

Assessing university policies for enhancing societal impact of academic research: A multicriteria mapping approach

Rosa Kuipers-Dirven^{1,2}, Matthijs Janssen ^{1,3*} and Jarno Hoekman³

¹Dialogic Innovatie en Interactie, Hooghiemstraplein 33-36, Utrecht, 3514 AX, The Netherlands

²Innovation & Impact Centre TU Delft, Building 26.C, Van der Burghweg 1, Delft, 2628 CS, The Netherlands

³Copernicus Institute of Sustainable Development, Utrecht University, Princetonlaan 8a, Utrecht, 3584 CB, The Netherlands

*Corresponding author. Email: m.j.janssen@uu.nl

Abstract

While there is a prolific debate on evaluating the societal impact of academic research, so far little attention has been paid to assessing the design and implementation of suitable organizational strategies. This article argues that evaluation methods are needed which are both formative and sensitive to diverging views on what defines and constitutes societal impact. We use a participatory deliberation method, the Multicriteria Mapping (MCM) approach, to examine how stakeholders appraise the use of university policy options for enhancing societal impact, and understand on what basis they judge the performance of these options. Focusing on a large Dutch research-based university, we conduct 22 interviews with academics, management, and support staff as well as strategic policy officers to examine how they rank and discuss the expected performance of university policy options identified in previous literature. Our results show that interviewees base their scores on criteria related to policy options' expected organizational output and external outcomes, as well as their practical and, to a lesser degree, cultural, and financial feasibility. The resulting rankings also point at contrasts in the perceived potential of policy options, with interviewees assigning priority to providing researchers with recognition and rewards for impact-based activities. We conclude by discussing how MCM can be used as a formative evaluation method to assess and select policies and inform decision-making that fit a university's particular situation. Besides drawing lessons for the context of our illustrative case, we also reflect on the relevance of the evaluation method and our findings for other universities.

Keywords: third mission; societal impact; academic engagement; policy appraisal; university policy; valorization

1. Introduction

Discussions about universities' impact on society and the societal impact of scientific research have gained significant importance (Trencher et al. 2014; D'Este et al. 2018; Saarela 2019). In a report of the League of European Research Universities, Van den Akker, Spaapen and Maes (2017) emphasize that 'societal impact is high on the agenda of universities and will be even higher in the years to come' (p. 6). The emphasis on societal impact broadens well-established 'third-mission activities' of universities to contribute to economic goals through knowledge commercialization, technology transfer, and the promotion of entrepreneurial activity (Etzkowitz 1998; Gulbrandsen and Slipersaeter 2007; Pinheiro, Langa and Pausits 2015; De la Torre, Casani and Sagarra 2018). It focuses instead on the entirety of interactions between a university and its stakeholders and a wide variety of changes in thinking and acting based on academic research that may result from these interactions (Molas-Gallart and Tang 2011; Spaapen and van Drooge 2011; De Jong and Balaban 2022). As such, the impact agenda provides a pluralistic frame for universities' engagement with society, in line with the prominence given to new forms of participatory knowledge production such as co-creation, community engagement, and transdisciplinary research in science policy discourse (Llopis et al. 2022; Whitmer et al. 2010; Trencher et al. 2014; Saarela 2019).

In response to these demands, universities struggle, however, with finding ways to create an organizational environment that enables the joint production of scientific and

societal value (Smit and Hessels 2021; Hessels, Van Lente and Smits 2009; De Jong, Smit and van Drooge 2016). An increased focus on societal impact requires conscious efforts by universities to formulate impact goals and missions and design and implement instruments to achieve these goals (Kitagawa, Sánchez Barrioluengo and Uyarra 2016; De Jong and Balaban 2022). Such organizational impact strategies are dependent on resource allocation, capacity building, and the creation of incentives, in order to translate strategies into actions and change dominant forms of scientific reward provision that currently tend to 'prioritise peer recognition and academic reputation within the scientific community, making the generation of societal impact ... a secondary consideration from the individual perspective of career progression in academia' (D'Este et al. 2018: 754). Organizational impact strategies also need to be aligned with the existing organizational environment, as it is known from previous studies that, for example, the presence and visibility of peer-communities (Becher and Trowler 2001), disciplinary knowledge bases (Wuchty, Jones and Uzzi 2007), and specialized supportive infrastructures such as Technology Transfer Offices (Zhou and Tang 2020) are important conditions for how societal impact can be generated (D'Este et al. 2018; De Jong and Balaban 2022).

So far, there is however little research on the role of universities in facilitating the generation of societal impact, let alone how specific organizational strategies and university-level policy instruments can contribute to enhancing societal impact of academic research (Perkmann et al. 2021; De Jong, Balaban and Nedeva 2022). Previous studies have provided insight

into assessment methods and tools that can be used to evaluate the societal impact of research on a project and program level (Smit and Hessels 2021; Sørensen et al. 2022), as well as the role that universities play in stakeholder engagement (Perkmann et al. 2021) and innovation ecosystems (Parker and Lundgren 2022). Less attention has been paid to methods that evaluate different organizational strategies of universities targeted at enhancing the societal impact of academic research.

In this article, we therefore provide an organizational perspective on assessment of societal impact and apply a formative evaluation method to explore how different university-level strategies for generating societal impact are appraised by stakeholders. Recognizing that the concept of societal impact is subject to plural, socially situated understandings and sense-making processes (De Jong and Balaban 2022) we follow the view that learning about suitable university strategies for societal impact is best to be combined with participatory deliberation (Stirling, 2003, 2008; Lahsen and Turnhout 2021). For universities that wish to inform themselves about which policy actions to consider to stimulate societal impact, this implies that there might be added value in relying on formative and prospective evaluation methods that can elicit stakeholders' judgements and perspectives on what and how policies for societal impact may work. The advantage of these methods is that they acknowledge the importance of social agency of stakeholders, whose diverse and sometimes conflicting views, values, and assessments shape how policies are received and will perform.

We specifically use the Multicriteria Mapping (MCM) methodology (Coburn and Stirling 2006) to demonstrate the use of a combined analytical and participatory appraisal and the insights it provides into the appraisal of university-level policy options for stimulating societal impact. Following the steps of the MCM method, we first identify potentially suitable university policy options. Second, focusing on a large Dutch research-based university with international presence, we examine how stakeholders appraise the expected performance of these options both individually and in relation to each other. Our goal is not to make one-size-fits-all claims about the expected performance of policy options or how to stimulate societal impact within universities. Rather, we use our findings as illustrative appraisals in context and aim to understand how formative evaluation methods and participatory appraisal can provide insight into (1) the diversity of options that universities can consider, and (2) the criteria and conditions stakeholders take into account when judging which policies to prioritize.

2. The MCM methodology

The MCM method tries to span the divide between narrow quantitative evaluation methods that might overlook wider considerations, and broad qualitative methods that include diverse perspectives but have difficulties with focusing on the context of the issue (Coburn and Stirling 2016; Lobstein et al. 2006). The aim of MCM is not to define 'the best single policy', but rather to explore an array of options and their possible interactions, conditions, and contextual implications (Coburn et al. 2021). In line with the principles of formative evaluation, focused on learning about context-specific mechanisms (e.g. Molas-Gallart et al. 2021), MCM assists in appraising policy options before they are implemented, while

taking into account factors that may condition their performance. This is in line with Smit and Hessels (2021: 11), who stress the importance of 'evaluation methods that combine the different aspects of societal value and align the way the various actors in knowledge production perceive value'. The results of MCM are meant to meaningfully inform decision-makers about which university-level policy options to consider, based on stakeholders' appreciation of a particular context. Moreover, as this is the first application of MCM to societal impact assessment, our results might also yield more general lessons regarding the nature, suitability, and evaluation of policy options for enhancing the societal impact of research.

The MCM research process (See Figure A.1 in Supplementary Appendix I) consists of four steps (Coburn and Stirling 2016): (1) defining policy options, (2) selecting stakeholders for interviews, (3) conducting interviews in which options are appraised using the MCM Tool, and (4) analysing and interpreting both quantitative and qualitative data. These four steps are explained below.

2.1 Step 1: Defining university policy options

A first selection of university policy options was made based on an explorative literature review and expert interviews. These options are defined as the *core policy options* in the MCM process that will be assessed by all participants. The aim was to provide an overview of possible university policy options focusing on the goal of enhancing the societal impact of academic research. Societal impact was defined in a broad sense as changes in thinking and acting in a wide variety of domains (e.g. economy, society, culture, public policy or services, health, the environment) based on academic research and resulting from interactions with stakeholders (Higher Education Funding Council for England 2011; Spaapen and van Drooge 2011).

2.1.1 Literature review.

The explorative literature review covered scientific publications and grey literature on the societal impact of academic research and policies to stimulate this, some of them specific to the Dutch context. In an initial scoping search we used a broad set of search terms in Web of Science and Google Scholar to identify relevant documents published after 2010. Search queries included (combinations of) terms like university policy instruments, societal impact policies, socially/societal relevant research, academic engagement, co-creation research, and engaged universities. This revealed the existence of related literature streams on third-mission activities, academic engagement, university's responses to societal challenges, participatory knowledge production, innovation policy for university/organizational change, measuring and evaluating societal impact, and the process of generating societal impact.

