Five Strategies for Practising Interdisciplinarity

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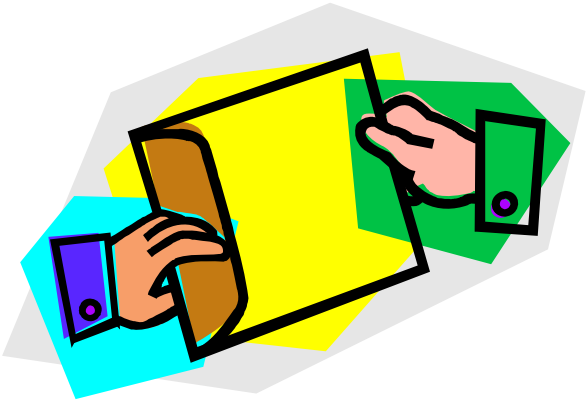
Introduction

Interdisciplinarity has been identified as a desirable direction of research and is being strongly promoted by research funding organisations in Europe and the US. The main rationale for encouraging interdisciplinarity is the concern that disciplinary research has become too narrowly specialized and that there are now diminishing returns of traditional disciplinary approaches. Interdisciplinarity, on the other hand, promises to be more innovative and seems to be a main characteristic of international level 'cutting-edge' research. In particular in the natural sciences some of the most exciting and most rapidly developing fields of research, such as biotechnology, nanotechnology and artificial intelligence, are inherently interdisciplinary. Analogously, it has been argued that the social sciences would also be able to benefit tremendously from interdisciplinary approaches to research, which would help in overcoming artificial disciplinary boundaries, parochialism and narrow-mindedness and would thus improve the overall quality of social science research. Although there seems to be some agreement that interdisciplinarity would be in principle desirable, there is also a lot of disagreement about what interdisciplinarity means in practice and how far it can go in theory. There is still no universally accepted definition of 'interdisciplinarity' and the interdisciplinarity debate itself now includes a great number of very different concepts such as crossdisciplinarity, multidisciplinarity, transdisciplinarity and so on. The purpose of this short paper is to discuss five approaches or strategies for conducting interdisciplinary research. All of these strategies have their promises and pitfalls, which will be explored. Although all researchers are certainly well advised to look beyond their own discipline, it is also clear that little could be gained by choosing an interdisciplinary research strategy just for the sake of it. In the end, it very much depends on the problem that the researcher aims to solve whether a disciplinary or an interdisciplinary approach would be more successful. Furthermore, it is also important which strategy of interdisciplinarity is chosen and with what kind of aim or ambition. The major questions are whether the aim is to solve a narrow research problem, which may benefit from an interdisciplinary approach, whether it is a problem that arises and is attacked in a non-academic context, whether the problem is in itself complex and discipline-transgressing, whether this fact may require the sharing of concepts, theories and methods across disciplines, or whether the array of problems is so big and complex that it necessitates the creation of a superdiscipline. Depending on the answers to these questions an individual researcher or a research community will choose one of the five different strategies discussed below.

1. Borrowing Knowledge and Methods (Crossdisciplinarity)



The most common and in some sense easiest form of interdisciplinarity does not actually require the collaboration of researchers with different disciplinary backgrounds, or in fact any collaborative research effort. The general idea is to look at what other disciplines have to say about a particular phenomenon or object within the scope of the own discipline, or alternatively to apply concepts and methods of their own discipline to phenomena or objects of other disciplines. This approach is sometimes called crossdisciplinarity. For example, a political scientist can study political institutions and processes by applying rational choice or game theory, which originate from other disciplines such as mathematics and economics. A political scientist may also use knowledge produced by the discipline of economics to explain certain features of a particular political system. Analogously, an academic may apply the methods of their own discipline to problems that are clearly outside the traditional scope of their own discipline. For example, an economist can apply economic methods and approaches for measuring and understanding happiness, or an anthropologist can use ethnographic methods for understanding the process of scientific research and discovery.

Challenges and Opportunities

Such borrowing and boundary-crossing has become commonplace within academia and it is primarily a means for achieving novelty and innovation. The problem with this practice is that it is often perceived to be imperialistic, as areas of knowledge belonging to different disciplines seem to be appropriated through crossdisciplinary research. Sometimes it may be highly inappropriate to apply some high-powered methods developed in a different context to problems that are different in nature and that do not really benefit from them. Mathematical methods are certainly effective for analysing economic processes, but when economists apply them to something different like ‘happiness’, it remains highly doubtful that it would be a phenomenon that is in principle quantifiable, or that it could be, for example, captured through statistical analysis or other mathematical methods. In addition, crossdisciplinarity is in another respect intellectually risky as it may be considered dilettantism to use the knowledge and methods of a different

discipline without having enjoyed the proper disciplinary training. The imported knowledge and methods may be new in one discipline, but the way in which they are applied could result in criticism from members of the 'exporting' discipline. As a result, crossdisciplinary borrowing requires at least 'adequacy' in the lender discipline.

