

## Some Challenges of the New Open Science Policy for the R&D Evaluation System: The Case of Slovenia

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**Abstract:** The European Commission's Open Science Policy should become a new *modus operandi* in the context of evidence-based R&D policy and practice. Yet changes are essential in national R&D evaluation systems if this goal is to be accomplished. Most critics of the established and long-standing R&D evaluation systems believe the European Commission's call for changes is being interpreted in the wrong way. By referring to the Open Science Policy, such critics seem ready to deny all of the positive achievements of traditional R&D evaluation systems. The contribution critically confronts the arguments of those critics in Slovenia who reject the important role played by bibliometric in the assessment of scientific quality and excellence.

### 1 Introduction

Expectations that the new open science policy will become the new *modus operandi* of research activities within the European Union (EU) are growing. As already declared in various strategic documents of the European Commission (EC), the open science model is to replace the traditional (closed) model of science that dominated in the past (EC 2020; EC 2017; EC 2016). Yet, how are the announced changes expressed in the R&D policy and practice of small scientific communities? This question constitutes the focus of my contribution. I highlight certain implications held by the EU's new policy of open science for how the R&D evaluation system is perceived by scientists in Slovenia. Slovenia is an EU member state with a small scientific community. Although it also has a relatively short tradition in the implementation of more standardised R&D evaluation procedures, the well-developed system for assessing research plays an integral role in the national R&D decision-making processes regarding the appointment/promotion of academic positions as well as grant applications.

In the last few years, the academic community in Slovenia has levelled plenty of criticism of the R&D evaluation procedures used in the context of R&D policy. Such criticism builds on the assumption that quantitative indicators cannot play any role in the assessment of scientific performance and excellence. Moreover, among such criticism one can also hear claims that the use of metrics in R&D evaluation procedures runs counter to the basic principles of the open science model being promoted by the European Commission. The main sources of this public criticism are certain research professional societies and research trade unions, alongside some 'public opinion makers' among researchers in Slovenia who in various public media publish their views

on the position held by science in society. Notwithstanding this, the relatively complex theme of R&D evaluation in science remains a relatively marginal topic for the broader Slovenia public, while attracting considerable attention in scientific circles.

Can we agree with this strong criticism and rejection of the R&D evaluation system being used in Slovenia as a country with a small scientific community? My contribution stresses that the new model of open science is extremely important for its introduction of new perspectives in traditional R&D evaluation procedures. Still, it cannot become an instrument to be opportunistically misused during national R&D policy debates. I believe the best and most promising way is to combine quantitative (metrics) and qualitative (peer review) measures in the country's R&D evaluation system and, whichever direction R&D policy in Slovenia is to take in the future, its first imperative must be to build a system of R&D evaluation that supports the excellence and international visibility of its scientific output.

In my conceptual and empirical investigation, I draw on content analysis of R&D policy documents and public opinions of scientists in Slovenia. By using the method of content analysis, I succeed at more general level to identify the main trends in public debates about R&D evaluation system in Slovenia.

My short essay is divided into three main sections. In section one, I present the basic characteristics of the model of open science. After briefly discussing why the open science platform is still sometimes extremely loosely defined, in the second section an overview is given of the R&D evaluation system in Slovenia. Slovenia is an EU member state with a small scientific community, which means the transparent and adequate use of quantitative measures that are treated as equal parts of qualitative R&D evaluation procedures is extremely important. In the third section, the 'populist' resistance among various groups of scientists in Slovenia against the use of metrics in the country's R&D evaluation system is described. It is concluded in this section that the more extreme criticism of bibliometric coming from part of the Slovenian academic community has no rational basis. The third section is followed by some short concluding remarks.

## **2 The New Open Science Policy in the Context of Responsible Research and Innovation**

I start with a short overview of the new open science policy. The biggest challenge arising from the new open science strategy is how to review and produce research outputs to ensure they have a strong societal impact (Von Schonberg 2013). Another important aspect of the new open science policy is the sharing of knowledge and data

among scientists as early as possible in open collaboration and to motivate them to use that in ground-breaking R&D activities. Accordingly, all scholarly publications on research results funded by public or private grants provided by national, regional and international research councils and funding bodies should be made immediately available through open-access repositories.

