Introduction to Evaluation

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ICTP Workshop on Science Communication in Developing Countries: Bridging the gap between science, policy and the general public – 17.10.2011

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Lecture Overview

- Why Evaluate?
- Evaluation Design Process and Choices
- Qualitative, Quantitative, or ‘mixed’ methods evaluation paradigms and designs.

Why Evaluate?

- *To build* a broader understanding of your audience and the impacts you can have on them.
- *To inform* your plans and *to predict* which communication methods and content will be most effective for your target audience.
- *To understand* or ‘to know’ whether you have achieved your objectives.
- *To re-design* your approach to be even more effective in future communication practice.

Science Communication Evaluation: Context

- Full-scale evaluation research unrealistic as a continuous activity for most institutions.
  - –May need to bring in external expertise
  - –May need additional training / skills

Recommended approach:

1. **At Minimum**: *Engage in Reflective Practice and use Audience Feedback Forms (Sampling)*

Science Communication Evaluation Context continued

2. **At minimum**:

   Specify intended outcomes and specific connections between content and delivery approach and these outcomes. (checked against current science communication research / theory)

Science Communication Evaluation Context continued

- **If possible**, formative evaluation of communication / interventions before full public rollout.
  - e.g. focus groups, other pre-testing of ideas
- **If possible**, Summative evaluation to address '**how**' and '**why**' communication worked well or poorly.
  - 'How' and 'why' hold broad implications

Evaluation Research

- Evaluation = sub-category of 'social research' (thus all principles of social research apply)
- Distinguishing feature of evaluation: **Focus on objectives / claimed outcomes** (*practitioners must specify these outcomes*)
- In order to evaluate them, practitioner objectives should be Specific, Measurable, Achievable, Realistic and Targeted.

Translating Practitioner Objectives into Evaluation Research Questions

- The evaluation process begins with concepts / ideas that a practitioner is aiming to deliver or communicate.
- Evaluation measures the degree to which these objectives (e.g. 'learning') are realized.

The Evaluation Process: 1st steps

- Vital process of translating abstract / general ideas / concepts (e.g. scientific literacy) into concrete, measurable variables.
- Easier said than done.
- This is called 'Operationalization' – consider:
  - How would you know that a particular kind of change has happened?
  - Think about what people would say or do if you were successful.

Definition:
Evaluation Research Design

Process of choosing how to most effectively assess intended outcomes from your communication / intervention.

Evaluation Design: Getting Started

- Choosing appropriate evaluation research design involves matching goals that motivate communication / intervention with evaluation methods for assessing those goals.
- Evaluation design all about making choices.
- To make a good choice, you need to know (1) what your evaluation options are and (2) how to decide between those options.

Research Design: Getting Started

- It is helpful to think of evaluation research methods as tools that offer a set of strengths that can be used to accomplish range of goals.

Measurement

- Operational definitions are required for the more abstract concepts that are typically the focus of research:
  - A key issue is what will be captured on a particular measure (i.e. ‘what counts?’)
  - Measurement error is an issue. (i.e. error due to measurement approach/tool)

USING QUESTIONNAIRES IN EVALUATION RESEARCH

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Questionnaire ('survey') Design

Questionnaire Design: Considerations

- Decide on your questions
- Decide on type of question response (e.g. Likert, multiple choice, open-ended) and refine the wording
- Decide on sequence of questions and overall layout of the survey form.

Questions

- Ensure clear connection between questions and research aims
  - This will require periodic critical self-evaluation of your developing questionnaire to ensure no extraneous questions have slipped in.
- Consider your analysis first, then design questions accordingly

Questions

- Beware of social desirability bias: Phrase sensitive questions impartially so respondent can answer truthfully without feeling stigmatised
- More prosaically, use a good legible font such as *Times New Roman*

The Survey Form

- Give your questionnaire form a title
- Note the version on the questionnaire form.
- Provide a brief introductory statement
- Contact and return (in the case of postal surveys) information should be included on the questionnaire
- Number individual questions to aid in the data entry and analysis process later on.
- Be consistent in phrasing and try not to use too many different question types in order to avoid confusing respondents.

Questionnaire Layout

- Don’t put too many questions on any one page of the survey.
- Response rate can be negatively affected by questionnaires that seem too long at the outset, so ensure that there are no unnecessary questions in the final version.
- Use *italics* and **bold** consistently: e.g. for instructions and for the questions or category headings
- Ensure a logical and simple structure for the questionnaire, avoiding unnecessarily complex and changing question types.

Question Sequence

- Typically, go from general to specific questions and from easy to difficult questions.
- Begin with questions that will be easy to complete or raise interest (don't start with emotionally charged or particularly difficult questions).
- However, if your topic is not difficult or emotionally charged, then it can make sense to save the demographic questions for the end so that the respondent does not become fatigued early in the questionnaire.

Question Types

- **Open-ended**

– What interested you in attending the science festival today?

- **Ranked Response**
  - Rank your preference from amongst the following options
- **Multiple versus single response**
  - Specify ‘select one’ or ‘tick all that apply’
- **Likert scale** (rating scales): 1-5, 1-7, 1-9

Final Notes on Questions: Part 1

- Ensure questions are as brief as possible.
- Use plain language. Avoic jargon, assumptions of specialist knowledge.
- Minimise ambiguity in the questions and response options
- Generally phrase questions / statements in positive to minimise any confusion

Final Notes on Questions: Part 2

- Ensure you don’t have any double-barrelled questions (e.g., ‘What interested you in visiting the festival this year and last year?’)
- **Avoid Leading Questions!!!**
  - Leading questions such as “Do you agree that ICTP is doing important work that will benefit mankind?”

