

# Building multidisciplinary collaborations

Janet Ball & Diego Oyarzún



@doyarzunrod

[homepages.inf.ed.ac.uk/doyarzun/](http://homepages.inf.ed.ac.uk/doyarzun/)

# Two parts

- Part 1: **Why** and **how**
- Part 2: Sharing **best practice** (do's and don'ts)

# Why?

- Scientific curiosity / learn / have fun
- Increase research income
- Reach new audiences
- **Global challenges require multiple disciplines**

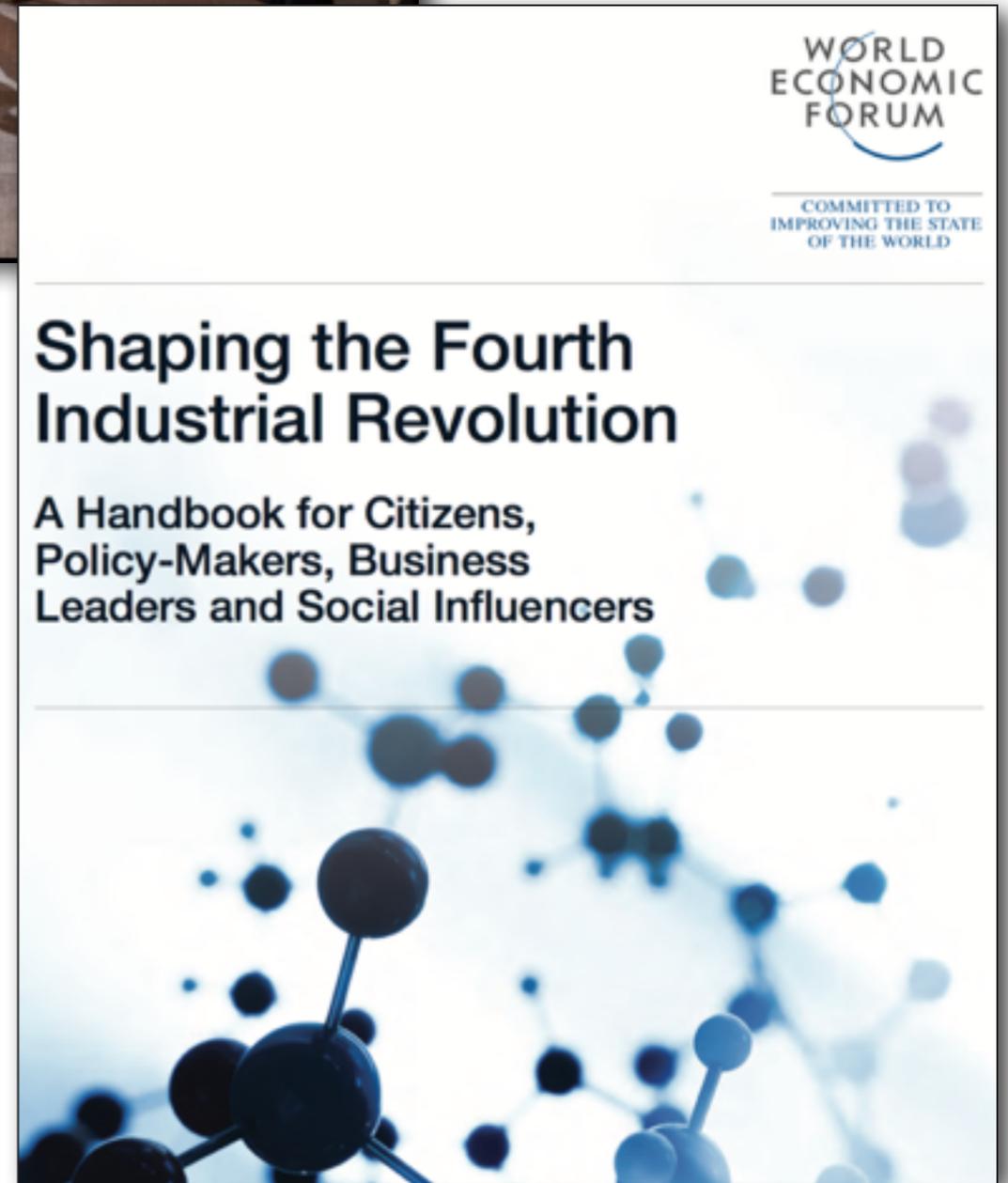
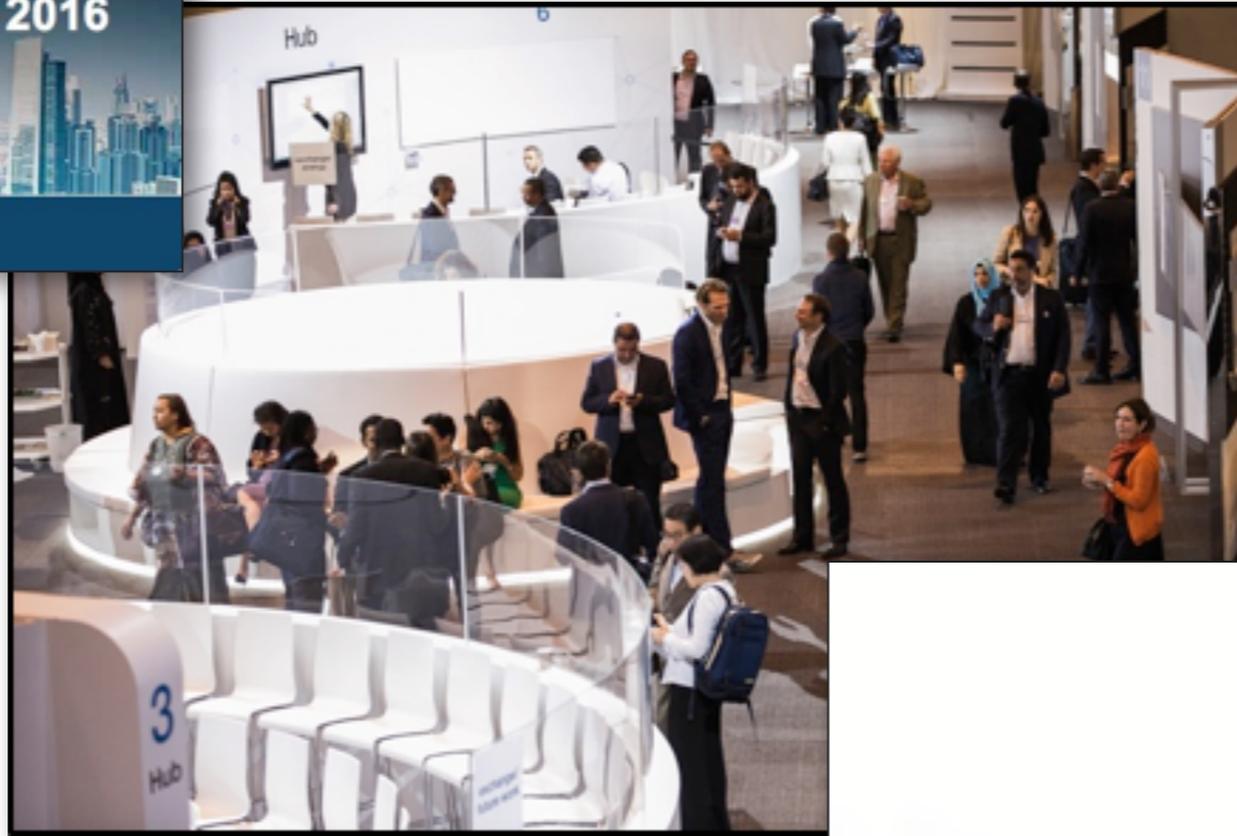
# Why?



## SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD







# SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

**1** NO POVERTY

**2** ZERO HUNGER

**3** GOOD HEALTH AND WELL-BEING

**4** QUALITY EDUCATION

**5** GENDER EQUALITY

**6** CLEAN WATER AND SANITATION

**7** AFFORDABLE AND CLEAN ENERGY

**8** DECENT WORK AND ECONOMIC GROWTH

**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE

**10** REDUCED INEQUALITIES

**11** SUSTAINABLE CITIES AND COMMUNITIES

**12** RESPONSIBLE CONSUMPTION AND PRODUCTION

**13** CLIMATE ACTION

**14** LIFE BELOW WATER

**15** LIFE ON LAND

**16** PEACE, JUSTICE AND STRONG INSTITUTIONS

**17** PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS

# How?

- **On to Janet**

Business School

Cardiovascular Science

Clinical Brain Science

Genomic and Experimental Medicine

Global Health Research

Inflammation Research

Integrative Physiology

**Medical Informatics**

Population Health Sciences

Reproductive Health

**EPCC**

EDINA and Data Library

College of Art

Education

Biological Sciences

Chemistry

Economics

**Engineering**

**Geosciences**

Health in Social Science

History, Classics and Archaeology

Law

Literature, Languages and Culture

**Maths**

**Philosophy, Psychology and Language Sciences**

And hundreds of other universities, companies, charities, social enterprises as collaborators, funders and partners – UK, Europe, rest of the world

### ➤ Why do it?

- How many calls have ‘inter- or multidisciplinary’ somewhere in the guidance?
- Grand challenges, global challenges need multiple viewpoints and inputs
- Push boundaries
- Problems don’t always sit in disciplines – social aspects
- Interesting
- Where the funding sits

### ➤ Issues

- Lack of faith in reviewers (note changes in REF panels)
- Management of bid process
- Find the funder for you
- Career progression outside discipline
- Talking across disciplines, understanding other perspectives and drivers
- Time and locations
- Finding the right partners
- Ethics
- IP

### ➤ Solutions

- Events, funder meetings, colleagues, Business Development, networking, Grants on the Web
- Research Professional, DoR emails on opportunities
- Co-creation
- Starting with seed projects
- Sound project structure and management
- Using Business Development, Consultancy and other colleagues to network and find partners
- Involve School and University support early – Portfolio Managers, Research Services, Research Support
- Leadership
- Flexibility
- Contracts – milestones, management structure, IP, publishing
- Time

# Process

---

- What's the challenge?
- And the solutions?
- How could you address it or what could your discipline bring to it?
- What other disciplines would be involved? Law, Engineering, Maths, Social Sciences?
- What type of organisations? Industry partners?
- Which funder remit is it in (who would lead)? Can you talk to a programme manager? Remit check?
- What will it cost? Do you need match funding or partner contributions for the call?
- Who do you need to work with?
- Are there any funder meetings, workshops? Is the College or University hosting any workshops? Can you ask them too?
- Example – Healthcare Technology Call

# EPSRC Cross-Disciplinarity and Co-Creation Priority in ICT

---

<https://epsrc.ukri.org/research/ourportfolio/themes/ict/introduction/crossictpriorities/crossdisciplinarity/>

- This priority encourages collaboration between researchers working in different disciplines and with users of research. **ICT landscape has rich opportunities for closer working between disciplines and many of the most exciting opportunities emerge at the interface between established areas.** Cross-disciplinary research includes novel collaboration within in the ICT community, with researchers across the EPSRC portfolio and with researchers funded by other research councils.
- **Co-creation** identifies and creates a consensus before a project starts and so builds a stronger foundation to support novel research. This kind of active collaboration across disciplines can help ensure that problems being tackled and opportunities being explored within the EPSRC ICT portfolio, are well-framed and clearly understood. Co-creation can lead to innovative ways to approach a research challenge, including some that could not be devised by researchers working in one discipline alone.
- **Co-creation** requires researchers to gain an understanding of each other's science so that, for example, methodologies from one discipline can be applied in another. It is this level of cooperation that can enable active partnerships, rather than more passive supplier-client type relationships to develop. Developing this level of understanding takes time.
- Researchers interested in a cross-disciplinary approach should actively involve collaborators in the earliest stages of devising a proposal. Being able to demonstrate that the various collaborators can work together effectively will strengthen a proposal. Workplans should allow time for ideas to be shared in the early stages of a project.
- *When applying for a Programme Grant you must detail how you have addressed this priority.*
- *EPSRC Themes <https://epsrc.ukri.org/research/ourportfolio/themes/> - across disciplines, funders and partner types*
- *Healthcare <https://epsrc.ukri.org/funding/calls/transformativhealthcare2050/> - new thinking, disruptive, innovative, collaborative, co-created, visionary  
'Applicants should demonstrate that applications are being co-created with relevant stakeholders which may include: service users, industry, clinicians, policy makers and practioners including allied healthcare workers'*