All basic EC documents concerned with the debate on the open science model mostly address these questions (e.g., EC 2020; EC 2017; EC 2016). They require the replacement of the traditional mechanisms supposedly based on the ‘publish or perish’ principle, then the promotion of scientific excellence as self-referential criteria etc. Unfortunately, these EC documents that talk about an open science policy platform sometimes use extremely loosely defined concepts of open science. They include many declarative statements about the need to introduce changes but lack more tangible recommendations on how to actually implement the changes. A good example is the genesis of the whole Open Science Policy Platform from 2016 onwards (EC 2020). In first 2 years, the Open Science Policy Platform strictly used the term altmetrics to describe alternative bibliometric approaches. In the next 2 years (2018–2020), the “altmetrics” concept was renamed—without it being highlighted—in “the next generation metrics” concept. This means that considerable inaccuracy is seen already at the level of semantics. Yet, to be fair, in the second period of the Open Science Policy Platform, more precise guidance is given to the various stakeholders on how to use “the next generation metrics”. For example, the project “Monitoring the evolution and benefits of Responsible Research and Innovation” has sought to develop indicators covering the six keys of responsible research and innovation (RRI) encompassed in the European Commission’s R&D policy scheme (for more, see: Mejlgaard et al. 2019; Peter et al. 2018).

The idea of open science shares the destiny of the more general concept of RRI. Last but not least, the idea of open science forms part of RRI. Although the RRI concept is extremely widespread in theoretical and practical (policy) discussions in the EU, one can find many disagreements on the interpretation of its basic principles (Mejlgaard et al. 2019). The various groups of stakeholders in Europe to be included in these discussions are still far from reaching a consensus, which is the main point of RRI. It thus makes sense to distinguish at least two basic concepts in RRI. First, the administrative- and policy-oriented concept is mainly a concept of representatives of the EC and based on six distinct keys: engagement, gender equality, science education, ethics, open science and governance (EC 2014; EC 2012). Second, the (meta)theoretical concept draws much more from the general epistemological principles: anticipation, reflexivity, inclusion and responsiveness (for more, see: Yaghmaei and Van de Poel 2021; Arnaldi and Bianchi 2016; Owen et al. 2013; Stilgoe et al. 2013).

In any case, the open science model is still in its early stages and if any real progress is to happen the stakeholders involved must invest greater efforts to operationalise it. On the contrary, the model will trigger considerable controversy on both the EU and national levels. Namely, as mentioned, even when all components of the open science model are relatively well elaborated on the theoretical and conceptual levels, there is no guarantee the model will not be misinterpreted by various groups of stakeholders on the national level.

### **3 The R&D Evaluation System in Slovenia as a Small EU Member State**

Today, the model of open science raises the question of the practical implementation of R&D evaluation systems. History has seen all manner of R&D evaluation practices. The R&D evaluation landscape in European countries has varied in terms of context, history and traditions, the actors and interests involved, and the types of problems the countries were facing. If we restrict our view to the situation in Slovenia as a small Central and Eastern European country, which is still in some sort of transitional period concerning the implementation of a modern R&D policy, it is necessary to recognise that before the political turn in 1990 Slovenia (as part of former Yugoslavia) did not have a modern R&D evaluation system in place, at least not an R&D evaluation system comparable with the R&D evaluation systems seen in Western European countries. Despite differences in the functioning of the R&D policies of the former communist countries (the position of national sciences in the former communist countries was not totally monolithic, while certain crucial differences also existed between former Yugoslavia and the countries of the former Soviet bloc), their common denominator was parochialism and intellectual isolationism, the lack of international collaborations and the subordination of science to the one-party ideology. In the former communist era, especially the results of the social sciences and the humanities were mainly published by domestic journals and publishing houses featuring relatively low scientific quality and strong political control. In communist times, the 'publish or perish' principle based on an objective type of R&D evaluation was never implemented in practice.

