WHAT IS SOCIETAL IMPACT OF RESEARCH?

A literature review

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ABOUT THE LBG

The Ludwig Boltzmann Gesellschaft (LBG) is an independent research organization with a focus on the health and life sciences, as well as social sciences and humanities. The LBG has a budget of 31.3 Million Euro (2018), out of which 31% are from the budget of the Austrian Federal Ministry for Education, Science and Research.

The LBG, with approximately 550 employees, operates 20 research institutes and clusters and 2 research groups. The LBG regularly experiments and tests new ways of cooperation between academia and non-scientific actors, such as businesses, the public sector and civil society. In 2016, the LBG Career Center, providing services to 200 Pre- and Postdocs and the LBG Open Innovation in Science Center, exploring the potential of Open Innovation for the scientific context, were established.

THE LBG OPEN INNOVATION IN SCIENCE INITIATIVE

The LBG conducts world-class research with the aim of addressing challenges of high societal relevance and generating societal impact that will lead to societally relevant innovations. The LBG is convinced that societal impact can be achieved through openness, interdisciplinarity, internationality, and a clear focus on quality. Therefore, the LBG started the 'Open Innovation in Science' initiative with the aim of systematically opening up research to enrich it through new knowledge drawn from beyond traditional disciplinary boundaries. The goal of the Open Innovation in Science initiative is to enable scientists and scientific organizations to generate more novel solutions for societal challenges by:

- re-defining research and innovation processes through a cultural shift to work more openly and collaboratively
- creating a culture of sharing, making the entire scientific process more interactive and permeable
- establishing new forms of stakeholder interaction and collaboration
- translating scientific knowledge into real-world innovations

Intensifying research that benefits society directly - this is the goal of the initiative of the LBG, which is unique in Europe. Science enters into a dialogue with the population and research processes are redesigned.

- Individuals become experts
- Science acquires new insights
- Research develops novel solutions

For further information on the 'Open Innovation in Science' initiative visit www.ois.lbg.ac.at/.

ABOUT THIS REPORT

This narrative literature review is meant to introduce the basic concepts and challenges of impact discourses and debates. Rather than a systematic literature review, the concepts are explicitly chosen to outline the literary basis and foundation of the activities of the Open Innovation in Science Center in planning and capturing the societal impact of (OIS) research groups and institutes.

CONTENT

PREFACE

Societal impact of research receives increasing attention across different national research landscapes as the wider impacts and benefits of research activities for societies at large come into scope. This non-comprehensive narrative literature review sets out to provide an insight into the concept of societal impact of research, its origins and manifestations, as well as the challenges with regards to the assessment of different types of impact.

While the concept of societal impact itself is not new, the topic has gained increasing attention in academic literature and practice across different national government and funding schemes in the past decades. This overview therefore includes a short outline of different national developments with regard to the promotion and evaluation of research impact. It also highlights some of the concerns and criticisms that are being addressed by scholars and research managers alike. This outline of national differences is followed by disciplinary differences in impact definitions and evaluation frameworks and the role of target audiences and particular practice communities in shaping and utilizing impact perspectives. We highlight how disciplinary differences contribute to the diversity of impact goals and influence the type of activity and conceptions associated with research impact. Despite these differences, there is a general and increased understanding across basic, theoretical and more practically, applied disciplines that societal relevance of research activities and outputs should be strived for, though without compromising research autonomy. Increasingly, this includes the notion that more collaborative, transdisciplinary research work can enhance research benefits for different societal stakeholders. Impact-related concepts show that Open Innovation in Science (OIS) practices and related participatory approaches, such as Public and Patient Involvement and Engagement (PPIE) or Responsible Research and Innovation (RRI) and individual researchers' engagement with diverse and non-scientific audiences and stakeholder groups can enhance the possibilities for research uptake. Societal impact goals are thus often accelerated through participatory approaches and the transfer and implementation of scientific findings in other societal and practice realms. In the final part of this literature overview, the focus will be directed towards some of the major discussions concerning impact challenges – both in theory and in evaluation practice. While this overview does not aim to provide a comprehensive review of assessment approaches, it will close with a brief outline of different evaluation frameworks.

THE RISE OF THE IMPACT AGENDA

Over the past two decades, increasing emphasis has been placed on the impact of scientific knowledge in diverse societal contexts beyond academia. The increasing relevance of research for social developments has become a focus of many research and innovation policies in high-income countries (Felt et al., 2018). Interest in the evaluation of non-academic benefits and impacts arising from science and research is growing rapidly, as funding agencies and governments around the world increasingly seek evidence of the value of their research investments to society (Oancea, 2019; Bornmann, 2012).

From the late 1980s diminishing public coffers compelled science to account for its accomplishments in the form of internal assessment (i.e. peer review) and indicators to measure scientific output and impact (Bornmann, 2012:217). At that time, the primary interest with regard to impact was to measure the impact of research on academia and scientific knowledge itself. The underlying assumption was that society at large could derive the most benefit from science conducted at the highest level. Since the 1990s, however, there has been a trend away from this automatic trust in the societal benefits of science, towards a thorough scrutiny of the societal use and benefits of research for different audiences and beneficiaries, and towards a growing expectation that evidence needs to be provided to demonstrate the value of science for society (Martin, 2011). These fundamental shifts in the research landscape are often described as "Mode 2". This expression coined by Gibbson et al. (1994) describes changes in the research system emphasising science that is characterized by transdisciplinarity and collaboration (both within the specific scientific disciplines and between the science world and other stakeholders) and basic research conducted in the context of its application for the end-users and beneficiaries of the research (Bornmann, 2012:218). While the quality of Mode 1 research is evaluated with respect to excellence and originality, the quality of Mode 2 research is assessed with respect to utilitarian values and criteria (Petit, 2004 in Bornemann 2012:218) and is expected to produce *socially robust* knowledge (Barr, 2005 in Bornemann 2012:218).

