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Chapter 2. Map of the *Handbook of Meta-Research*

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This handbook is a collective project arising from a dynamic configuration of overlapping disciplines and fields concerned with systematic, critical and reflexive inquiry into the normative frames, institutional workings and lived realities of research (broadly conceived across sectors, domains and approaches). As discussed above, there is no strict delineation of what is, and what is not, meta-research and the field will continue to reject moves towards strong disciplinisation so long as the benefits of the reflexivity paradox remain a central characteristic. We do not pretend that the chapters included in this Handbook are a comprehensive representation of the meta-research work. As it stands it is, instead, more of a working guide and introduction into the field. Through this working guide, this Handbook is an invitation to see who we are, as researchers; research stakeholders; or, more broadly, members of the public who are concerned with the ways in which research (including science) has been working to date. The idea of meta-research signals that the field's future is moving to a more collective, inclusive and fluid understanding of what is interesting (to individual researchers and organisations) and what is valuable (including in the formalised sense of pre- and post- research evaluation processes) in research and its cultures.

The Handbook is divided into four sections (outlined below): Public value of research; Policy and governance of research; Knowledge dynamics; and Research cultures and careers. Each section gathers a variety of views about the key topics within these spaces. We asked contributors specifically to choose what they considered to be the 'hot topic' within their area of meta-research. Sometimes this 'hot' topic was grounded in the contributor's background and in years of accumulated expertise and insight. Other times, contributors looked forward towards new methodological tools, thematic lines on inquiry and the conceptualisation of issues that the field of meta-research will, in their opinion, face in the future. In each piece, there is a concentration of discussion on the roles that systems, institutions and individuals, as layers of investigation in meta-research, play in creating the cultures in which knowledge and value are created, constructed, communicated, debated, and disseminated. The result is a collection of papers that are theoretically rich as well as methodologically sound, and that demonstrate the potential for growth of the field for the future when data become bigger and more available.

The first part of the Handbook, *The public value of research*, explores the contested notions and associations of value in research. Here, the public's role as an investor in research is acknowledged,

alongside how this has transformed research assessment processes globally through the inclusion of formalised assessment of *ex ante* and *ex post* notions of value that exist beyond academia. Such change has not come without costs, as J. Britt Hollbrook explains, in that although the principle of academic self-governance remains in all assessment practices, its role as a central principle in research is limited and new changes to the research space may challenge it. Towards this end, Richard Woolley, Paula Otero-Hermida, Irene Monsonís-Payá and Magdalena Wicher in their chapter explain the foundations of, and main differences in, the conceptualisation of Responsible Research and Innovation (RRI), as an example of incremental culture change. Zoe Hope Bulaitis outlines the need for a type of humanities-led meta-research for the study of disciplines whose outcomes and indicators of public value are not automatically translatable or amenable to indicators of value more commonly used in STEMM disciplines. Alis Oancea then introduces the idea of ‘research-impact nexus’ to signpost areas of impact that are generative and valued within different communities across the humanities, arts and social sciences (HASS), but may be difficult to compress into the timeframes, contributory claims, and material evidence of benefit that are associated with impact narratives ‘optimized’ for assessment purposes. Eliel Cohen, in his chapter on STEMM academics’ understandings of societal value, uses interview data to note that albeit academics may share a commitment to societal value as central to their research, they may interpret its meaning differently. He argues that meta-research must be cognizant of these differences in their investigation of culture, as any change is likely to affect researchers and their work differently also. Finally, Silje Tellman and Reetta Muhonen reflect on the influence that increased emphasis on impact evaluation in research may have had on the visibility and recognition of public sociology in the UK and Norway. From these contributions, it is clear that, although an understanding and promotion of value to the public from research is broadly accepted by various research stakeholders, a reorientation of research towards notions of public value is not free from contestation and may challenge how research rewards and cultures operate. The chapters offer several sites available to meta-research to further develop our understandings of these tensions and their influence on research outcomes and practice.

