REVIEW ARTICLE

Integrating social sciences and humanities in interdisciplinary research

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ABSTRACT   Recent attempts to integrate the social sciences and humanities (SSH) in funding for interdisciplinary research have been challenged by a number of barriers. In funding programmes, such as the EU Horizon 2020, the SSH are absent in most calls for contributions. This article revisits the main policy drivers for embedding SSH research in interdisciplinary research. By analysing recent policy initiatives, the article shows how policymakers across the world continue to be ambivalent regarding the role of the SSH. While many stakeholders acknowledge the need to integrate SSH research in solving key societal challenges, such as climate change, migration or national security, funding for SSH is limited and tends to focus on strategic interventions and instrumental solutions. By accounting for the diversity of interdisciplinary collaborations the article recommends a more context-sensitive approach to research funding, which acknowledges the heterogeneity and volatility of research across different knowledge environments. This article is published as part of a thematic collection on the concept of interdisciplinarity.

Introduction

Few scholars dispute that interdisciplinary research is altering the way in which researchers engage in the scientific process. Indeed, it is becoming more and more evident that major research funding agencies are increasingly focused on strengthening interdisciplinary collaboration. Many argue that this transition is slowly beginning to change what it means to undertake research, affecting both the epistemology and ontology that underlie contemporary research programmes. In areas such as cognitive neuroscience, behavioural economics or cultural studies, interdisciplinary research has emerged as a key mode of knowledge production (Bondebjerg, 2015; Callard *et al.*, 2015). Of course, this development is variable depending on research area and research agendas with some areas more inclined towards interdisciplinary collaboration than others, but it is rare to find researchers today who have no engagement with scholars outside their own speciality. While some decry the loss of disciplinary skills and techniques, others have embraced the interdisciplinary turn and its potential for translating scientific knowledge into societal impact (Huutoniemi *et al.*, 2010; Klein, 2010; Frodeman, 2011; Wagner *et al.*, 2011).

The transition towards interdisciplinary collaboration is manifold. It emanates from within the scientific community as research progresses and new scientific problems emerge that are not confined to a single disciplinary perspective. It also derives from the world of politics. In numerous instances, policymakers and funding agencies call for researchers to address the

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grand societal challenges of globalization-led economic, ecological and demographic change (Langfeldt *et al.*, 2012). In the last decade, numerous funding programmes have been launched across the European Union and United States, which are designed to stimulate interdisciplinary collaboration. Among the most prominent examples is the European Framework Programme for Research and Innovation, Horizon 2020, with a total budget of €70.2 billion (2014–2020). Similar programmes can be identified throughout Europe and the United States—ranging from national research and innovation strategies to the establishment of new departmental structures and interdisciplinary research centres at universities (Bozeman and Boardman, 2014).

Most of the current literature on science policy and research funding acknowledges that interdisciplinarity is itself a complex phenomenon that takes place along a continuum extending from short-term collaborations with minimal levels of commitment to large-scale research programmes with significant levels of interaction. One of the most crucial and contested questions in debates over interdisciplinary research is the extent to which "soft" and "hard" approaches needs to be combined. Classical examples of interdisciplinarity, such as biochemistry or synthetic biology, integrate disciplinary perspectives from several fields that already share a common methodology and ontology. In contrast, more recent attempts to further interdisciplinary collaboration in fields such as obesity studies, healthy ageing or climate change need to bridge a much wider gap between disciplinary backgrounds and approaches. Obesity studies, to take one example, encompass research across genetics, metabolism, neuroscience, psychology, ethics, economics, political science and regulation, making interdisciplinary collaboration much more challenging to coordinate (Porter *et al.*, 2007).