Societal impact of research, however, is a complex phenomenon which "involves a wide variety of direct and indirect non-linear and self-reinforcing activities" (Bornmann, 2012:220) and it is not solely attributable to a single research project or output. Thus, there are manifold manifestations and forms of societal impact of research (conceptual, instrumental, capacity-building etc.) and a variety of methodological frameworks for research impact evaluations.

IMPACT ACROSS NATIONAL SCIENCE SYSTEMS

Since the developments regarding the theory and evaluation of impact began in various national science systems at different times, they also underwent a variety of specific transformations. All of these approaches, however, have the common denominator of having searched for ways to make the impact of research on society visible and assessable. We will therefore start by providing a short outline of these specific national developments before discussing the most important discourses and concerns around the Impact Agenda in the realm of sciences.

1.1 Impact and the REF-Framework in the UK

A series of reforms in the UK higher education funding landscape in the last fifteen years constitute a new "research impact agenda" that changed academic working lives and practices and set out to ensure that research work and knowledge is used beyond academia (Smith et al., 2020). The underlying assumption behind this agenda is that science should be beneficial to society and that academics should be subject to a social contract in which they receive public funding and in return provide society with useful innovations and policy support. However, the emergence of specific incentives to achieve research impact reflects a much longer-standing concern with the social return on investment from

the public funding of science and the historical role of universities and academic scholarship in society (Bornmann, 2012, Clarke 2010, Wilkie, 1991 in Smith et al., 2020). An emphasis on impact is thus often envisioned to enable fruitful engagement with a range of potential beneficiaries, such as government entities, local communities, businesses and the wider public in order to achieve societal and economic impacts. The UK is a forerunner in introducing and implementing an assessment framework for impact:

The so-called REF (Research Excellence Framework) is a research impact evaluation system of British higher education institutions undertaken by the public UK funding bodies. It requires academics to demonstrate that their research activities will benefit non-academic audiences, and thus represents an innovative approach within research governance structures and funding schemes to encourage particular kinds of research activities that enable the unfolding of *impacts* beyond academia. There are several assumptions inherent to the REF framework, first and foremost the belief that research impact will be positive and that researchers should be able to articulate these effects and related socio-economic benefits, which then can be comparatively assessed by reviewers. Also, there is a consensus that the distribution of research funding should remain primarily focused on supporting 'excellent' research, while partially also reflecting the ability of research to achieve demonstrable impact (Smith et al., 2020:14).

According to Erno-Kjolhede and Hansson (2011), the new REF is a clear political signal that the traditional model of assessing research quality based on quantifiable metrics and its accompanied strong focus on publications is no longer considered sufficient by policy-makers (in Bornmann, 2012: 223). Instead, narrative evidence in case studies is increasingly desired, because a case-study approach can demonstrate the complexity of societal impact in a range of academic research, from the creative arts to the natural sciences, in a more differentiated manner (Bornmann, 2012:229). In consequence, most UK universities have introduced institutional mechanisms to support research impact and invested in new roles and centres dedicated to this and to knowledge exchange. One of the most significant shifts relates to the decision to incorporate impact case studies and impact narratives into research assessment exercises within universities (Bornmann, 2012:222). This approach to impact is closely observed by other, especially high-income, countries with an interest in increasing engagement opportunities with a wide range of audiences beyond academia and to increase the societal relevance, revenue and visibility of research work.

1.2 European level

Across Europe, governments are incentivizing the generation of impact through conditions attached to research funding and through research evaluations, which increasingly evaluate the societal relevance of research alongside research excellence (Reed, 2020:5). This effort is particularly pronounced in the European Union: the direction of future research funding in the European Union suggests that research impact considerations should play a greater role (European Commission 2017 in Smith et al., 2020). Science should play a central role in the development of an innovation-oriented society. The mission-oriented research and innovation agenda of the European Union sets out to address global issues and solve complex, societal challenges (Mazzucato, 2018). The so-called "missions" should develop a transformative potential for science, technology, industry and society. There is also a clear emphasis on the integration of the social sciences and humanities and an expectation that they will assume a leading role in areas in which it is all about the "major social issues of our time" (EC 2017,16 in Felt et al., 2018:6). The importance of science and research for society leads to questions being raised about how scientific knowledge can find its way into policy-making, public debates and other developmental contexts and how this should be supported and made visible and thus comprehensible (Felt et al., 2018:6). The EU Research and Innovation programme "Horizon Europe" has the most advanced program of impact evaluation that has been seen in any EU framework program (Reed, 2020:5). What is more, the EU funds projects that foster evaluation of societal impact:

for example, the international SIAMPI project (funded under the European Commission's Seventh Framework Programme; www.siampi.eu) advocates for research organisations to gather more data on the social impact and on research outcomes on wider audiences (SIAMPI, 2011:7). The project had the objective of developing approaches and tools for the evaluation of societal impact that are applicable in different disciplines and evaluation contexts. The project's analyses showed that interactions between scientists and other stakeholder groups in society are key for successfully generating societal impact (see: Productive Interactions).