Piloting your Survey

- First, you can probe in-depth with pilot respondents about some particular questions
  - Look for the effects of different phrasing
  - how they have interpreted a given question
  - how this interpretation is reflected in their answers and whether any individual words or phrases are jarring or difficult to understand for any reason.
- Second, the survey in its entirety should be administered to pilot respondents.
  - Analysing the respondents' answers to open-ended questions and their feedback on question wording, sequence, layout, etc. can then be used to refine the final polished version of the survey that is used in the main study.

Piloting your own Questionnaire

- *Exercise*: Design one survey question + response options related to your project as an individual then try out the questions in small group (3 people) and get feedback (mainly at the first level of pilot survey feedback).
  - Report back on what kinds of changes were recommended

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Quantitative Evaluation Research and Sampling

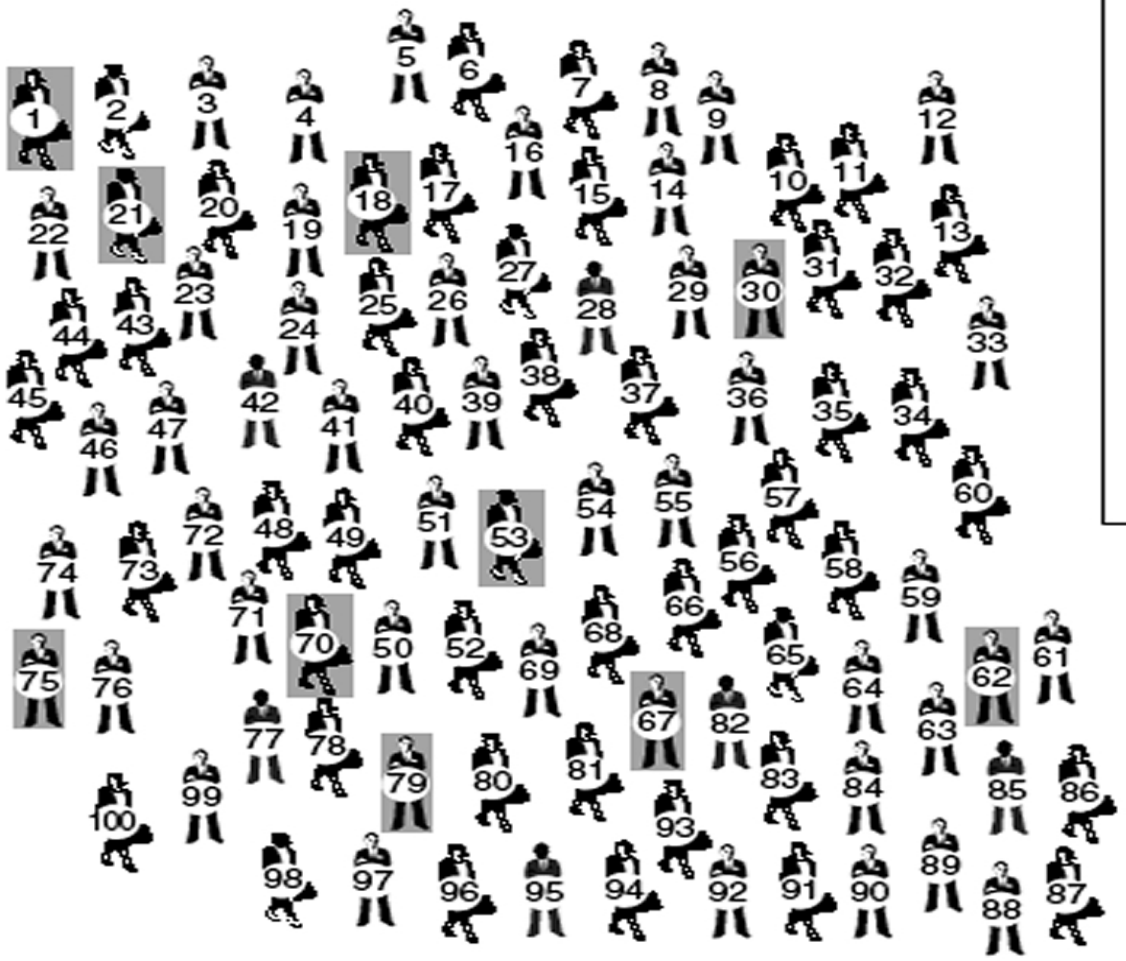
Introduction to Sampling

- Sometimes we the whole population we are interested in (e.g. every member of your audience).
- But most of the time this would be too difficult or time consuming.
- So we usually study just a sample of the cases that we are interested in. (e.g. a few members of your audience)
- What is most important in selecting a sample is that it is **representative** of the **population**.
- When a sample is representative we can make statements / claims about the population based on the sample.

What is a Representative Sample?