# Useful links and contacts

---

- GCRF <https://www.fasttrackimpact.com/gcrf-resources> and <http://web.inf.ed.ac.uk/infweb/research/gcrf>
- ISCF <https://www.ukri.org/innovation/industrial-strategy-challenge-fund/> and <https://www.edweb.ed.ac.uk/research-support-office/funders-and-funding/industrial-engagement/industrial-strategy-challenge-fund> Caroline Woodside and Julia Gilliam from Edinburgh Innovations offer support for developing bids
- <http://web.inf.ed.ac.uk/infweb/research/support> - research support in the School
  - Contacts, policies, procedures
  - Inter-Disciplinary Research Challenges in Computer Systems for the 2020s (see next slide)
  - Working with Director of Research
- <https://www.edweb.ed.ac.uk/research-support-office/toolkit-for-applicants/successful-applications/cse> copies of successful applications but if what you want isn't there, ask your portfolio manager

# Inter-Disciplinary Research Challenges in Computer Systems for the 2020s

---

The broad landscape of new technologies currently being explored makes the current times very exciting for computer systems research. The community is actively researching an extensive set of topics, ranging from the small (e.g., energy-independent embedded devices) to the large (e.g., brain-scale deep learning), simultaneously addressing technology discontinuities (End of Moore's Law and EnergyWall), new challenges in security and privacy, and the rise of artificial intelligence (AI).

While industry is applying some of these technologies, its efforts are necessarily focused on only a few areas, and on relatively short-term horizons. This offers academic researchers the opportunity to attack the problems with a broader and longer-term view. Further, in recent times, the computer systems community has started to pay increasing attention to non-performance measures, such as security, complexity, and power. To make progress in this multi-objective world, the composition of research teams needs to change. Teams have to become inter-disciplinary, enabling the flow of ideas across computing fields.

While many research directions are interesting, this report outlines a few high-priority areas where inter-disciplinary research is likely to have a high payoff

- a) Developing the components for a usable planet-scale Internet of Things (IoT), with provably energy-efficient devices. This report envisions a highly-available, geographically distributed, heterogeneous large-scale IoT system with the same efficiency, maintainability, and usability as today's data centers. This planet-scale IoT will be populated by many computationally-sophisticated IoT devices that are ultra-low power and operate energy-independently.
- b) Rethinking the hardware-software security contract in the age of AI. In light of the recent security vulnerabilities, this report argues for building hardware abstractions that communicate security guarantees, and for allowing software to communicate its security and privacy requirements to the hardware. Further, security and privacy mechanisms should be integrated into the disruptive emerging technologies that support AI.
- c) Making AI a truly dependable technology that is usable by all the citizens in all settings. As AI frameworks automate an increasing number of critical operations, this report argues for end-to-end dependable AI, where both the hardware and the software are understood and verified. Further, AI needs to turn from a centralized tool into a capability easily usable by all the citizens in all settings to meet an ever expanding range of needs.
- d) Developing solutions to tackle extreme complexity, possibly based on formal methods. This report argues for the need to tame the explosion of system complexity and heterogeneity by creating new abstractions and complexity-management solutions. Such solutions need to be accessible to domain experts. An important step towards this goal is to scale out and extend formal methods for the real world.