1.2.1 The Netherlands

One of the most developed examples of impact evaluation to date has occurred in the Netherlands, where evaluation is conducted alongside quality assessment (based on self-assessment and site visits) (Donovan, 2008 in Bornemann, 2012:221). A study of documents from evaluation processes in the Netherlands shows that more than 80% of the evaluations included a societal impact assessment (van der Meulen & Rip, 2000 in Bornmann, 2012:221). The main dimensions used are the expectation that the research will contribute to socio-economic developments (relevance), the interaction with (possible) users or other societal actors and the actual use of the results (ibid.). Since 2015, Dutch universities have been required to submit several pages concerning impact narratives for each of their research units as part of their six yearly Standard Evaluation Protocol (Reed, 2020:5). Like the UK, the Netherlands thus adopted a case-study approach to research impact assessment. According to the Royal Netherlands Academy of Arts and Sciences (2010), an institute can be evaluated based on three major aspects: the societal *quality* of the work, the societal *impact* of the work and the *valorization* of the work (Bornmann 2012:221). The societal quality of the work refers mainly to the efforts of research actors to exchange productively with diverse stakeholders and to contribute to important debates in society. The societal impact of the work goes a step further and refers to the changes in stakeholder groups and specific procedures and regulations that can be measured via outlining the behavioural changes of individual as well as institutional actors. Finally, the valorization of work touches on all the activities aimed at facilitating research uptake and making scientific results available, comprehensible and suitable for application in services, products and processes (ibid.)

1.3 Australia

Australia plays quite a prominent role in the current debates and developments relating to incentivizing and rewarding research impact. In fact, the decision to use impact case studies in the UK university research assessment exercise (REF2014) was closely informed by approaches and discourses that were prevalent in Australia. The evolution of impact assessment has been a back-and-forth process between Australia and the UK and the research impact agenda was thus developed synergistically and iteratively between Australia and the UK (Smith et al., 2020:15). Recent approaches to assessing impact in Australia differentiate between 'engagement' and impact and develop different methodologies for assessing each (Williams and Grant, 2018 in Smith et al., 2020:15). In 2018, the Australian government introduced the *Engagement and Impact Assessment* as part of the Excellence in Research for Australia (Australian Research Council, 2017 in Reed, 2020:7). This approach was applied to Australian universities and evaluates societal impact through concrete outcomes in the two fields 'engagement' and 'impact'. Moreover, it also evaluates the presence of institutional mechanisms promoting or enabling research impact, through outcomes based on qualitative descriptions of how the institutions facilitated impact realization and research uptake (Research Council of Australia 2018:8 in Muhonen et al. 2019:36). However, in comparison to the UK REF-system, the Australian research system uses more metric indicators, which are then supplemented with narrative case studies. According to Kate Williams and Jonathan Grant, "Australia is more likely to take the lead on the development of lower-cost, metrics-based systems, because their assessment is not associated with

direct financial incentives. The costs of assessing impact in the UK can be justified given the high level of funding that follows, but this justification is more difficult in Australia" (LSE Impact Blog, 2018).

WHAT IS SOCIETAL IMPACT?

THE DIFFERENCE BETWEEN ACADEMIC AND SOCIETAL IMPACT

Societal impact is often defined as "the demonstrable contribution that excellent research makes to society and the economy. This occurs in many ways – through creating and sharing new knowledge and innovation; inventing ground-breaking new products, companies and jobs; developing new and improving existing public services and policy; enhancing quality of life and health and many more." (UKRI website, 2019 in Smith et al., 2020:14). Scientific impact refers to the impact that is generated by research within the scientific and disciplinary community itself. It is often measured via number of citations, numbers of publications or AltMetrics (e.g. social media activities) to mirror how research activities affect theoretical as well as methodological developments within scientific and disciplinary communities. Societal impact, on the other hand, focuses on the effects and changes that research activities unfold beyond the academia in other areas of life such as society, culture, public services, health or the environment. This can include changes in practice, policy and legislation, but could also include changes at the level of awareness, understanding and personal skill development (REF, 2019:83 in Smith et al., 2020:22). While there are manifold definitions and types of impact in specific disciplinary realms, a key assumption inherent in these definitions is often that impact must be demonstrable. This means that a focus on activities and outputs that foster research impact, such as organizing a conference and workshops or publishing a report, is not sufficient. Instead, there must be evidence of research impact being used, such as by policymakers and practitioners and leading to improvements in services, products or businesses (Reed, 2016: 10).

TYPES OF IMPACT

There are many different definitions and types of impact that vary according to disciplinary traditions and realms (Reed, 2016: 10). Most researchers and funders tend to focus on *instrumental impacts* that are more tangible and demonstrate actual changes in policy and practice. However, a range of other types of impacts of research may also be defined, such as *conceptual impacts, capacity building impacts* and *attitudinal* or *cultural impacts. Conceptual impacts,* for example, refer to the subtler changes in awareness and new understandings and perspectives that can be discerned in society due to the research project. Some of these changing attitudes can also have very concrete and impactful consequences for specific stakeholder groups or individuals. Similar to conceptual impacts, *attitudinal and cultural impacts* also underline societal changes on the behavioural level, such as an increased willingness to engage, participate and collaborate in new partnerships and teams (Reed, 2016:10). While *capacity-building impacts* emphasise the long-term transformations due to new learning environments (such as training of students and professionals), *enduring connectivity impacts* focus specifically on follow-up interactions between different stakeholders related to a research project, such as joint proposals, reciprocal visits, workshops and lasting relationships across disciplines and organizations (ibid.).

UNDERSTANDING SOCIETAL IMPACT

RESEARCH UPTAKE

To understand how research generates changes beyond academia, we need to understand the concept of research uptake. Research uptake refers to the idea that research impact does not unfold in a scientific vacuum, but that through knowledge mobilization and dissemination beyond academic settings, scientific expertise moves into practice and policy settings where it can progress towards impact (Phipps, 2016). So, research uptake is the use of research evidence, tools and methodologies by researchers, policymakers, implementers or practitioners to inform policy or practice outside a purely academic setting, where it can actually enable societal impact. Research uptake is a process rather than an end in itself. Through the use of research evidence and findings in an organizational and societal context, research can lead to benefits and changes for different social actors. At the same time, research uptake – the fact that research is incorporated, used and implemented in a practical and non-scientific setting – can already be seen as an important evidence of research impact. In fact, once an organization receives information from dissemination and communication activities of research, it takes this knowledge into the organization to determine whether the research is useful for professional practice, (social) service provision and policy. Thus, implementation and practical use is dependent on the non-academic partner, who uses scientific evidence and research outcomes to decide on organisational matters that have effects on the lives of end-beneficiaries, and thus creates societal impact (Phipps, 2016:32). Therefore, co-production and collaboration between non-academic and academic partners along the impact pathway can accelerate the societal impact of research (ibid, p. 33). Co-production increases the partner's readiness to take up findings, because they themselves delivered input and ideas, which enhances the motivation and engagement of the non-academic partner with the research content.