As directly searching for university policy instruments generated few relevant results, we focused on highly cited papers that we identified based on the search terms and screened their full texts for mentionings of policy options as an inclusion criterion. We also screened papers for the policy-relevant documents they cited. About 30 papers were then read in detail and checked on examples of concrete interventions, incentives, and support structures universities can deploy to stimulate societal impact of academic research. Encountered policy options were added to a list, up to the point that

reading additional documents yielded no new options. Many of the ultimately identified policy options were obtained from grey literature like policy documents on Dutch ‘valorization’ strategies, with some of these documents being suggested by consulted experts (see below). This concerns for instance the Vision for Science 2025 by the Ministry of Science, Culture and Education (OCW 2014), a position paper by a consortium led by the alliance of Dutch universities (VSNU et al. 2019), and a report by the Royal Netherlands Academy of Arts and Sciences on charting the impact of research on society (KNAW 2018). In an iterative process, two of the authors assigned the identified instruments to the categories that constitute the core policy options for the next steps in the MCM analysis.

2.1.2 Expert interviews.

To validate the set of possible university policy instruments and options, interviews were held with experts knowledgeable about university policies and societal impact of academic research in the Netherlands. The experts could provide suggestions for additional instruments and alternative ways of grouping them into policy options, as well as for relevant documentation. In total, five expert interviews were needed to reach a point of saturation.

After processing revisions following from the expert interviews, we arrived at the overview shown in Table 1. The instruments are grouped into seven policy options. Together, these policy options target main elements of universities’ impact strategies as recently proposed by De Jong and Balaban (2022). One policy option consists of initiatives to clarify what societal impact *goals* a university has, and why. Another category of instruments concerns means to change behaviour and stimulate researchers to become more impact-oriented, which encompasses providing incentives (like HR policies and earmarked resources) and strengthening the capability of university staff (by offering training and information) to achieve impact. The third impact strategy element ensures that academic research is performed in an *environment* that is favourable for creating impact. Corresponding policy options rely on instruments for facilitating boundary spanning (to enable interaction with external organizations or social groups) and for developing innovative curricula (so that impact can be achieved via teaching activities).

In line with the MCM method, the aim of defining this list of core policy options is not to be exhaustive but rather to identify the range of possible university policy instruments which was then open for further discussion during the MCM interviews (Step 3).

Besides the core university policy options, *one discretionary option* was defined: ‘wait-and-see’. This discretionary option is optional and implies to *not pro-actively* implement university policies. Since all core policy options have a strong pro-active focus, one indirectly takes a normative opinion that ‘something has to be done’ to enhance societal impact. If a stakeholder felt that it is necessary to include a policy option that is not pro-active, he or she could add this discretionary option to the MCM appraisal.

2.2 Step 2: Select stakeholders to be interviewed

To select stakeholders to be interviewed, employees from Utrecht University and public organizations in the Dutch higher education sector were contacted. Regarding the Dutch context, universities in the Netherlands are relatively

managerial compared to other European universities and tend to be organized in a relatively hierarchical manner with top-down management setting clear strategic goals (Seeber et al. 2015). As a result, university management has considerable control over the development of policy instruments and sending signals to employees about how their (impact) activities are valued and rewarded (De Jong and Balaban 2022). Regarding the specific university context, Utrecht University is one of the oldest and largest universities in the Netherlands. It has a central board and seven research and education Faculties consisting of multiple departments or ‘schools’ and covering a broad range of fields within the humanities, social sciences, life sciences, and natural sciences. At the time of interviewing, impact strategies were closely linked to four strategic themes that aim to address grand societal challenges: Dynamics of Youth, Institutions for Open Societies, Life Sciences, Pathways to sustainability. These themes had their own interdisciplinary ‘hubs’ that stimulate knowledge exchange with societal partners in temporary project organizations and based on various societal impact pathways. Moreover, individual faculties implemented a strategic agenda for societal impact with related HR-policy implications for recognition and rewards of societal impact activities. There were also supportive institutions for more classical ‘third mission activities’ including Utrecht Holdings, Centre for Entrepreneurship and UtrechtInc.

The sampling of stakeholders for interviews was based on their role in relation to societal impact in the university or public organization, and thereby also their involvement in opening up the debate on university policy options for ensuring societal impact of academic research. We distinguished between three roles: (1) academics involved in societal impact activities related to their research; (2) management and support staff at faculty or university level (e.g. faculty and university policy advisors, faculty valorization officers, faculty business developers, heads of valorization and academic affairs, project managers, supporting centres for impact, vice dean impact, etc.); and (3) strategic policy officers from Dutch public organizations involved with societal impact of universities. Stakeholders that were not engaged in societal impact activities were excluded from the sample to ensure that stakeholders had sufficient experience with the opportunities and barriers within the university system to facilitate societal impact. By doing so this study explicitly focuses on how societal impact can be enhanced, leaving aside questions to what extent this is a desirable mission for the university in the first place. In this context, interviewees could however argue that not every academic needs to be involved in societal impact activities, while they could also suggest to design policy instruments in such a way that they are exclusively targeted to those academics that do or do not have the motivation to engage in societal impact activities.

Via purposive and snowball sampling, 46 potential stakeholders from each of the three participant types were contacted to engage in MCM engagements. In total, 22 stakeholders agreed to engage in the MCM process; see Table A.1 in Supplementary Appendix II. Of all the different stakeholder types, it was most challenging to find academics involved with societal impact activities to engage in the research, since many of the academics stated to lack time for an interview of 2 h. Also, some academics cancelled the interview due to time limitations.

Table 1. Overview of university policy options for enhancing societal impact of academic research

| Policy option | Instrument examples from literature |
|---|---|
| Impact strategy element: Goals (signal why impact is important and create shared understanding of what impact is) | |
| O1. Communication policy Setting up an internal communication policy (e.g. for identifying and highlighting the desired and achieved societal impact of research) and external communication policy (informing others about societal research topics and results). | <ul style="list-style-type: none"> • Incorporate societal impact strategy (and a clear definition of what societal impact contains, a core mission and strategic-planning efforts) and communicate this to the public via several communication tools, e.g. to include societal impact achievements in annual reports. (Addressed in Whitmer et al. 2010; De Jong 2015) • Developing an explicit standard for addressing solutions to societal challenges with academic research to promote a societal impact research focus and encourage institutional leaders and researchers to craft shared definitions. (Addressed in Wowk et al. 2017) • Foster a supporting academic culture to overcome cognitive (cultural) barriers from within the university. (Addressed in Saarela 2019; D'Este et al. 2018) • Inform the public about science (science communication). One of the easiest mechanisms for a university to engage in dialogue with its surrounding community is through the university website. Changes that communicate openness to promote relationship-building with community stakeholders. (Addressed in Dijstelbloem et al. 2013; Whitmer et al. 2010) |
| Impact strategy element: Behaviour—Incentives (motivations and means to achieve impact) | |
| O2. Human resources (HR) policy Rewards and recognition and differentiation possibilities within human resources policy: the researcher can decide to have societal impact activities considered as one of his or her core tasks, rewards, and further promotions. | <ul style="list-style-type: none"> • Provide researchers with sufficient time for societal impact activities. (Saarela, 2019) • New research evaluation criteria to determining research quality (away from fixed quantitative metric—include useful measures that value work that contributes to both general knowledge and societal action). (Addressed in Wowk et al. 2017; Van den Akker, Spaapen and Maes 2017; Cornell et al. 2013; Whitmer et al. 2010; Dijstelbloem et al. 2013) • Implement credit and recognition in reward structures across staff for a diversity of useful output and societal impact activities (including guest lectures, publications in interdisciplinary journals, development of decision-making tools, network development, mentoring, media outlets, etc.) by changes in salary, sabbaticals, additional research assistants, renewal of contracts. (Addressed in Wowk et al. 2017; De Jong 2015; Cornell et al. 2013) • Allow for skill and task diversity in the composition of research groups. (Addressed in Wowk et al. 2017; D'Este et al. 2018) • Changing career strategies: long-term involvement with society sits add odds with an academic career progression that values a constant stream of research outputs. A major obstacle for younger scholars is the relative lack of successful models to follow when charting an academic career in the area of societal impact. (Addressed in Whitmer et al. 2010; De Jong 2015; Cornell et al. 2013; Dijstelbloem et al. 2013; Trencher et al. 2014) |
| O3. Earmarked resources Resources are made available to help and support (risky) societal impact projects in various phases. It is a direct signal that the work is valued. | <ul style="list-style-type: none"> • The preparation of specially earmarked research funds fostering for solution-oriented work/co-creative partnerships/collaborative/participatory research. (Addressed in Trencher et al. 2014; Wowk et al. 2017; Cornell et al. 2013; Whitmer et al. 2010) • Insert seed funding for societal impact projects. (Addressed in Wowk et al. 2017) • Long-term funding for (risky) projects, (e.g. for sustainability projects). (Addressed in Cornell et al. 2013; Dijstelbloem et al. 2013) |
| Impact strategy element: Behaviour—Capabilities (enhance knowledge and abilities to achieve impact) | |
| O4. Impact training and coaching Educate researchers by offering societal impact training and coaching programs for (Ph.D.) researchers within the university. | <ul style="list-style-type: none"> • Educate/train researchers with the competences needed (Saarela 2019), for example: individual-level engagement skills (Perkmann et al. 2013) communicating science to the outside world, including through social networks and crowdsourcing exercises (Wowk et al. 2017), other diverse sets of skills (technical, procedural, managerial) and intellectual capital (organizational, social, and human capital) to address the academic and non-academic communities simultaneously (D'Este et al. 2018), and skills for co-developed research (Cornell et al. 2013). • Provide mentoring and leadership training. (Addressed in Whitmer et al. 2010) • Mentor junior colleagues for societal impact practices. (Addressed in Cornell et al. 2013) |
| O5. Information provision policy Improving internal university information provision for researchers about the process around societal impact of research, funding mechanisms, and other administrative requirements for societal impact generation. | <ul style="list-style-type: none"> • Sharing information on the portfolios of scientific and societal impacts generated by individual researcher's activities and experiments to enable learning. (Addressed in Cornell et al. 2013) • Overcoming transactional barriers from the university (e.g. administrative work that must be dealt with in societal impact activities). (Addressed in D'Este et al. 2018) • Provide technical support by using new information systems and technologies as a means of access to knowledge, as a repository of knowledge, as a research tool, which all have implications for the production, diffusion and use of knowledge in responding to societal problems. (Addressed in Cornell et al. 2013; Whitmer et al. 2010) • Ensuring transparency, availability and accessibility of data and information of societal impact projects. (Addressed in Wowk et al. 2017) |