This report also describes other, related research challenges. <https://dl.acm.org/citation.cfm?id=3297279>

# Useful Links

---

- <https://www.wiki.ed.ac.uk/display/ISSTInterdisciplinary/Interdisciplinary+wiki> screenshot below
- <https://www.researchprofessional.com/0/rr/funding.html> - finding funding
- Who's working with who? <https://epsrc.ukri.org/research/ourportfolio/themes/ict/>
- Find out how the panels work by joining <https://epsrc.ukri.org/funding/assessmentprocess/college/memberselection/>

1. A Short Guide to Developing Interdisciplinary Research Proposals by Professor Joyce Tait and Dr Catherine Lyall
2. A Short Guide to Reviewing Interdisciplinary Research Proposals by Dr Catherine Lyall, Ann Bruce, Professor Joyce Tait and Dr Laura Meagher
3. A Short Guide to Building and Managing Interdisciplinary Research Teams by Dr Catherine Lyall and Dr Laura Meagher
4. A Short Guide to Supervising Interdisciplinary PhDs by Dr Catherine Lyall, Dr Laura Meagher and Professor Joyce Tait
5. A Short Guide to Troubleshooting Some Common Interdisciplinary Research Management Challenges by Dr Catherine Lyall and Dr Laura Meagher
6. A Short Guide to Designing Interdisciplinary Research for Policy and Practice by Dr Catherine Lyall
7. A Short Guide to Developing Interdisciplinary Strategies for Research Groups by Dr Catherine Lyall, Prof Robin Williams, Dr Laura Meagher
8. A Short Guide for Funders of Interdisciplinary Research by Dr Wendy Marsden, Dr Catherine Lyall, Dr Ann Bruce and Dr Laura Meagher
9. A Short Guide to Evaluating Interdisciplinary Research by Dr Catherine Lyall, Prof Joyce Tait, Dr Laura Meagher, Dr Ann Bruce and Dr Wendy Marsden
10. A Short Guide to Leading Interdisciplinary Initiatives by Dr Laura Meagher, Dr Catherine Lyall, Dr Ann Bruce and Dr Wendy Marsden
11. A Short Guide to Exploring Interdisciplinary Careers by Prof Catherine Lyall with Dr Laura Meagher

# Intra-, cross-, multi-, inter-, trans...?

---

- Intradisciplinary: single discipline.
- Crossdisciplinary: viewing one discipline from the perspective of another.
- **Multidisciplinary: people from different disciplines working together, each drawing on their disciplinary knowledge (medical team in operating room using different skills to save patient).**
- Interdisciplinary: integrating knowledge and methods from different disciplines, using a real synthesis of approaches.
- Transdisciplinary: creating a unity of intellectual frameworks beyond the disciplinary perspectives

# Intra-, cross-, multi-, inter-, trans...?

---

- REF – *‘If a case study is relevant to more than one major research subject area then it is classed as interdisciplinary’*
  - REF 2021 subject panels to have interdisciplinary expertise. Each main Research Excellence Framework assessment panel should have at least one member with interdisciplinary experience, according to the findings of a REF advisory panel.
- Multidisciplinary “Theory, methods, and interpretive standards of the different disciplines are employed. Interpretation of the results from different disciplines typically occurs post hoc, often from the perspective of one discipline that may emerge as dominant within the project.” (Rossini & Porter, 1979)
- Interdisciplinary “Approaches integrate separate disciplinary data, methods, tools, concepts, and theories in order to create a holistic view or common understanding of a complex issue, question, or problem” (Wagner et al., 2011, p. 16)
- Transdisciplinary “Trans-sector, problem-oriented research involving a wider range of stakeholders in society” (Klein, 2008, p. S117)
- Crossdisciplinary This term is often used to describe the three research modalities defined above

# Best practices

- What are the main challenges?
- Best practice in writing multi-partner applications
- Expected outcomes / metrics of success