Funding hints and tips from the EPSRC

Computing Science and Mathematics Skill Sharing

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Introduction

This is a summary of topics covered at ICT Theme Early Career Workshop

Full slides from both instalments of the workshop are here:
https://www.epsrc.ac.uk/newsevents/events/ictecworkshopcardiff/

Very helpful! Do look for similar calls (subscribe to their email alerts) and put in an *expression of interest* — not a lot of work.

(excerpts from their slides are included here so apologies for the odd formats and slide numbers...)

First, some background on the EPSRC to give context, and their motivation

EPSRC

Investing in research for
discovery and innovation

- EPSRC is the main UK government agency for funding **research and training in engineering and the physical sciences**, investing more than £850 million a year.

- With a mission to promote and support, by any means, high quality **basic**, **strategic** and **applied** research and related postgraduate **training** in engineering and the physical sciences.

- Aim to **advance** knowledge and technology, and provide **trained** scientists and engineers, which meet the needs of users and beneficiaries, to the **benefit of the UK**.

- Agenda set by UK Government: where the money comes from!
- EPSRC administer the allocation and distribution of grants to fund research projects.
  - The general outcomes / objectives / priorities are set to meet the Government agenda
  - However, the award process is driven by peer review (see right)
  - Reviews and ranking of grants for funding are conducted by academics
  - Balancing of areas within a discipline (see later) is also determined in consultation with academics

- Grants are an **investment** to "the benefit of the UK"

- Investing in long term, fundamental engineering and physical sciences research and training

- Two major things to consider:
  - New Cross-ICT priorities
  - Balancing Capability

proposal

↓

reviews

↓

respond to reviews

↓

panel

↓

decision
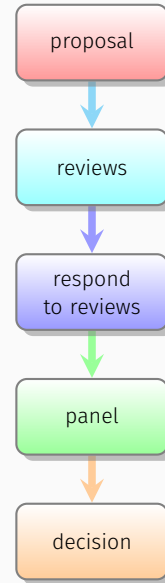
New Cross-ICT priorities

First, some context...
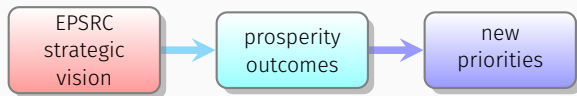
A proposal mostly talks about these in the *National Importance* section: reviewers then comment on the case you've made. See the reviewer forms at

www.epsrc.ac.uk/funding/assessmentprocess/review/formsandguidancenotes/

Importance (maximum 4,000 characters)
Please comment on the national importance of the research. Include how the research:
• Contributes to, or helps maintain the health of other disciplines contributes to addressing key UK societal challenges and/or contributes to future UK economic success and development of emerging industry(s)
• Meets national needs by establishing/maintaining a unique world leading activity
• Complements other UK research already funded in the area, including any relationship to the EPSRC portfolio

- Vision: *"Investing in research, discovery and innovation; Delivering prosperity for the UK; Successful nations are science nations."* — this feeds in to four **prosperity outcomes**

- https://www.epsrc.ac.uk/about/plans/deliveryplan/

- *"Researchers remain free to submit any ideas, at any time, for projects that will further knowledge and enhance the UK's capability – our commitment to the ideas of researchers is paramount. We do, though, want the Prosperity Outcomes to prompt researchers to think widely and creatively about how their curiosity, their knowledge and skills can be deployed, either singly or alongside others, to directly address the challenges we all face."*

- **Productive Nation** e.g. Innovative, disruptive technologies; Business innovation via digital transformation; Transformation to a sustainable society: the circular economy.

- **Healthy Nation** e.g. Transforming community health and care; Improving prevention and public health.

- **Resilient Nation** e.g. Energy security and efficiency; Reliable infrastructure; Better solutions to acute threats.

- **Connected Nation** e.g. Data-driven economy; Capitalising on the Internet of Things; Safe and trusted cyber-society.