(continued)

Table 1. (continued)

| Policy option | Instrument examples from literature |
|--|---|
| O6. Facilitating boundary spanning | Impact strategy element: Environment (creating spaces to achieve impact) |
| Establishing a co-operative network, open events and open meeting places in and around the university campus to enable interactions and engagement with stakeholders (e.g. other knowledge institutions, public authorities, companies, government, civil society). This policy option enables direct engagement with society: facilitating the connection between universities and societal actors. | <ul style="list-style-type: none"> Invest in support structures for interaction and networking to foster the interface between science and society. (Addressed in Perkmann et al. 2013; Whitmer et al. 2010; Wowk et al. 2017) Institutional leadership and researchers that foster and maintain dialogue across stakeholder groups and engage with internal and external experts. (Addressed in Spaapen and Van Drooge 2011; De Jong 2015; Sarewitz 2016) Set up interactive events, meeting locations, and knowledge arenas to facilitate engagement of science and stakeholders (as a facilitator for both understanding the stakeholders, as acquisition for funding, networks). (Addressed in Saarela 2019; Cornell et al. 2013) Assign knowledge brokers (work between society and science) and assign intermediary roles to foster the connection between university scientists and societal actors who potentially could participate in and benefit from knowledge exchange processes. (Addressed in D' Este et al. 2018; Saarela 2019) Involve the market and stakeholders in addressing the unmet needs and determining the priority of research topics. (Addressed in Van de Burgwal, van Der Waal and Claassen 2018; Dijstelbloem et al. 2013) |
| O7. Innovative curriculum development | |
| The development of educational components in the curriculum of bachelor's and/or master's programs that take societal impact into account. This is based on the idea that teaching, learning and research is blended and forms the basis for future researchers and (their) efforts geared to finding answers to societal challenges. | <ul style="list-style-type: none"> Structural changes in personalized graduate degrees scoping for non-traditional career paths. (Addressed in Wowk et al. 2017) Linking science to the educational system to achieve societal impact: training the next generation of scientists will foster the interaction between science and society (Cornell et al. 2013; Dijstelbloem et al. 2013). A result is also that faculty members also continue their own learning experience and expand their network vis education (Whitmer et al. 2010). Innovative curriculum development: traditional science education does not adequately provide students with the right skills (Cornell et al. 2013; Whitmer et al. 2010). Each person's educational experience at the university: 'should build the skills, disposition, and capacities for engaging in complex and socially relevant issues; with training that not only includes academic theory, methodologies and techniques, but also skills such as negotiation, communication and integrative research methods and practices.' (Cornell et al. 2013: 68) |

2.3 Step 3: Conduct MCM interviews

The collection of qualitative and quantitative data was carried out via face-to-face MCM interviews, referred to as *MCM engagements*. Interviews were conducted in the second and third-quarter of 2019 and each of the interviews lasted 1.5–3 h. During these interviews, the core and, if preferred, discretionary and/or additional university policy options were appraised by the participants on their expected performance to enhance the societal impact of academic research. The online MCM tool, developed by the University of Sussex was used.¹ Interviewees received a briefing document before the interview. During the MCM engagements, respondents had the specific Dutch (national-level policies and developments) and university context (goals and organizational strategies) in mind. An extensive description of the steps in the MCM engagements is provided in [Supplementary Appendix I](#).

2.4 Step 4: Analysing appraisals of university policy options

The fourth step in the MCM research process is to analyse the quantitative and qualitative data collected in the MCM engagements. The qualitative MCM data consists of the chosen criteria and principles by which the policy options were appraised; notes entered in the MCM software that explains the stakeholders' decisions; notes extracted from the interviews' transcripts; and additional documents—if any—provided by the participant to support his or her statements. The quantitative MCM data concerns scores given to the university policy options based on the chosen criteria, the weights provided to each criterion, and the final performance ranks of the appraisal.

To obtain a deeper understanding of the context, conditionality, and uncertainties of policy options, the qualitative data was analysed in a systematic way. All quotes from the MCM engagements were pooled in an Excel sheet and categorized by criteria type, policy option, weights, context, and conditionality. This provided the possibility to interpret corresponding qualitative input from the participant(s) on one or more of these elements and facilitated comparison of qualitative data from different participants.

In the next section, the following results will be discussed, each with corresponding contextualization based on stakeholders' perspectives and explanations: (1) options used in appraisal; (2) criteria types (issues) used in appraisal; (3) relative importance (weights) assigned to those criteria; (4) aggregated performance scores of the university policy options in performance ranks graphs; and (5) scores per criteria.

3. Results

3.1 Options used in appraisal

All participants indicated to feel comfortable with the provided core policy options and recognized them as possible policies for universities. In the first part of the appraisals, the participants expressed their initial view on the set of core options (here denoted as O1–O8, with numbers corresponding to their order in [Table 1](#) and [Table A.2](#) in [Supplementary Appendix III](#)).

First, some participants pointed at a blurred distinction between communication policy (O1) and information provision policy (O5). They regarded these options to be highly interdependent and therefore inseparable. Others considered the

distinction between these two policies to be evident: communication policy is about 'spreading the word' about societal impact goals, activities, and achievements within and outside the university, while information provision is more related to impact creation advice, guidelines, instructions, and monitoring offered internally via the university's data and knowledge management systems.

Second, the majority of participants mentioned that the communication policy option was very broad and could be implemented on different levels within the university. For example: on the university-wide level by providing a societal impact vision, strategic impact themes, and best practices, but also on a faculty level by providing communication support for societal impact projects. Such support entails efforts to write communiques and spread them via websites, newsletters, social media, or presentations.

Third, everyone agreed that recognizing and rewarding societal impact within HR policy (O2) should not be obligatory for all researchers, at least on the short term. Instead, HR policy should allow for diversity in researchers' careers. However, many participants advocated to monitor and evaluate societal impact activities during yearly HR evaluations of every researcher to flag their importance. Participants also discussed impact assessment challenges. This primarily concerned the question of changing quantitative performance indicators to a more flexible narrative assessment approach.

Fourth, participants provided examples of the many variations of earmarked resources (O3). Earmarked resources could range from 'providing a whole back-office for societal impact within every faculty' to 'providing yearly seed money to potentially impactful research projects'. They also mentioned that receivers of the earmarked resources could vary, for instance in terms of goal, theme, timeline, target audience, or phase of the impact project.

Fifth, the majority of the participants emphasized that facilitating boundary spanning (O6) should not only focus on 'push' mechanisms (what can we do with our knowledge in society?) but also 'pull' mechanisms (what does society want from us?), thereby underlining co-creation instead of linear view on impact creation. They regarded it crucial to not only think from a university perspective, but also from a broader perspective in which the university is embedded in an ecosystem.

Four participants chose to include the discretionary option of not doing anything in the appraisal (O8). Reasons to do so were (1) because societal impact of academic research is considered to be 'not that bad' under current policy circumstances, and (2) the curiosity to compare the discretionary option with the other policy options. Most participants felt that universities are obliged to pro-actively enhance societal impact and chose to exclude the discretionary option.