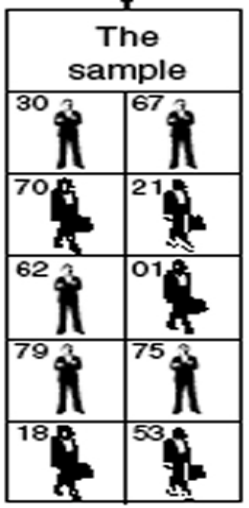
- To be representative, the sample should accurately reflect the whole population of interest.
- We cannot fully know how to select a sample that is representative based on what people look like, etc.
- Therefore the best we can do is be sure that every member of the population has an equal chance of being included in the sample.
- The central principle in a Probability Sample is random selection.

A Simple Random Sample



Appendix B
Table of Random Numbers

10480	15011	01536
22368	46573	25595
241 30	48360	22527
421 67	93093	06243
375 70	39975	81837
779 21	06907	11008
995 62	72905	56420
963 01	91977	05463
895 79	14342	63661
854 75	36857	53342
289 18	69578	88231
635 53	40961	48235
09429	93969	52636



What is a Representative Sample?

- Some random samples are more complex:
  - For example, involving 'clustering' or 'stratifying'.
- At minimum, should use systematic sampling (e.g. every 15th person)
- Not all samples = probability samples.

Non-random Samples (less good)

- Types of Non-Probability Sample:
  - Convenience sampling
  - Snowball sampling
  - Quota sampling
- Since non-probability samples do not involve Equal Probability of Selection, cannot make accurate statistical statements / claims about whole population.

Assessing Research Quality

- **Allow for Negative Findings**
  - Can your hypotheses be shown to be wrong with the kind of evidence you are collecting?
- **Validity**
  - What are you really measuring?
- **Reliability**

Top Tips

- Evaluation requires very clear, specific and measurable objectives

Beware of 'Raising Awareness' and 'Inspiring Interest'!

- Quantitative Methods

Get the design right at the beginning! (e.g. pilot testing)

- Sampling

Equal probability of selection is optimal!

- Surveys

Good for large samples and large claims / statements, but think carefully about questions!

