Matthew Wallace and Ismael Rafols.

INGENIO (CSIC-UPV), Spain.

Research portfolios for societal challenges: a conceptual framework

Abstract:

In the context of calls for increased transparency in the administration of public research, there is a need to better account for how resources are allocated as a means to achieve societal goals. Calls to address large-scale multi-stakeholder challenges (e.g., poverty reduction, malaria eradication, climate change mitigation and adaptation) focus on policy outcomes, multidisciplinarity and international coordination, and require a systems approach to allocating and administering research funds. These problems are often framed as "grand challenges" (e.g., Daar et al., 2007; Reid et al., 2010). Research portfolios are tools that might help decision-makers consider a broad scope of research avenues and make strategic choices in priority-setting in terms of research agendas, complementarities and synergies rather than relying solely on evidence on the perceived quality of individual projects. A portfolio approach is particularly timely as scholars and policymakers seek new means of taking stock of "public values" and "social impact" of research (Bozeman and Sarewitz, 2011; Cozzens and Snoek, 2010).

From corporate R&D, to public value portfolios

The notion of a "research portfolio" has become more and more common among large science performers and funders over the past 20 years (Merrill and McGeary, 1999; National Science Foundation, 2001, p. 3).A portfolio sometimes just refers to a unit of analysis for reporting on expenditures, but also in other cases it is also a means of analysing how funds are spent at various scales (from laboratory to centre to agency). In the academic literature, increasing references to the term and other synonymous expressions have often been used either rhetorically, or, in the case of corporate R&D portfolios, focusing narrowly on monetary expenditure and returns. Analogies derived from this latter take, i.e. a financial view of portfolios, remain dominant. However, we posit that the conventional methods applied to private-sector R&D, though relatively well-developed (Chien, 2002), are ill-suited for public decision making. We argue that there is a need to take a critical look at these financial interpretations and to revisit the "research portfolio" approach from a public science perspective. Our examination of the uses of the term reveals a strong disconnect between science policy practices and potentially relevant scholarly literature – e.g., studies on the socio-economic impact of research, on biases in research evaluation, and science dynamics. This paper aims to bridge this gap, and explore how relevant scholarly literature can inform science policy practices in portfolio appraisals and management (Rogers and Dietz, 2012; Srivastava et al., 2007).

Focusing on portfolios for societal challenges

We propose that the notion of portfolio may be particularly useful when applied to tackling

a given societal problem in which science's contribution is viewed as important, such as in pandemic influenza, climate change or aging. We revisit the notions of risk, benefit and diversity, broadening the interpretation beyond monetary terms to include a range of societal considerations and, most importantly, to allow for a plurality of diverging opinions and values. In particular, we propose to develop a comprehensive understanding of the existing research landscape, in terms of social, cognitive and institutional parameters. Furthermore, a portfolio approach tries to make possible to connect the options for future research with identifiable social outcomes and stakeholder considerations. We further propose that the research landscape lens may be helpful for thinking on the interactions and potential synergies between portfolio elements.

Multiple value perspectives and incomplete knowledge in portfolio appraisal

Applying portfolios to so-called “grand challenges” – complex, multidisciplinary research to address major societal issues – implies taking into account a wide variety of perspectives relating to what specific outcomes are to be prioritized or what approaches will be effective and socially acceptable in bringing solutions. These complex problems also require a diversity of research avenues, including many which involve interdisciplinary approaches. Also, many such challenges (e.g., food security, climate change adaptation, pandemic preparedness) operate within a context of highly incomplete knowledge, and are thus better addressed by a variety of different approaches (Stirling, 1994). For example, for a given institution or country, one must not only consider better research outcomes, but also expected benefits in terms of human capital (Bozeman and Rogers, 2001), whereby high levels of diversity can come at a cost of decreased specialization. For this reason, diversity has to be considered not only at the level of a given portfolio, but also as a set of portfolios, namely because, unlike private-sector R&D, “public good” research results are often shared among producers.