In total, 9 participants suggested 11 additional university policy options, provided in an overview in Table A.3 in [Supplementary Appendix III](#). Besides the suggestions to strengthen the university's knowledge transfer offices and to map the current societal impact activities of researchers, three additional options concern financial incentives on several university levels. Examples of these options differ from the core policy option of earmarked resources on the university level, as they include specific financial incentives from the faculty level (which can differ per faculty) and a rolling fund on the individual level (where individuals can use money from societal impact activities for follow-up societal impact projects

and/or research). The six additional options focus on various ways to enhance leadership, define management tasks, and provide a vision within the university to successfully embed societal impact within its culture, practices, and regulations. Participants suggested appointing leaders and professionals at faculty and/or department level with a specific impact mandate. While some of these suggestions were also partly covered in the core policy options, participants that mentioned these additional options clearly felt that financial incentives and leadership are crucial to successfully enhance societal impact of academic research.

3.2 Criteria used in appraisal

In total, 85 criteria and one principle² were used to appraise the university policy options. Before ranking and interpreting the appraisals, the different types of criteria defined by the participants to appraise the university policy options were clustered to 'issues as a higher-order criteria' via open coding. Three coding iterations took place before deciding on the final issue clusters. In each iteration, the lead researcher of this study collected feedback from at least one co-author. The final issue clusters consist of three aggregation levels: first-order, second-order, and third-order issues (see [Figure 1](#)).

From the clustering, two third-order issues emerged: expected goal attainment and feasibility of implementation. These third-order criteria were both used 43 times in the appraisal of policy options. Within the second-order issue clustering, the most popular issues were practical feasibility (28%), expected organizational output (27%), and expected external outcome (23%). The latter two implicitly reflect different stages of a logical framework linking inputs for university policy options to outputs and outcomes required for generating societal impact. Participants also mentioned cultural feasibility (12%) and financial feasibility (10%) as second-order issues, but considered them less often.

Looking at first-order issues that were used at least five times or more, we observe that within the expected organizational output cluster, the 'enabling' and 'impact valuing' criteria are dominant. These two first-order issues are criteria to score the policy options' potential to enable researchers in achieving societal impact, and its potential to contribute to recognition and rewarding for researchers involved in societal impact activities. One participant mentioned for instance: 'The researcher at centre stage. How does the option offer support? Does it take away burden? Does it support the researcher? The motivation is often high, but the right support is often missing' (P19). Another participant states: 'Recognition and rewarding, that is really what is lacking ... What does it bring for the recognition and appreciation of the researcher?' (P2).

Within the issue of expected external outcome, the main first-order issue mentioned was 'efficacy'. An interviewee stated: 'What does have the largest impact on the behaviour of individual researchers? Those are the options to get researchers in motion. And in the end ... yes, you can expect that most employees at the university are quite career-oriented' (P7).

Within the practical feasibility issue, the most prevalent criteria are 'integrability' and 'applicability'. Participants generally found it relevant to determine to what extent a new and improved policy option could integrate with and apply to the university's current practices and governance system. For instance: 'It should not go at the expense of primary activities.

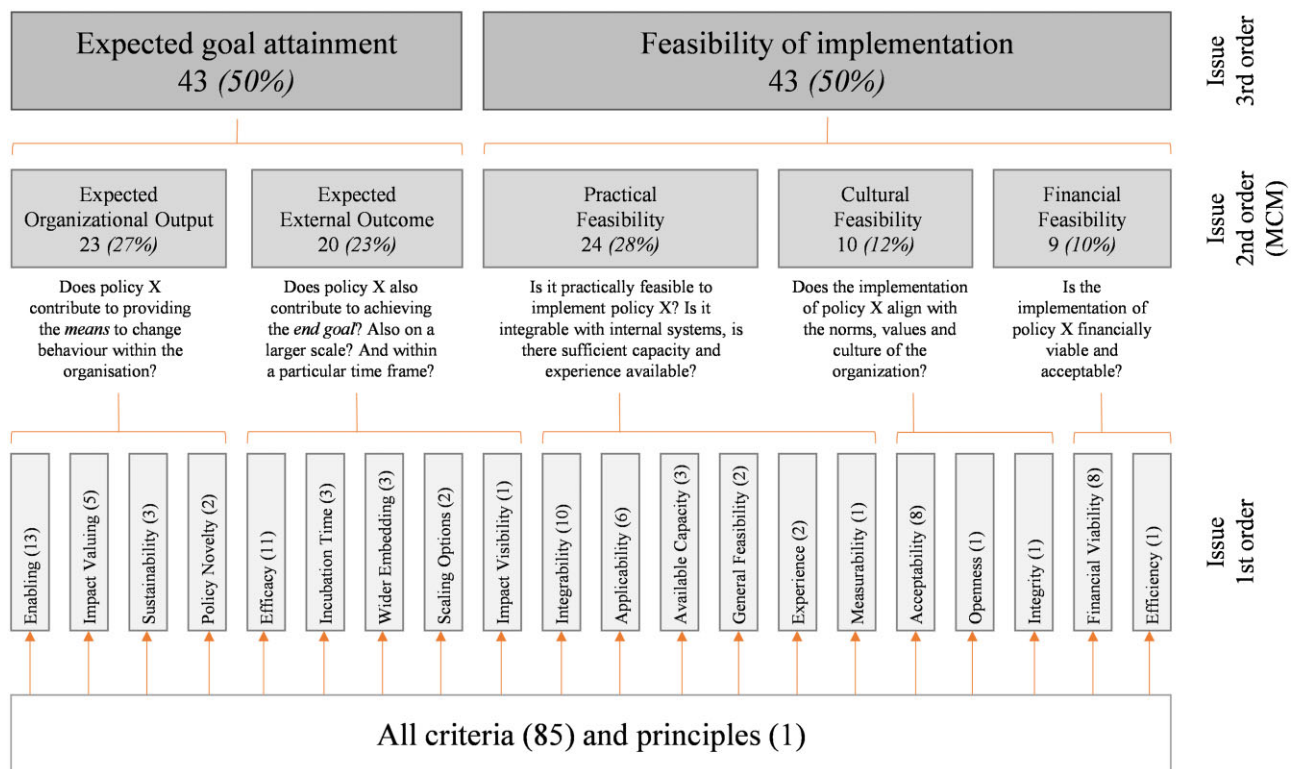


Figure 1. Criteria subdivision in issues, and the number of times each issue was used for ranking policy options.

It can also go too far, I think. ... How does the option relate to primary activities? That balance matters' (P3).

Finally, concerning the cultural and financial feasibility issues, criteria related to the 'acceptability' and 'financial viability' of university policy options were deemed most important. A couple of participants felt that academics' resistance against policies could be a determining factor in the perceived performance of a university policy option. One interviewee mentioned for example: 'Are our researchers, for whom we make policy in the end, going to appreciate this? Or at least not resist at a large scale? ... That support base should be there' (P7). The participants highlighting financial viability stressed that universities already have to deal with financial shortages in education and research, which would leave less room for impact funding.

3.3 Criteria weights

Participants assigned weights to the criteria of their choice. Each participant could distribute 100 weight 'points'. The weights report presented in Figure 2 shows the relative importance participants assigned to the various criteria. The mean value of the weights is determined by taking the average of the normalized weights of the particular participants that have used criteria in their appraisal belonging to that particular issue. As participants could use multiple criteria belonging to the same issue, the figure also shows the ranges between the overall highest and lowest weights assigned to criteria belonging to that issue.

On average expected organizational output of a policy option has the highest relative importance. Moreover, the upper limit of the weight extrema range for this issue has a value of 100. The high average weight of expected organizational output aligns with the comments of the participants: to

successfully enhance societal impact of academic research, the university policy options should in the first place enable and motivate the researchers and support staff to do so. One participant illustrates this as follows: '[when talking about societal impact] you should ask 'to what extent is this really reaching stakeholders?' It's all about the actual output' (P13). Providing the right support, appreciation, and other enabling conditions within the university are considered to be crucial in this respect.

After the expected organizational output, the weights of expected external outcome, practical feasibility, and cultural feasibility follow with an almost equal relative importance. Besides providing enabling conditions on an organizational level, the efficacy of university policy options was considered essential. This includes long-term effects, scalability, and impact visibility for actors outside the university. Various participants refer to pursuing flywheel effects: 'Is something a one-off effort? Or is it driving a change process that goes well beyond that particular initiative? Isolated efforts require too much energy ... You have to think in terms of contributions to bigger transformations' (P20). Additionally, many participants emphasized one should not overlook the practical and cultural requirements when implementing potentially effective policy. Participants stated the bureaucratic character and historically deeply rooted culture of academic values, norms, and habits of the university makes it challenging to implement new policy options: 'It has to do with academic culture, routines, standard practices ... some options are really going against how we are used to work in the university' (P11).