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ICT research and research training contributes by:

▌▌ Enabling a competitive data driven economy

▌▌ Achieving transformational development and use of the internet of things

▌▌ Delivering intelligent technologies and systems

▌▌ Ensuring safe and trusted cyber society

▌▌ Designing for an inclusive, innovative and confident digital society

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We have developed a set of new cross-ICT priorities:

- Data Enabled Decision Making
- Future Intelligent Technologies
- Safe and Secure ICT
- Cross-Disciplinarity and Co-Creation
- People at the Heart of ICT
- New and Emerging Areas

- The cross-ICT priorities were published along with the Research Area strategies on 15 February 2017

More information at `https://www.epsrc.ac.uk/research/ourportfolio/themes/ict/introduction/crossictpriorities/`

All grants can demonstrate alignment to these priorities, but in particular for fellowships:

- **Early career fellowships** must demonstrate alignment to 'People at the Heart of ICT'
- **Established career fellowships** must demonstrate alignment to both 'People at the Heart of ICT' AND the 'Cross Disciplinarity and Co-Creation'

Data-Enabled Decision Making

- New methods for making decisions in a data-rich world
- Will require an integrated approach in which every element reflects the ultimate need for the outputs of that process to in some way benefit a person making a decision.
- This will include, but not be limited to:
  - data wrangling,
  - data analytics,
  - interaction with data,
  - data visualisation
- The data in question will often be complex, incomplete and/or mixed mode.
- There could also be opportunities for work on hardware and computer architectures for enabling faster, more efficient or even real-time decision making.

Future Intelligent Technologies

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- Promote development of intelligent, adaptive or autonomous systems that can learn, adapt and make decisions without the need for human control.
- Will inform and contribute to a new level of smartness, e.g. systems exhibiting social intelligence, understand context and adapt accordingly.
- High-ambition priority
- Move towards computing-with-meaning
- Computational systems able to match or even exceeds, levels of human performance in interpreting and making sense of information

Safe and Secure ICT

- Modern life relies increasingly on its digital dimension.
- We are highly dependent on connected information systems and our dependence exposes us to risks.
- Promote work which reduces the risks associated with ICT technology
- Reliability, robustness and maintainability
  - in the face of accidents, malice or unpredictable events.
- Technical, socio-technical and human-centric approaches will be required.

Cross-Disciplinarity and Co-Creation

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- 'Cross-disciplinarity and co-creation' encourages collaboration
    - between disciplines and sub-disciplines
    - with users of research.
- Focus on the benefits of cooperation and partnership throughout research process
- ICT landscape has rich opportunities for closer working between disciplines
- Many of the most exciting opportunities emerge at the interfaces between established areas.
- Co-creation approaches will help ensure that the problems being tackled and the opportunities being explored within the EPSRC ICT portfolio are well-framed and clearly understood.

People at the Heart of ICT

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- People engage with and are impacted by ICT as commissioners, users and often without even knowing it.
- Encourages the development of better ICT by asking researchers to acknowledge the relationship that people have with ICT and ICT-enabled systems
- Consider the impact these technologies can have on people.
- Consider these relationships and impacts throughout the research process from planning to implementation.
- Move beyond abstract notions of 'the user' and instead develop a more detailed and realistic understanding of the stakeholders in their research and what solutions which address people's needs look like.