Exploring interactions, complementarity and synergies between portfolio elements

A key component of portfolio analysis involves identifying interactions between research avenues. Here, the visualisation of the existing research landscape – based on cognitive proximity – can provide insights into how different types of research avenues can be related (Rafols, Porter and Leydesdorff, 2010). Complementary social, institutional and organizational parameters can also be visualized or analysed within such a landscape. We illustrate our discussion using bibliometric data on avian influenza, where a variety of disciplines are mobilized to tackle a common problem, but where there are diverging perspectives on research priorities. We can identify and characterize research avenues, as well as describe the levels of diversity in some of the existing portfolios of major funders. Overall, we view quantitative data sources and tools related to bibliometrics just as a component of a broader effort to expand the evidence base for decisions on funding for research portfolios. Thus, a portfolio “lens” can be a practical means of considering the balance of research options to address a specific issue. Irrespective of whether the driver is a targeted policy initiative or a public debate, moving beyond simple financial analogies to discuss public research portfolios can lead to identifying alternative sets of projects, potentially leading to alternative solutions, which are distinct not only in terms of cost-effectiveness, but possibly also in terms of greater inclusiveness (e.g., Chalmers et al., 2014).

These are complementary or alternative to existing approaches which tend to focus primarily on research quality.

Conclusions

In summary, we propose that new conceptualizations and methodologies associated with research portfolios could foster strategic thinking in funding for societal challenges. This could support new approaches to developing policy for science in a public sector context, most notably in evaluation, where the current focus for project selection is perhaps too focused on "research quality". In terms of wider science policy processes, this could have direct implications for the role of peer review and basic indicators of "quality". More broadly, portfolios can facilitate increased transparency and stakeholder engagement in debate and decisions regarding public research. In addition, our approach provides a means to consider grand challenges beyond a simplistic dichotomy of basic vs. applied research, moving towards a holistic, more systemic approach that is better suited to such endeavours. We discuss the potential value of this approach at a variety of different scales and for several typologies of such "grand challenges", including current public research initiatives in the U.S. and Europe.

References

B. Bozeman and J.D. Rogers (2001), "Strategic management of government-sponsored R&D portfolios", Environment and Planning C: Government and Policy, 19, 413-442.
B. Bozeman and D. Sarewitz (2011), "Public Value Mapping and Science Policy Evaluation", Minerva 49, 1-23.
I. Chalmers (2014), "How to increase value and reduce waste when research priorities are set", The Lancet, 383, 156-165.
C.F. Chien (2002), "A portfolio-evaluation framework for selecting R&D projects", R&D Management 32, 359-368.
S. Cozzens and M. Snoek (2010), "Knowledge to policy. Contributing to the measurement of social, health and environmental benefits", Paper prepared for the Workshop on the Science of Science Measurement", Washington, December 2-3, 2010.
A.S. Daar et al. (2007), "Grand challenges in chronic, non-communicable diseases", Nature 450, 494-496; W.V. Reid et al. (2010), "Earth system science for global sustainability: grand challenges", Science 330, 916-917.
J.S. Dietz and J.D. Rogers (2012), "Meanings and policy implications of 'Transformative Research': Frontiers, Hot Science Evolution and Investment Risk', Minerva50, 21-44.
S.A. Merrill and M. McGeary (1999), "Who's balancing the research portfolio and how?",Science 285, 1679-1680.
National Science Foundation (2001), The Scientific Allocation of Scientific Resources, NSB 01-39 Discussion Paper,
http://www.nsf.gov/nsb/documents/2001/nsb0139/nsb0139_2.htm.
I. Rafols, A.L. Porter, and L. Leydesdorff. 2010. "Science Overlay Maps: A New Tool for Research Policy and Library Management." Journal of the American Society for Information Science and Technology 61 (9): 1871–87.
C.V. Srivastava, N.D. Towery and B. Zuckerman (2007), "Challenges and opportunities for research portfolio analysis, management and evaluation", Research Evaluation,16, 152-156.

A. Stirling (1994), “Diversity and ignorance in electricity supply investment: Addressing the solution rather than the problem”, Energy Policy, 22, 195-216.