DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INNOVATION
COMMITTEE FOR SCIENTIFIC AND TECHNOLOGICAL POLICY

First update on the CSTP project on Digital Science and Innovation Policy and Governance initiatives

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This document provides an update on the scope of the CSTP's "Digitalisation of Science and Innovation Policy and Governance" (DSIP) project, as originally outlined at the Committee's Spring 2017 meeting (see [DSTI/STP(2017)4]), and gives an overview of progress to date. It also sets out the project's next steps (including a survey of DSIP initiatives, three in-depth topic reviews, and case studies of "national DSIP ecosystems") and the shape of its planned final outputs. The project is one of the pillars of the CSTP's digitalisation work (see [DSTI/STP(2017)19]) and is expected to contribute to the OECD-wide Going Digital project (see [DSTI/CDEP/GD(2017)8]).

Delegates are invited to review the project's scope and proposed next steps and to indicate their country's interest in participating in the project's case studies of national DSIP ecosystems.

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Introduction

1.   This document provides an update on the scope of the CSTP's "Digitalisation of Science and Innovation Policy and Governance" (DSIP) project, as originally outlined at the Committee's Spring 2017 meeting (see [DSTI/STP(2017)4]), and gives an overview of progress to date. It also sets out the project's next steps (including a survey of DSIP initiatives, three in-depth topic reviews, and case studies of "national DSIP ecosystems") and the shape of its planned final outputs. The project is one of the pillars of the CSTP's digitalisation work (see [DSTI/STP(2017)19]) and is expected to contribute to the OECD-wide Going Digital project (see [DSTI/CDEP/GD(2017)8]). ***Delegates are invited to review the project's scope and proposed next steps and to indicate their country's interest in participating in the project's case studies of national DSIP ecosystems***.

DSIP project scope

2.   Digitalisation is increasingly impacting public administration, including in the field of science and innovation (S&I) policy. New DSIP initiatives are emerging that increasingly interconnect databases and apply new technologies and applications that allow them to be exploited more extensively. This means digital data can be more readily used to build a picture of the incidence and impact of S&I activities, providing a potentially valuable signal to science and innovation decision makers. DSIP systems can be used, for instance, by ministries to help design, implement, monitor and evaluate policies; and they can be used by funding agencies to plan, coordinate, monitor and evaluate their activities.

3.   Since digitalisation is increasingly pervasive across government, it is important to define precisely what is meant by DSIP. The project uses the following definition:

> *DSIP initiatives refer to the adoption or implementation by public administrations, with responsibilities for science and innovation, of practices characterised by an intensive and novel use of digital technologies and/or data resources, with the aim of supporting the formulation of science and innovation policy or the delivery of public services in this area.*

4.   One major point is that DSIP initiatives are public sector action focused – their primary goal is to support some aspect of the public policy process – though the provision of functionalities (e.g. through standard or customised products) can come from any actor in the system, including the private sector. Furthermore, the practices referred to can include new or re-used procedures, e.g. for evaluating impacts, and infrastructures, e.g. new databases.

5.   The project's overarching objective is to provide the CSTP with the means to make an informed assessment of the transformational potential and possible pitfalls of DSIP. It also aims to facilitate mutual learning between countries that are planning, developing or using DSIP systems.

6. As outlined in the Spring 2017 project proposal [DSTI/STP(2017)4], in the absence of voluntary contributions, the project's budget remains modest and can cover just a few activities. A modular approach was proposed, as outlined in Figure 1, dividing the project into (i) core activities financed through Part 1 funding and (ii) optional activities funded through voluntary contributions.