Verdict: borrowing is appealing because it seems easy to do and is an obvious way to achieve novelty; the downside is that it often requires a substantial effort on the part of the borrower to learn 'foreign' knowledge and methods and that it entails some intellectual risk to stray away from established disciplinary knowledge and methods. ➔ Best for narrow problems that are situated in the gaps between disciplines.

2. Interdisciplinary Collaboration without Synthesis or Collaboration with the Hierarchical Integration of Knowledge (Multidisciplinarity)

The second strategy for interdisciplinary research does require some limited collaboration of researchers from different disciplines and is generally referred to as multidisciplinarity. In multidisciplinary research a team of researchers works towards a common aim or on a common problem, but each represented discipline works independently or in sequence. The contributions of the disciplines are purely complementary to the final product, which may just consist of a compilation of disciplinary research on a common theme or object. Alternatively, this collaboration may result in an integrated research product that synthesizes the disciplinary perspectives into a coherent picture. If it does, it means that the synthesis is carried out as a final step by the principal investigator(s), possibly without any exchange between the disciplines concerned. The discipline-specific research may be carried out by contract researchers who are skilled in using particular research methods that have been decided upon in advance by the principal investigator(s).

Challenges and Opportunities

The challenge of any collaborative effort is to manage the team and to make sure that everybody is doing what he or she is supposed to do. The particular difficulty in multidisciplinary research is that the success of the research

project depends to a very large degree on the team leader or principal investigator, who would be unlikely to be fully competent in all the disciplines and methods involved. This is a problem because the principal investigator has to come up with a research plan that works. Furthermore, the principal investigator has to evaluate and integrate all of the contributions of the multidisciplinary team. In cases where the final product is only a summary of disciplinary perspectives on a certain topic or object, it may not be very difficult to do. However, if the aim is to produce an integrated research product that can take into account the various disciplinary perspectives on a given problem, it may be an extremely challenging task. First of all, there is the issue that different types of knowledge need to be fused together, which may require the development of some sort of meta-language into which the disciplinary 'languages' can be translated in order to make the disciplinary perspectives compatible and comparable. This process of integration can be in itself a major effort. Secondly, the various disciplinary research methods may produce a contradictory picture and it will be up to the principal investigator or consumer to decide what is in the end most relevant and what is less relevant or inaccurate. In some cases this may involve some negotiation amongst the team, so that the perspectives of the team members and their respective disciplines are represented correctly in the final product.

Verdict: the multidisciplinary approach is probably most common in collaborative interdisciplinary research, as it widens the scope of a research project, but it does not establish a full dialogue between disciplines; many issues and problems connected to the use of mixed-methods apply to multidisciplinary research as well; producing a fully-integrated research product from multidisciplinary research can be very difficult and the main burden is on the team leader. ➔ Best for narrow problems that span several disciplines and best whenever an integrated product is not required.

3. Cooperating with Non-University Stakeholders of Research (Transdisciplinarity)

A different strategy for doing interdisciplinary research is to look for research collaborators outside of the academic/university context and to produce a

research product primarily for the purpose of application, for example the development of new technology or the formulation of policy. This kind of research represents a major tendency and it has been termed ‘mode 2 knowledge production’ by Michael Gibbons et al., who consider it to be ‘transdisciplinary’ knowledge production in contrast to scientific/disciplinary knowledge production. The phenomenon of the research collaboration of universities with industry and other non-university organisations is continuously growing in importance, especially in the context of consulting contracts and technology development. Although research collaboration with non-university stakeholders is still most common in the natural sciences, engineering and computer science, there are also increasing opportunities for academics from the social sciences to go outside the university and the academic funding system to do contract research for the private sector, NGOs and the voluntary sector and, of course, the public/government sector.