New and Emerging Areas

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- Encourage truly transformative concepts and technologies within and beyond currently recognisable ICT space
- Needs to comprise something more than an advance, however significant, within an established field.
- It must be genuinely disruptive, offering real potential to significantly alter current practise in research or industry.
- Ideas in ICT might arise in two ways:
  - grown within the ICT research landscape
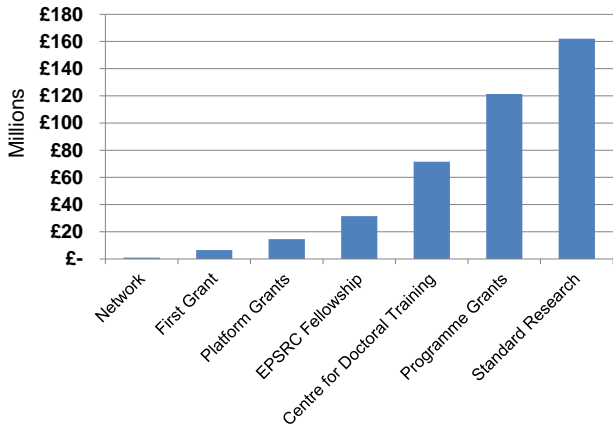 - introduced into ICT from other themes / disciplines
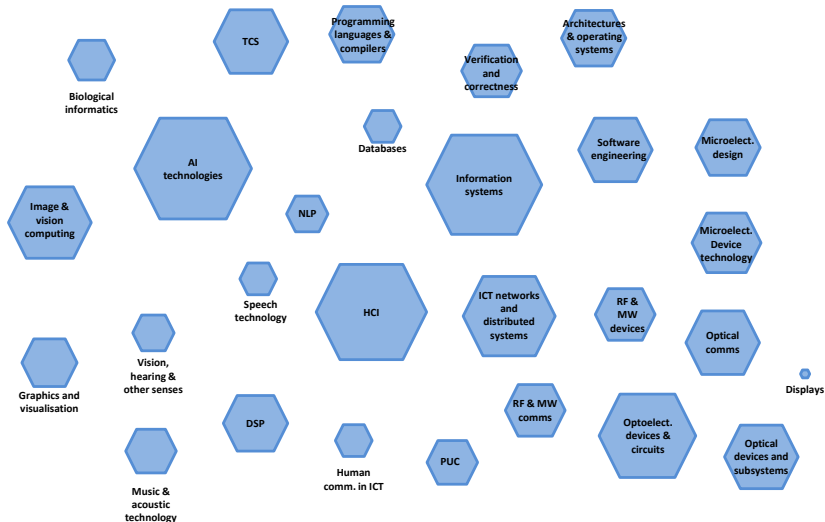
Balancing Capability

How ICT Research is Funded

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- ▌▌ Research Area model
- ▌▌ Rationale for each area with a strategy based on evidence
- ▌▌ No allocations by research area

Current ICT portfolio:
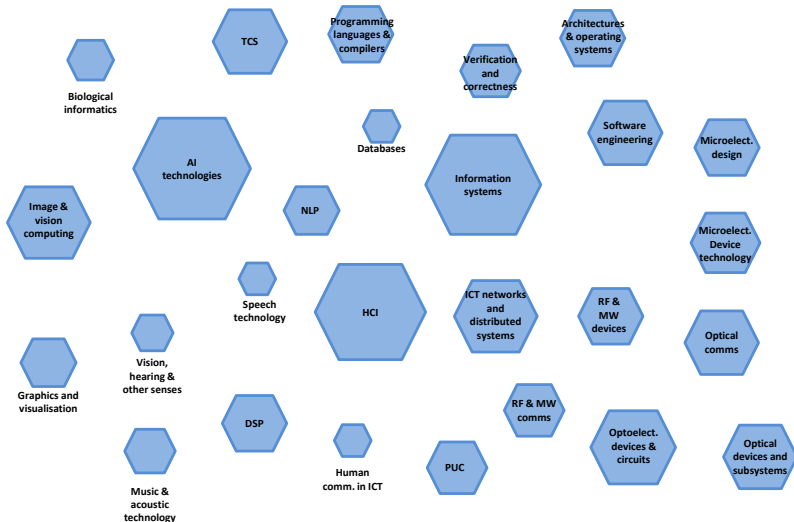Approx. £415M active grants

