



A guide to evaluating your **Ingenious project**

Introduction

This guide gives a brief introduction to some evaluation theory, provides information on the Ingenious key outcomes and sets out how to plan an effective evaluation.

If you follow the tips in this guide you should be able to conduct a meaningful evaluation and find out some interesting information about the impact of your project.

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The Ingenious scheme

As the UK's national academy for engineering, the Royal Academy of Engineering brings together the most successful and talented engineers from across the engineering sectors for a shared purpose: to advance and promote excellence in engineering.

One of the Academy's key aims is to promote engineering at the heart of society. We want to improve public understanding of engineering, increase awareness of how engineering impacts on lives and increase public recognition for our most talented engineers. As such the Academy is seeking to build capacity for engineering-themed public engagement. This involves bringing together and working with the engineering and public engagement sectors.

Ingenious grants are available for projects that aim to provide engineers with practical experience of public engagement activities and include creative activities that enable the engineers to engage target audiences.

The Ingenious grants programme aims to:

- inspire creative public engagement with engineering
- stimulate engineers to share their stories, passion and expertise in innovative ways with wider audiences
- develop engineers' communication and engagement skills
- create debate between engineers and people of all ages to raise awareness of the diversity, nature and impact of engineering.

The Ingenious grant scheme aims to build a community of engineers who are confident, knowledgeable, skilled and experienced in public engagement through the provision of guidance, mentoring, training and networking opportunities.

Evaluation resources and support

In addition to this guide, all grant holders are offered support in the Ingenious evaluation surgeries. Furthermore, the Ingenious evaluation toolkit (www.raeng.org.uk/ingeniousevaluationtoolkit) includes materials such as questionnaires and other resources to help.

Why evaluate?

Evaluation involves collecting evidence that helps you, the Academy and our funders, the Department for Business, Innovations and Skills, to assess the reach, quality and impact of your project and, most importantly, to identify ways to improve practice in future projects.

This is not about 'proving' success but accurately recording what has been achieved and the lessons you have learnt from the experience.

Who should do the evaluation?

Evaluations can be conducted internally, that is by a member of your project team or organisation, or externally by another organisation or consultant.

For most projects, **internal evaluation** is fine. Its advantages are that the evaluator will already know the organisation and how the project works. However, internal evaluators can lack objectivity as they may be too close to a project to make a clear judgement about its success.

The main advantage of contracting an external evaluation is objectivity. Appointing an external evaluator will also take some of the workload from the project delivery team. In addition you may wish to appoint an evaluator that has specific skills or experience in eliciting opinions from particular audiences. If you are planning to appoint an **external evaluator**, set aside enough of your project budget to pay for their time (typically 3-10%).

Planning evaluation: six questions

To help design an effective and appropriate evaluation plan for your project, begin by thinking about the following six questions in the order shown below:

1. What do you want to find out?
2. How will this help you?
3. How much time, money and staff do you have?
4. What type of audience do you need to sample? What challenges will they present?
5. What are the most effective methods for achieving your evaluation aims?
6. How will you disseminate the results of your evaluation to your stakeholders?

Pitfalls to avoid

x Starting by choosing your methods.

Clearly define the aims of your evaluation before beginning to think about evaluation methods. Once you have defined your aims, you should choose the methods that best deliver your aims within the resources available to you.

x Collecting data simply because it is easy to collect.

Often the most useful data is the most difficult to collect. Ask 'how will this help you?' to help you filter out evaluation objectives that may yield data that is easy to collect but of little value in terms of evaluation and learning.

x Only collecting evidence of success.

This is likely to give you a distorted picture of what actually happened with your project. You may also lose the opportunity to learn useful lessons for future projects.

x Being over ambitious.

This could include aiming for too large a sample or the choosing to use overly complex methods for your evaluation. Be mindful of the resources available for carrying out your evaluation – and don't let the perfect become the enemy of the good.

Key Outcomes

The Academy requires each grant holder to identify specific **key outcomes** related to the delivery and impact of projects. These will enable the Academy to gather comparable information across a wide variety of projects and help build a picture of the effectiveness of the grants scheme as a whole.