Many scholars and decision makers agree that most of the complex problems that face society today, from the consequences of anthropogenic climate change to personalized medicine and public health, require *integration* of diverse understandings (Klein, 2008; Wagner *et al.*, 2011; McLeish and Strang, 2015). Yet, in discussions over interdisciplinarity it is often unclear, if this integration of disciplinary perspectives extend only across epistemic communities that are already aligned with each other's vocabularies, say, across the biological and medical sciences, or if interdisciplinary collaboration requires a deeper transcendence of disciplinary boundaries beyond the natural, social and human sciences. The later question takes us into the controversial territory of a number of recent debates over research funding. More particular there has been a growing concern regarding the proper role of the social sciences and humanities (SSH) in interdisciplinary research, and how the research community can ensure that policymakers and funding agencies are committed to include SSH when initiating large-scale interdisciplinary programmes.

Solving complex real-world problems requires bringing together insights from multiple disciplines. But hierarchies and asymmetries continue to persist even in the face of contrasting declarations. In the next sections, I sketch the current policy framework and the major policy drivers for including SSH in interdisciplinary collaboration. After having introduced the main arguments to embed SSH research in interdisciplinary projects, the article then moves on to consider some of the key obstacles to interdisciplinary research, with a special emphasis on the different modes interdisciplinary collaboration. Rather than covering only one specific type of research, interdisciplinarity is a generic and broad-scaled concept that extends across a wide range of different scientific practices and approaches, making it difficult to evaluate within a unified framework. I argue that interdisciplinary research need to include the SSH but that more effort is needed to understand the structure, motives and impact of interdisciplinary research across different scientific fields.

Embedding SSH in interdisciplinary research

Embedding "soft sciences and approaches" (SSH and aspects related to science communication and responsible research) has become a major priority within science policy in the last decade. The political negotiation and subsequent implementation of the current European Framework Programme for Research and Innovation "Horizon 2020" presents an instructive example of the deliberations and controversies surrounding the inclusion of SSH in major interdisciplinary programmes. Before agreeing on the European Commission's proposal for Horizon 2020, numerous policy reports, whitepapers and declarations were published by stakeholder groups in Europe to ensure support for the multi-billion research programme (König and Mayer, 2013). The main trust of Horizon 2020 is exemplified by the uptake of the term "Grand Challenges". According to the grand challenge approach, funding for research and innovation must abandon former thematic and bureaucratic structures and instead focus on mustering resources to solve the most pressing challenges facing society (Georghiou *et al.*, 2011; Langfeldt *et al.*, 2012).[1]

This approach to research funding is based on the admission that nation-states must overcome their short-termism and address the economic, environmental and social problems that are likely to be long term and involve multiple institutions and disciplines (Wæver and Leydesdorff, 2012). Crucially, the grand challenge approach requires that science, technology and innovation are directed towards "complex problems" the implications of which transgress traditional behavioural, cultural, societal and ethical divides. For example, research on demographic change (that is, the ageing population) is often cast in terms of designing new solutions and medical interventions that include knowledge about patients, citizens and end-users in the research process (EC, 2011). Similar, according to several policy documents, the shift towards a sustainable economy will need to include combined efforts in developing new technologies and at the same time create new models of democracy, engagement and eco-friendly behaviour, which draw on a wide variety of interdisciplinary competences in the SSH (Scavenius, 2014). In other words, taken at face value, the grand challenge approach to research and innovation requires integration of knowledge about societal transformations, their underlying dynamics, their inherent opportunities, as well as the instruments and technologies to manage these transitions.

The grand challenge approach to European science and innovation was first established in the Lund Declaration, published under the auspices of the Swedish Presidency of the European Council in 2009. The Lund Declaration states that European funding for research and innovation should be reoriented to address interdisciplinary challenges that affect not only contemporary societies but also the future of human civilization itself. This move in science policy discourse towards interdisciplinary solutions reflects a change in emphasis compared with former European framework programmes. Rather than merely focusing on industrial relevance and university-industry collaborations, the Lund Declaration focuses on a new mission-oriented approach to science and innovation that is oriented towards societal goals.