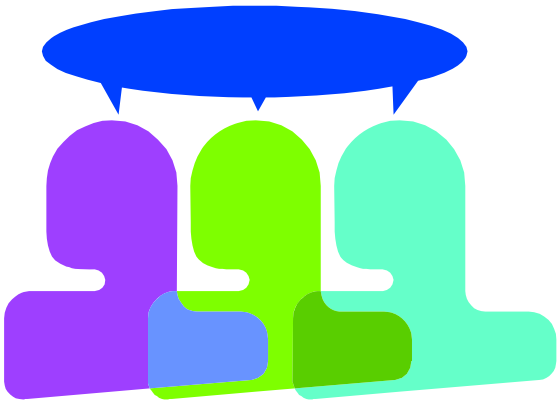
Challenges and Opportunities

As non-university research collaborators are stakeholders in the results or products of research, academic researchers often need to work very closely with their clients on a day-to-day basis. It thus involves some participation of non-academic stakeholders in the overall research process. Transdisciplinary research projects can bring together very different people, with very different interests and very different backgrounds, who have to work together as a team to produce a desired outcome. Very often the academic collaborators will not be able to determine the final aims of the research and will find themselves in the subordinate role of a service provider. Unlike crossdisciplinary and multidisciplinary research, transdisciplinary research is not derived from already existing disciplines or the research agendas of disciplines, but is driven by real-world problems and usually entails the opportunistic selection and use of research methods according to whatever ‘fits’ the problem. While there is clearly a market for academic research and problem-solving, the fact that such activity occurs outside of conventional academic work and outside legitimating scientific discourses often means that transdisciplinary research is less appreciated and less prestigious within academia. The products of transdisciplinary research do not usually result in academic publications and there is also the stigma of bias caused by the willingness of academics to accept and further the particular aims of their non-academic clients. Though new scientific knowledge and methods can be developed in the context of transdisciplinary research projects, it remains questionable to what extend transdisciplinary research is still ‘scientific’ and whether it would indeed advance science overall.

Verdict: transdisciplinary research offers great opportunities for both finding research funding sources and for researchers to directly engage in real-world/societal problems and to work towards their solution; the downside is that transdisciplinary research tends to be highly normative (and not objective) and that it solves only very narrow and specific problems; it is not interested in the bigger scientific/epistemological questions, which often means that

transdisciplinary research is less respected in 'normal' science, as it usually contributes little to it. ➔ Best for applied or non-scientific problems.

4. Sustained Efforts of Sharing Concepts, Theories and Methods (Inter- or Supradisciplinarity)



While in multidisciplinary research the disciplines share their insights on a given problem, in the inter- or supradisciplinary approach the disciplines collaborate on developing some common perspective. The idea of sharing common concepts, theories and methods with other related disciplines is certainly an old one. Ever since the early days of modern science there have been discipline-transgressing paradigms that could be applied to a variety of disciplines. An early interdisciplinary paradigm is Marxism, which has stimulated the development of Marxist schools of thought within a great variety of disciplines and fields of study, including philosophy, economics, political science, sociology, literature and art, and environmental and development studies. A newer supradisciplinary endeavour is Ludwig von Bertallanffy's project of creating a general systems theory, which dates back to the 1950s. Other deliberately supradisciplinary projects are structuralism, deconstruction, poststructuralism, feminism and, of course, complexity theory. All of these efforts of connecting disciplinary discourses through sharing concepts, theories and methods have led to the formation of respective 'ideological' camps within many, if not most disciplines.

Challenges and Opportunities

While it is very easy for a Marxist literary theorist to communicate and to reach an agreement with a Marxist economist, this would be certainly difficult for followers of different paradigms, no matter whether they belong to the same discipline or not. Although there may be some similarities in terms of theory design between Marxism, systems theory and deconstruction, they are still incompatible world views, which effectively resist any further integration with other paradigms. As long as these competing supradisciplinary paradigms coexist on an equal level, there is obviously little hope for genuinely improving the communication and exchange, not only across disciplines, but also across the different paradigms. In recent years complexity theory has been promoted as the ultimate meta-theory, which would allow all

disciplines to share their knowledge or to reformulate their knowledge in terms of the theory of complex systems. The idea that many different phenomena could be understood as complex systems and that all complex systems have similar characteristics (nonlinearity, feedback loops, irreducibility) is certainly appealing and persuasive. However, it is also true that not everything is a complex system and that the theory of complex systems has many varieties and branches.

Verdict: Inter- or supradisciplinarity is the sustained effort of integrating knowledge originating from various disciplines; it requires collaboration across disciplines that can change and enrich the disciplines concerned; the downside is that there are still too many competing paradigms and that a scientific meta-discipline that can connect most or all disciplines is still far off. ➔ Best if the intended audience already subscribes to the paradigm that is chosen and if there is a lengthy time period available for the project.