The Ingenious **key outcomes** are split into three types: metrics, experiences and impacts. Two main target audiences have been identified on which to focus your key outcomes on - engineers and publics:

- **Engineers** are the most important target audience for the Ingenious grants scheme. They will be involved in every Ingenious project and their opinions and experiences are of special interest to the Academy.
- **Publics** include adults, children, families, teachers, museum visitors etc.

Public engagement practitioners are a third audience for the Academy. The impacts on this audience will be measured the Academy by other means and therefore are not included under the key outcomes.

Key outcomes: metrics

You will need to report metrics in terms of the number and type of activities completed, the number and type of participating engineers involved and the number and type of public audiences reached.

Key outcomes: experiences

For engineers we want to know what numbers found the experience of participating in the project:

- Enjoyable
- Well-organised
- Thought-provoking
- Worthwhile

For the public audiences we want to know what number found the experience of attending the event, visiting the website, etc:

- Enjoyable
- Informative
- Well-organised
- Thought-provoking
- Appropriately-pitched

Key outcomes: impacts

These key outcomes relate to the benefits gained by the engineers and by the public audiences in terms of increased knowledge, deeper understanding, skills developed and attitudes changed.

Such outcomes might include:

- Engineers gained a deeper understanding of the public's attitudes towards engineers and engineering.
- Engineers developed better communication skills.
- Engineers had more confidence in their ability to engage the public.
- Engineers were inspired to take part in future public engagement activities.
- Public audiences gained a deeper understanding of the range of work engineers are involved in.
- Public audiences were challenged about misconceptions they held about engineers e.g. they just fix broken machinery.
- Schools students were inspired to find out more about engineering.
- Public audiences developed problem solving skills, the ability to think in three-dimensions or team-working abilities.

SMART project objectives

Once your key outcomes have been set, revisit your original project objectives in your Ingenious grant application. These will help you think about exactly what you want your project to achieve.

Ensure that your objectives are SMART:

- Specific
- Measurable
- Achievable
- Relevant
- Time-bound

An example aim and related SMART objective is given below:

Aim: To develop engineering contacts for future public engagement activities.

SMART objective: To establish three new engineering contacts with three separate organisations and involve them in the current Ingenious project.

Reframe your objectives as shown above so that you are able to assess them through your evaluation.

Different evaluation approaches

You need to decide how your evaluation will be designed to best address your key outcomes and project objectives. Some options include:

A **before-and-after** evaluation is used to compare audience members' knowledge and attitudes before and then after an activity. Asking the same questions at each stage gives a measure of any changes. However, this type of design can be labour-intensive.

An alternative is an **after-only** evaluation, where opinions are gathered after the event. For example, your evaluation could ask respondents to reflect on their knowledge and attitudes prior to the activity and how they feel it has changed as a result of the activity. Although this is easier to do than before-and-after evaluation it is important to remember you are relying upon respondents to honestly and accurately assess any changes in knowledge and attitudes.

Quantitative approaches measure the scale and extent of outcomes and impacts – for example, how many people were reached, what percentage felt a certain way, what percentage showed evidence of learning. Quantitative approaches involve collecting relatively small amounts of data from a large number of people. Quantitative research usually involves the use of questionnaires or surveys consisting mostly of closed questions.

Qualitative approaches are used to understand why something happens and involves collecting a large amount of detailed information from a relatively small sample of people. Qualitative approaches usually involve techniques such as focus groups or in-depth interviews involving mostly open-ended questions.

A **mixed method** approach combines qualitative and quantitative data and is often the best way to collect the facts and figures required by the Academy and gain a deeper understanding about the effectiveness of your project.