Financial feasibility has the lowest relative importance. Participants emphasized that financial criteria are important to take into account, but that financial risks should not be 'leading' in deciding on the performance of university policy

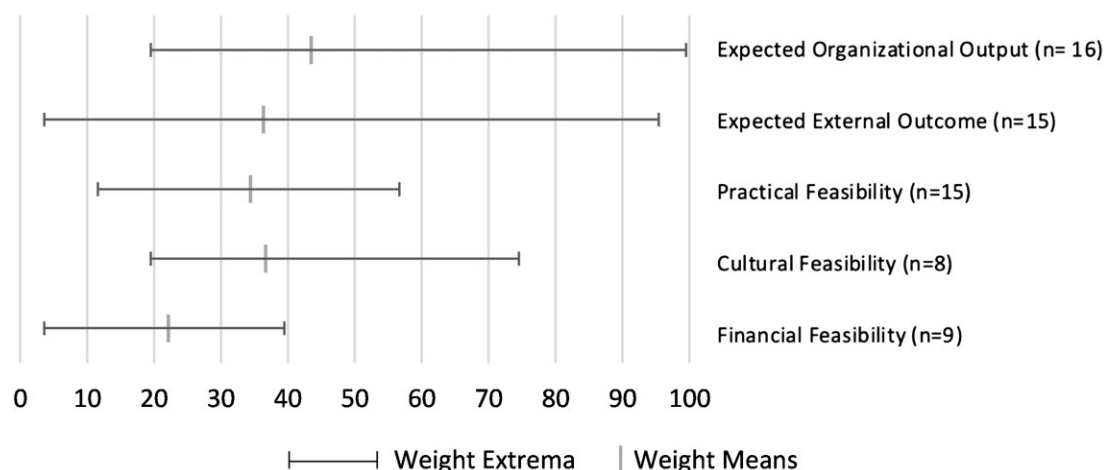


Figure 2. Weights per second-order issue, aggregated for all 22 MCM engagements.

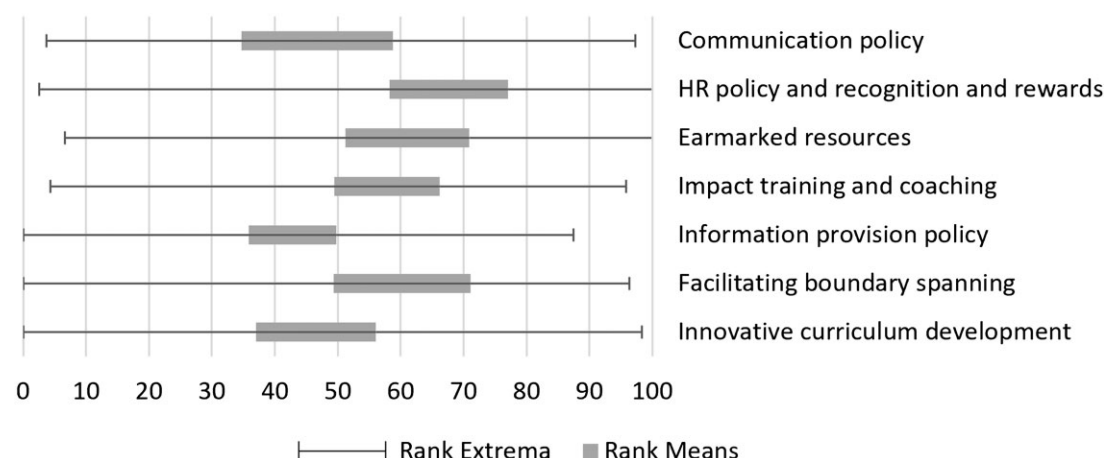


Figure 3. Rank means and extrema aggregated for all 22 MCM engagements.

options. Although investments in societal impact projects could lead to a financial loss on the short term (e.g. by publishing fewer academic publications), it also has the possibility to have a high return on investment in the long term. As one participant puts it: ‘Of course there are financial risks. But what matters is that [these investments] have positive effects, both societally and financially’ (P11). If participants are concerned about financial feasibility, they point at administrative difficulties related to moving or combining budgets (e.g. across departments) rather than that they are sceptical about increasing budgets. Cultural feasibility is indeed considered more important, as suggested also by the following quotes: ‘Where there’s a will, there is a way. If there is a support base, it will happen, you know, if you really want it’ (P17); ‘Money is not the issue; it’s more about the cultural shift’ (P5).

3.4 Overall performance ranking of university policy options

The rank reports visualize the overall scores of the appraisals for each university policy option, based on the selected criteria used by the participants. Both the MCM Tool and coded interview quotes assisted in structurally comparing ranks and interpreting the results of all MCM engagements. Since not all

participants chose to include the discretionary option or used (similar) additional policy options, the comparative analysis of the final ranks here only focuses on the core options (presented in Table 1 in Section 2).

Overall, participants mentioned that all university policy options have some potential to enhance societal impact of academic research. Scoring the options invited participants to identify the respective potential benefits and opportunities, as well as the potential pitfalls or difficulties associated with that option. During engagements, a few participants were very certain about the performance of university policy options under a criterion and therefore scored the option with very narrow ranges, or without any ranges at all. However, most participants were less confident and/or identified conditions influencing the performance of a policy options and were therefore more comfortable in providing ranges with diverging pessimistic and optimistic scores.

Figure 3 provides the aggregated performance scores (based on all criteria) of all MCM engagements on normalized rank scores between 0 and 100. When looking at the mean performance scores, HR policy (O2) has the highest mean performance score, followed by earmarked resources (O3), facilitating boundary spanning (O6), and impact training and

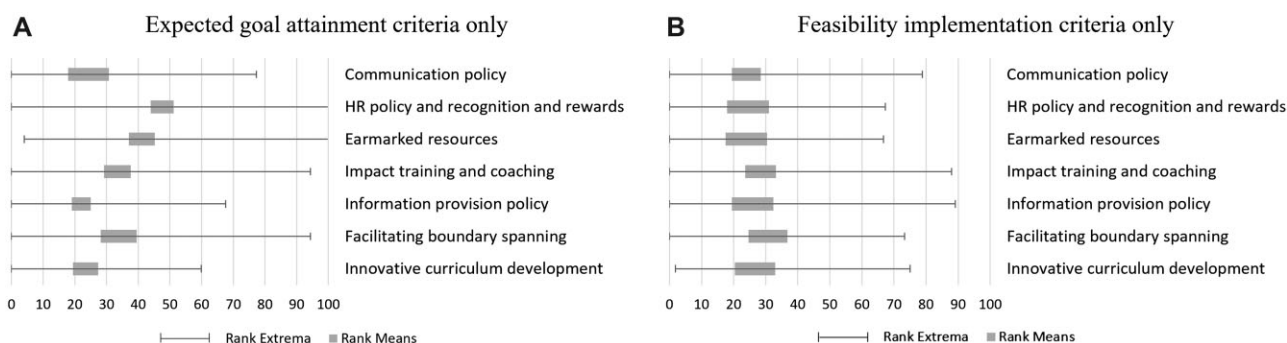


Figure 4. Rank means and extrema, aggregated for all 22 MCM engagements, per third-order issue. (A) Expected goal attainment criteria only. (B) Feasibility implementation criteria only.

coaching (O4). In other words, these university policy options are believed to have the highest potential to enhance societal impact of academic research. The adoption of HR policy was considered as ‘the missing element’, and therefore as the university policy action most crucial for enhancing societal impact: ‘HR policy is what is really lacking. ... There are tracks for all sorts of profiles, but not for impact. ... This is simply the most obvious incentive one could imagine’ (P2). ‘I would have tremendous expectations [of impact-gearred HR policies]. ... It ensures you that your impact is being recognised and rewarded’ (P19). Participants also regularly indicated that financial incentives like earmarked resources could be a good motivation for researchers to engage actively in societal impact activities, projects, and experiments, given the perceived shortage of funding for research projects.

Communication policy (O1), information provision policy (O5), and innovative curriculum development (O7) were scored relatively lower, with pessimistic scores being below a ‘neutral’ score of 50. According to the qualitative data of the interviews, these three options are believed to have significant potential downsides and pitfalls. For instance, with respect to innovative curriculum development, one participant notes: ‘Things are changing so rapidly. You really need people that follow this closely, and not just some generic manual’ (P19). And on communication policy: ‘This has great potential. ... But it takes a clear vision. Now some results are put in the spotlights, but it [the implications in terms of societal impact] remain entirely unclear’ (P21).

Communication policy is considered to be necessary and supportive of other policy options, but allegedly does not have the potential to be a ‘game changer’ on its own compared to the first four policy options. ‘Communication policy itself doesn’t really enable. It’s not an actual driver; there is no real stick or carrot that truly activates’ (P18). The same holds for information provision policy. Individually, both policies reflect that the university shows and says that societal impact is essential and necessary, but they do not provide researchers with the supporting means to act on it accordingly. Something similar applies for innovative curriculum development, which is considered to be a necessary and effective policy option in particular for the long term. The lower performance scores stem from doubts about the short-term effects of this policy option.