PATHWAYS TO IMPACT

The term "pathway to impact" is commonly used in discussions on research impact to describe the processual as well as nonlinear nature of impact and addresses the manifold ways in which societal impact of research can unfold. Inherent to this concept is the idea that innovations in society are not only the result of scientific and technological development, but to a large extent the outcome of an iterative process of interaction between scientific and other social realms and its different stakeholders (LERU position paper 2017:4). This means that innovation and research take place in a network in which different partners and actors with diverse knowledge and expertise collaborate on the basis of a joint agenda and impact goal. Societal impact is then something that unfolds along different pathways, usually as a consequence of interactions between different stakeholders and their contributions (LERU position paper, 2017:23). There are usually many different pathways to impact, that all highlight the conditions and productive interactions supporting and enabling impact processes. In this framework, societal impact is thus best understood as a process. Impact is the outcome of these creative interactions between different stakeholders and their contribution along this process (LERU position paper, 2017:23). The concept highlights the conditions supporting and enabling these impact processes.

PRODUCTIVE INTERACTIONS

The concept of productive interactions takes up the concepts of research uptake – the idea that societal impact is created if research is picked up by actors from practice and pathway to impact - the idea that impact unfolds itself during the research process. It emerged from the EU-funded SIAMPI project and has been advocated by the LERU University group as providing a good tool for evaluating research impact (Muhonen, 2019:36). The concept assumes that "scientists do not transfer the

knowledge that they generate themselves; rather, societal impact happens on the basis of iterative processes among researchers and research stakeholders" (Bornmann, 2012:226). The 'productive interactions' approach allows for narrowing the gap between developments in the impact theory and the evaluation practice regarding impact assessment by emphasising on 'productive interaction' throughout the research process and on the social context in which these occur (Spaapen et al.,2011:216). Productive interactions are defined by Spaapen and Van Drooge (2011) as "exchanges between researchers and stakeholders in which knowledge is produced and valued that is both scientifically robust and socially relevant" (Spaapen et al., 2011:212). Three kinds of productive interactions are usually defined: direct (personal) interactions, indirect interactions (mediated through artefacts) and financial interactions (mediated through exchange relations). So productive interactions may be in the form of direct contact and dialogue with non-academic actors, but it can also be indirect interactions such as via exhibitions and media formats as well as financial interactions and economic exchanges (Bornmann, 2012:226). These diverse interactions are productive when they lead to efforts by non-academic actors to use or apply research results or practical information and experiences and if, for example, behavioural changes happen due to this new knowledge and research uptake. In this sense, a productive interaction represents a moment where the research system encounters societal actors, enabling societal stakeholders to influence scientific actors and vice versa (Muhonen et al. 2019) and where both scientific and societal value is generated as a result. As such, these productive interactions between different stakeholders and researchers enable societal impact to unfold and bring about actual changes and benefits for society at large. The aforementioned EU-SIAMPI project recommends an approach to assessing impact that promotes 'productive interactions' rather than 'sellable' or 'demonstrable' impacts and results and therefore emphasises evidence on engagement with a diversity of stakeholders as well as knowledge exchange work (Spaapen et al. 2011 in Smith et al., 2020:16). In this view, impact is less about a specific outcome or end product, but about a process of relationship-building, dialogue and engagement with different research audiences throughout the research process.

The argument that active interaction with non-academic stakeholders is essential for achieving impact is followed in other concepts: for example, Morton (2015) proposes an interactive model of research utilization. This approach acknowledges the importance of networks and of research impact as a process involving many actors interacting and communicating over time (Morton, 2015:406). Moreover, research itself is seen as a process of engagement with research users "around multiple stages, for example, developing research questions, clarifying the research design, interpreting the research data and communicating the research implications." (Nutley et al. 2007:286) In this interactive approach, the ways in which research is conducted, communicated and taken up are as important to understanding and assessing impact as wider utilization. Meanwhile, the term "knowledge exchange" refers to activities that set out to increase the uptake of research. It also embraces an understanding of research use that emphasize the importance of interactions between people and ideas whether in policy or practice. Similar to the interactive model of research utilization (Morton, 2015) it also highlights the importance of relationships and networks in which research is shared, used and reused, so that it unfolds societal impact in different domains and with benefits for different target audiences and social groups.

IMPACT AND OIS PRACTICES

The overview of important concepts in literature about societal impact of research shows the importance of building and maintaining relationships throughout the research process to achieve research uptake and impact. In discourses on research impact, public involvement and engagement and related concepts that emphasize participatory approaches, such as Responsible Research and Innovation (RRI) or Public and Patient Involvement and Engagement (PPIE) are thus often viewed as

tools and routes towards societal impact of research. These interactive processes place an emphasis on trust, dialogue and collaborative partnerships and are essential on the pathway towards greater and more sustainable research impact (Reed, 2016). Involvement activities and approaches are generally conceptualized as a two-way process that involves both interaction and listening with the aim of generating mutual benefits (Wilson et al., 2014:3 in Smith et al., 2020: 100). To understand societal impact of research, we thus need to understand whether and how different stakeholders are engaged (i.e. the impact pathway) and not solely on the final outcome of the research project, because "*it is often the process of engagement that is inherently most valuable to those we engage with - the conversations, debates and exchanges of skills and ideas rather than the final impact or change. And indeed, potential change may come at a much later date, when no measurement will be in place to capture it*" (King and Rivett. 2015:229 in Smith et al., 2020:111)