The country's political turn and attainment of independence at the beginning of the 1990s also included changes to R&D policy. Along with the radical political turn came requirements to establish a new relationship between science and politics. Through the processes of transition, R&D policy actors in Slovenia encountered new challenges, including how to ensure the objective assessment of scientific quality and excellence.

During this period, the processes entailed in the transition of Slovenian R&D policy coincided with an interesting phenomenon: the old Western European democracies with long standing and well-established scientific systems were in the phase of ending the old social contracts for science where it was expected that the self-regulation of academic communities would assure the integrity and productivity of research. Yet, instead, the main R&D policy decision-makers in Western Europe began to impose stricter auditing of R&D output in academic science. “In West Europe, we witnessed at that time the triumph of science and technology (S&T) indicators—not only of bibliometric indicators—in the context of the encompassing need for assessments and the striving for evidence-based R&D policies” (Barre 2010: 229).

Evaluative metrics began to be used for research assessment purposes in most academic institutions and funding agencies on the assumption that more publications and higher citation counts mean increased productivity and better-quality research. Quantitative measures also started to be used by universities for the recruitment/promotion of staff and by funding agencies for evaluating grant applications. Moreover, evaluative metrics began to be used to rank universities around the world (for more, see: Ma and Ladisch 2019; Sørensen et al. 2016; Guston 2000).

In this situation, the recently started reform of R&D policy in Slovenia in many respects follows the new ideas regarding how R&D evaluation systems are organised in Western Europe. As concerns the introduction of new democratic mechanisms to allow more objective tools to be used to monitor the quality and excellence of scientific output, in Slovenia the establishment of the Slovenian Research Agency was extremely important. The Slovenian Research Agency—the only public funding institution in Slovenia—succeeded to organise new R&D evaluation procedures to assess the merits of research undertaken in the public sector. After the Slovenian Research Agency was set up, the expert system in Slovenian science began to more strictly apply a combination of quantitative (bibliometric) and qualitative (peer review) measures. Bibliometric (publications, citations etc.) became relevant in these new processes for evaluating science. For example, in the evaluation of R&D proposals for public funding submitted to the Slovenian Research Agency, the following criteria were applied:

- 1) The number of peer-reviewed publications of submitters of the proposal within the last 5 years, taking regard of differences in the publication ‘habitus’ of scientists working in different scientific fields (disciplines);
- 2) The number of citations within the Science Citation Index and the Social Science/Humanities Science Citation Index over the last 10 years; and
- 3) The funding received from non-Agency sources within the last 5 years.

Each selected dimension of scientific performance (publication productivity, scientific impact, efficiency in obtaining funding) is given a number of points that are then used as a 'weight' while calculating the final score. According to information collected for the quantitative part of the R&D evaluation at the Slovenian Research Agency, the criterion of reliability is entirely fulfilled. Namely, the Agency has over a period of 20 years managed to create the national information system called "SICRIS", which permits access to the complete bibliography of every active researcher in Slovenia. There is also no problem with the collection of information concerning scientific citations because the Web of Science international information system is used. The data concerning any third-party funding of scientists' projects are directly obtained from scientific research organisations in Slovenia.

In my view, in a small scientific academic community like the community of scientists in Slovenia the use of bibliometrics in the R&D evaluation system brings more positive than negative effects, not only because bibliometrics can avoid the determination of quality and impact in science on the grounds of idiosyncratic and subjective opinions used by individual researchers who prefer to glorify their own achievements, but also because it can better help to avoid conflicts of interest. Namely, small countries are more vulnerable to conflicts of interest due to the reliance on qualitative peer reviews. The transparency of qualitative (peer-review) processes is not necessarily guaranteed. Such situations create various pressures that lead towards the informal and hidden penetration of the interests of different external lobby groups in the area of science. This means the transparent and adequate use of quantitative measures being treated as equal to the qualitative R&D evaluation procedures is extremely important. Although these R&D policy instruments can also be misused by a non-competent administration, they give great benefits to small scientific communities by increasing transparency in the allocation of state R&D funding.

#### **4 Is the Criticism of the Use of Bibliometrics in Slovenia's R&D Evaluation System Always Justified?**

Two types of dissatisfaction may be seen in the scientific community in Slovenia concerning the practical implementation of the R&D evaluation system as the basis for distributing funds for public science.

