evaluator needs the assessment to be IEF-compliant.

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**Interviewer and case study author:** Lark Parker-Rhodes, Technopolis Group UK

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