Rowe and Fewer (2000) provide a participatory framework in which different engagement concepts are outlined with regard to their role in regulating the flow of knowledge from researchers to societal actors and users: Public communication, public consultation and public participation (Muhonen et al., 2019:36). Public participation differs from the other two concepts of public engagement, because it clearly includes some degree of dialogue and exchange. More so, collaborative knowledge generation by researchers working with other stakeholders (i.e citizens, patients, end-users and other beneficiaries) reflects a novel relationship between research actors and society that is very likely to increase research impact (Greenhalgh et al., 2016). Co-creating processes, research activities and products with societal stakeholders significantly increase societal impact and foster dynamic, locally adaptive community-academic partnerships. This "move beyond the academic ivory tower" is crucial to generate productive interactions with different societal stakeholders and thereby creating the environment for societal impact to unfold and to deliver benefits for society at large (Greenhalgh et al., 2016).

It is important to keep in mind that involvement practices have been historically developed in different forms and characteristics across academic disciplines. Involvement and engagement with the public and non-academic subjects as well as specific fieldwork methodologies have long roots in academic understandings of the role and value of research work. For example, many experiences and substantial theoretical works in the social sciences deal with the inclusion and engagement of beneficiaries of social research and non-academic audiences, making public involvement an essential part of research practice and fieldwork methodology in the social sciences and humanities. In applied disciplinary fields, academics have a long tradition of working together with industry partners. Many academic fields have extensive experiences in organising public events or providing advice to policy and practice audiences. The increasing relevance and importance of research impact thus did not invent new involvement practices; however, it clearly encourages researchers to build partnerships with non-academic actors in a more *systematic* way and thereby helped institutionalise these practices as increasingly legitimate and essential practices for academics (Smith et al., 2020: 87). The focus in funding schemes shifted towards requiring collaboration and coproduction with external partners, thus encouraging research organizations and individual researchers to seek partners in a more systemic and consolidating way (Smith et al. 2020:97).

IMPACT PERCEPTIONS ACROSS DISCIPLINES

IMPACT TYPES

Disciplinary orientation influences the type of activity and conceptions associated with research impact. The norms and traditions shared within disciplines, fields and methodological approaches frame what can count as "positive impact" and as desirable impact-oriented activities for individuals and groups (Oancea, 2013:248). When referring to societal research impact, academics in arts and humanities usually emphasise the 'public good', a sense of the general value of science, public dialogue and cultural enrichment. Meanwhile, scholars working in the life and earth sciences often emphasise policy impacts, practical improvements and working together with industry partners. Social scientists, in the meantime, tend to stress policy impacts (e.g. in public health), societal change and broader engagement. In general, applied research, primarily aimed at solving concrete problems, is more intertwined with the needs and experiences articulated by concrete users. Applied disciplines therefore already have closer relationships with end-users and applied areas such as public health are thus often very supportive of the impact agenda (Smith et al., 2020:97). Generally, across all disciplinary boundaries, the impact agenda has led to increased collaborative work and engagement with non-academic audiences (ibid.).

IMPACT TARGET AUDIENCES

Disciplinary differences are most tangible when it comes to discussions about target audiences, since most disciplines have 'core' audiences and types of impact (Smith et al., 2020:76). For example, many applied sciences tend to have close relationships with research users and strong links to practice and highlight these practice audiences, often within the public sector, as the main target of their impact activities. There is evidence that impact is easier to achieve where these long-standing disciplinary-professional practice links exist, such as in the fields of medicine, law and education (Smith et al. 2020:80). While the policy realm is often identified as a target area for impact in the social sciences, industry is an important target audience for the natural sciences and engineering. For scientists working in chemistry or physics, industry is the context in which it is easiest to demonstrate impact and there are historic and well-established science-industry collaborations in place (Smith et al. 2020:77). The situation is quite different for researchers in the humanities, where the main target audience is often members of the public, and impacts and changes arising from working with communities and individuals are harder to document and measure. These difficulties regarding the measurement of impact is however not due to certain disciplines having less impact than others, but rather point to the limitations in impact frameworks that still favour outcome over process.

ARTS & HUMANITIES

When asked about research impact in its broadest sense, most academics working in the arts and humanities emphasised the 'public good', a sense of general value of research work, public engagement activities and cultural enrichment (Smith et al., 2020:63). According to Oaneca (2013) there is an ongoing shift in the humanities, partly due to the Impact Agenda, away from traditional indicators of academic significance towards measures of public engagement, educational values and policy influence and advocacy (Oancea 2013:243). It is true that engagement with society at large is an important element for researchers in museum-related disciplines, where work on accessibility and contextualisation of historical archives and material cultural artefacts for the wider public is highly valued. In these contexts, however, demonstrating the impact of that research work is largely based on indicators of popularity (for example exhibition visitor counts, feedback rating and catalogue sales), thereby missing the more conceptual impacts of work in the humanities and arts (Oancea, 2013:244). What is more, many scholars in the humanities argue that research that may not seem to have direct,

current relevance (short-term impact) should still be pursued. In fact, the cumulative, non-linear and slow nature of impact in the humanities is essential to long-term conceptual, cultural and discursive changes. Shaping public readiness to disrupt established norms takes time and in the short-term, these processes often escape measurement (Oaneca, 2013:244).