- There is a finite budget
- Trying to avoid one area gobbling up all of the funding
- EPSRC state how they would like to shift the balance in funding between particular subject areas
- Not getting rid of areas: just 'grow' / 'reduce'
- Note: *"If no one submits a proposal in an area we can't grow it"* and *"proposals must still be high-quality"*
- Again this is assessed by academics as part of the review process: reviewers and panel members should consider the arguments made for fit into balancing
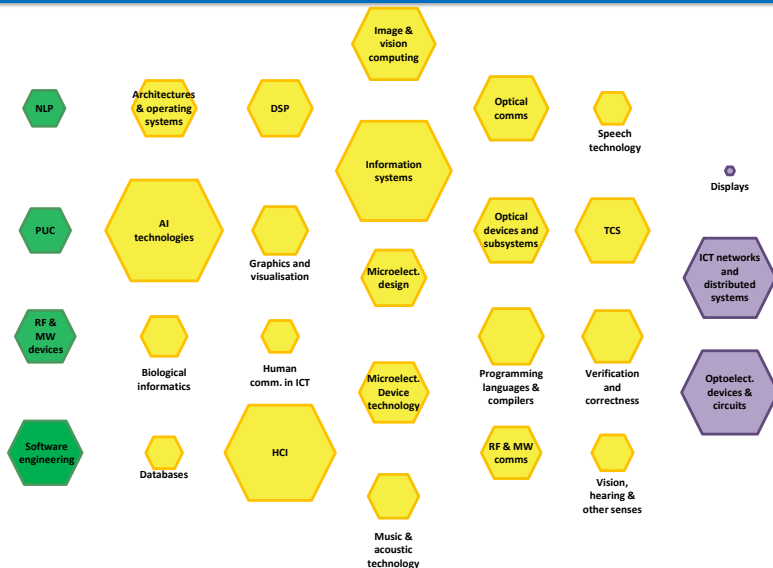- The areas for growth and reduction were chosen following wide-spread consultation

Current ICT portfolio

The ICT portfolio we aim to achieve by the end of the next period - approximately

TCS

Programming languages & compilers

Verification and correctness

Architectures & operating systems

Biological informatics

Databases

Software engineering

Microelect. design

AI technologies

Information systems

Image & vision computing

NLP

Microelect. Device technology

Speech technology

HCI

ICT networks and distributed systems

RF & MW devices

Optical comms

Graphics and visualisation

Vision, hearing & other senses

DSP

Human comm. in ICT

PUC

RF & MW comms

Optoelect. devices & circuits

Optical devices and subsystems

Music & acoustic technology

Planned trajectories for ICT Research Areas

Planned trajectories for ICT Research Areas – rationales and strategic focus

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Key for a data driven economy, the internet of things, intelligent tech, and safe and trusted cyber security

NLP

Displays

Research into displays is now part of other research areas

Key for the internet of things, intelligent tech, confident digital society, future healthcare, business innovation

PUC

Can contribute to the internet of things, solutions to acute threats, future healthcare, business innovation

RF & MW devices

ICT networks and distributed systems

Still want a significant portfolio but a shift towards other research areas, most notably PUC – researchers in this area encouraged to collaborate and link to real world tests

Increased emphasis needed for safe and trusted cyber society, intelligent tech, reliable infrastructure and solutions to acute threats

Software engineering

Optoelect. devices & circuits
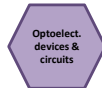
Still want a significant portfolio but can't justify current size at expense of other areas– researchers encouraged to continue to take a systems approach and for there to be a range of projects by scale and scope

Researchers have to submit high quality proposals

Reduce does not mean stop

Why Balancing Matters for Researchers

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The research area strategies and priorities have a **direct** bearing on:

- Expectations for applications for **standard** grants
- Our **fellowship** priorities
- Expectations for **programme grant** applications
- Any upcoming CDT calls (none announced yet)
- Any other targeted calls
- Where we focus our efforts