On one hand, the dissatisfaction based on requirements to make R&D policy decision-making less bureaucratic seems to be justified. As noted by some critical observers, continuous changes to R&D policy decisions without strong enough participation of scientists have been observed (Adam and Gorišek 2020; Majdič 2021).

One weakness of Slovenia's R&D policy is the lack of cooperation between policy decision-makers and scientists. The entrenched bureaucratisation and rigidity of some institutions responsible for practical implementation of R&D policy mean there has been little propensity to lead communication with various groups of stakeholders. This is also often true of the Slovenian Research Agency, which does not always ensure that the interests of scientists are promoted in their expert bodies. In that sense, Slovenia is still at the beginning of forming a modern institutional R&D policy decision structure that would establish a balance between the autonomy and the heteronomy of the science system in the national framework (Mali and Pustovrh 2017).

On the other hand, part of the research community is constantly resistant to any kind of introduction of quantitative measures in science. In their extreme criticism of bibliometric, this group of scientists overlooks its inherent applied value for all stakeholders involved in R&D policy decision-making processes, especially if such R&D evaluation instruments are used in a small scientific community. Namely, as noted, a small scientific community notoriously lacks transparency. As a result, the traditional approaches to the complex processes of R&D evaluation are overestimated, sometimes based on the very loose argument that only qualitative types of evaluations guarantee the autonomy of academic science. In my view, the criticism based on the rejection of bibliometric is unjustified.

In the Slovenian context, two different groups of 'on-duty critics' of the use of bibliometric in the R&D evaluation process can be detected.

The first group of 'on-duty critics' includes researchers from various scientific fields and disciplines who frequently use social media to raise their voice among the wider expert or non-expert public. This group of scientists is making a shift towards a new pattern of hybrid science communication, which includes characteristics previously attributed to journalism. Although the vast majority of scientists today consider presenting their opinion on various matters of science to the broader public to be an important element of the social role of scientists (Horst et al. 2017), in all countries a narrow group of scientists has formed that is extremely involved in presenting their personal views on different aspects of science and science policy in social media. Their constant appearances on television, radio and in newspapers mean they often take on the role of 'public opinion makers' in the scientific community. It is also true that these scientists have often transformed into people who see it as their duty to commentate on everything and their use of social media is encouraging them to express their personal idiosyncratic views rather than pure facts. Here, the situation in Slovenia is not very different to that seen in other European countries.

Scientists who have held the role of the leading 'public opinion-makers' have in the last few years lamented that the use of bibliometric in R&D is creating the hyper-production of worthless publications, because "academic science in Slovenia is

becoming exclusively the domain of fighting for a greater number of publications and citations” (Dolenc 2019). They, for example M. Klanjsek Gunde and U. Opara Krasovec, also complain that the “quantitative measures used at the Slovenian Research Agency are automatically leading to biases by distribution of financial resources for research projects and provide the basis for scientific fraud and scientific corruption” (Gunde and Opara 2016). Strong criticism of the use of quantitative evaluative measures according to policy decisions of the Slovenian Research Agency concerning the distribution of funding for public science has been triggered by the many other scientists who perform the role of ‘critical voices’ in science in front of the wider public.

The second group of ‘on-duty critics’ in Slovenia comprises particular scientific professional societies and trade unions that represent the interests of employees in the whole scientific community or its separate (disciplinary) branches. The priority of these organisations and their heads is to protect and defend the collective rights of employees in science (trade unions) or to ensure professional standards important for the progress of certain disciplines in science (professional scientific societies). In this sense, they raise their voice in the public with regard to a wide variety of R&D policy matters.

Since the main activities of trade union researchers in Slovenia in the last period have primarily been oriented to protecting and defending the rights of young researchers in the first few years of their professional career (including the loosening of the habilitation criteria for obtaining a permanent job position at academic institutions), the opportunity has not been missed to prepare an official statement on the deficiencies of the Slovenian Research Agency when distributing funding for public science (Skupna izjava Sindikata vzgoje, izobrazevanja in znanosti 2020). The leaders of the Slovenian trade union of researchers has constantly mentioned as a crucial deficiency of the Slovenian Research Agency the excessive use of bibliometric in the country’s R&D evaluation processes.