5. Sustained Efforts for Rearranging the Disciplines into a Smaller Number of Superdisciplines (Super- or Megadisciplinarity)

There is the argument that disciplinary boundaries are artificial creations of the late 19th century. The disciplines developed out of the pragmatic division of labour that made sure that every discipline had its own turf from where it could develop itself. However, during the 20th century all of the original disciplines have broadened their scope so much that they now largely overlap with numerous other disciplines. Traditional disciplinary divisions no longer seem to make much sense and it is fairly normal that researchers cross disciplinary boundaries and that they collaborate with members of other disciplines who have the same or a similar specialisation. This raises the question whether many of the current disciplines could be merged into a few super- or megadisciplines, which could organise the accumulated knowledge of the existing disciplines much more effectively. The few remaining superdisciplines could not only integrate several social sciences into a unified social science discipline, but may also bridge the traditional divide between

natural and social sciences. For example, it has been proposed to create an Earth System Science, which could combine many elements of natural sciences and social sciences disciplines in order to understand earth as an integrated physical and social system. Another example might be a global social theory, which could unify all of the social and behavioural sciences.

Challenges and Opportunities

Superdisciplines go already beyond the interdisciplinary approach, as they intend to merge several disciplines. In comparison, supradisciplinarity (sharing concepts, theories and methods) still respects disciplinary boundaries and leaves the disciplines themselves intact. At the same time, superdisciplines would remain within the framework of disciplinarity, although they would imply a major rearrangement of the existing disciplines. A final aim, or tendency, could be the eventual unification of all knowledge and all disciplines in the sense of 'a theory of everything', as is still being pursued in physics. The attempts of unifying the sciences are meant to counteract the negative implications of the fragmentation of knowledge and are considered to be a form of democratising knowledge by making it more accessible for everybody, including non-scientists. On the other hand, a theory of everything seems highly unlikely because of the limits to formalisation as proven by the mathematician Kurt Gödel. According to Gödel's incompleteness theorem any mathematical theory with a finite description is either inconsistent or incomplete. A consistent and complete global social theory that could cover every aspect of human life and behaviour could be simply logically impossible.

Verdict: super- or megadisciplinarity can address the problem of the overlapping of disciplines and the resulting duplications of effort; however, it has still too few supporters and the aims of a unified social science or even a unified science are probably unrealistic. ➔ Best for 'global' problems which are enormously complex, discipline-transgressing and generally irreducible and if there is a very lengthy time period available for the project.

Conclusion

All of the five strategies for engaging in interdisciplinarity are very different in nature and with regard to their impact on disciplines, disciplinarity and science at large. Borrowing knowledge and methods from other disciplines is very likely to leave the affected disciplines largely unchanged. Only if crossdisciplinary research can create a new area of knowledge that attracts enough interest from academics working in related areas, it may become in the long run a semi-autonomous field of study and research, or even a new discipline. The multidisciplinary approach is also very likely to leave the disciplines unchanged, as there is no real dialogue between disciplines. If

there is any integration of knowledge in multidisciplinary research, it only happens in a narrow context. The transdisciplinary approach is different, however, because it ignores and in some sense undermines the whole idea of disciplinarity. The general tendency that so much research is being carried out outside of the university context and outside of scientific discourses could mean in the long term that science becomes anarchical or postdisciplinary in the sense that 'scientific' methods are employed opportunistically for solving applied problems and narrow questions. In other words, universities and academics would become research service providers to the industry and the government, losing much of their professional autonomy. The inter- or supradisciplinary approach is different again. Supradisciplinarity has been gaining some currency across science in recent years, especially with regard to the growing appeal of complexity theory and the theory of complex systems. Many disciplines have already incorporated their main ideas and their terminology. This means supradisciplinarity has the capability of transforming disciplines and of building bridges to other disciplines. At the same time, there is no reason to believe that complexity or complex systems theory could effectively merge or unify several related disciplines. It certainly does not follow that the adoption of complexity theory by several disciplines would make such merging necessary or desirable. Finally, there is super- or megadisciplinarity, which would indeed be an effort of a large-scale rearrangement of the disciplines with the intention of overcoming many of the traditional disciplinary divisions that are perceived by some academics to be artificial and unnecessary. The final aim would be the unification of knowledge, or at least a merger of related knowledge branches (e.g. disciplines sharing the same object or domain). There are a few research organisations and academics who promote the idea of a unified science, but considering the fact that even such a well organised science such as physics still lacks a unified theory, it seems still very unrealistic to achieve a unification of natural and social sciences, or even a unification of all of the social sciences.

Suggestions for Further Reading

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