Following, the Lund Declaration, two other European declarations have been published underlining the need for creating a research-friendly environment in Europe. The Aarhus Declaration (2012) stresses the importance of investing in higher education, research and innovation to enable universities to contribute effectively to the EU 2020 strategy for "smart sustainable and inclusive growth" through the provision and sustained support for scientific excellence and basic research. But even more crucially, the Vilnius Declaration (2013) established a European-wide position among research institutions and funding

agencies to shore up priorities for integrating SSH in interdisciplinary research programmes.

The Vilnius declaration

Notwithstanding the high number of supporting documents and initiatives, the European Commission's focus on stimulating interdisciplinary solutions as part of Horizon 2020 hit a crucial barrier in the final political negotiations of the framework progamme. While there was general agreement in the European science community that the grand challenge approach to science, technology and innovation has a better chance of delivering solutions to the Union's most pressing challenges, there was at the same time scepticism towards the Commission's ability to breakoff from former bureaucratic structures and integrate experts across multiple epistemic communities. The political rhetoric of interdisciplinarity, as expressed by the Commission and conveyed in a number of high-level reports, gave rise to major concerns. Not only was it unclear which role was foreseen for the SSH, or what amount of funding they would receive, basic questions about interdisciplinary peer review, the scientific diversity of projects and the assessment of project outcomes remained unanswered. At the same time, the notion of interdisciplinarity, as distilled from the Commission's writings, was overtly managerial and stylized—cast in a bureaucratic vocabulary driven by user-needs and political incentives rather than bottom-up research interest.

The SSH community reacted strongly with calls for better and deeper integration of humanities and social science research, leading to a number of reports and studies of the role of SSH activities in large-scale research funding (LERU, 2013; Science Europe, 2013). Most of these arguments were summed up at the conference "Horizons for Social Sciences and Humanities" organized under the Lithuanian EU presidency in September 2013. The conference was preceded by a public consultation to collect evidence about the current state of SSH in Europe, and the ambitions and needs as well as the structural challenges of the SSH community in specific fields. Among the issues brought up in the consultation, two-thirds of the respondents ranked SSH as highly relevant to interdisciplinary research. A strong consensus was expressed that SSH are not only carried out in disciplinary contexts, and that contemporary SSH projects are inherently interdisciplinary in nature, taking place in different scientific and organizational settings (Nowotny et al., 2014).

The consultation concluded with the publication of the Vilnius Declaration, authored by a European high-level expert group. In the declaration, representatives of key European SSH institutions, such as the European Research Council, The League of European Universities and Science Europe, presented a comprehensive strategy to embed SSH research in interdisciplinary collaboration and create a more inclusive space for SSH in funding for interdisciplinary solutions.[2] Among other things, the declaration elaborated crucial principles for the integration of SSH in Horizon 2020: defining research problems in novel ways; considering the working conditions of all research partners and setting up efficient collaboration across disciplines and research fields; fostering interdisciplinary training and research; and connecting social values with research evaluation (Nowotny et al., 2014).

One of the main problems identified in the Vilnius process was the gap between the broadly conceived research themes of Horizon 2020 and the conservative, vertical hierarchies of disciplines in university settings, including the persistence of disciplinary publications, career structures and peer review (Nowotny, 2015). The Vilnius Declaration also made it clear that genuine interdisciplinary partnerships can be difficult to nurture

and require a long-term co-creation of knowledge among diverse epistemic cultures. Time and again interdisciplinary research is used more as a rhetorical devise to underline the strategic importance of science and technology rather than as a venue for solving real societal problems. In other words, the actual ability and willingness to integrate the research repertoire of SSH still leaves a number of questions unanswered.

Considering these facts, the European association for research funding agencies, Science Europe, has kept a sustained focus on analysing and mapping the contribution of SSH research to interdisciplinary collaborations. Science Europe has insisted that real change need to take place at the level of European science policy in the short and long term, avoiding quick fixes and superficial policy rhetoric and instead focusing on real progress and opportunities. Among other things, the association has monitored the implementation of the first Work Programmes in Horizon 2020 (which opened for proposals in 2014). Taken together, it turns out that only 27% of the EU research funding schemes (under the "Challenge" pillar) invites contributions from SSH. In other words, SSH are not embedded in almost 75% of the proclaimed interdisciplinary projects (Science Europe, 2014). This situation is even worse when looking at the humanities. A conservative estimate is that the humanities are involved in about a third of the SSH-flagged topics. This demonstrates that the humanities are not embedded in 90% of Horizon 2020, the world's largest interdisciplinary funding programme.