The second part of the Handbook, *Policy and governance of research*, takes these discussions of public value and its assessment further by considering the policies surrounding the governance of research. In this section, more stakeholder views on research are introduced, albeit we note one area that is not as well covered as we would have wished, that of open knowledge practices – a key reason for which is not editorial oversight, but the ongoing constraints around funding open access book publications and harmonising preprint, deposit and sharing policies; still a long way to go. Chapters in this section note a move away from a sense of shared meanings of terms such as ‘science’ and ‘research’, and towards competing terms in the meta-research space that imply epistemic diversity and the agency of research when mobilised towards political and social action. As such, within the chapters in this section, terms such as ‘evidence’, ‘knowledge’ and ‘innovation’ become commonplace. As research and knowledge expands and notions of research value grow to include non-academic outcomes, so too does the number of political, commercial and public agents invested in research practice. Writing from the perspective of a policymaker, and therefore a user (and

commissioner) of meta-research, Steven Hill reflects on who uses meta-research and, using the example of the UK's Research Excellence Framework (REF), suggests that the principle of research producing evidence also applies to meta-research and the systems established to evaluate research. Simon Marginson broadens the discussion to global and national systems in science, arguing for a multi-scalar approach to the analysis of science within meta-research. Returning to the UK as a case study, Frédérique Bone and Beverley Sherbon demonstrate the importance of considering the role of funders in national research landscapes and cultures, in particular for universities as a principal site where research takes place.

Switching away from science systems to evidence governance, Kathryn Oliver, Euan Adie and Annette Boaz in their chapter explore the definition of meta-research through the perspective of evidence production and use. They acknowledge that the term means different things to different people and outline how this diversity of views epitomises the divides evident within the meta-research field. The use of systematic reviews as a tool to translate research outcomes into usable knowledge is discussed by James Thomas in his chapter on research synthesis. He specifically calls for further research into the science of evidence synthesis, as understanding how research is used to aid decision-making in different settings is needed to understand how knowledge production and the needs of society are brought together formally. Where meta-research meets evaluation there are always tensions, as discussed by Andrew Plume in his chapter. This is more so when combined with other issues in meta-research such as research management, EDI, research performance, as well as the prediction of future performance. In her chapter, Xin Xu provides an example from China and discusses the dynamics between the changing policy and research evaluation practices in Chinese higher education.

Section 3 focuses on *Knowledge dynamics in meta-research*, beginning with a historical overview on data used to support modern meta-research and their relative availability, and going on to explore predominant and emerging approaches to data analytics in the meta-research field. In many ways, the growth of commercial citation providers (e.g. Clarivate, Scopus) and the growth of data in the meta-research field result in a focus that is simultaneously data rich, for example in relation to the availability of big data, as well as data poor, in that the research does not often vary away from a concentration on citations. Many quantitative studies in meta-research have used the citation as the basis of analysis. In this section we explore such citation-based meta-research, but also examples and arguments for extensions of meta-research analytics to include alternative-indicators, methods and foci for analysis. Thed van Leeuwen reflects on bibliometrics studies being a unique characteristic of meta-research. In his chapter, he explores changing publication practices over time and focuses on three case studies illustrating how, upon being measured, researchers change their behaviour. This is a base for questioning the reliability of measures used to monitor or assess research behaviour based on citation data only. The late Paul Benneworth¹, and Julia Olmos- Peñuela speak about the diversification of actors and relationships in research and the knowledge economy. From their perspective, continual shifts in relationships between knowledge and its multiple stakeholders

have repercussions for the stable relationship between universities, as custodians of knowledge, and society.

Further to this, the chapter by Rodrigo Costas, Carmen Corona-Sobrinó and Nicolás Robinson-García explores the role that ORCID could play in meta-research, extending such studies away from a concentration on citations as the focus of studies utilising bibliometrics. In the authors' own words, the focus of meta-research studies 'on journal publications limits our understanding by leaving out aspects of the scientific endeavour that go beyond scientific publishing'. Gemma Derrick and Tony Ross-Hellauer examine one of the more powerful self-governing tools in research culture, peer review. Using the concept of the subaltern, they look at the risks faced by SSH research in legitimising its contribution to the knowledge base by an increasingly overburdened scholarly peer review system. They argue that traditional models of scholarly peer review inspired by STEM research are ill-equipped to promote Social Sciences and Humanities (SSH) innovation and value, and explore instead alternative models of peer review for SSH.

In their chapter, David Mills and Kelsey Inouye combine reflection on publishing regimes and cultures in academia with a call for more post-colonial perspectives of research excellence in meta-research. Using data from Nigerian journal editors, Mills and Inouye explore the pressure to publish in this non-western context. By doing so, the chapter questions the relevance of research integrity principles established in western contexts for the realities of research conducted in the global south. In the following chapter, Nelius Boshoff and Similo Ngwenya demonstrate the utility of bibliometrics and studies of research dynamics by using established techniques to explore the growth of bibliometric studies in South Africa and understand networks of researchers through a study of joint-authorship. For this chapter, a citation is a cognitive connection between authors, ideas and research teams rather than simply a measure of quantity and, by extension, prestige. Finally, Faresteh Didegah in her chapter explores how approaches incorporating social media platforms and mainstream media mentions, or else Altmetrics, can be used to investigate domains of the meta-research landscape that are inaccessible to studies using citations only. Using diabetes as an example, Didegah illustrates how Altmetrics can be used to understand the dissemination of research beyond the world of academic and scholarly publishing, as well as broader questions of public awareness of research.