Top Tips

Evaluation Design

- **Avoid positive bias and allow for possibility of negative outcomes.**

Qualitative Evaluation Methods

- **Stay open-ended and be a sponge of information!**

Interviews

- **Deep understanding of relatively few people**

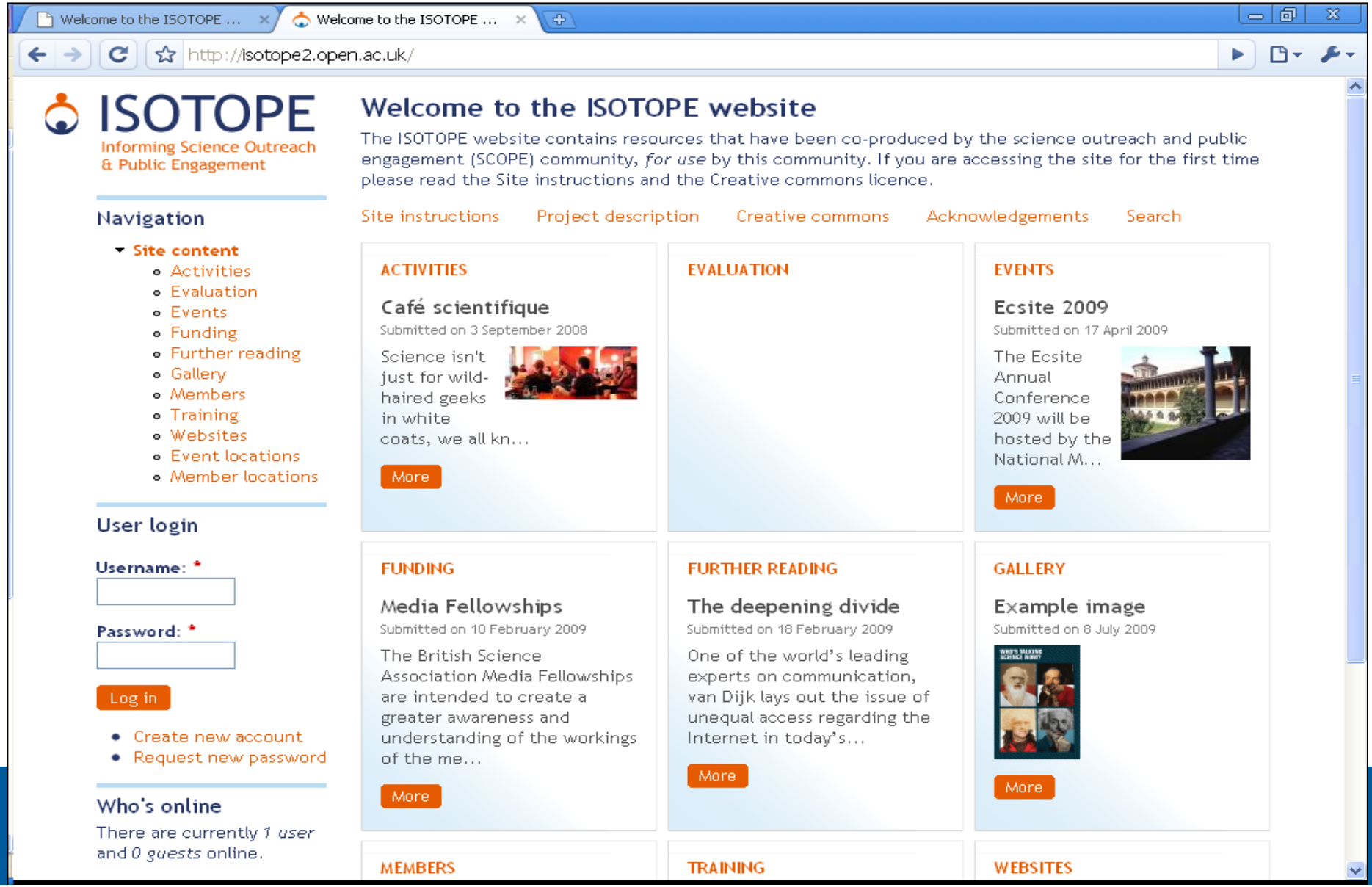
ISOTOPE

- I would invite you to visit the ISOTOPE (Informing Science Outreach and Public Engagement) website.

create and share at

isotope.open.ac.uk

ISOTOPE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Password: *
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Request new password
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Further Issues and Considerations

Before Survey Data Collection

- Contact letter to potential respondents, introducing yourself and explaining the study's purpose and expected outcomes (i.e. a research report for X purpose or Y organisation).
- Informed consent: This doesn't always need to be on a separate form but you should secure consent before the respondent commences the survey.

The Survey Process

1. Clearly identify your aims
2. Select your population and sample
3. Select how data will be collected
4. **Build your questionnaire**
5. **Pilot the survey and re-design accordingly**
6. Conduct main survey
7. Analyse data and report results

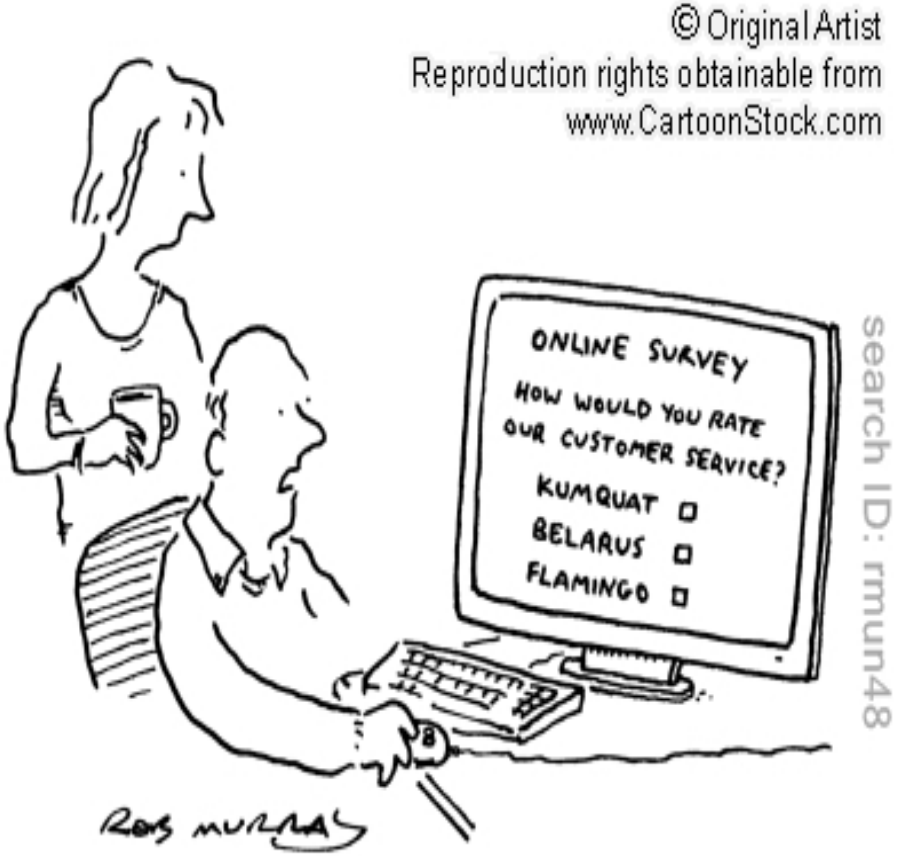
Principles of question design

- **Closed-ended single-choice survey question responses need to be:**

Exhaustive – that everyone fits into one category

Exclusive – so that everyone fits into only one category (unless specifically required to 'tick as many as apply).

Unambiguous – so that they mean the same to everyone and all responses are comparable.



Survey Design Flaws – Beware of:

- Construct Validity: The soundness of the measures as indicators of the constructs purported to be examined by the investigators
- Non-specific effects: Improvements or changes from effects not specific to the factor or treatment under study
- Novelty effect: General energizing and uplifting effects of a new, exciting experience
- Confounding Variables: Failure to take into account the fact that the experience under study may include more than one component that affects outcome

Survey Design Flaws (Avoid!) continued

- Demand Characteristics: The tendency of participants to alter their responses in accord with what they believe to be the researchers' hypothesis
- Experimenter expectancy effect: The tendency of investigators to unintentionally bias the results in accordance with their hypotheses
- Response Bias: A bias in subject responding due to the test instrument rather than the subjects' actual beliefs
- Sampling Bias due to non-random sampling: Unintentional sampling of subjects that introduces systematic error or bias into the results

Final Notes on Questions: Part 2

- Be careful pre-categorising your data (e.g. by asking for age ranges rather than current age or year of birth).
  - This can limit your analysis options downstream.
- Categories can always be applied later, but pre-categorised data can't be turned back into continuous data