In the meantime other examples demonstrate the call for humanities and social science in Horizon 2020, which are useful for the further discussion. For instance, the Commission's call to promote mental well-being in the ageing population invites proposals to include research into the psychological, environmental and social determinants of healthy ageing, including cultural parameters such as loneliness, poverty and conflict (EC, 2014). The same is true for the Commission's call to address consumer engagement for sustainable energy systems, which explicitly calls for proposals that focus on changing the behaviour of citizens towards more environmental-friendly consumption. Other examples include research on social mobility, crime prevention, polarization, extremism, responsible research and innovation, and data management, including language interpretation, semantic analysis and information retrieval (EC, 2014).

While these examples provide insight into the policy framework surrounding interdisciplinary research funding, they still to a large extent exhibit a specific type of interdisciplinarity that has been selected to serve specific policy ends. Note that the SSH components of interdisciplinary collaboration in the examples provided above tend to focus on behavioural research and emphasize social technologies and interventions, while downplaying the interpretive, culturally shaped, historically emergent way in which such practices are configured. The difference in vocabulary between behaviour (more inclined towards deterministic accounts of human agency) and practice or context is significant (Wæver and Leydesdorff, 2012). This latter point is also reflected by the fact that funding for interdisciplinary research is rarely concerned with citizens' deep-seated preconditions for behaviour (sense-making, interaction, or culturally embedded values or attitudes) and more concerned with incentives, policy design, institutional solutions and so on. The research called for in funding programmes, such as Horizon 2020, tend to presume a problem-solving model of research over more theoretically oriented and reflexive approaches to human agency, culture and history—reflecting the politics of interdisciplinarity. In a policy environment of strategically oriented and mission-driven research, the SSH disciplines are called upon mainly as a mechanism for delivering advise on "the human factor" and as a vehicle for problem-solving and social innovation, which

constitute only a very small part of the research repertoire of the SSH field.

Interdisciplinary integration

As it was shown in the previous section, there is reason to raise concern about the political structures and bureaucratic dependencies that may prevent the effective embedding of social science and humanities in large-scale interdisciplinary projects. This is true of Horizon 2020 as well as other interdisciplinary funding programmes across Asia and the United States. More fundamentally, the problem- or mission-oriented approach that dominates most calls for interdisciplinary research tends to favour a mode of knowledge production, which is not aligned with the research style of the SSH. The latter point has to do with the fact that integrative research across the main scientific fields is often difficult, time-consuming and uncertain. When the SSH are incorporated into interdisciplinary research, they are often brought in as an "add on", or as an independent project within the overall project architecture. This is in large part due to fact that the strong emphasis on integration of different research traditions often leaves out attention to the epistemic distinctiveness and theoretical commitments of different disciplines.

Most scholars of science and technology studies agree that interdisciplinary research involves some type of *integration* (Wagner *et al.*, 2011) or variation thereof such as "convergence" (Fuller, 2011), "synthesis" (Rafols and Meyer (2010)), "fusion" (Krohn, 2010), "amalgamation" (Bozeman and Boardman, 2014) or "unification" (Dupré, 2006). Common among these definitions is an emphasis on the ability to move beyond single disciplines to address research topics from new perspectives, theories, concepts and methodologies that together form a body of knowledge beyond the traditional disciplinary boundaries. In their comprehensive literature review, Wagner *et al.* (2011) suggest that a consensus has emerged around the importance of the process of knowledge integration in interdisciplinary projects. The emphasis on integration highlights "the need to bring disparate knowledge regimes together" (O'Rourke and Crowley, 2012). At the same time, integration also represents the "Achilles' heel" of interdisciplinary projects exactly because interdisciplinary modes of research cut across different ontological and epistemological regimes (Repko, 2008).