Figure 1. Proposed DSIP modules – an update

The project's modular structure, as outlined in [DSTI/STP(2017)4]. There are currently no plans to proceed with the shaded modules
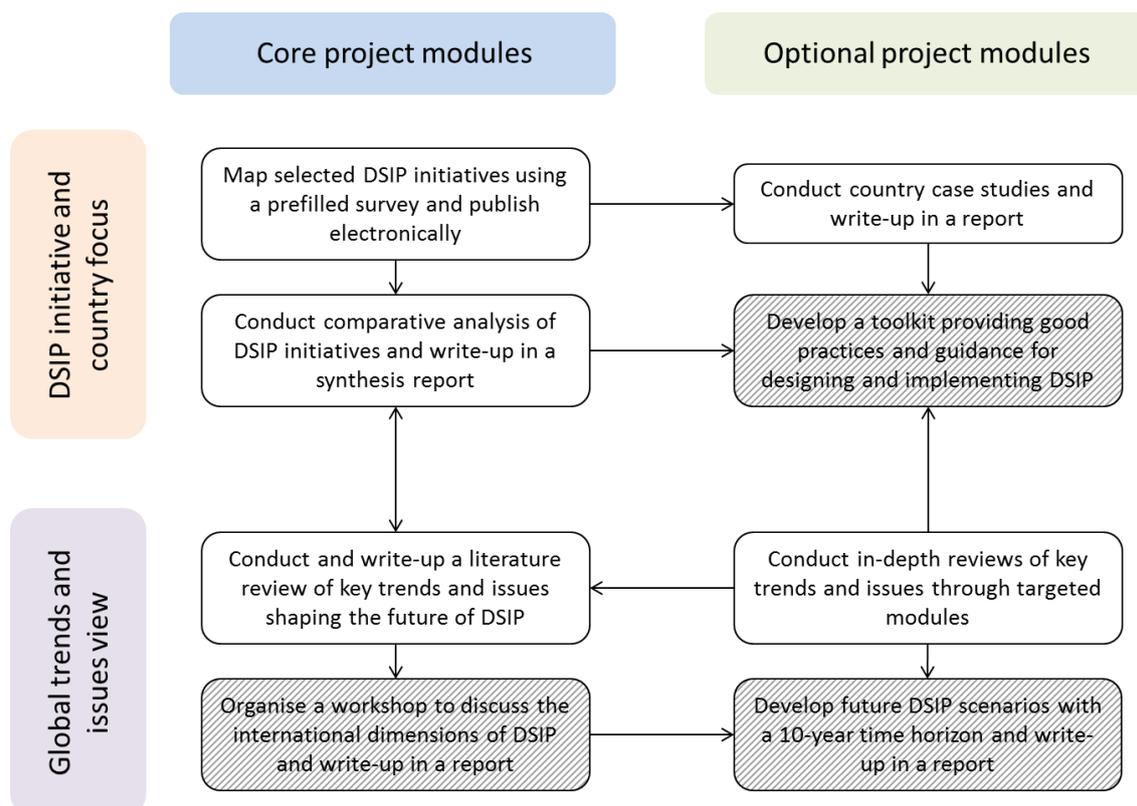
7. Among the core activities is a mapping and comparison of selected DSIP initiatives, accompanied by a literature review of key trends and issues impacting DSIP. These are on track and a survey of more than 60 DSIP initiatives is about to get underway, as described in the next section. A workshop exploring the international dimensions of DSIP was also proposed. While the international angle features extensively across the project, a workshop dedicated solely to this topic would need to be hosted by a country.

8. The project proposal's optional activities included topic-specific targeted modules that would provide in-depth reviews of selected key issues; country case studies of national DSIP ecosystems; an online toolkit that would provide guidance on the design and implementation of DSIP infrastructures; and the formulation of future DSIP scenarios. The first two activities have attracted some support and will proceed in some form. As described below, one country has already signalled its intention to request a country case study and it is hoped a few others will follow suit. The Secretariat is also

leveraging existing activities and interests, e.g. in NESTI, to undertake in-depth reviews of a handful of topics. In the absence of voluntary contributions, there are currently no plans to create a toolkit or future scenarios.

9.   Much of the work is ongoing, and several draft findings will be shared with the CSTP at its March 2018 meeting. Country case studies will not begin until 2018. The project's final outputs are expected to include a standalone multi-chapter publication (outlined in Box 1), and a project synthesis chapter in the CSTP's synthesis of work on 'The Digitalisation of Science, Technology and Innovation'. The results of the project are also likely to be used in the 2018 STI Outlook. In the meantime, the Secretariat has presented the project to the NESTI, GSF and TIP working parties, to the European Commission in Brussels, and to a meeting of the Small Advanced Economies Initiative in Helsinki. It has also held bilateral discussions with those responsible for designing new DSIP initiatives in Finland, New Zealand and Norway.