Data collection methods

Method	Advantages	Disadvantages
Observation	Suitable for collecting data related to behaviour; Works well when subjects are involved in an activity and unable to provide detailed/objective opinions (for example young children).	Subjects may change their behaviour if they are aware they are being observed; Potential for observer bias or difference in interpretation between observers; Difficult to simultaneously observe and record.
Interview	Allows collection of in-depth information; More likely to get a representative cross-section of your audience; Respondents can be asked to explain their responses; Questions can be clarified.	Requires skill on the part of the interviewer to elicit honest responses; Time-consuming and therefore expensive.
Focus group	Very 'rich' source of data; Group situation provides security for respondents; Time available allows moderator to explore issues in great detail and for respondents to reflect deeply on their opinions.	Time-consuming and expensive; Requires skill on the part of the interviewer as group dynamic is crucial to collecting useful data; Crucial to ensure that an appropriate sample is selected for the group; Requires a suitable venue for the sessions.
Questionnaire	Inexpensive; Can be anonymous; Large sample sizes possible; Can be distributed in a number of ways; Quick and easy for people to respond.	Appropriate questionnaire design is crucial to success; Inappropriate for use with young children, adults with poor reading/writing skills etc; Potentially low response rate; Self-selecting sample often does not fully represent your audience; Clarification of questions and answers not possible.
Data mining	Automatically collected data – bookings, materials produced during workshops etc; Data is already available.	Must ensure reliability of data; You have to infer the motivations and opinions of the people who booked the event, downloaded the resource etc; Only provides at best a partial picture of what happened.

You may decide that you wish to use several of these methods to collect different types of information or to cross check the reliability and validity of your data.

Questionnaire design

The key to effective questionnaire design is knowing exactly what you want to find out, so base your questionnaire on your objectives and key outcomes. The purpose, structure, wording and layout of your questionnaire are important.

Purpose

A questionnaire is only as good as the questions it contains, so ask yourself what you will do with the information that each and every question yields. If you are unsure of the answer, consider removing the question. Prioritising items in this way will help ensure that you make the most of the questionnaire.

Structure

The questionnaire should always start with a brief sentence or two explaining the purpose of the questionnaire and what the data will be used for. As a rule, questions should move from the general to the specific.

Think about whether you will use closed (multiple choice) or open-end questions (where the respondent uses their own words to respond).

Closed questions are quicker and easier to answer and the data is already sorted into categories. However closed questions do not provide depth of information nor do they take account of responses which you had not anticipated.

Open-ended questions are more time-consuming and difficult to answer. Respondents will usually require some encouragement to give more than one word answers and the interviewer needs to accurately record what was said. Analysing this data is more time consuming as answers need to be sorted into categories. However open-ended questions provide much richer data and give respondents the opportunity to properly explain their feelings and ideas.

Wording and layout

Think about your wording to minimise bias in the questionnaire, and avoid leading people to answer one way or another. Your questionnaire should be long enough to allow you to collect the information you need, but not so long it puts people off completing it. Try to fit your questions on two sides of A4 in 12 point text or larger if you can. Even better to fit it on one side of A4.

Designing and conducting interviews

Interviews are 'conversations with a purpose'. When properly designed and conducted they can be a very powerful technique. Compared to questionnaires you have a much better idea of who is responding and the opportunity to seek clarification and further detail.

Types of interview

Structured interviews are identical for every interviewee. The interview schedule (a guide that is used by the interviewer) can look very similar to a questionnaire - they are useful when questionnaires are not appropriate, for example when dealing with those with poor written skills, or to achieve a random sample of participants.

Semi-structured interviews also use a schedule but respondents are encouraged to expand on their answers and digress to include other relevant points.

Paired interviews, where two respondents are interviewed at the same time, can help interviewees feel more relaxed as well as doubling the sample size. Listening to the response of the other interviewee also acts as a useful prompt eliciting more thoughtful responses from both parties.

Focus groups bring together four to eight people for a group conversation. Participants are encouraged to explain and qualify opinions, which can spark ideas from others in the group and so provide a very rich source of information. The group must be recruited by the researchers, it should not be self-selecting. Flashcards, storyboards, video footage and other exercises can be used to help elicit opinions.

Recording data during interviews

Recording an interview provides the most accurate record. Make sure the interviewee/s are happy to be recorded and that you explain whether anyone else will listen to the interview and anonymity. Later, the recording can be transcribed word-for-word, or you can make notes of relevant points. Alternatively the interviewer or an observer can make notes.