Exactly how scientists integrate their approach with the approaches taken by other disciplines remain contested (Budtz Pedersen, 2015b). One of the main reasons for this is the fact that different disciplines work with different theoretical languages that incorporate different epistemic goals and strategies. Generally speaking, different disciplines ask different explanation-seeking questions, and hence employ different levels of abstraction (Faye, 2007). To bridge the divide among two or more disciplines, careful attention needs to be given to the formulation and coordination of research questions and methodologies. This is especially pertinent when including the SSH where methods for drawing inferences or establishing interpretation are not always commensurable with the traditions of natural and health sciences.[3]

Moreover, SSH researchers are often not involved in the initial formulation of the research problem that defines the joint project. Rather they are called upon in specific work packages, such as in science communication, public engagement or bioethics (Rabinow and Bennett, 2008). Because of this asymmetrical relation there is a constant risk in interdisciplinary funding programmes that the social science and humanities becomes merely an appendix to the techno-scientific disciplines. This is in part because of the political constraints underlying interdisciplinary integration. If SSH researchers are not included in the initial planning or research design it will be more difficult to identify common research problems and hence less likely that integration emerges.

Many of the challenges associated with interdisciplinary research increase with the cognitive distance between disciplines including, among other things, the development of a common theory language and methodology. For example, during the course of the second half of the twentieth century, the field of *climate science* emerged as a synthesis of different disciplines within the natural sciences occupied with atmospheric carbon dioxide, nitrogen and phosphorous cycles, biodiversity, monitoring of water and land use, ocean acidification and ozone depletion and so on. Together these disciplines shared a commitment to express data and interpretation of humans' relation to the environment in terms of numbers and, in this form, integrate the different expert cultures into a narrative of quantifiable change. Later, economics was integrated as well with the special assignment of calculating the economic value of resources and processes, or "services", that the ecosystems supply (Sörlin, 2013). This was a successful move to establish one of the most influential integrative knowledge communities of the past decades: *environmental studies*.

However, as perceptively analysed by Sörlin (2013), the production and interpretation of environmental changes remained exclusively in the domain of the natural sciences and economics based on the predictive authority of threats posed by quantifiable change. At the same time it proved much more difficult to integrate the qualitative interpretation of human beings living with and causing climate change. While the cognitive proximity among the conventional environmental disciplines had generated a strong hegemonic consensus on policy-relevant climate models, and hence constructed a dominant societal interpretation of climate change, more distant disciplines, such as the SSH, were largely absent. As a result larger patterns of value-based systems and the social and human aspects of environmental change have typically been kept at a distance (Sörlin, 2013). Only in the last decade serious steps have been taken to overcome the gap between these groups of disciplines and integrate SSH expertise into the field of climate science— leading to the establishment of environmental humanities. While techno-scientific expertise undoubtedly continues to be needed, it is increasingly supplemented by knowledge about fundamental changes in the internal operative mechanisms of societies and economies, including studies of how people, citizens and companies react to environmental phenomena.

The example of environmental studies illustrates how long time it takes to establish an integrated knowledge field. In this case it took more than half a century before interdisciplinary research centres, research careers and interdisciplinary journals were established. Overcoming barriers to interdisciplinary collaboration, such as the cognitive distance between expert fields, or the difficulty of choosing a clear publication strategy, requires significant investment of time and resources on the part of researchers, as well as careful attention to the different incentive structures of the collaborating disciplines.

In this context, it is important to acknowledge that interdisciplinary collaboration is itself a multi-dimensional phenomenon that involves different scales of collaboration. In the literature, Klein (2010), Stokols *et al.* (2003) and Wagner *et al.* (2011) have famously distinguished between multi-, trans- and interdisciplinarity, each of which involve different levels of collaboration. Lately, post-, de- and anti-disciplinary modes of research have been added to the list of cross-disciplinary knowledge production. Taken together, there is no uniform definition of interdisciplinary collaboration, and hence no uniform funding scheme for promoting it.