Cross-Disciplinarity and Co-Creation

Cross-Disciplinarity and Co-Creation

- An evolution of the previous "working together" priority
- *"Many exciting opportunities for transformative research emerge at the interface between established areas. The ICT landscape forms an ideal platform with rich opportunities for closer working between disciplines"*
- *"In Co-Creationary research, a strong foundation for novel research is established by identifying and creating a consensus before a project starts"*
- Consideration of this priority in all standard mode proposals is encouraged
- Requirement for Established Career Fellowships and Programme Grants
- *"EPSRC peer review process will be monitored to identify any bias against cross-disciplinary proposals"* (they were keen to emphasise that statistically if anything cross-discipline proposals have a slightly higher success rate)
- Demonstration of effective links with collaborators will strengthen any proposal
    - Involve potential collaborators in the earliest stages
    - Include time in your workplan for understanding the other disciplines
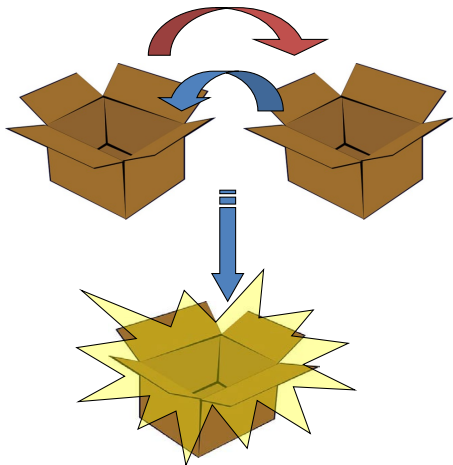
multidisciplinarity

- studying a research topic in several disciplines simultaneously
  - a painting: art history and mathematical geometry
- goals: limited to the framework of (home) disciplinary research
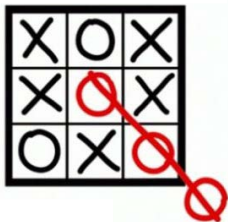 - others as a "service industry"
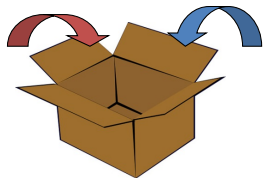
interdisciplinarity

- goal: transfer of methods from one discipline to another
  - new capabilities, new approaches, even new disciplines

transdisciplinarity

- between, across, *beyond* disciplines
- goal: "understanding the world" (not just one disciplinary view of it)
  - a unity of knowledge

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- Prof Susan Stepney, York Centre for Complex Systems Analysis
- extended seminar format; talk, then cakes, then back in the room for discussion
- reading groups across disciplines
- small, risk free projects to test ideas (summer school)
- co-supervising research students across disciplines

YCCSA

- York Centre for Complex Systems Analysis

- we are an **interdisciplinary** team of 90+ staff and students

  - Biology – Chemistry – Computer Science – Electronics – English – Environment – History of Art – Management – Mathematics – Physics …

  - we have associate members from other universities :

    - Birmingham – Cambridge – Durham – Madrid – Manchester – Oxford – Warwick …

- we focus on real world complex systems requiring interdisciplinary solutions – and a **common** mindset :

  - **systems thinking**

    - "*the totality is not, as it were, a mere heap, but the whole is something beside the parts*" – Aristotle, ~350 BCE [tr. W. D. Ross 1924]

    - "*the whole is other than the sum of its parts*"

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YCCSA problem domains, and tools

Socio-technical Systems

Resilient Systems

Fisheries

System Forensics

Ecosystem Interactions

System Simulation

Systems Biology

Robotics

Cancer

Gamification

Novel Computation

...

Immunology

Viruses

Complex Systems Science

Networks

Statistics

Spectroscopy

Bio-inspired Search

Mathematical Modelling

Computational Modelling

Swarm Engineering

Narratives

Beyond ICT, or beyond EPSRC?

