# Short Guide to Developing Interdisciplinary Research Proposals

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## Definitions and models of interdisciplinary research

Interdisciplinary research often requires more resources of time, effort, imagination and money than single discipline research (and may also involve higher risks of failure) but the rewards can be substantial, in terms of advancing the knowledge base and helping to solve complex societal problems.

**We define interdisciplinary research as occurring where the contributions of the various disciplines are integrated to provide holistic or systemic outcomes[1].**

Interdisciplinary research can be *within* the social sciences or *between* the social, natural and life sciences and can be sub-divided into:

- Research which aims to further the expertise and competence of academic disciplines themselves, e.g. through developments in methodology which enable new issues to be addressed or new disciplines or sub-disciplines to be formed

- Research which is problem focused and addresses issues of social, technical and/or policy relevance with less emphasis on discipline-related academic outcomes

These two models of interdisciplinary research are appropriate to different types of research question and will require differing combinations of expertise in researchers[2]. The criteria for the choice of disciplines to be involved in a project will also differ in each case.

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[1] Multidisciplinary research, where each discipline works in a self-contained manner with little cross-fertilisation among disciplines or synergy in the outcomes is not discussed here.

[2] Bruce, A., Lyall, C., Tait, J. and Williams, R. (2004), "Interdisciplinary Integration in the Fifth Framework Programme", Futures, 36/4, pp. 457-470.

Motivations for setting up and funding interdisciplinary research programmes might include:

- the nature of the subject is interdisciplinary (e.g. transport, environment)

- researchers are transferring information from the laboratory to the real world

- the research is user driven (not necessarily commercial)

- the research is particularly relevant to policy making in complex areas

- single discipline research has encountered a bottle-neck and more than one discipline is needed to make a breakthrough

For individuals engaging in interdisciplinary research motivations might include a desire to:

- engage with 'real world' problems

- tackle socially relevant issues

- contribute to the advancement of academic disciplines

## Strategies for integrating disciplines

Disciplines have survived for so long in the academic world because they serve the very useful function of constraining what the researcher has to think about. They set a boundary on the parameters of interest (what to include and what to leave out) and dictate the range of methodological approaches that are relevant. They thus provide a clearly defined starting point for a project but they also pre-determine to a large extent what the outcomes of the research will be. If this framework is partially or wholly removed, as is the case in interdisciplinary research, inexperienced researchers can be overwhelmed by the resulting complexity. An **active strategy** is thus needed to provide for integration among the different disciplines and different models in an interdisciplinary project.

Much more than discipline-based projects, interdisciplinary projects have to undergo a **preliminary research phase** that is open-ended. This initial phase involves trying out a range of possible boundaries to the problem to see which gives the best 'fit', allowing the outputs of this analysis to determine the disciplines to be involved[3]. This should be part of the process of developing a research proposal and it should be clear from the proposal what has been done and that the outcome represents a justifiable decision on the project's boundaries.

The outcome of the initial exploratory phase should be:

- a specification of the range of issues that are central to the research problem

- how they interact with one another to create or sustain the problem

- how these interactions can be modified to deliver an implementable, synergistic solution

**Interdisciplinary research does not occur automatically** by bringing together several disciplines in a research project. Extra effort is needed to promote the formation of a cohesive research team involving researchers from different disciplines, to combine expertise from several knowledge domains and to overcome communication problems among researchers from different disciplines.

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[3] For relevant techniques see: RL Flood and M Jackson (1991) *Creative Problem Solving*. Chichester: Wiley and P Checkland and J Scholes (1990) *Soft Systems Methodology in Action.* Chichester: Wiley.

Perceived problems in conducting interdisciplinary research include:

- language and communication issues
- institutional structures and procedures
- divergences in worldviews across disciplines

It thus takes longer to bring together an effective interdisciplinary team, the start-up phase of a project will take longer and the demands on the project co-ordinator will be greater.

## Skills needed by interdisciplinary researchers

In interdisciplinary research, personality and attitudes of researchers are at least as important for success as discipline base and specialisation. Useful characteristics are:

- flexibility, adaptability, creativity
- curiosity about, and willingness to learn from, other disciplines
- an open mind to ideas coming from other disciplines and experiences
- good communication and listening skills
- an ability to bridge the gap between theory and practice
- a good team worker

A good interdisciplinary researcher will also have a **high tolerance for ambiguity**. This means not prematurely reducing a problem to a limited set of dimensions, but taking time to explore a range of dimensions, to test several potential boundaries to a problem until the apparently optimum boundary and set of dimensions has been identified. These explorations should be part of the teamwork conducted by the project co-ordinator and the ability of team members to engage productively in this process is very important to the project's success.

Researchers who have skills and knowledge in more than one discipline are particularly valuable members of interdisciplinary teams, but a mono-disciplinary researcher with most of the above attributes should be capable of learning rapidly to operate in an interdisciplinary environment.

The following additional qualities are also relevant to good project management:

- understanding (not necessarily in depth) across the project's main discipline domains
- understanding application areas, in industry or the public sphere, for project outcomes
- focus on team work and on practical results, to overcome differences in disciplinary orientation and between, say, participants from public and private sectors
- respect for other disciplines and some understanding of their general principles
- expertise in their own discipline(s), but not necessarily a strong ambition to pursue a career in that discipline which would inhibit their willingness to invest attention elsewhere
- balancing openness to new ideas with maintaining the progress of the project
- skills in building relationships, trusting the judgement of others, good interpersonal and diplomatic skills and a pro-active approach to interaction with partners
- finally, a clear vision of the project and what it is trying to achieve

## The role of stakeholders and users

Stakeholders can play an important role in interdisciplinary research, focusing attention on the need for relevance to real world problems and encouraging the uptake of research results by industry or other end-users. User engagement is often perceived as a way of reinforcing the interdisciplinary nature of research projects since users' needs are usually not demarcated along disciplinary lines. Strong interdisciplinary proposals are often those that are designed in close collaboration with potential users, not least because this can permit access to research data, research subjects or additional funds.

However, it would be wrong to assume that users will automatically have a better understanding than academics of the 'real world' nature of problems. On the contrary, user communities might not fully understand the nature of their problem and this can compromise the quality of the research and may lead it in unproductive directions. Interactions with stakeholders can also be problematic, for example if key research partners move posts unexpectedly, if commercialisation or other pressures lead to demands for premature delivery of outputs, if delays in delivery of project outputs jeopardise commercial applications or if delays in obtaining research funding cause users to lose interest in the project. **A plan for stakeholder and user engagement, with allowances for such contingencies, is needed.**

## Checklist for a good interdisciplinary research proposal

- Specify clearly why an interdisciplinary approach is needed, which type of interdisciplinary approach is envisaged and which disciplines should be involved. (Where this has been based on a formal analysis of the problem domain, describe the process briefly.)

- Describe how the disciplines involved will be integrated and how this relates to the type of interdisciplinarity involved; demonstrate how the quality of integration will be assured

- Describe the leadership role and management strategy to deliver the desired outcomes

- Summarise the interdisciplinary skills of the researchers involved

- Where relevant, develop a clear plan for the involvement of end users and stakeholders in the project, including contingency plans for recognised pitfalls. Indicate clearly the benefits to stakeholders and the roles of stakeholders in contributing to the project

- Budget for, and justify, the additional resources needed

- Describe how interdisciplinarity will be reflected in the project outputs and outcomes

This note was first produced by the authors for ESRC in the form of advice to applicants. For further information contact **c.lyall@ed.ac.uk**

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