10.   Finally, the Secretariat has set up a DSIP "informal expert group" jointly with the REITER project[1] to advise on useful information sources and to reflect on some of the key trends and issues uncovered by the project. While some informal group members participated in a joint EC-OECD workshop organised in the context of the REITER project,[2] most interaction is expected to be remote, using the IPP's communities of practice platform. The informal group currently has around 30 members, who include those working on or studying existing DSIP initiatives and the wider digital STI policy landscape.

11.   The remaining sections of this document are devoted to describing progress-to-date and future activities along three lines:

- Survey of DSIP initiatives
- Selected in-depth studies
- Country case studies

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[1]   See https://innovationpolicyplatform.org/stip-monitoring-and-analysis-ec-oecd-project.

[2]   See https://www.innovationpolicyplatform.org/stip-monitoring-and-analysis-ec-oecd-project/semantic-technologies-and-semantic-web-structuring-data.

Box 1. Proposed structure of the DSIP final report

Chapter 1 – overview of DSIP

Provides an introductory high-level overview of the DSIP landscape, introducing the main actors and their activities, and discussing the types of systems in use and under development, the reasons for their emergence, their significance today and in the future, the key trends and issues shaping developments, and the opportunities and challenges that lay ahead. The chapter will be based on a literature review and the project's main empirical findings.

Chapter 2 – results of a survey of DSIP initiatives

Provides an account and comparative assessment of the results of the project's survey of DSIP initiatives.

Chapter 3 – meeting the interoperability challenge

Provides an overview and analysis of the interoperability challenge, one of the main issues in delivering DSIP systems, and the roles that emerging standards can play. The chapter will be based largely on the work carried out by NESTI on unique, persistent and pervasive identifiers.

Chapter 4 – DSIP and the future of research assessment

Provides an overview of existing and future implications of DSIP for research assessment. The chapter will build on Annex 3 of the project proposal document, drawing upon further insights from the survey of initiatives.

Chapter 5 – the private sector in DSIP

Provides an account and assessment of the considerable roles played by the private sector in the DSIP space, focusing on the potential benefits and risks. This chapter will be based on the project's in-depth review of the private sector's roles in DSIP.

Annex (optional) – country case studies

Depending on the timing of country case studies, these could be included in an annex to the report or, alternatively, published as stand-alone reviews.

Survey of DSIP initiatives

12.   A survey of those DSIP initiatives already underway is a fundamental building block for understanding the emergence and transformative potential of such systems. Such a survey will explore, as far as it is feasible, issues related to the founding, funding, purpose and scope of DSIP initiatives and the impacts they have (Box 2). It should also contribute to developing a comprehensive typology of DSIP initiatives and tools, which would be useful for comparing and planning systems in the future.

13.   In a first step, the March 2017 project proposal [DSTI/STP(2017)4] listed scores of initiatives, identified through a web search, that could be included in such a survey.

The Secretariat subsequently consulted CSTP delegates on this list to check its veracity and to collect some basic data on each initiative, including on its owner, its launch year, the types of data it includes, its functional features, its funding model, its status (e.g. operational, in planning, etc.), and a contact point. Around two-thirds of delegations responded to the consultation in April 2017, signaling the Committee's active interest in the project. The results are openly available on the DSIP project website.[3]

14. A quick review of responses shows that most systems incorporate data on individual researchers, research organisations, project and grant awards, and research outputs in the form of academic publications. Fewer include data on research equipment and facilities, and on research impacts, including citations and patents. Data is predominantly sourced from a mix of funding agencies (typically their administrative data, e.g. databases of grant awards) and research performers (e.g. university CRIS (Current Research Information Systems)), as well as proprietary bibliometric and patent databases.

15. The Secretariat has used this baseline data to identify more than 60 initiatives that meet the definition of a DSIP initiative outlined above. The managers of these initiatives will be contacted over the next three months to participate in the survey of DSIP initiatives, which will use a mix of telephone interviews and an online questionnaire. The Secretariat will seek to interview as many DSIP initiative managers as is feasible in the time available. All initiative managers will, in any case, be sent a questionnaire survey to complete that will illicit more detailed information on their systems that is otherwise difficult to obtain. The Secretariat will make this data openly available on the project website.