As the intervals of the rank means in Figure 3 differ only to a limited extent, with all policy options having big extremes, a more detailed inspection of scores per criteria issue is required to better understand underlying patterns.

3.5 Ranking per criteria issue

Figure 4 presents the ranks of policy options for the two identified third-order performance criteria separately. The overall mean performance scores of policy options resulting from selecting feasibility criteria are generally lower than the ones from using expected goal attainment criteria. This is consistent with the participants’ views that organizational changes within universities are difficult because of their organizational complexity, bureaucratic character, and historically deeply rooted culture of academic values, norms, and habits. One participant stressed: ‘Universities are simply extremely rigid organisations. If you want to do things differently, e.g. when engaging in valorisation ... , you have to think creatively and try to move around existing structures’ (P1).

The scores based on expected goal attainment criteria (Figure 4A) resemble overall scores, with HR policy (O2) and earmarked resources (O3) having relatively high mean scores compared to the other university policy options. However, when comparing these scores with the rank means retrieved from applying feasibility criteria, as shown in Figure 4B, a big part of the rank means for HR policy (O2) and earmarked resources (O3) are below 30. Thus, although these two policy options score high on expected impact, they are believed to be challenging to implement. Questions from participants provide illustrations of some pressing concerns: ‘What do you measure in evaluating societal impact; who decides what impact is most desirable?’ (P10); ‘How do you decide what project is going to receive earmarked money?’ (P22) ‘How do (inter)national parties act on these policy options; what if they don’t play along?’ (P9).

The differences between rank means of performance scores of the various options in Figure 4B are small. Still, participants perceived facilitating boundary spanning (O6) and impact training and coaching (O4) as slightly more feasible than the other options. A provided explanation is that these options fit with the existing environment as the university already started experimenting with facilitating boundary spanning and impact training, and therefore is considered to have some experience with, and face less resistance against, both university policy options.

4. Conclusions and discussion

Much has been written on the importance of societal impact of academic research, and the need for universities to perform better on this account (D’Este et al. 2018; Saarela 2019). Nonetheless, due to dominant structures and institutions,

universities still struggle with adapting their organizational system accordingly (Kitagawa, Sánchez Barrioluengo and Uyarra 2016; De Jong, Smit and van Drooge 2016). This study responds to the call for more research on policies for university-level organizational change (Perkmann et al. 2021; De Jong and Balaban 2022), as well as on methods for evaluating their potential (Smit and Hessels 2021). To this end we provided an overview of possibly suitable university-level policy instruments, derived from theory and expert interviews. We then conducted an MCM analysis (Coburn and Stirling 2016) to understand its value for formative evaluation and to examine which considerations may apply when weighing various policy alternatives.

4.1 Contributions

Given that stimulating societal impact is a relatively new concern for universities, a key issue is accounting for diverging views on what defines and constitutes societal impact, and what role universities should play in the first place (e.g. De Jong, Smit and van Drooge 2016; De la Torre, Casani and Sagarra 2018). As consensus is lacking on what policies should achieve, and how they should do so, there is no uncontested criterium against which different alternatives can be evaluated. This situation thus rather calls for formative evaluation methods that are used before policy options are implemented, to elucidate how stakeholders' judgement of policies relate to their beliefs and interpretation of the problem at hand. A participatory deliberation method like MCM can be suitable in this respect, as eliciting policy rankings and discussions about them sheds light on assumptions and conditions that undergird expectations on how policy options will perform in a particular context. More specifically, MCM appears to be fruitful for drawing out a possible set of policy solutions; the criteria by which they are appraised; and a context-specific assessment of how they are expected to perform. Below we elaborate how this can be relevant for decision-making and reflect on lessons for scholars and practitioners concerned with enhancing the societal impact of academic research.

4.1.1 Relevance for decision-making.

Eliciting different perspectives, and understanding how they are motivated, is likely to be helpful in the search for shared visions on how to move forward in improving a university's societal impact. This sensitivity to different perceptions makes the MCM approach fit in formative evaluations aimed at learning about possibilities, more so than in summative evaluations that should give an objective account of a policy's actual impact. After all, especially in formative assessments there is merit in systematically collecting views on what options and what criteria are deemed relevant, and why. This can feed into both the development of impact visions as well as the actual adoption (and continuous adjusting) of the ultimately selected options (e.g. Molas-Gallart 2015; Molas-Gallart et al. 2021).

In our research setting, the usefulness of MCM was confirmed in a validation session held after completing the MCM analysis. In the validation session, eight participants from both the expert consultations and MCM engagements stressed the usefulness of understanding why policy option appraisals differ between participants. Many of the participants initially believed that progress in impact strategy development was being hampered by the high level of

disagreement among relevant stakeholders, and were thus pleasantly surprised to discover that one policy alternative stood out as relatively uncontested. For the other policy options, the participants indicated that knowing more about diverging perspectives helped them to decide which specific concerns to examine and which policy options to discuss in more detail. They also believed that the MCM results might help them to respond to (or even anticipate) possible implementation issues more effectively. Although overall the results of the MCM analysis were received as highly relevant for determining what next steps to take, there were also reservations. This pertained in particular to uncertainties relating to the actual impact of the various policy options and the corresponding demand for deploying more summative evaluation strategies as discussed below.

To better demonstrate in what way MCM analyses can inform decision-making in a particular context, and to interpret results that might also hold relevance for other universities, it is helpful to consider some of the case findings more closely. In the illustrative appraisals conducted in the context of a large research-based university in the Netherlands, stakeholders based their scores on criteria related to goal attainment in terms of the expected organizational output and ultimate outcome as well as the (cultural, practical, and financial) feasibility of the university policy options. The observed order of aggregated performance scores of the policy options primarily stemmed from differences in judgements about the expected goal attainment of these options, with feasibility concerns generally being less decisive for the overall ranking of policy options. A possible explanation here is that especially over the past years, the momentum for universities to strongly embrace impact strategies has been growing significantly in the Netherlands (De Jong, Smit and van Drooge 2016; De Jong and Balaban 2022). This corresponds with the results of the MCM analysis that seem to suggest that among respondents at Utrecht University there was a preference for more radical change as long as impact goals were attained, instead of a focus on more incremental changes that were relatively feasible to implement.

Another main observation from the investigated case is that participants almost unanimously pointed at the necessity to provide researchers recognition and rewards for societal impact activities. Implementing such HR policies stands out as a relatively uncontested course of action among our respondents, while for the other policy options it is hard to discern a clear ranking. This finding was confirmed at the aforementioned validation session. In an exercise asking which concrete actions to focus on during the next 4 years, most of the attending audience stressed again the importance of first adjusting the university's HR policies. Such insight in how far consensus stretches is likely to be useful when charting impact strategies, as certainty about support for a choice makes it easier to act assertively. Or, by the same token, learning about disagreements regarding which policy option to prioritize can guide sense-making processes as described by De Jong and Balaban (2022).

In relation to measuring societal impact when seeking to reward it via HR policies, participants stressed the importance of qualitative measures, such as narratives, and less emphasis on quantitative indicators (Benedictus et al. 2016; Hicks et al. 2015). Societal impact comes in many forms, which should not be ignored when deciding on the implementation of university policy options. What impact is being prioritized, and

through which channels, might thus need to be articulated in the university's vision and reference framework related to societal impact. Switching to narrative-based assessment can spark much-needed discussions on what impact is and how to achieve it, thereby possibly also becoming in itself an instrument for driving further changes.³ Other promising examples of HR policy highlighted in the MCM engagements include practices like hiring staff with a demonstratable impact profile, as well as adapting the career development criteria for scientific personnel. This also connects with the term 'team science', as found in literature and Dutch policy documents (e.g. the position paper by VSNU et al. 2019; Falk-Krzesinski et al. 2010), which underlines the benefits of acknowledging researchers' different talents and assessing them on both their individual and team performance.

Finally, we observe that HR policies (and to a lesser extent, earmarked resources) were regarded as an essential and quick-to-implement cornerstone for driving societal impact. Their success is ultimately believed to depend on complementary investments like setting up clear communication policies and developing appropriate training. Analogous to crafting coherent policy mixes for stimulating innovation (Flanagan, Uyarra and Laranja 2011) or sustainability transitions (Rogge and Reichardt 2016), driving societal impact of academic research can thus be interpreted as finding the right configuration of, in this case, goal-setting, incentivizing policies, and capacity building policies to create favourable conditioning factors in the environment. In sum, as being able to position impact-enhancing policy options with respect to each other is a precondition for combining them effectively, MCM-based assessments also seem to be helpful for understanding intricate policy interdependencies.