An introduction to ‘Public Engagement’

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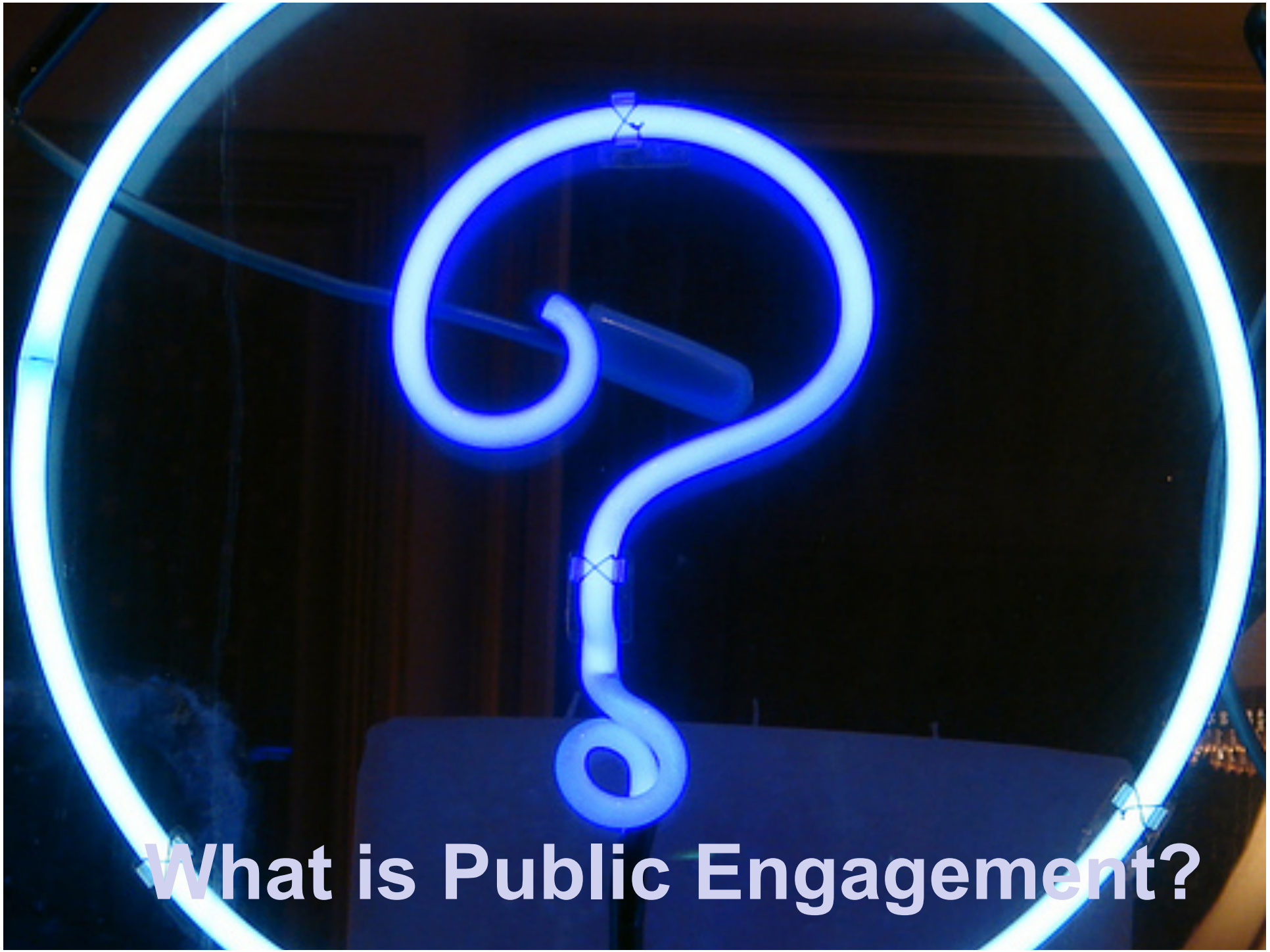

What is Public Engagement?

Public Engagement can be:

- Science Communication
- Site-based (e.g. Zoo-based or Museum-based)
- Education (e.g. scientists talking in schools)
- Outreach
- New Media (e.g. Dialogue on Twitter / Facebook)
- Festivals
- Consultations
- Debate and dialogue
- Collaborative research (e.g. megalab)

Many different models

The deficit model

Public 'deficit' of:

i. understanding of **scientific knowledge**

ii. **trust** in science – **more info, transparency, or explanation, will restore trust** (via 'understanding our motives')

iii. understanding of scientific **process** – science cannot give certainty nor zero-risk (Bob May 2000)

- all suggest public responses are emotional, irrational and 'without knowledge'
- Citizens seen as naïve and gullible to media misinformation
- Public should not question 'our' scientific-institutional culture

Public deficit model: ‘Facts’ over ‘Process’

“**Science education in schools focuses too much on facts, rather than process**, leading to the misleading impression that science… deals in certainties rather than, as is more often the case, conclusions based on the balance of probabilities after evaluation of the available evidence”.

Robert May, FRS: UK Government chief-scientist:
11 July 2000, lecture Hannover Expo, Germany.