Over the last 5 years, some scientific professional societies (also often known as “scholarly societies”) have followed the same (critical) discourse as the trade union. In Slovenia, scholarly societies are associations which facilitate interactions of interested scholars on the national level to promote professional standards in their scientific disciplines. Although the primary goal of scientific professional societies is to improve the general image of the scientific discipline they represent through public advocacy, fostering networking, information sharing, professional development etc., they are often involved in very specific disputes. The controversies surrounding the role of bibliometric in R&D evaluation processes is one example of such a specific and hardly rational dispute. For example, the Slovenian Sociological Association which should develop and advance sociology as an area of professional expertise and as an



academic discipline has in the last 5 years published a few official statements that constantly repeated that the “evaluation of research work based on bibliometric encourages the commercialisation or mainstreaming of science in Slovenia and supports the profit-oriented company Thomas Reuters, stifles critical scientific reflexivity and, last but not least, forces researchers into unpaid labour” (Stalisca Slovenskega socioloskega drustva do vrednotenja znanstvene uspešnosti 2018).

In any case, all types of criticism presented above coming from all groups of ‘on-duty’ critics extremely oversimplify the complex issues linked with the use of bibliometric in R&D evaluation processes. While they can be considered by some as a type of professional engagement of scientists and experts which contributes to the plurality of discussions, none of them make a significant contribution to making R&D policy decision-making processes more transparent. Namely, in their one-sided and populist criticism they overlook that bibliometric approaches, especially when appropriately used in combination with qualitative peer-review assessments, hold the potential to expand the democratic participation of all stakeholders involved R&D policy decision-making. The attraction of bibliometric lies not only in its transparency and ease of understanding in the academic scientific community, but in its ability to translate information about research outcomes to non-academic stakeholders. That is, bibliometric helps non-academic stakeholders to deduce information regarding the perceived validity and quality of scientific results and producers of scientific results.

In the last part of the discussion, I present the main arguments against the scepticism emerging from certain scientists and their official representatives in Slovenia concerning the use of bibliometric in R&D evaluation processes.

1. The critics of bibliometric are unaware that, although the first forms of science evaluation were born in “Tormentin”, they have represented the crucial driving factor of scientific progress from the origin of modern science onwards. Also, that in the context of the complex socio-epistemic structure of R&D evaluation processes, which have advanced over the history of modern science, it has been difficult to strictly separate quantitative and qualitative dimensions (Arocena et al. 2019; Glaeser 2010). The relationship between quantity and quality in science is inherently interconnected. In that sense, bibliometric evaluations appear to be legitimated by scientific practices themselves. Their legitimacy stems from the fact that bibliometric evaluations rely on cumulated qualitative judgements. For example, if bibliometric is condemned for being based only on the quantitative counting of scientific publications, then it has been overlooked that every scientific publication already preliminarily passed the qualitative peer review. The same is true of the bibliometric measure of citations. Citations are not only quantitative numbers. They indicate peer judgements on scientific impact. Many critics of bibliometric refer to the

deficiency of “metrics literacy” (Rafols 2018). They are unable to see the dual function of bibliometric as a form of scientific expertise, i.e., to help governmental administration as well members of the scientific community to improve the quality of R&D policy decision-making processes.