4.1.2 General lessons for enhancing societal impact.

Based on the above we conclude that conducting an MCM analysis may help to gauge stakeholders' views on the expected performance of policy options that fit a university's particular situation. Besides demonstrating the potential of MCM as a method for participative deliberation, also some of the reported findings of applying this method can be generalized and inform scholarly debate.

As for the *rank of policy option(s)* receiving the highest score(s) in the illustrative case study, this is likely to be organization, context, and time-specific. That is, the observed preference for introducing HR policies that recognize and reward societal impact is to be seen in the light of a broader national and organizational discussion and policy tradition on societal impact strategies. This involves multiple generations of 4–6 year 'valorisation programmes' for supporting universities in developing and institutionalizing structures for enhancing the (mostly economic) impact of academic research (Janssen et al. 2018). It is also plausible that the high appraisal of impact-conducive HR policies is conditional on the fact that many enabling conditions for generating societal impact (D'Este et al. 2018) have been put in place already, which then leads to HR policies as the next focus of attention.

The context specificity of our findings probably hold less for the *policy options* retrieved from the literature and expert interviews, which cover the three impact strategy elements of goals, behaviour (motivations and incentives), and environment (De Jong and Balaban 2022). Based on the conducted appraisals such policy options can also be categorized according to their potential to pay off in the short or the long term.

Also, the *criteria* on which these options were judged are likely to be of relevance for other settings. Findings on both these accounts might inform replications of the current study at other universities, especially because the MCM approach itself still allows stakeholders to add their own policy options and criteria. We can only speculate to what extent also the *criteria weights* have a generic character. A possible explanation for expected organizational output to receive the highest average weight (above expected external outcome) is that, in general, organizations might base their strategies and judge their performance on actions that belong most clearly to their sphere of control rather than to the spheres they ultimately would like to influence (Belcher and Halliwell 2021). However, it might be that in other settings stakeholders consider feasibility criteria more important due to for instance lack of resources, or when there is less mandate for managers to formulate and implement impact strategies in a relatively top-down manner.

4.2 Limitations and further research

This study obviously has its limitations. For the purpose of 'exploring and illuminating contending views' (Coburn and Stirling 2006: 7), a total of 22 participants is high enough for drawing meaningful observations. It is also comparable to, for example, the 15 participants in the MCM analysis by McDowall and Eames (2007) and the 26 participants found in Hansen (2010). Still, while the analysis of policy appraisals by stakeholders related to Utrecht University only served illustrative purposes, the illustration would have been even stronger with a larger number and higher variety (e.g. in terms of represented departments) of participants in the MCM engagements. Caution in drawing firm conclusions is especially warranted when trying to generalize the results across organizations or countries. Utrecht University might be organized differently than other universities in the Netherlands and beyond, and have a different mix of disciplines. A distinctive feature of the Dutch context is for instance the relatively large power of university boards, as compared to universities in which more autonomy is allocated at the department or even chair level (like in many German universities). The MCM method seems less appropriate for the latter type of cases, as there is less focus on deliberating centralized policy strategies. How appraisals differ between, for example, staff functions, or countries might be addressed in stratified follow-up studies with larger numbers of participants, for which methodological inspiration can be taken from Coburn et al.'s (2021) recent MCM analysis of antimicrobial resistance policies in six countries.

Also the sampling of respondents has its limitations. Since we took the objective of enhancing societal impact as a starting point, the MCM engagements generated only little discussion on the strategy of doing nothing at all, even though some participant did add this as a discretionary policy option. It is important to acknowledge the existence of resistance against increased prioritization and extension of universities' third mission, as well as to strong changes in the dominant metric-based system for assessing and evaluating researchers' performance (see also De la Torre, Casani and Sagarra 2018).

These considerations point at avenues for further research, which could be either deepening or broadening the current topic and method. First, since the challenges on how to enhance societal impact of academic research is an (inter)national issue, it would be interesting to see how employees

from other (types of) universities, or even universities in other countries, rank the different policy options. These studies could provide a broader understanding of how the university policy options are expected to perform, thereby also informing efforts at the (inter)national level to provide universities with the right type of generic support. A second research avenue consists of exploring in more depth the specific ways university policy options can be implemented. Besides taking into consideration complementarities between newly introduced policy options, it seems worthwhile to study the link with policy options already in place because of universities' other two missions (excellent research and education). Third, it is recommended to complement the suggested formative assessment approach with more summative impact evaluations once actual policy measures have been put in place. Information about observed and non-observed intended and unintended effects may serve to improve the information basis on which future policy appraisals can be based.

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Supplementary data

Supplementary data are available at *Research Evaluation Journal* online.

Notes

1. See for the MCM Tool, provided by the university of Sussex: <<https://app.multicriteriamapping.com>>
2. The principle that was used is 'step-by-step implementation', under the criteria issue 'applicability'. The principle served as a filter before assigning scores based on all other criteria: if a policy option is considered unacceptable under this principle, the option is left out of appraisal. The principle was used in only one MCM engagement, wherein all policy options turned out to be acceptable under this principle. Therefore, all university policy options were still included in this appraisal.
3. Regarding the latter, Utrecht University recently adopted a new recognition and reward scheme that considers factors like contributions to societal impact instead of scientific impact factors (Woolston 2021).

References

- Becher, T., and Trowler, P. R. (2001) *Academic Tribes and Territories*. McGraw-Hill Education (UK). Buckingham: SRHE and Open University Press.
- Belcher, B., and Halliwell, J. (2021) Conceptualizing the elements of research impact: towards semantic standards. *Humanities and Social Sciences Communications*, 8: 1–6.
- Benedictus, R., Miedema, F., and Ferguson, M. W. (2016) 'Fewer Numbers, Better Science', *Nature*, 538: 453–5.
- Coburn, J., and Stirling, A. (2016) 'Multicriteria Mapping Manual - Version 2.0', SPRU Working Paper Series. <<https://doi.org/10.13140/RG.2.2.36039.50082>>
- Coburn, J., Bone, F., Hopkins, M. M., Stirling, A., Mestre-Ferrandiz, J., Arapostathis, S., and Llewelyn, M. J. (2021) 'Appraising Research Policy Instrument Mixes: A Multicriteria Mapping Study in Six European Countries of Diagnostic Innovation to Manage Antimicrobial Resistance', *Research Policy*, 50: 104140.
- Cornell, S., Berkhout, F., Tuinstra, W., Tàbara, J. D., Jäger, J., Chabay, I., de Wit, B., Langlais, R., Mills, D., Moll, P., Otto, I. M., Petersen, A., Pohl, C., and van Kerkhoff, L. (2013) 'Opening up Knowledge Systems for Better Responses to Global Environmental Change', *Environmental Science and Policy*, 28: 60–70.
- De Jong, S. P. L. (2015) *Engaging Scientists: Organising Valorisation in The Netherlands*. Den Haag: Rathenau Instituut.
- De Jong, S. P. L., and Balaban, C. (2022) 'How Universities Influence Societal Impact Practices: Academics' Sense-Making of Organizational Impact Strategies', *Science and Public Policy*, 49: 609–20.
- De Jong, S. P. L., Balaban, C., and Nedeva, M. (2022) 'From 'Productive Interactions' to 'Enabling Conditions': The Role of Organizations in Generating Societal Impact of Academic Research', *Science and Public Policy*, 49: 643–5.
- De Jong, S. P., Smit, J., and van Drooge, L. (2016) 'Scientists' Response to Societal Impact Policies: A Policy Paradox', *Science and Public Policy*, 43: 102–14.
- De la Torre, E. M., Casani, F., and Sagarra, M. (2018) 'Defining Typologies of Universities through a DEA-MDS Analysis: An Institutional Characterization for Formative Evaluation Purposes', *Research Evaluation*, 27: 388–403.
- D'Este, P., Ramos-Vielba, I., Woolley, R., and Amara, N. (2018) 'How do Researchers Generate Scientific and Societal Impacts? Toward an Analytical and Operational Framework', *Science and Public Policy*, 45: 752–63.
- Dijstelbloem, H., Huisman, F., Miedema, F., and Mijndhardt, W. (2013) 'Why Science Does Not Work as It Should. And What To Do About It', Science in Transition Position Paper.
- Etzkowitz, H. (1998) 'The Norms of Entrepreneurial Science: Cognitive Effects of the New University–Industry Linkages', *Research Policy*, 27: 823–33.
- Falk-Krzesinski, H. J., Börner, K., Contractor, N., Fiore, S. M., Hall, K. L., Keyton, J., Spring, B., Stokols, D., Trochim, W., and Uzzi, B. (2010) 'Advancing the Science of Team Science', *Clinical and Translational Science*, 3: 263–6.
- Flanagan, K., Uyarra, E., and Laranja, M. (2011) 'Reconceptualising the 'Policy Mix' for Innovation', *Research Policy*, 40: 702–13.
- Gulbrandsen, M., and Slipersaeter, S. (2007) 'The Third Mission and the Entrepreneurial University Model', Bonaccorsi, A. and Daraio, C. (eds.) *Universities and Strategic Knowledge Creation: Specialization and performance in Europe*. Edward Elgar Publishing, 112–43.
- Hansen, S. F. (2010) 'Multicriteria Mapping of Stakeholder Preferences in Regulating Nanotechnology', *Journal of Nanoparticle Research*, 12: 1959–70.
- Hessels, L. K., Van Lente, H., and Smits, R. (2009) 'In Search of Relevance: The Changing Contract between Science and Society', *Science and Public Policy*, 36: 387–401.
- Hicks, D., Wouters, P., Waltman, L., de Rijcke, S., and Rafols, I. (2015) 'The Leiden Manifesto for Research Metrics', *Nature*, 520: 429–31.
- Janssen, M. J., Den Hertog, P., Korlaar, L., De Haas van Dorsser, S., and De Boer, P. (2018) *Eindevaluatie Valorisatieprogramma*. Utrecht: Dialogic. <<https://www.dialogic.nl/wp-content/uploads/2018/03/Eindevaluatie-Valorisatieprogramma-Dialogic-30-juni-2018.pdf>> accessed 9 Sep 2022.
- Kitagawa, F., Sánchez Barrioluengo, M., and Uyarra, E. (2016) 'Third Mission as Institutional Strategies: Between Isomorphic Forces and Heterogeneous Pathways', *Science and Public Policy*, 43: 736–50.
- KNAW/Royal Netherlands Academy of Arts and Sciences. (2018) *Maatschappelijke impact in kaart*. Den Haag: KNAW. <<https://www.knaw.nl/publicaties/maatschappelijke-impact-kaart>> accessed 9 Sep 2022.
- Lahsen, M., and Turnhout, E. (2021) 'How Norms, Needs, and Power in Science Obstruct Transformations towards Sustainability', *Environmental Research Letters*, 16: 025008.