The last section, *Cultures and careers*, is arguably the largest and the fastest growing theme within meta-research. In this section, issues relating to governance, representation, equality and career trajectories in research are investigated. Among chapters on gender and careers, however, there is one major absence and that is issues relating to broader aspects of EDI such as disability and race. This absence is not an oversight on behalf of the editors and authors contained herein, but instead is reflective of how limited meta-research has been on these EDI issues to date, as well as, potentially, of the differential impacts of the pandemic on different scholarly communities within meta-research at the time of commissioning the Handbook. We note restrictions on data-capabilities at the time of writing, as well as an unfortunate reluctance to address these prevailing and prominent issues in

research culture and its workforce. Many research projects on these topics are currently underway and although the preliminary stage of these projects meant that they were not in a position to contribute a potential chapter at the time, these studies represent a future key research focus of meta-research as they work to address persistent and pervasive inequalities in research culture.

To begin this section, Carolina Cañibano, Richard Woolley, Eric Iversen and Carmen Corona-Sobrino present key understandings of research careers in the meta-research field. Indeed, this chapter questions the legitimacy of a 'linear research career' and argues that the rise of the impact 'agenda', where researchers must demonstrate a public value from their research, has complicated trajectory options for would-be researchers. This has also further emphasised a move away from the idea of a typical, to one of an a-typical research career. A longer-term view of transformations in academic careers is taken by Gerlese Åkerlind, who recounts a longitudinal study of researchers from 1997-2012 which reports on how academic life has changed during this period. The results show increased administrative workload as well as a difference in how researchers engage with research as 'interest-inspired' to one shadowed with a pressure to perform. This, Åkerlind argues, increased the emotive reactions of individuals to the growing institutional and wider cultural pressures. Further to this, Lynn McAlpine in her chapter presents a conceptual model to understanding post-PhD career trajectories that includes the interaction between individual motivations and structural factors, such as those created by organisations, economics and research policies. Here, McAlpine explores the mobility of PhD graduates across employment sectors in light of the decreased availability of research jobs, and ECRs becoming more open to the prospect of a research career beyond academia. The chapter by Julie Bayley and Kieran Fenby-Hulse explores the increasing professionalism of research management and administration roles within research organisations. Termed the 'phantoms of academia' by the authors, individuals acting in these roles are a vital part of research culture and too often go unnoticed in meta-research studies. Yet, despite this invisibility, these roles not only offer alternative career options for ECRs, but also are vital in fostering and delivering value to the production, and promotion, of research.

Following on from this, the section's chapters explore issues of gender representation in the research endeavour including, but not restricted to, issues relating to greater gender parity in research production, practice as well as dissemination. The chapters included in this section engage with some of the more prominent issues shaping meta-research on gender and the disadvantages that the non-ideal worker faces within research culture. Towards this end, Jens Peter Andersen looks at the national and global distributions of authors in the top 1% cited. The gender breakdown of members of this so-called 'research elite' across fields and countries is sobering, with the results highlighting widely spread and persistent gender inequalities in who is visible and receives attention from their peers. Richard Watermeyer continues with an analysis of gender inequity in public engagement activities from research. In methodological contrast to the previous chapter, the qualitative approach utilised by Watermeyer shows how, despite over-representation of women in public engagement

activities, gender inequalities still exist and contributions by women are still undervalued in research assessment and recognition.

We hope that this Handbook will facilitate discussions within the meta-research space and help sustain momentum towards a more inclusive and interdisciplinary production of knowledge that we can use to simultaneously produce valuable, high-quality research, as well as contribute responsibly to the environment in which we work. There is a privilege associated with the ability to produce and interact with knowledge as it is being created that can be all too often overlooked or dismissed by researchers. Meta-researchers have the added privilege of being permitted to examine the conditions under which knowledge is constructed. It is a privilege that cannot go unrecognised as we strive to re-design the very systems and cultures which, through knowledge, transform society and our wider, non-academic world.

ⁱ Prof Paul Benneworth passed away during the production of this *Handbook*, in April, 2020. His death signifies a momentous loss to the field and to a generation of early career researchers who benefited from his ongoing mentoring and support. Vale Paul.