SOCIAL SCIENCES

Similar to the debates about research impact in the humanities and arts, issues of incompatibility between the immediate relevance of research and its more critical and transformative qualities are also a discussed in the context of the social sciences (Smith et al., 2020:89). Contributions to broader intellectual and public life and debate happen cumulatively and collectively, through often subtle processes of diffusion and networks, rather than being directly measurable and attributable to individual outputs or researchers (Oaneca, 2013:246). Nevertheless, research impact in the social sciences usually focuses on policy impact, societal change and broader engagement with target communities (Smith et al., 2020:64). Applied social science is generally intertwined with user communities and there is a longstanding tradition of closely working with non-academic partners to develop solutions to current and emerging challenges. There are, however, also great variations in traditions to understand the relationships with research partners and participants within the field of social science and throughout the process of fieldwork and exploration. Participatory approaches within the social sciences, for example, often embrace a notion of co-creation of knowledge that explicitly values the experiences, perspectives and needs of all participants involved. Other traditions of social research, on the other hand, might prioritize the role of articulating independent public critique rather than a strong methodological as well as epistemological emphasis on participation and co-creation (Smith et al., 2020).

PUBLIC HEALTH

As is generally observed by Smith et al. (2020) and Oancea (2013), researchers within disciplines that are overtly applied tend to drive institutional shifts towards research impact and utility. The field of public health is marked by a particularly high interest in its research impact, especially on policy-making. Researchers who want to undertake policy-oriented work thus seem to feel especially supported by institutional impact incentives. In fact, public health researchers often argue for a stronger relationship between research and policy that this is likely to be achieved through increased interactions between research and policymaking (Smith et al., 2020:161).

PHYSICAL AND ENGINEERING SCIENCE

Scholars working in life and earth sciences tend to emphasise policy impacts, practical improvements and working with industry. With regard to the physical and engineering science, the differentiation between the applied or non-applied nature of research is essential in trying to determine the possible benefits and impacts of research endeavours in this field. The impacts of non-applied research in the natural science and engineering contexts are more difficult to demonstrate and to monitor, because the contribution of such work is predominately the growth of scientific knowledge itself and sometimes also the methodological transfer. While methodological transfer could be taken up in more applied areas and industry or business contexts and thus foster economic revenues, the theoretical work contributes more to disciplinary and interdisciplinary knowledge creation and dissemination and is crucial for the disciplinary development. Impacts in these areas are less visible, especially for the public, although these theoretical and methodological insights often get transferred into more applied fields, which are more directly linked to knowledge and technology transfer, product development, start-ups and intellectual property and patents. Current impact incentives are likely to strengthen public appreciation of these activities and processes (Oancea, 2013:247).

ASSESSING SOCIETAL IMPACT

CHALLENGES OF IMPACT INCENTIVES

The notion that science should in one way or the other be beneficial to society is widely supported in the realm of academia as well as the general public (Bornmann, 2013). However, there are also strong concerns that impact incentives are limiting academics' ability to ask questions and conduct research that does not directly address accepted policy issues and most of these concerns are framed with reference to the importance of protecting 'blue skies' research or critical analysis and research practices (Smith et al., 2020:41). While broader politics, prevalent societal discourses and policy interests always had an influence on knowledge production and utilisation, legitimate concerns exist that efforts to bring policymakers and researchers even closer together exacerbates this in ways that is critical (Smith et al., 2020:42). In this context, academics and researchers from different disciplinary fields, often emphasise the important role of research ethics, values and continuous exchange in their relationships with research users, policymakers, businesses and research funding organizations (ibid.).

Other concerns and criticisms with the impact agenda focus more generally on the potential consequences of current efforts to incentivise, measure and reward research impact and the problems with demonstrating and 'attributing' impact (Smith et al., 2020). In this paragraph, we aim to outline the most important arguments. It is commonly agreed that societal impact is harder to assess than the scientific impact of research (Smith, 2020). According to Felt et al. (2018) there are three main clusters of consideration in the international literature with regard to the challenges of societal impact assessment.

The main challenge is the issue of *causality* and *attribution* (Felt, 2018:10, Smith, 2020, Bornmann, 2013). The causality problem highlights that social change or the resolution of a specific societal challenge takes place in complex configurations where causal connections are neither demonstrable nor verifiable. This does not mean, however, that no impact has occurred. In fact, "the routes through which research can influence individual behaviour or inform social policy are often very diffuse" (Rymer, 2011 in Bornmann, 2013:230). Often, it is therefore unclear what can be attributed to the research and what can be attributed to other inputs and interventions. This creates inequalities between different scientific disciplines: For example, social science knowledge is, unlike the products of natural science-technical research, not diffused in society in the form of objects and technologies, but rather as concept and orientation knowledge. The successful integration of social science knowledge is often connected with the fact that it becomes invisible as specific social science knowledge (Felt et al., 2018). Meanwhile, attributions to basic or blue-sky research, while crucial to generate new knowledge, are much harder to assess, as advances in understanding may not be ready for application immediately (Bornmann, 2012). The difficulty of identifying a causality hinders measuring and grasping impact in a meaningful way, i.e. in a way that goes beyond rewarding 'performative impact' or symbolic research (Bornmann, 2013:230).

The second challenge in line with Felt et al. (2018) is the *internationality* problem. It emphasises that knowledge and interactions, especially today concerning the 'grand challenges' of our time, take place simultaneously on many levels and localities and that it is therefore very difficult to make clear attributions of impact. Finally, Felt et al. (2018) stress that *time* is a critical issue: If questions about research impact are asked too early, there is a heightened risk of favouring research that brings short-term effects over research with long-term benefits (Felt et al., 2018:9). In fact, societal impacts of research projects and activities often take a long time to unfold and become apparent (Rymer, 2011 in Bornmann, 2013:230). This holds especially true for basic research, whose long-term impact

perspective may be especially vulnerable to the drawbacks of premature measurement of impact yielding only short-term benefits (Martin, 2007; Bornmann, 2012).