2. It would be good to shift away from the habitual discussions of the most fervent critics of bibliometric who claim that the end of bibliometric will re-establish equality in the Slovenian scientific community because the scientific ‘establishment’ that achieved (symbolic or material) privileges in the old times will lose them upon the introduction of exclusively qualitative evaluation criteria. Instead of this populist discourse which lacks any kind of knowledge of Robert Merton’s theory of accumulative advantages in science (Merton 1968), it would be much more constructive to look at the positive effects of bibliometric. Namely, such simplified criticism overlooks that an R&D evaluation system based on a suitable balance between quality and quantity can help increase the visibility of Slovenian scientists in the international arena. Studies on the ‘publishing habitus’ of Slovenia’s researchers have pointed to the emergence of specific phenomena known in social network theory as “small worlds” (Cugmas et al. 2020; Mali et al. 2017; Ferligoj et al. 2015). Small worlds phenomena refer to the closed forms of scientific collaborations in local and parochial circumstances which do not contribute to the greater international visibility of scientists. In the context of scientific collaboration in the social sciences and humanities in Slovenia, many of these small worlds have been found, for example when all researchers in the same department or the same research institute have published a book of proceedings with a domestic publishing house. Although in these cases the scientists express a high level of commitment to mutual collaboration, their international visibility remains negligible.
3. The critics of bibliometric in Slovenia are insufficiently aware that different interpretative frameworks exist in theory and practice regarding what the idea of open science should be. With the open science model, contradictory interests can be detected among various groups of stakeholders, e.g., the primary interest of some of them is how to establish a balance between public and private interest, while others are interested in finding a balance between qualitative and quantitative R&D evaluation instruments etc. Although current criticism of bibliometric all around the world is often based on disreputable global initiatives and manifestos, such as the San Francisco Declaration of Research Assessment (DORA 2013) or the Leiden Manifesto (Hicks et al. 2015), the ideas contained in these declarations cannot find an easy way being realised in national contexts. In Finland, an analysis was undertaken among experts and scientists of the existing national R&D evaluation system. The study

showed that they are aware quantitative data are still reliable for realistically interpreting quality and impact regardless of the problems that erode their credibility (Lauronen 2020). A study which investigated how Norwegian scientists perceive citations in terms of quality and visibility showed that their perceptions are 'ambivalent', yet mainly positive (Ma and Ladisch 2019).

4. Although altmetrics momentarily enjoys support among a wide group of scientists in Slovenia, all of the questions about this alternative approach to R&D evaluation procedures remain unanswered. Today, one encounters the lack of a common definition of what altmetrics in R&D evaluation should at all represent (Regan and Henchoin 2019; Robinson-Garcia et al. 2018). On one hand, altmetrics has been proposed by some experts as an attractive option to capture the societal impact of research and to draw attention to the scholarly communication taking place in the online environments of social media. For example, academic researchers working at universities are not only expected to be responsible for the creation of new knowledge and its transfer through teaching, but to engage by way of social outreach and public engagement. Therefore, all R&D evaluation procedures and indicators should also be adapted to these expectations. On the other hand, all debates around altmetrics are still imbued with inconclusive arguments, contradictory feelings on what is its novelty etc. For example, most altmetric analyses have extrapolated the bibliometric citation model to social media, and developed indicators based on the mentions (saying or citations) of scientific publications in social media platforms like Twitter, Mendeley, or blogs. Therefore, we might ask what is the novelty of altmetrics at all with regard to traditional bibliometric.

I have attempted to point to four cases where bibliometric will continue to play an important role in any model of science, including the open model of science. While the issues concerning bibliometric are an ongoing subject of controversy among scientists and R&D policy decision-makers, this does not mean that bibliometric must no longer be an element of R&D evaluation processes. In this sense, the extreme criticism of bibliometric levelled by part of the Slovenian academic community has no rational basis. It forms part of the recent 'populist' scientific trends which have also emerged in certain other scientific communities. They have little or nothing in common with the open science concept promoted by the European Commission.

## 5 Conclusion

In my brief contribution, I have tried to show that some kinds of 'populist' resistance among various groups of scientists in Slovenia against the use of quantitative

measures in the context of the national R&D evaluation system are not justified. Their reference to the model of open science has no rational basis. In the open science model, the priority is to follow a responsible approach to R&D evaluation procedures. Here, the crucial question is not how to replace bibliometric with altmetrics, but how to responsibly develop R&D evaluations generally. A further improvement of R&D evaluation processes is certainly the most important step needed for improving the quality and excellence of scientific output in Slovenia. This improvement cannot be based on the opinion that we need to separate the qualitative and quantitative dimensions of science. As I have sought to explain, the quantity/quality relationship in science is inherently interconnected. Accordingly, bibliometric evaluations appear to be legitimated by scientific practices themselves.

