

FAIR Data Principles - introduction

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- 1991-1999 **Tokyo University of Foreign Studies** (librarian)
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- 2003-2012 **Thomson Reuters** (now **Clarivate**)
- 2012-2015 **Nature Publishing Group** (now **Springer Nature**)
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The beginning

The FAIR Guiding Principles were formally introduced in 2016 to improve scientific data management and stewardship.

2016年、科学データの管理とデータスチュワードシップを改善するためのFAIR原則が正式に発表された。

Wilkinson, M., Dumontier, M., Aalbersberg, I. et al. The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data* 3, 160018 (2016). <https://doi.org/10.1038/sdata.2016.18>

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SUBJECT CATEGORIES

- Research data
- Publication characteristics

Comment: The FAIR Guiding Principles for scientific data management and stewardship

Mark D. Wilkinson et al.*

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There is an urgent need to improve the infrastructure supporting the reuse of scholarly data. A diverse set of stakeholders—representing academia, industry, funding agencies, and scholarly publishers—have come together to design and jointly endorse a concise and measurable set of principles that we refer to as the FAIR Data Principles. The intent is that these may act as a guideline for those wishing to enhance the reusability of their data holdings. Distinct from peer initiatives that focus on the human scholar, the FAIR Principles put specific emphasis on enhancing the ability of machines to automatically find and use the data, in addition to supporting its reuse by individuals. This Comment is the first formal publication of the FAIR Principles, and includes the rationale behind them, and some exemplar implementations in the community.

Supporting discovery through good data management

Good data management is not a goal in itself, but rather is the key conduit leading to knowledge discovery and innovation, and to subsequent data and knowledge integration and reuse by the community after the data publication process. Unfortunately, the existing digital ecosystem surrounding scholarly data publication prevents us from extracting maximum benefit from our research investments (e.g., ref. 1). Partially in response to this, science funders, publishers and governmental agencies are beginning to require data management and stewardship plans for data generated in publicly funded experiments. Beyond proper collection, annotation, and archival, data stewardship includes the notion of ‘long-term care’ of valuable digital assets, with the goal that they should be discovered and re-used for downstream investigations, either alone, or in combination with newly generated data. The outcomes from good data management and stewardship, therefore, are high quality digital publications that facilitate and simplify this ongoing process of discovery, evaluation, and reuse in downstream studies. What constitutes ‘good data management’ is, however, largely undefined, and is generally left as a decision for the data or repository owner. Therefore, bringing some clarity around the goals and desiderata of good data management and stewardship, and defining simple guideposts to inform those who publish and/or preserve scholarly data, would be of great utility.

This article describes four foundational principles—Findability, Accessibility, Interoperability, and Reusability—that serve to guide data producers and publishers as they navigate around these obstacles, thereby helping to maximize the added-value gained by contemporary, formal scholarly digital publishing. Importantly, it is our intent that the principles apply not only to ‘data’ in the conventional sense, but also to the algorithms, tools, and workflows that led to that data. All scholarly digital research objects—from data to analytical pipelines—benefit from application of these principles, since all components of the research process must be available to ensure transparency, reproducibility, and reusability.

There are numerous and diverse stakeholders who stand to benefit from overcoming these obstacles: researchers wanting to share, get credit, and reuse each other’s data and interpretations; professional data publishers offering their services; software and tool-builders providing data analysis and processing services such as reusable workflows; funding agencies (private and public) increasingly

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European Commission - Statement



G20 Leaders' Communique Hangzhou Summit

Hangzhou, 5 September 2016

1. We, the Leaders of the G20, met in Hangzhou, China on 4-5 September 2016.

2. We met at a time when the global economic recovery is progressing, resilience is improved in some economies and new sources for growth are emerging. But growth is still weaker than desirable. Downside risks remain due to potential volatility in the financial markets, fluctuations of commodity prices, sluggish trade and investment, and slow productivity and employment growth in some countries. Challenges originating from geopolitical developments, increased refugee flows as well as terrorism and conflicts also complicate the global economic outlook.

3. We also met at a time of continued shifts and profound transformations in the configuration of the global economic landscape and dynamics for growth. With these transformations come challenges and uncertainties as well as opportunities. The choices we make together will determine the effectiveness of our response to the challenges of today and help to shape the world economy of the future.

4. We believe that closer partnership and joint action by G20 members will boost confidence in, foster driving forces for and intensify cooperation on global economic growth, contributing to shared prosperity and better well-being of the world.

5. We are determined to foster an innovative, invigorated, interconnected and inclusive world economy to usher in a new era of global growth and sustainable development, taking into account the 2030 Agenda for Sustainable Development, the Addis Ababa Action Agenda and the Paris Agreement.