Following these arguments, most impact incentives and models of evaluation appear to be based on simplistic ideas about how impact can be used for tackling societal challenges. They tend to lean on the assumption that a simple, linear relationship between research evidence and positive social or policy change. What is more, research impact is largely understood to be positive. Excellent research, however, does not always produce positive and socially robust outcomes. Finally, there is concern about the inclusiveness of societal research impact assessment: for example, a strong focus on impact can help reify impact heroes and traditional elites rather than opening up towards actors and ideas from non-academic communities. What is more, societal impact for one specific group in a particular locality and time may be perceived as damaging the interests of other social groups (Smith, 2020). Defining the benefits of research is thus in itself a highly subjective process (Smith, 2020). However, this definition is crucial: sociological studies of science have demonstrated that measuring something in itself changes what is being studied and examined (Smith, 2020). Finally, measuring impact requires an understanding of what exactly impact is, what it looks like and how it unfolds (see Impact Perceptions Across Disciplines). As discussed, there are different conceptions and types of impacts, including instrumental impacts, conceptual impacts, attitudinal changes and impacts relating to cultural changes and capacity building processes (Reed et al., 2018). This has consequences for evaluation, because impact that is considered to be a direct change in policy and practice will require a different evaluation framework than impacts that are more conceptual in nature (i.e. new framings and awareness).

These challenges lead to a strong call for improved impact assessment frameworks: Instead of rewarding individual scientists and research projects for achieving research impact based on narrow indicators (such as citations in policy papers), scholars and practitioners suggest to develop impact frameworks that reward collaborative endeavours and environments that foster long-term relationships with a diversity of non-academic subjects and audiences (Smith e al., 2020:200). In this context, the role of universities is crucial, both as workplaces that are open and engaged with the world beyond academia and as open public spaces that create impactful environments in which different stakeholders can interact and exchange with each other (Smith et al., 2020:200). Research funding agencies should play a central role in rewarding the generation of impactful environments and reflecting the time and expertise needed to create and foster such spaces. Finally, it is important to note that, while valuing activities that create the conditions for research uptake and therefore the unfolding of societal impact of research in societies is crucial, it is not a one-size-fits-all approach. In fact, it is also very important to protect spaces for critical and discovery-focused scholarship that is valuable for reasons other than impact, such as experimental, theoretical and critical scholarship (ibid.).

DIFFERENT APPROACHES TO IMPACT ASSESSMENT

In the context of societal impact assessment, assessment methods and evaluation can be understood as the process of collecting, contextualising and interpreting data to assess the significance, reach and attribution of impacts from research (Reed, 2021; Bornemann 2012). Different evaluation frameworks set out to tackle these theoretical as well as methodological challenges. The numerous and vast diversity of methodological as well as theoretical frameworks in both research and practice of impact evaluation can be summarized in three main evaluation approaches: quantitative measurements, qualitative approaches in form of narrative accounts and case studies, and approaches that emphasize interaction, communication patterns and knowledge mobilization between research and societal stakeholders. In a typology of research impact design provided by Reed (2021), these approaches can be summarized into five main categories, namely experimental and statistical approaches, evidence

synthesis approaches, system analysis methods, indicator-based approaches and textual, oral and arts-based methods (Reed, 2021:5). In the following paragraphs we will shortly outline the ones that are most important to our work at the OIS Center, namely *system analysis methods, indicator-based approaches* and finally *textual, arts-based methods.*

Systems analysis methods

Evaluation design based on system analysis methods are usually used ex-post to examine whether research was necessary to cause impact and to explore whether a particular research activity or project made a significant contribution. They tend to combine a range of qualitative and quantitative research methods to depict complex cause-and-effect relationships. Broadly speaking, system models allow a detailed understanding and mapping of causal links from research to impacts and are thus useful for grasping complex, non-linear and unpredictable outcomes (Reed, 2021:7). Among the most prominent system analysis methods are *contribution analyses* as well as *contribution and network mapping*, *social network analysis* and *qualitative network mapping* (Reed, 2021:5). The main idea behind the contribution approach is that it acknowledges that research is only one factor among many that influence outcomes and creates impacts in the societal sphere. As a family of methods, system models range from purely quantitative, process-based models, to qualitative conceptual and participatory models. At the quantitative end of the spectrum are modelling techniques that estimate impacts arising from evidence-based interventions in policy and practice (Reed, 2021:8). On the qualitative end of the spectrum, conceptual approaches are used to trace social and cultural impacts, including environmental, economic and socio-political effects and changes in the cognitive realm such as values and beliefs (Reed, 2021:8). Interviews, questionnaires and focus groups are often used for assessing these qualitative and discursive changes that often happen as a result of specific interpersonal as well as person-environment interactions (ibid.).

For research activities in the social sciences and humanities, Oancea (2017) suggests a qualitative network mapping and analysis to map the history and web of relationships and social interactions surrounding a project and the "value constellations" happening as a consequence of it (Oancea, 2017:304). In this perspective, networks and interactions are understood as value in themselves and efforts should be directed into visualising and understanding these value networks and providing narrative accounts of the meaning and benefit of concrete interactions. In a qualitative network mapping exercise researchers and participants are asked to do a semi-structured interview in which they together draw and map a diagram of the network that surrounds a specific project. The focus of such a qualitative, configurative network mapping can be a single research project or an individual's long-term research activity, but also a programme in an institutional setting and usually includes a variety of elements, such as flows (direct, reciprocal), types of flows (human resources, physical, information), relationships (direct, indirect, fuzzy), nodes (research, non-research, partners, administration, others), intensity and quality of flows (Oancea, 2017:306). These mapping exercises highlight both the conceptual as well as methodological relevance of networks, interactions and configurative flows (Oancea, 2017:311).