Whereas, multidisciplinary research combines two or more disciplinary perspectives, the cooperating experts speak as separate voices each from within their own specialism. In transdisciplinary collaborations the goal is to transcend the scope of academic research through an overarching coordination of research agendas with actors outside academia. In this context, researchers need competence not only to collaborate with each other but also to interact with external stakeholders. Finally, interdisciplinary collaboration is considered to integrate approaches, methods and theories from different scientific disciplines to solve complex scientific problems, which may over time lead to the creation of new scientific fields, such as biochemistry, neuroscience or environmental humanities.

In other words, what counts as good or successful inter-disciplinarity depends on which type of collaboration one privileges—ranging from attempts to integrate multiple disciplinary perspectives, the attempt to integrate academic and non-academic stakeholders or the attempt to develop new scientific models across different disciplines (Repko, 2008, for a critical appraisal, see Holbrook, 2013). Again, it is worth stressing that failure to comply with these ideals of interdisciplinary integration and coordination is likely to be the result of more deep-seated economic and political dispositions. If, for instance, the over-arching goal of research is to produce knowledge that is applicable to actors outside academia, there needs to be a demonstrable pull from policymakers and stakeholders to include SSH research in joint projects.

Modes of interdisciplinary collaboration

Even though the societal impact of interdisciplinary research is widely recognized by funding agencies and policymakers, there is relatively little evidence about the incentives and barriers to engage in interdisciplinary research. To gain more insight into the nature of interdisciplinary collaboration, the Humanomics Research Centre in Copenhagen has carried out a survey of attitudes towards interdisciplinary research among 1100 Danish humanities scholars. We looked at different strategies for engaging in interdisciplinary research, as well as different modes of interdisciplinary research to identify barriers and possibilities for collaboration (Budtz Pedersen and Stjernfelt, 2016).

The survey shows that while Danish researchers overall have a high number of interdisciplinary relations (65% of all respondents collaborate with scholars outside their own discipline), the type and scale of collaboration vary substantially across different fields. According to respondents, many researchers acknowledge the value of interdisciplinary research. However, the survey suggests that there may exist several (non-congruent) reasons for why researchers engage in interdisciplinary collaboration, distributed across three different dimensions of interdisciplinarity:

1. Researchers belonging to a well-established discipline with a strong consensus on basic principles, traditions and career structures (such as linguistics, classics and historiography) engage mostly in multidisciplinary collaboration in which they cooperate with researchers from other established disciplines. Here, collaboration is structured around a division of cognitive labour, with different disciplines taking responsibility over different steps and components in the research process.
2. Another group of researchers engage in interdisciplinary research by actively migrating into an interdisciplinary field (that is, a field of research that is not defined by disciplinary capture, such as gender studies, media studies, cultural studies or area studies). Here, there is an in-bound mobility of researchers into the interdisciplinary field, with scholars getting hired and socialised into the field from a variety of other fields, while there is less formal collaboration with external fields.

3. Finally, the survey demonstrates a hybrid tendency where disciplines have some in-bound mobility of researchers (that is, recruit researchers from other disciplines) while at the same time engage in external research collaborations. Among other fields, philosophy and educational research belong to this group, which is characterized by methodological eclecticism.

According to this study there is no uniform definition of interdisciplinary collaboration, and hence no overarching measure of interdisciplinary integration. None of the above modes of research are easy to map onto established notions of inter-, trans- or multidisciplinarity. Rather, interdisciplinarity concerns a range of different epistemic practices, which extends across different scales of mobility, proximity and organization—from formalised research collaboration to recruitment and circulation of scholars with diverse scientific backgrounds. The observed empirical distribution of different interdisciplinary clusters has implications not only for the evaluation of research but also for research funding. Only 11% of the respondents reported that the provision of target funding and mission-driven research programmes motivate them to engage in interdisciplinary projects. As much as 82% reported that interdisciplinary collaboration starts from the bottom-up, with researchers working to understand complex problems and in this process engage with collaborators from outside their own speciality. In the next section this diversity of interdisciplinary constellations and its impact upon research funding is further analysed.