- Llopis, O., D'Este, P., McKelvey, M., and Yegros, A. (2022) 'Navigating Multiple Logics: Legitimacy and the Quest for Societal Impact in Science', *Technovation*, 110: 102367.
- Lobstein, T., Millstone, E., Jacobs, M. N., and Stirling, A. (2006) *Policy Options for Responding to Obesity: UK National Report of the PorGrow Project*. Brighton: University of Sussex.
- McDowall, W., and Eames, M. (2007) 'Towards a Sustainable Hydrogen Economy: A Multi-Criteria Sustainability Appraisal of Competing Hydrogen Futures', *International Journal of Hydrogen Energy*, 32: 4611–26.
- Molas-Gallart, J., and Tang, P. (2011) 'Tracing 'Productive Interactions' to Identify Social Impacts: An Example from the Social Sciences', *Research Evaluation*, 20: 219–26.
- Molas-Gallart, J. (2015) 'Research Evaluation and the Assessment of Public Value', *Arts and Humanities in Higher Education*, 14: 111–26.
- Molas-Gallart, J., Boni, A., Giachi, S., and Schot, J. (2021) 'A Formative Approach to the Evaluation of Transformative Innovation Policies', *Research Evaluation*, 30: 431–42.
- OCW/Ministry of Education, Culture and Science (2014) *Vision for Science 2025 - Choices for the Future*. Den Haag: Ministerie van Onderwijs, Cultuur en Wetenschap. <<https://www.nwo.nl/en/vision-science-2025>> accessed 9 Sep 2022.
- Parker, R., and Lundgren, P. (2022) 'The Role of Universities in Transformative Innovation Policy', *Science and Public Policy*, 49: 159–67.
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., and Sobrero, M. (2013) 'Academic Engagement and Commercialisation: A Review of the Literature on University–Industry Relations', *Research Policy*, 42: 423–42.
- Perkmann, M., Salandra, R., Tartari, V., McKelvey, M., and Hughes, A. (2021) 'Academic Engagement: A Review of the Literature 2011–2019', *Research Policy*, 50: 104114.
- Pinheiro, R., Langa, P. V., and Pausits, A. (2015) 'One and Two Equals Three? The Third Mission of Higher Education Institutions', *European Journal of Higher Education*, 5: 233–49.
- Higher Education Funding Council for England (2011) REF2014: Assessment framework and guidance on submissions. <<https://www.ref.ac.uk/2014/pubs/2011-02/>> accessed 9 Sep 2022.
- Rogge, K. S., and Reichardt, K. (2016) 'Policy Mixes for Sustainability Transitions: An Extended Concept and Framework for Analysis', *Research Policy*, 45: 1620–35.
- Saarela, S. (2019) 'From Pure Science to Participatory Knowledge Production? Researchers' Perceptions on Science-Policy Interface in Bioenergy Policy', *Science and Public Policy*, 46: 81–90.
- Sarewitz, D. (2016) Saving Science. *The New Atlantis: A Journal of Technology & Society*, (Spring/Summer), 49: 6–40.
- Seeber, M., Lepori, B., Montauti, M., Enders, J., de Boer, H., Weyer, E., Bleiklie, I., Hope, K., Michelsen, S., Mathisen, G. N., Frølich, N., Scordato, L., Stensaker, B., Waagene, E., Dragsic, Z., Kretek, P., Krücken, G., Magalhães, A., Ribeiro, F. M., Sousa, S., Veiga, A., Santiago, R., Marini, G., and Reale, E. (2015) 'European Universities as Complete Organizations? Understanding Identity, Hierarchy and Rationality in Public Organizations', *Public Management Review*, 17: 1444–74.
- Smit, J. P., and Hessels, L. K. (2021) 'The Production of Scientific and Societal Value in Research Evaluation: A Review of Societal Impact Assessment Methods', *Research Evaluation*, 30: 323–35.
- Sørensen, O. H., Bjørner, J., Holtermann, A., Dyreborg, J., Sørli, J. B., Kristiansen, J., and Nielsen, S. B. (2022) 'Measuring Societal Impact of Research—Developing and Validating an Impact Instrument for Occupational Health and Safety', *Research Evaluation*, 31: 118–31.
- Spaapen, J., and van Drooge, L. (2011) 'Introducing 'Productive Interactions' in Social Impact Assessment', *Research Evaluation*, 20: 211–8.
- Stirling, A. (2003) Risk, Uncertainty and Precaution: Some Instrumental Implications from the Social Sciences. *Negotiating change*, 33–76.
- Stirling, A. (2008) "Opening Up" and "Closing Down" Power, Participation, and Pluralism in the Social Appraisal of Technology', *Science, Technology, & Human Values*, 33: 262–94. [10.1177/0162243907311265](https://doi.org/10.1177/0162243907311265)
- Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N. H., and Kraines, S. B. (2014) 'Beyond the Third Mission: Exploring the Emerging University Function of co-Creation for Sustainability', *Science and Public Policy*, 41: 151–79.
- Van de Burgwal, L., van Der Waal, M., and Claassen, E. (2018) *Leveraging Academic Knowledge in the Innovation ecosystem - The Societal Impact Value Cycle as a Toolbox*. Rotterdam: Stichting Maatschappij en Onderneming (SMO).
- Van den Akker, W., Spaapen, J., and Maes, K. (2017) *Productive Interactions: Societal Impact of Academic Research in the Knowledge Society*. League of European Research Universities (LERU). <<https://www.leru.org/publications/productive-interactions-societal-impact-of-academic-research-in-the-knowledge-society>> accessed 9 Sep 2022.
- VSNU, NFW, KNAW, NWO and ZonMw. (2019) Room for Everyone's Talent. Towards a New Balance in the Recognition and Rewards of Academics. <<https://vsnu.nl/recognitionandrewards/wp-content/uploads/2019/11/Position-paper-Room-for-everyone%E2%80%9999s-talent.pdf>> accessed 9 Sep 2022.
- Whitmer, A., Ogden, L., Lawton, J., Sturmer, P., Groffman, P. M., Schneider, L., Hart, D., Halpern, B., Schlesinger, W., Raciti, S., Bettez, N., Ortega, S., Rustad, L., Pickett, S. T., and Killilea, M. (2010) 'The Engaged University: Providing a Platform for Research That Transforms Society', *Frontiers in Ecology and the Environment*, 8: 314–21.
- Woolston, C. (2021) 'Impact Factor Abandoned by Dutch University in Hiring and Promotion Decisions', *Nature*, 595: 462. <<https://www.nature.com/articles/d41586-021-01759-5>> accessed 9 Sep 2022.
- Wowk, K., McKinney, L., Muller-Karger, F., Moll, R., Avery, S., Escobar-Briones, E., Yoskowitz, D., and McLaughlin, R. (2017) 'Evolving Academic Culture to Meet Societal Needs', *Palgrave Communications*, 3: 1–7.
- Wuchty, S., Jones, B. F., and Uzzi, B. (2007) 'The Increasing Dominance of Teams in Production of Knowledge', *Science*, 316: 1036–9.
- Zhou, R., and Tang, P. (2020) 'The Role of University Knowledge Transfer Offices: Not Just Commercialize Research Outputs!', *Technovation*, 90–91: 102100.