Indicator-based approaches

In contrast to system analysis approaches that are typically used ex-post, indicator-based approaches are often used for impact planning activities, so at the beginning or before a specific research activity (Reed, 2021:7). At the heart of these approaches are so-called *logic models* that show how different resources, inputs and activities might be linked to specific outputs, outcomes and overall impact and objective. Rather than a method in a strict sense, indicator-based approaches allow ordering and identifying relevant methods in evaluation processes, by tracing causal chains from research to impact based on anticipated logical frameworks or a theory of change. Typically, they involve the identification

of activites, impact indicators and research objectives, which can be designed either in an expert-led top-down approach or co-created with relevant stakeholders. One of the advantages of logic models is their ability to standardise the collection of data in the creation of case studies that are easily comparable and thus transferrable to different disciplinary contexts (Reed, 2021:10).

One of the most prominent approaches, especially in the context of public health research, is the *Payback Framework*, developed in the mid-1990s by Buxton and Hanney with the aim to demonstrate the 'payback' of public investments to research, health services and public health research in general (Donovan and Hanney, 2011). While the Payback Framework is mostly used in the context of health service research, it has also been adapted to other disciplines such as the social sciences and humanities (Wooding et al., 2007 and Levitt et al., 2010 in Donovan and Hanney, 2011:2) and there are strong arguments that the framework can successfully be used in diverse disciplinary contexts for the assessment of societal impact (Bornmann, 2013:226). The widely-used framework is often understood as a tool to facilitate data collection and cross-case analyses. It usually involves a series of feedback rounds that work well with the unilinear nature of most research processes. The framework consists of two major elements, namely a logical model of the overall research process and a series of indicators to categorize the individual impacts of research. The Payback Framework depicts five main categories of benefits that can be divided into more traditional academic benefits and wider impacts. The more traditional academic impacts include indicators such as knowledge production, benefits to future research, research use and research capacity-building. The wider categories include impacts such as policy and product development, health & health sector benefits as well as broader general economic benefits. Data and evidence for these categories can be collected through surveys of decision makers and analysis of documents, and several studies have demonstrated that the framework can be used for societal impact assessment in different contexts (Bornmann, 2013:226).

Textual, oral and arts-based methods

Textual, oral and arts-based evaluation methods tend to build impact narratives and cases that build plausible arguments in how far research activities were necessary to cause impact. To support the argument, they use multiple sources of evidence that attribute effects and benefits to research. All of these methods can be participatory: relevant stakeholders and participants in research are involved in the evaluation itself, thereby shaping the evaluation processes and thus potentially further enhancing the overall impact (Reed, 2021:8). Textual and oral methods have a number of advantages for impact reflection, because qualitative data from interviews and focus groups can contextualize and explain data and processes to provide a bigger picture of the project and research activity. In fact, qualitative accounts often enable a more thorough understanding of how and why a research project was or was not effective and what might be changed to make it more impactful. Research methods prominent in the arts and humanities aim to provide a deeper, more nuanced and often more personal understanding of lived experience, meanings, identities and values (Coates et al. 2014 in Reed 2021:8). They should therefore not only be considered relevant for research evaluation in the arts and humanities, but can be used to evaluate impacts arising from any discipline and scientific area.

There is a great variety of methods that would fall under the umbrella of arts-based methods and among the most prominent are *ethnographic testimonials, participant observation*, *interviews* and *focus groups*, *oral history* and *storytelling, but also* elements of *poetry, fiction* and even *dance and theatre*. These arts-based approaches can be especially fruitful when working with vulnerable groups, persons with limited verbal or written competences or in situations where access to the emotional, affective and embodied realms of life is desirable. Last but not least, arts-based methods in themselves provide a medium for communicating the findings of an evaluation in a powerful way and are thus often used to support dissemination, making project reporting more engaging, accessible and relevant to those beyond professional practice and academia (Reed, 2021:9).

CONCLUSIVE REMARKS

This non-comprehensive literature review has drawn on some of the most important literature on societal research impact to provide an overview of the basic discourses, concepts and types of impact and the challenges inherent to these incentives and perspectives. It started by situating the topic in a larger historical context of changing science-policy relationships and described how a focus on societal relevance of research is highly connected to a shift in most of the research systems to foster more collaborative, transdisciplinary research practices. While these developments happened in different national research landscapes at different times and underwent specific transformations, there are common aspects to be found in most contexts. The most fundamental one is that engagement and involvement activities with stakeholder groups outside of academia itself are increasingly considered central for leveraging societal research impact. The ideas of important concepts in the field of research impact such as "productive interactions", "pathways to impact" and "research uptake" and knowledge mobilization provide strong support to this notion: While the particularities of the concepts are discussed in this overview, the main idea behind these concepts can be summarized as an acknowledgement of the significance of building and facilitating strong and sustainable relationships between researchers and other societal actors and non-academic stakeholders. It is often precisely through these interactive processes that research findings and ideas can be transferred to non-academic settings and societal impact of research can unfold in society. Creating and fostering such an environment in science communities and academia is therefore key for increasing societal impact and thus for delivering and enabling research benefits for society at large. This said, however, it is clear that disciplinary differences exist and most scientific disciplines have different and specific target audiences and practice communities. The definition of what is considered as positive impact and what impact-oriented activities are practiced thus varies substantially across disciplinary fields. Here, we briefly touched upon some of the concerns often articulated by scholars in basic research areas and highlighted that finding a balance between the autonomy of science and its aspiration to be societally relevant lies at the heart of most impact debates. Other challenges and concerns regarding impact incentives were also discussed and major methodological debates and approaches concerning impact assessment were outlined. In the last part, we briefly introduced basic evaluation frameworks and differentiated between system analysis methods, indicator-based approaches and more narrative, arts-based methods in demonstrating, assessing and interpreting societal research impact.

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