Integrative environments

Designing research policy for interdisciplinary collaboration requires a long-term perspective and a broader notion of integration than is usually adopted. Standard policies tend to be defined and studied in terms of the existing research and innovation system with an in-built bias towards the technical and health sciences (Kuhlmann and Rip, 2014). Indeed, the focus on grand challenges should itself become a driving force for the inclusion of different disciplinary perspectives.

> The complex nature of today's problems, in particular those involving human-environment interactions, poses challenges to the very ways in which science are pursued. Foremost among these challenges is that single discipline approaches provide only the most basic of understandings of complex problems and must be supplemented by insights gained from pursuing explanations jointly from many disciplinary perspectives. (Hirsch and Luzadis, 2013: 100)

Rather than focusing on one aspect of the world, interdisciplinary projects must generate a suite of compatible hypotheses to structure research at multiple levels of the problem. Synthesizing these elements into a unified approach, however, presupposes the possibility of developing a common meta-theoretical language, which integrates separate bodies of data, methods, tools and concepts to create a synthetic view. While this may be the goal of some interdisciplinary ventures, this notion of integration is not sufficiently sensitive to the real-world intricacies of research collaboration. Furthermore, the strong notion of integration runs the risk of overlooking the organizational resources, time and commitment needed for developing long-term interdisciplinary communities.

Another challenge of integrating the humanities and social sciences in interdisciplinary programmes is the fact that these programmes tend to be asymmetrical. As Viseu (2015) notes the SSH (often a single social scientist or humanist) are typically brought in after the project has been designed and the key

research questions have been identified. This asymmetry is present in the different stages of integration—from leadership to funding, knowledge production and dissemination, and ultimately, research evaluation and assessment. Yet, this relationship often remains hidden or unaddressed in most research funding programmes.

Now there might be more fruitful ways of integrating the social science and humanities within interdisciplinary projects. Some measures could be easily implemented, according to Viseu (2015: 291): "Initiatives aiming for integration should have teams of social scientists, instead of one or two individuals, and these teams should be given the financial and operational autonomy to define and implement their activities". Furthermore, for SSH to make meaningful contributions the right incentives need to be in place. Among other things, this involves a push for project funding that—from the start—allocate resources for the SSH component instead of bring in SSH researchers later in the project. Research questions must be assessed and decided with input from all involved participants.

In addition, it is necessary to change the attention from a purely instrumental notion of integration (that is, the ability to solve complex problems) to integrative environments (that is, the ability to generate a reflexive understanding of the problem space in question). One cannot simply derive solutions by specifying the problem and developing a diagnosis. Interdisciplinary problems, such as climate change, food security or migration are open-ended, and learning about the nature of the problems and how to address them must be an integral part of any interdisciplinary effort. For integration to be fruitful, we must change its meaning from one of short-term project funding to long-term collaboration and commitment to build interdisciplinary ecologies. Doing so involves changes to scientific practice, as well as alignment between funding agencies, universities and academic communities.

If this ambition of alignment and long-term collaborative efforts is to be realized, more attention should be directed towards the operation of interdisciplinary environments, including education, research, and public outreach. While there is no simple answer to the question of how integrative research should be organized or stimulated, there exist several examples of universities and communities that have establish integrative environments.

In the humanities, a major development in recent years has been the development of new integrative fields such as Medical Humanities, Environmental Humanities and Digital Humanities. These fields integrate expertise across different traditions and create an interface between areas of expertise from the social, human and natural sciences. An example is the Environmental Humanities Laboratory at the KTH Royal Institute of Technology in Sweden. The goal of the laboratory is to "foster a post-disciplinary development through tapping into the growing international field of environmental humanities, and to further a humanities research agenda for sustainable development" (KTH, 2015). Similar initiatives exist at other institutions. For example the Centre for Research in the Arts, SSH at Cambridge embed numerous experts from a wide range of disciplinary backgrounds. At Stanford University funding from the Stanford Challenge has been allocated to nurture interdisciplinary approaches to research and teaching in areas such as education, environment, human health and international affairs. This kind of integrative funding has enabled Stanford to set up durable and long-term interdisciplinary teams.