Tips for good interview technique

- As an interviewer you are neutral and non-judgemental. Use non-leading prompts such as 'for what reasons do you feel that way?' or 'tell me a bit more about that'.
- Ask questions clearly and succinctly. If you are using a list of options both read it out loud and show it to the interviewee
- If the interviewee's first response to an open-ended question is 'I don't

know' - wait! Most often what the interviewee means is 'give me a moment to think about that'. Pausing for a few seconds nearly always elicits a proper response

- You can tell if an interview or focus group is going well – as the interviewer/facilitator you will not be doing much talking!

Sampling

Evaluators refer to a **population** as everyone that was involved in an intervention (for example an Ingenious project). It is often not possible to include the whole population in the evaluation so a representative cross section or **sample** of the population is selected to provide feedback. Some common sampling methods are described in the table below.

Type	Method	Description
	Census	All members of the population are included
Random: often used for quantitative work	Random	Sample selected from the population randomly
	Stratified	Homogeneous strata (for example schools in a schools project) within the population are identified. Random samples are then taken from each stratum
Non-random: often used for qualitative work	Quota	Sample members selected by means of a visible characteristic (for example gender) until quota is met
	Judgemental	Sample chosen based on evaluator's judgement of who can provide the most valuable information
	Snowball	Sample selected using networks where each sample member is asked to recommend future sample members
Mixed	Systematic	Selection of the n th member of a population or stratum, e.g. every 10th person to leave a lecture.

One method not included in the table is a **self-selecting sample**, where it is up to the members of a population to decide whether they would like to be in the sample. This can happen when, for example, questionnaires are left in a corner of an activity venue for people who wish to complete them. This introduces bias because often only those that have had a strongly positive or negative experience are motivated enough to leave feedback when given the choice.

Random or systematic sampling methods are best for quantitative work because the data collected are likely to represent the opinions of the population as a whole. With qualitative work, you will have a much smaller sample so will look for those that have had interesting experiences. A judgemental or snowball sample can work well here. Whatever sampling method you use, be sure to explain the reasons for using it in your evaluation report.

Data analysis

Managing the data you collect from your evaluation in a sensible way can help avoid difficulties later, during analysis and reporting.

Data entry and coding

The easiest way to enter data is into a spreadsheet such as Microsoft Excel or specialist statistical packages such as SPSS.

Enter the data so that each row of the spreadsheet corresponds to one respondent's questionnaire or interview.

If you have used questionnaires or structured interviews, number each paper questionnaire, interview schedule or observation sheet. Include this reference in your spreadsheet so you can double-check responses if you need to quality check the data entry.

It is a good idea to keep hold of hard copies of completed questionnaires or interview schedules for at least 12 months to resolve any queries.

Quantitative data

The first step in analysing quantitative data is to look at frequencies, for example how many people ticked the different boxes on a questionnaire.

- Use the 'frequency' function in Excel to do this (consult Help if you're not familiar with it).
- You can also use the PivotTable function in Excel to look at frequencies (refer to Help if you have not used it before).

For more advanced analysis, statistical packages such as SPSS can be used.

You need to check that any differences between different sub-sets of your sample are genuine differences, not just random variation. As a rough rule of thumb the % margin of error for any results is approximately equal to:

$$(1/\sqrt{\text{sample size}}) \times 100$$

Hence an approximate margin of error for a sample of 1,000 people is plus or minus 3%.

$$(1/\sqrt{1000}) \times 100 = \pm 3\%$$

And for a sample of 100 is plus or minus 10%

$$(1/\sqrt{100}) \times 100 = \pm 10\%$$

Qualitative data

Qualitative data is less straightforward to analyse, because responses are more likely to give a much deeper impression of respondents' opinions. When analysing such data, you should look to identify common themes in the responses.

A simple way of doing this is known as category analysis, which involves grouping similar responses into categories. Category analysis works well for open questionnaire items or open items in a semi-structured interview.

Reporting your results

The Ingenious Final Report Form provides a framework for how you will report back to the Academy. A copy of this form is sent to each grant holder at the beginning of your project. It includes space to comment on the Ingenious **key outcomes** identified for your project as well as other outcomes and impacts.