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[3] See https://innovationpolicyplatform.org/digital-science-and-innovation-policy-dsip.

Box 2. Lines of enquiry for mapping DSIP initiatives

1. What are the origins of the initiative, i.e. how was it started, by whom and to meet what perceived needs?

2. What are the initiative's stated objectives?

3. What sources of data does the initiative use?

4. Who are the main actors (e.g. data providers, users, etc.) and what incentives and/or behavioural norms does the initiative offer/depend on for them to build and/or use its services?

5. What is the initiative's business model for building and sustaining its services?

6. How does the initiative manage the so-called "data cycle", i.e. data generation; data collection, aggregation and processing; data distribution and delivery; and data use and reuse?

7. What digital architectures and technologies does the initiative use?

8. How does the initiative use, promote or develop interoperability standards, such as unique identifiers or subject ontologies?

9. Has the initiative required civil servants, as well as policy organisations more broadly, to acquire new skills and capacities (e.g. in data analytics)?

10. To what extent has the initiative contributed to a culture of data use and sustained more knowledge-based decisions throughout the policy cycle (including in agenda-setting, policy and programme planning, implementation, and evaluation)?

11. To what extent has the initiative further empowered non-governmental actors in the policy process?

12. To what extent has the initiative supported cross-government information-sharing and horizontal policy coordination?

13. How does the initiative manage issues of security and privacy?

14. To what extent is the initiative open in sharing its data and transparent in the algorithms it uses?

15. What does "success" look like and what are the main barriers to the initiative achieving this?

16. The Secretariat will then carry out a comparative analysis of the survey data. This will explore similarities and differences between existing DSIP initiatives, with a view to better understand the key factors shaping their successes and limitations. It will also attempt to derive a typology of DSIP initiatives based on the comparative analysis. The project's final report will feature the results of this analysis throughout and will include a dedicated chapter describing all aspects of the survey (see Box 1).

In-depth topic reviews

17.   The project proposal presented at the March 2017 CSTP meeting [DSTI/STP(2017)4] included several options for carrying out in-depth reviews of key issues affecting DSIP developments. In the absence of voluntary contributions for this activity, the project's in-depth reviews are largely limited to topics where existing activities or interests can be leveraged and where desk-based research can readily add value. The project includes three in-depth reviews on the following topics:

- Key infrastructures for DSIP: Unique, persistent and pervasive identifiers (UPPIs)
- Private sector roles in DSIP systems
- DSIP systems in research assessment

Key infrastructures for DSIP: Unique, persistent and pervasive identifiers (UPPIs)

18.   Being able to uniquely and unambiguously identify and match the people and organisations involved in S&I across a wide range of relevant systems and datasets has the potential to make national and international S&I systems more efficient by facilitating re-use of information already provided ("enter once, reuse often") and as a result facilitate the more efficient administration of research related procedures in the digital age. Furthermore, UPPIs could become an important statistical infrastructure which:

- makes data matching easier and more robust,
- facilitates new analyses offering important new insights in key areas such as S&I globalisation, knowledge flows, etc.,
- enables more timely and more detailed analyses, and
- ultimately informs better S&I funding decisions and policies.

19.   Scoping of possible work on UPPI systems with international reach is taking place under NESTI lead. This work is looking at the main systems already in existence, analysing their key similarities and differences and the links between them. It is also considering aspects affecting analytical potential (coverage, quality, openness, etc.), as well as broader factors such as ownership of the UPPI system, privacy, and registry approaches and technology. Potential policy-actions will be identified. A short paper, with a number of questions and considerations for policymakers will be shared with the DSIP community of practice and with CSTP in Spring 2018, with the resulting input helping to shape a final chapter to be included in the DSIP final report.

Private sector roles in DSIP systems

20.   The private sector has developed an important and growing role in the DSIP space. For example, academic publishers, web services companies, and providers of proprietary data management systems have a multitude of interactions with the public sector relating to DSIP, providing access to proprietary databases, digital analytical tools, and unique identifiers. The nature of these relations goes beyond simple provision of services and encompasses different levels of public-private cooperation including, but not limited to, joint development of new methods and tools for analysis of research impact, and collaboration on designing and implementing digital platforms for policy-making purposes.