At a time where funding for interdisciplinary research is increasing in intensity it is necessary that policymakers and funding agencies are committed to build sustainable interdisciplinary environments instead of merely funding short-term projects that are likely to reproduce existing academic asymmetries. Because of the diversity of interdisciplinary projects, a more advanced, contextual and multi-dimensional model of integrative research needs to be adopted, which includes contributions from the SSH. Bringing together researchers from diverse disciplinary backgrounds, or creating new emergent subfields, necessarily transcends existing cultures of knowledge creation and dissemination.

Funding for interdisciplinary research requires that policy-makers and members of the scientific community move beyond simplistic notions of interdisciplinary collaboration (Cronin and Sugimoto, 2014). Understanding the empirical richness and different scales, modes and temporalities of interdisciplinary research will lead to a more comprehensive model for stimulating integrative environments than the one currently adopted by leading funding agencies. Learning how interdisciplinarity works in different communities, contexts and sectors will also help widen the understanding of how research impact is achieved in different interdisciplinary settings.[4] Building on the Danish survey of humanities scholars what counts as "good" or "true" interdisciplinary research is likely to be different depending on context and perspective.

Conclusion

This article has offered a brief genealogy of the role and integration of the SSH in interdisciplinary funding programmes. Analysing some of the obstacles and challenges associated with embedding SSH in interdisciplinary research, I have argued that more attention is needed with regard to setting up appropriate frameworks for interdisciplinary collaboration. Not only does the current literature distinguish different modes of collaboration, ranging from attempts to integrate multiple disciplinary perspectives; the attempt to integrate academic and non-academic stakeholders; and the attempt to create new scientific models across different disciplines. Furthermore, there exist substantial empirical differences with regard to the dispositions and strategies for engaging in interdisciplinary research. This is especially true in SSH where publication, communication and career patterns do not follow the dominant model of techno-scientific knowledge production. As in many other cases, there is no one-size-fits-all for priority setting, peer review, project management or distribution of academic merit across different disciplinary environments. Rather, maximizing the participation of SSH researchers in interdisciplinary projects will require new tools and platforms that reflexively stimulate the curiosity, creativity and problem-solving capacity of all the involved disciplines. This exercise is worthwhile. In areas such as climate change, resource efficiency, urbanization and medicine, there is an urgent need to develop a much deeper understanding of human experience and meaning in a hyper-connected but unstable world.

Notes

1 The €70.2 billion programme is based on three pillars: (1) "excellent science," (2) "industrial leadership" and (3) "societal challenges". The third pillar is designed to tackle societal challenges and is expected to receive an overall funding of about €32billion from 2014 to 2020. Priority is given to seven different challenges: (1) health, demographic change and well-being; (2) food security, sustainable agriculture, marine research and bioeconomy; (3) secure, clean and efficient energy; (4) smart, green and integrated transport; (5) climate action, resource efficiency and raw materials; (6) inclusive and innovative societies; and (7) security.

2 Together with pressure from national governments the SSH community managed to get an additional "Challenge" established in Horizon 2020 with dedicated funding for SSH, the so-called Challenge 6: "Europe in a changing world—Inclusive, innovative and reflective societies.

3 Obviously one can argue, that explanatory integration is not the primary goal of interdisciplinary collaboration, and that the focus on integration discards other aspects of interdisciplinarity (Richards, 1996; Lattuca, 2001; Moran, 2002). I sympathize with this view. However, as will become clear in a moment, different types of integration do indeed figure among the main parameters used for promoting interdisciplinary research.

4 Elsewhere, I have offered an account of the impact of SSH scholarship as it enters into societal decision-making and translates into public value (Budtz Pedersen, 2015a; Budtz Pedersen, 2015b).

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