Beyond the ‘deficit model’ of publics

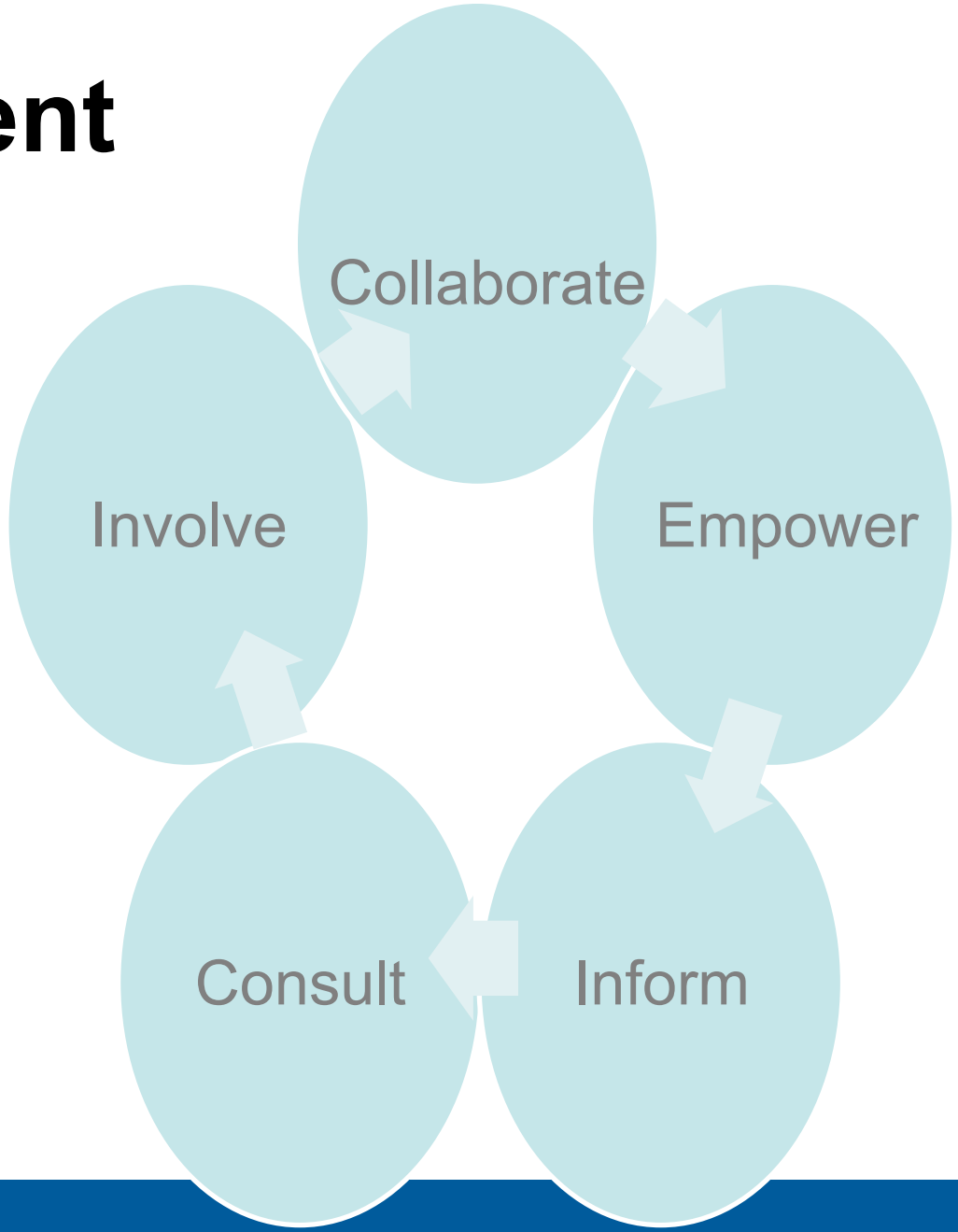
- Yes, there is public ignorance of science
- There is also scientific / institutional ignorance
  - of science
  - of publics and their realities
- Public ignorance is NOT the cause of ‘public scepticism’ or public mistrust
  - It is not the case that to ‘know science / zoos is to love them’
- Scientific denial, of *scientific* ignorance is a key factor in public mistrust / disengagement