21.   Private sector involvement in DSIP initiatives has potential benefits. Private firms can often provide off-the-shelf, well-developed solutions and building blocks for DSIP. These can be implemented relatively quickly and at an agreed cost, without the public

sector needing to develop the necessary skills in-house beforehand. But there are also potential risks. For example, outsourcing data management activities to the private sector may result in loss of control over the future development trajectory of DSIP systems; reliance on proprietary products and services may lead to discriminatory access to data; and the public sector's adoption of commercial standards for metrics may greatly contribute to the emergence of private platforms that exhibit network effects that are difficult to contest.

22.   This in-depth review will provide an overview of the main private sector actors in the DSIP space and their existing and potential roles in shaping its dynamics. The survey of DSIP initiatives described above is expected to provide some insights on the private sector roles. This will be complemented by desk research that examines some of the main actors and their related strategies and activities. A draft report will be presented to the CSTP in Spring 2018 for inputs, after which it will become a chapter in the DSIP final report.

DSIP systems in research assessment

23.   Digitalisation of S&I policy can potentially change how monitoring, assessment and evaluation of research activities are performed. The digital footprint of science can be identified and analysed by recent forms of digital tools contributing to timelier and better-informed decisions on allocation of research funding. Digital tools can be applied to creating a new system of indicators of research productivity or for improving existing ones. This in-depth review focuses on alternative metrics (altmetrics), promises and challenges of DSIP systems for research monitoring, assessment and evaluation, as well as on the limits, dangers, and pitfalls of digitalisation. It draws heavily on the 15-page annex already prepared for the project proposal in March 2017 (see Annex 3 in [DSTI/STP(2017)4/ANN]).

Country case studies of national DSIP ecosystems

24.   The survey described above will collect information on individual DSIP initiatives. Yet, initiatives emerge in a kind of mutually-shaping ecosystem of other data infrastructures, software applications, skills sets, standards and policy expectations that largely determine their success or otherwise. As Figure 2 shows, "national DSIP ecosystems" can include many actors with different types of relationships; multiple sources of data and technologies; a mix of DSIP system outputs and promises; and a range of challenges in using and maintaining such systems. All of these elements interact in nationally-specific ways, reflecting different histories and institutional set-ups.

25.   While the survey of initiatives will collect some information on the national context in which a given initiative sits, it can provide only scant insights on the features and workings of any national DSIP ecosystem. Understanding the different elements and their dynamics calls for dedicated country case studies, particularly given the novelty and our limited knowledge of DSIP ecosystems. The holistic view offered by case studies is also important from a policy perspective, highlighting various points in the national ecosystem where policy frameworks and interventions can help rather than hinder DSIP developments.

26.   Case studies will first and foremost benefit the countries under review, of course, providing an informed outside assessment of their national DSIP ecosystems. One country has already signalled its intention to make a voluntary contribution to fund a

DSIP country case study. This coincides with a national initiative to renew some of its DSIP infrastructures that are already quite advanced. Besides mapping the system along the lines set out in Figure 2, the case study will explore what improvements could be made in terms of (i) interoperability and connecting different data sources, (ii) facilitating international comparisons and co-operation, and (iii) building a robust infrastructure that enhances the value of the data. Overall, the case study is expected to contribute to formulating a new "national DSIP strategy".

27.   Case studies will also benefit our general understanding of DSIP ecosystems and their dynamics, even more so if several national case studies can be carried out simultaneously. The findings of several national case studies can be compared to identify key similarities and differences and to investigate their causes. These insights can inform the eventual development of frameworks for comparing countries' DSIP ecosystems in a more systematic way, incorporating, for example, key indicators. Conducting several national ecosystem case studies in parallel could also support mutual learning between countries at similar or different points in the "DSIP development cycle" (Figure 2). Indeed, the project's case studies work could be designed to incorporate a strong peer review element that boosts this mutual learning.

28.   Case studies will start in spring 2018, after the survey of DSIP initiatives has been completed and the data analysed. Countries should inform the Secretariat as soon as possible of their interest to participate in the project's case studies.

Figure 2. Country case studies: elements of a DSIP ecosystem