## References

- Adam, F. and Gorisek, M. (2020), Meritokracija med mitom, normo in realnostjo (Meritocracy between Myth, Norm and Reality). *Družboslovne razprave*, Vol. 36, No. 94/95, pp. 217–238.
- Arnaldi, S. and Bianchi, L. (2016), *Responsibility in Science and Technology*. Wiesbaden: Springer VS.
- Arocena, R., Goeransson, B., Sutz, J. (2019), 'Towards making research evaluation more compatible with developmental goals.', *Science and Public Policy*, Vol. 46, No. 2, pp. 210- 18.
- Barre, R. (2010), 'Towards socially robust S&T indicators: Indicators as debatable devices, enabling collective learning.' *Research Evaluation*, Vol. 19, no. 3, pp. 227–31.
- Cugmas, M., Mali, F., Ziberna, A. (2020), 'Scientific collaboration of researchers and organizations : a two-level blockmodeling approach', *Scientometrics*, Vol. 125, No. 3, pp. 2471–89.
- Dolenc, S. (2019), Koga nagrajuje slovenska znanost. *Kvadrakadabra - Casopis za tolmacenje znanosti*, November 16, Available at: <https://kvarkadabra.net/2019/11/nagrade/> (Accessed: September 3, 2021).
- DORA (2013), San Francisco Declaration on Research Assessment. Available at: [http:// www.ascb.org/dora/](http://www.ascb.org/dora/) (Accessed: April 29, 2021).

- EC (2014), European Commission: Rome Declaration on Responsible Research and Innovation in Europe. Available at: [http:// www. ec.europa.eu/ research/swafs/ pdf/ rome\\_ declaration\\_ RRI\\_ final\\_ 21\\_ November](http://www.ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_November) (Accessed: January 21, 2021).
- EC (2020), European Commission: Progress on Open Science - Towards a Shared Research Knowledge System Final Report of the Open Science Policy Platform. Luxembourg: Publications Office of the European Union.
- EC (2012), European Commission: Responsible Research and Innovation. Europe's Ability to Respond to Societal Challenges. Directorate- General for Research and Innovation, Brussels. Available at: [https:// ec.europa.eu/ research/ swafs/ pdf/ pub\\_ public\\_ engagement/ responsible- research- and- innovation- leaflet\\_ en.pdf](https://ec.europa.eu/research/swafs/pdf/pub_public_engagement/responsible_research_and_innovation_leaflet_en.pdf) (Accessed: April 2, 2021).
- Ferligoj, A., Kronegger, L., Mali, F., Snijders, T., Doreian, P. (2015), 'Scientific collaboration dynamics in a national scientific system', *Scientometrics*, Vol. 104, No. 3, pp. 987–1012.
- Glaeser, J. (2010), 'From Governance to Authority Relations?', in R. Whitley, J. Glaeser, and L. Engwall (Eds.), *Reconfiguring Knowledge Production*. New York: Oxford University Press, pp. 357–69.
- Klanjšek, M. and Opara Krasovec, U. (2016): Javna sredstva za znanost – vse po starem?, *Delo*, January 24, 2016. Available at: <https://old.delo.si/mnenja/gostujoce-pero/javna-sredstva-za-znanost-ndash-vse-po-starem.html> (Accessed: August 29, 2021).
- Guston, D. (2000), *Between Politics and Science: Assuring the Integrity and Productivity of Research*. Cambridge: Cambridge University Press.
- Hicks, D., Wouters P., Waltman, L., De Rijcke, S., Rafols, I. (2015), 'The Leiden Manifesto for Research Metrics', *Nature*, Vol. 520, pp. 429–31.
- Horst, M., Davies, S., Irwin, A. (2017): *Reframing Science Communication*. In: U.Felt, R.Fouche, C.Miller, L.Smith-Doerr (Eds.), *The Handbook of Science and Technology Studies*. Cambridge and London, The MIT Press, pp. 881–909.
- Lauronen, J.P. (2020), 'The dilemmas and uncertainties in assessing the societal impact of research.' *Science and Public Policy*, Vol. 47, No. 2, pp. 207–18.