New ‘democratisation of science’ agenda

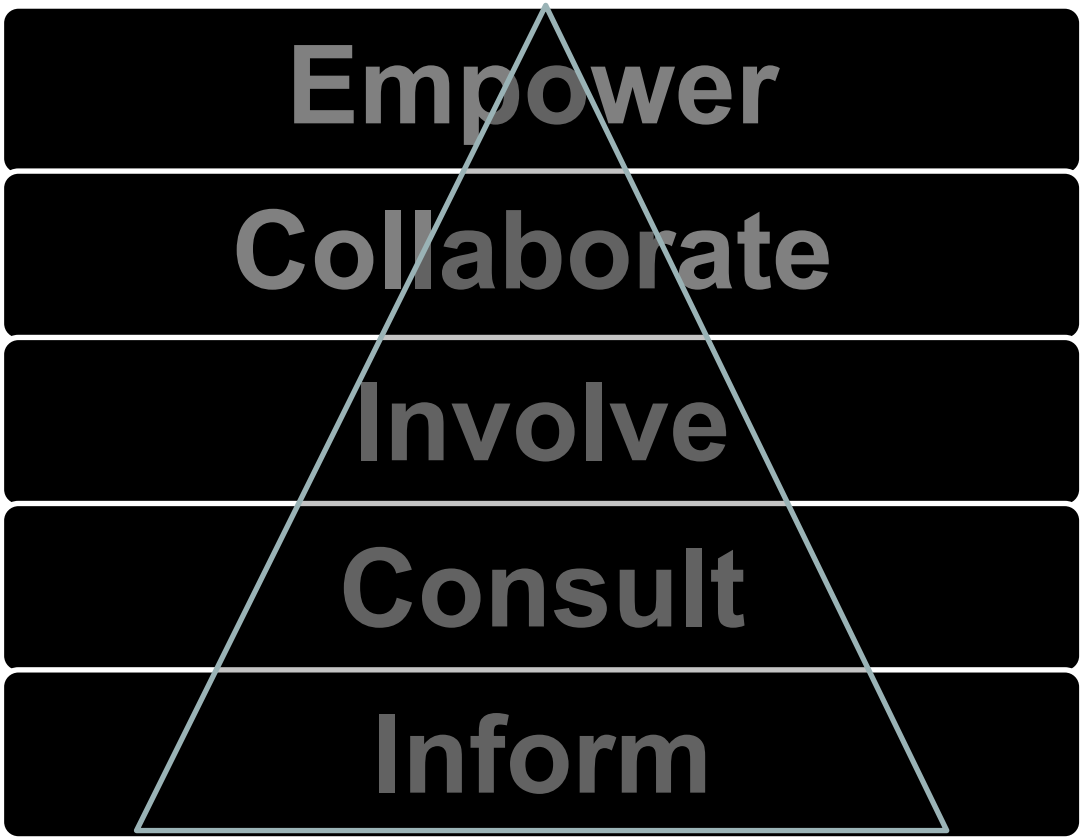
- dialogue
- public engagement
- participation (various methods)
- inclusivity of knowledges
- transparency and accountability
- extended peer-review

i.e. “scientific citizenship” etc

Engagement Aims



And another way of looking at it



Number of people involved

Why engage?