The report sections are as follows:

- 1. Grant details**
Grant reference and amount, including partnership funding and in-kind support.
- 2. Project details**
Details about the project including its aims and a written summary of its outcomes.
- 3. Key outcomes - metrics**
Key outcomes and actual figures for the number of events, activities and/or resources you delivered.
- 4. Key outcomes - experiences**
Here you will be asked to report on the experiences for the engineers and public audiences that were involved in your project.
- 5. Key outcomes - impacts**
Here you will report on the impacts for the engineers and public audiences involved in your project.
- 6. Project objectives**
This section provides space to add information on the remainder of your project objectives that you have addressed through your evaluation.
- 7. Media coverage**
This section asks you to list items of media coverage generated by the project.
- 8. Shared learning**
A space to comment on successes and challenges with the project delivery.
- 9. Sustained benefits and on-going work**
If your project has a legacy you can describe it here. In addition, you may have written an additional evaluation or project report that gives greater details. You can summarise this here, or provide a link in this section. You should also mention any papers or talks where you have shared this data with your colleagues or other organisations.

Glossary

Coding

The process of assigned data from open-ended questions to different categories of answer.

Closed question

A question where the interviewee selects their answer from a pre-determined list of two or more options.

Evaluation

The process of measuring the effectiveness of a programme.

Evaluation instruments/materials

The means by which you will collect your data.

External evaluation

An evaluation conducted by an external person or group, such as a consultant.

Focus group

A group interview, typically with four to eight participants, lasting for 40-90 minutes, run by a moderator.

Formative evaluation

Conducted during the development of the workshop, website, exhibition etc. Data provided so that designs and content can be modified before the final product is delivered. Formative evaluation is often quick turn-around, qualitative research.

Indicator

A particular aspect of a project that can be evaluated to determine its effectiveness or lack of effectiveness.

Internal evaluation

An evaluation conducted by a member of the project team.

Impact

The long-term outcomes of a programme or activity on people's knowledge, understanding, attitudes and skills.

Key outcomes

Are set by projects to help the Academy measure success.

Mixed method

Evaluation using a mixture of qualitative and quantitative methods.

Metrics/monitoring

Collecting basic quantitative information about inputs, outputs and outcomes, audiences and activities.

Open-ended question

A question that has to be answered in the interviewees own words; options are not offered by the interviewer.

Output

What is produced by the project team – events run, training courses delivered, blog posts written.

Outcome

Usually means the short-term impacts on people’s knowledge, understanding, skills and attitudes.

Peer evaluation

Where two individuals or organisations evaluate each other’s work.

Pilot

A trial run of an activity or evaluation to identify areas for improvement.

Population

Every individual that takes part in a programme.

Qualitative

Research or evaluation that deals with what happens and why.

Quantitative

Research or evaluation that measures outcomes numerically – how much, when, where.

Sample

The individuals from the population who take part in the evaluation.

Secondary source

A source of information used in an evaluation that does not involve collecting evidence first hand, for example existing literature.

Semi-structured interview

An interview with a flexible schedule of questions that guides the interviewer rather than a script that they have to accurately follow.

SMART objectives

Are specific, measurable, achievable, relevant and time-bound.

Summative evaluation

Conducted at the end of a project to ‘sum up’ its effectiveness.

References and further reading

If you are interested in finding out more about evaluation theory or techniques, try the following:

Focus groups – a practical guide for applied research
Krueger RA; Sage, (1998)

Research Methodology: A guide for beginners
Kumar R, London, Sage (1996)

Evaluation: A systematic approach (4th ed)
Rossi PH & Freeman HE, Newbury Park CA, Sage (1989)

Doing and Writing Qualitative Research
Holliday A, London, Sage (2002)

Theory-driven Evaluations
Chen, HT, Newbury Park CA, Sage (1990)

Statistics for Dummies
Rumsey DJ, John Wiley & Sons (2011)

The Ingenious evaluation toolkit is an electronic resource which includes example questionnaires and interview schedules as well as links to other resources. Visit the site at:

www.raeng.org.uk/ingeniousevaluationtoolkit

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