- Ma, L. and Ladisch, M. (2019), 'Evaluation complacency or evaluation inertia? A study of evaluative metrics and research practices in Irish universities'. *Research Evaluation*, Vol. 28, No. 3, pp. 209–17.
- Majdic, G. (2021): 'Kako spremeniti znanstveno objavljanje in vrednotenje raziskovalnega dela v času odprte znanosti?' (How should we change scientific publishing and evaluation of scientific work in the time of open science?, *Casopis za kritiko znanosti*, Vol. 49, No. 282, pp. 64–73.
- Mali, F., Pustovrh, T., Platinovsek, R., Kronegger, L., Ferligoj, A. (2017), 'The effects of funding and co-authorship on research performance in a small scientific community', *Science and Public Policy*, Vol. 44, No. 4, pp. 486–96.
- Mali, F. and Pustovrh, T. (2017), RD&I policy decision-making in Slovenia during the transition: lost opportunities and challenges for a more innovative economic and democratic development. In Adam, F. (Ed.), *Slovenia: social, economic and environmental issues*, (European political, economic, and security issues). New York, Nova Science, pp. 147–162.
- Mejlgaard, N., Bloch C., Madsen, E. (2019), 'Responsible research and innovation in Europe. A cross-country comparative analysis', *Science and Public Policy*, Vol. 46, No 2, pp. 198–209.
- Merton, R. (1968), 'The Matthew Effect in Science: The reward and communication systems of science are considered', *Science*, Vol. 159, No. 3810, pp. 56–63.
- Owen, R., Bessant, J. R., Heintz, M. (2013), *Responsible innovation: managing the responsible emergence of science and innovation in society*. Chichester: John Wiley.
- Peter, V., Mejlgaard, N., Bloch, C. (2018), *Monitoring the Evolution and Benefits of Responsible Research and Innovation in Europe: Summarising Insights from the MoRRI Project*. Brussels: European Commission.
- Rafols, I. (2019), 'S&T indicators in the wild: Contextualization and participation for responsible metrics', *Research Evaluation*, Vol. 28, No. 1, pp. 7–22.
- Regan A. and Henchion M. (2019), 'Making sense of altmetrics: The perceived threats and opportunities for academic identity'. *Science and Public Policy*, Vol. 46, No. 4, pp. 479–89.

- Robinson-Garcia, N. Van Leeuwen, T., Rafols, I. (2018), 'Using altmetrics for contextualised mapping of societal impact: From hits to networks'. *Science and Public Policy*, Vol 45, No. 6, pp. 815–26.
- Skupna izjava SVIZ za javnost (2020), Dovolj imamo institucionalizirane korupcije ter neresnega odnosa ARRS do raziskovalk in raziskovalcev, Ljubljana, February 5, 2020. Available at : <https://www.sviz.si/dovolj-imamo-institucionalizirane-korupcije-ter-neresnega-odnosa-arrs-do-raziskovalk> (Accessed: September 6, 2021).
- Sørensen, M., Bloch, C., Young, M. (2016), 'Excellence in the Knowledge-Based Economy: From Scientific to Research Excellence', *European Journal of Higher Education*, Vol 6, pp. 1–20.
- Staliska Slovenskega socioloskega društva do vrednotenja znanstvene uspešnosti (2018), Slovensko sociolosko društvo, Ljubljana, December 15, 2017. Available at: <https://www.sociolosko-drustvo.si/english> (Accessed: September 7, 2021).
- Stilgoe, J., Owen, R., Macnaghten, P. (2013), 'Developing a Framework for Responsible Innovation'. *Research Policy*, Vol. 42, No. 9, pp. 1568–80.
- Von Schomberg, R. (2013), 'A Vision of Responsible Research and Innovation', in R. Owen, M. Heintz and J. Bessant (Eds) *Responsible Innovation*. London: John Wiley, pp. 31–45.
- Yaghmaei E. and Van de Poel I. (2021), *Assessment of Responsible Innovation. Methods and Practices*. London and New York: Routledge.