Better Science
Governance

Social Cohesion

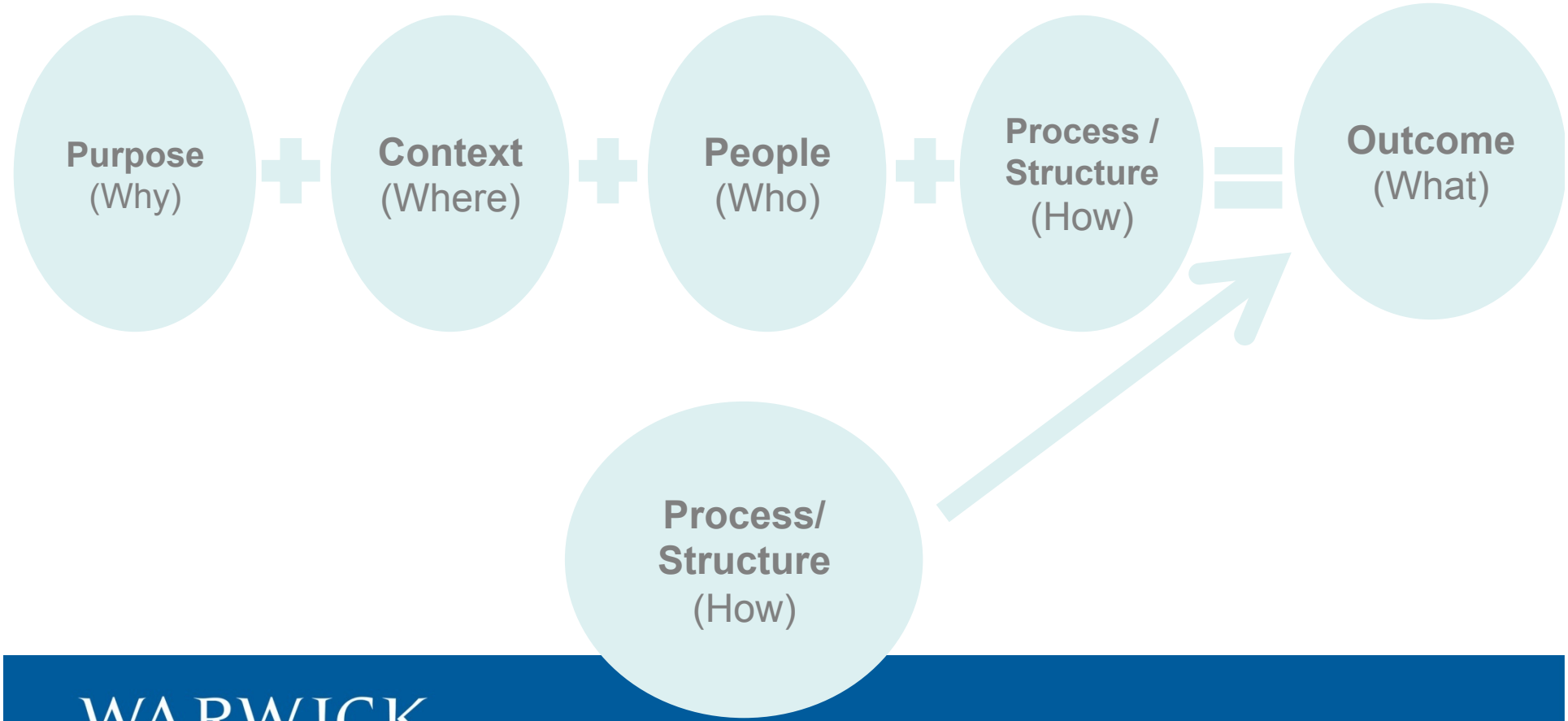
Improved Services

Improved Law &
Regulations

Ownership

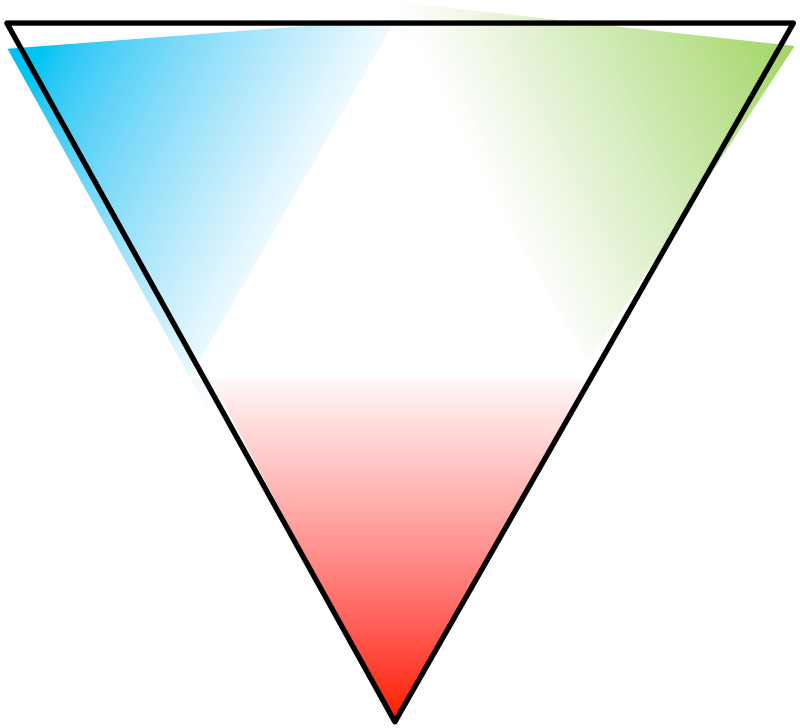
Mutual Learning

Making it all add up



Public Engagement Triangle

Transmit
To inspire, inform, change, educate, build capacity and involvement or influence decisions of others (e.g. the public)



Receive
To use the views, skills, experience, knowledge of others (e.g. the public) to inspire, inform, change, educate or build your own capacity or decisions

Collaborate
To collaborate, consider, create or decide something together

Thinking about the benefits

- Engagement as an end in itself
- Engagement as an means to an end
- Engagement as an external requirement

- Engagement to benefit institution
- Engagement to benefit participants
- Engagement to benefit society

Key points

- Don’t engage unless you mean it
- Understand your participants
- Communicate clearly
- Listen

Where to go for more information

- ISOTOPE www.isotope.open.ac.uk
- BSA www.britishscienceassociation.org
- Wellcome Trust www.wellcome.ac.uk
- NCCPE www.publicengagement.ac.uk
- Sciencewise ERC www.sciencewise-erc.org.uk

Questions about Public Engagement?

RCUK Public Engagement with Research Strategy – our Vision

- To enable society to value and have confidence in research processes and outputs;
- For public engagement to inspire young people to pursue research careers; and
- To increase the societal impact of research by creating a culture where:
  - The research sector and researchers themselves value public engagement as an important activity;
  - An awareness of social and ethical issues informs research decisions.

Adapted from RCUK

RCUK Public Engagement with Research Strategy – our rationale

- **If we involve and listen to the public** (and encourage our research communities to do so) then our decisions and research should be informed by their views, and therefore more likely to have enhanced impact in return for the investment.

- Similarly, **if we talk with the public** (and encourage our research communities to talk to the public) about the outputs of our research and their implications and applications then society will share in the benefits of that knowledge, whether for their health, wealth or culture, and therefore helping to maximise the impact of that research.

- And **if we encourage researchers to interact with schools** to enrich students' experiences then we can help improve the supply of skilled people to the research base and the UK economy and encourage more to act as informed citizens.

What's in it for me?

Benefits of public engagement for researchers:

- Skills development
- Career enhancement
- Enhancing your research quality and its impact
- New research perspectives
- Higher personal and institutional profile
- Influence and networking opportunities
- Forming new collaborations and partnerships
- Enjoyment and personal reward
- Additional funding
- Increasing awareness of the value of research to UK society
- Increasing student recruitment
- Inspiring the next generational of researchers

RCUK Public Engagement with Research Strategy – our aims

- **Aim 1** **Recognising and responding to public views** – Identify public attitudes and values to be considered through the lifecycle of research, and foster debate that will enable public aspirations and concerns to contribute to Councils' policies and research strategies.
- **Aim 2** **Inspiring young people** – To help secure and sustain a supply of future researchers to support the research base that is critical to the UK economy by encouraging engagement between young people and researchers.
- **Aim 3** **Supporting researchers** – Achieve culture change in the HE and research sectors so that public engagement is embedded alongside research and valued as an important activity through encouraging researchers to engage with the public and supporting and rewarding those who do so.

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