- No double jeopardy – one proposal, one panel
- Cross-Theme funding
- Cross-Council funding
- Joint reviewer selection
- EPSRC remit query service

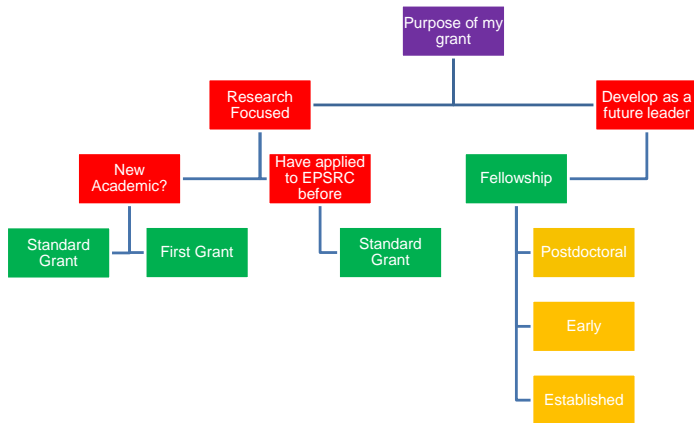http://www.epsrc.ac.uk/funding/howtoapply/basics/remit/remitqueries/

Funding for early career researchers

- Fellowships `www.epsrc.ac.uk/skills/fellows/areas/` which also come with funding for RAs in ECR and Established categories
- First grants
- Standard grants

Which grant is for me?

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Purpose of my grant
- Research Focused
  - New Academic?
    - Standard Grant
    - First Grant
  - Have applied to EPSRC before
    - Standard Grant
- Develop as a future leader
  - Fellowship
    - Postdoctoral
    - Early
    - Established

Other grants are available; Workshop grants, Network Grants and Overseas travel grants.
(Apply via Standard Grant mode)

What are Fellowships?

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▌▌A fellowship is a **personal award**, designed to provide the recipient with the necessary support to establish or further develop themselves as a leader of the future.

▌▌No eligibility rules based on years of post-doctoral experience or whether you hold (or do not hold) a permanent academic position

▌▌No nationality restrictions

EPSRC Fellowships Scheme

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POSTDOCTORAL	EARLY CAREER	ESTABLISHED CAREER
Applications not invited at this career stage.	Applicants must align their proposal with *People at the Heart of ICT* strategic priority. Applicants are encouraged to align with other ICT priorities.	Applicants must align their proposal with BOTH *People at the Heart of ICT* AND *Cross Disciplinarity and Co-Creation ICT* strategic priorities. Applicants are encouraged to align with other ICT priorities.

Robotic and Autonomous Systems (RAS) (Joint with Engineering)

First Grant Scheme – Key features

- Are not a 'must' you can go straight to Standard Research grant

- Funding capped at £125,000
  - calculated at 100% fEC; EPSRC contributes 80% fEC

- Duration max. 2 years

- No closing dates

- Open for proposals in all of EPSRC's remit

- Only allowed to apply once!

- First Grant proposals are only in competition with other First Grants

http://www.epsrc.ac.uk/funding/howtoapply/routes/newac/firstgrant/

First Grant Scheme – Eligibility

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- Within 36 months of first academic lecturing appointment in a UK university or probation period of the new appointment

- Submit within 10 years of PhD or equivalent prof. qualification

- Hold an academic university post that exceeds the duration of the grant

- You do NOT hold an EPSRC Early/Established Career Fellowship

- You are applying to EPSRC as a PI for the first time

- You *can* be a Co-I on another grant already

- Unsuccessful EPSRC fellowship applicants *can* apply for a First Grant

Standard Research Funding

- Flexible funding route which supports a wide range of research programmes.

- Key Features:
    - No fixed length
    - No fixed value
    - No closing dates – Applications can be submitted all year round
    - No constraint on field of research, permitted it is within EPSRC remit!

- Things to consider:
    - High Risk/High Return proposals are encouraged.
    - Embracing new concepts or techniques.

- Relevant activities funded via this route:
    - Long term proposals aimed at developing critical mass.
    - Feasibility studies.
    - Overseas Travel Grants.
    - Workshops.

General tips

Disclaimer!

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There is no magic formula. Remember, the standard is very high. The typical success rate (number of funded applications vs total number of applications) is relatively low. (Between 10-30%)

From EPSRC perspective, a grant should:

▌▌ Be high quality science/engineering

▌▌ Have <u>appropriate</u> levels of risk and ambition

▌▌ Align with the UK's strategic priorities (Understand what they are!)

▌▌ Contribute to the health of the UK's existing research base (Who else is in this space?)

▌▌ Show a realistic pathway to high impact (Note the emphasis on <u>pathway</u>)

▌▌ Aim to provide good value for money (Appropriate resources)

▌▌ Request enough but not too much (Too little and you lack credibility)

▌▌ Demonstrate the necessary track record and skills needed to deliver the grant

These are a minimum! Grants which do not meet these criteria risk being rejected prior to peer review!

- a good idea is necessary, but not sufficient on its own
- explain WHY the proposal is: ambitious, important, challenging
- provide EVIDENCE
- pathways to impact: can't predict impact! This is how you will try to make it happen. NB trained people are an impact to society. Also another chance to state importance.
- *Responsible research and innovation*: show in your PTI that RRI principles will be followed (essentially anticipating possible routes to impact and closely involving possible stakeholders): `www.epsrc.ac.uk/research/framework/`
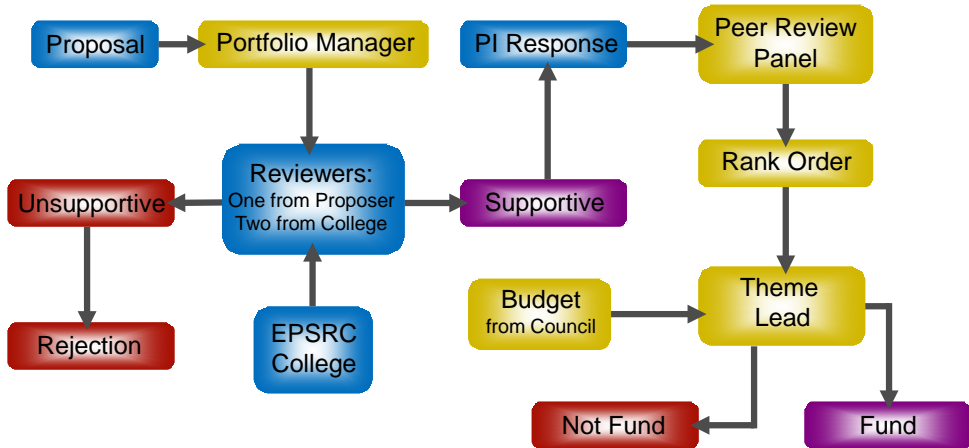
This is crucial! At panel, all that will be presented is a summary of the reviewers' scores and comments, and your responses to them.

- **be humble** — assume reviewer is an expert!
- **focus on the words**, not just the scores.
- deal with anything that's consistent
- respond to **every** criticism
- **use evidence** — don't just say "X said, Y said"
- e.g.: "too incremental" — "X has been unanswered for n years" "rest of project is ambitious; this part is necessary and represents balancing risk"

Part 2: Writing a review response

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"This is over-ambitious"

Good Response:

Refer to the workplan, explain the risks and how they will be managed, explain how the impacts will be made throughout the grant, explain why the ambition is necessary for this project.

Bad Response:

Insist that all research requires risk or high ambition.

Ignore or dismiss the criticism.

Summary

EPSRC are very approachable. Many times during the workshop they told us to pick up the phone if we are unsure of any part of the process. Most of the staff have a research background but not in ICT (likewise for the other themes).

Key message for writing a proposal is the be clear and to answer the questions. All the expectations are set out so make sure they are addressed.

Even the best proposals sometime miss out because competition is strong, so keep trying.