6. In this context, we, the G20, as the premier forum for international economic cooperation, forge a comprehensive and integrated narrative for strong, sustainable, balanced and inclusive growth, and thereby adopt the attached package of policies and actions - the Hangzhou Consensus - based on the following:

- Vision. We will strengthen the G20 growth agenda to catalyze new drivers of growth, open up new horizons for development, lead the way in transforming our economies in a more innovative and sustainable manner and better reflect shared interests of both present and coming generations.
- Integration. We will pursue innovative growth concepts and policies by forging synergy among fiscal, monetary and structural policies, enhancing coherence between economic, labor, employment and social policies as well as combining demand management with supply side reforms, short-term with mid- to long-term policies, economic growth with social development and environmental protection.
- Openness. We will work harder to build an open world economy, reject protectionism, promote global trade and investment, including through further strengthening the multilateral trading system, and ensure broad-based opportunities through and public support for expanded growth in a globalized economy.
- Inclusiveness. We will work to ensure that our economic growth serves the needs of everyone and benefits all countries and all people including in particular women, youth and disadvantaged groups, generating more quality jobs, addressing inequalities and eradicating poverty so that no one is left behind.

Strengthening Policy Coordination

7. Our growth must be shored up by well-designed and coordinated policies. We are determined to use all policy tools - monetary, fiscal and structural - individually and collectively to achieve our goal of strong, sustainable, balanced and inclusive growth. Monetary policy will continue to support economic activity and ensure price stability, consistent with central banks' mandates, but monetary policy alone cannot lead to balanced growth. Underscoring the essential role of structural reforms, we emphasize that our fiscal strategies are equally important to supporting our common growth

objectives. We are using fiscal policy flexibly and making tax policy and public expenditure more growth-friendly, including by prioritizing high-quality investment, while enhancing resilience and ensuring debt as a share of GDP is on a sustainable path. Furthermore, we will continue to explore policy options, tailored to country circumstances, that the G20 countries may undertake as necessary to support growth and respond to potential risks including balance sheet vulnerability. We reiterate that excess volatility and disorderly movements in exchange rates can have adverse implications for economic and financial stability. Our relevant authorities will consult closely on exchange markets. We reaffirm our previous exchange rate commitments, including that we will refrain from competitive devaluations and we will not target our exchange rates for competitive purposes. We will carefully calibrate and clearly communicate our macroeconomic and structural policy actions to reduce policy uncertainty, minimize negative spillovers and promote transparency.

8. We are making further progress towards the implementation of our growth strategies, but much more needs to be done. Swift and full implementation of the growth strategies remains key to supporting economic growth and the collective growth ambition set by the Brisbane Summit, and we are prioritizing our implementation efforts. In the light of this, we launch the Hangzhou Action Plan and have updated our growth strategies, including new and adjusted macroeconomic and structural policy measures that can provide mutually-supportive benefits to growth. We will also strive to reduce excessive imbalances, promote greater inclusiveness and reduce inequality in our pursuit of economic growth.

Breaking a New Path for Growth

9. Our growth, to be dynamic and create more jobs, must be powered by new driving forces. While reaffirming the importance of addressing shortfalls in global demand to support short-term growth, we believe it is also imperative to address supply side constraints so as to raise productivity sustainably, expand the frontier of production and unleash mid- to long-term growth potential.

10. We recognize that in the long run, innovation is a key driver of growth for both individual countries and the global economy as a whole. We are committed to tackling one of the root causes of weak growth by taking innovation as a key element of our effort to identify new growth engines for individual countries and the world economy, which will also contribute to creating new and better jobs, building a cleaner environment, increasing productivity, addressing global challenges, improving people's lives and building dynamic, cooperative and inclusive innovation ecosystems. We thus endorse the G20 Blueprint on Innovative Growth as a new agenda encompassing policies and measures in and across the areas of innovation, the new industrial revolution and the digital economy. In this context, we recognize the importance of structural reforms. We will act on the recommendations of the Blueprint in accordance with our national circumstances and in line with our vision for leadership, partnership, openness, inclusiveness, creativity, synergy and flexibility.

11. We commit to important cross-cutting actions related to multi-dimensional partnerships, supporting developing countries and improving skills and human capital. We will set up a G20 Task Force supported by the OECD and other relevant international organizations to take forward the G20 agenda on innovation, new industrial revolution and digital economy, subject to the priorities of the respective future G20 presidencies, ensuring continuity and consistency with the results so far, and promoting synergies with other G20 workstreams.

12. To achieve innovation-driven growth and the creation of innovative ecosystems, we support dialogue and cooperation on innovation, which covers a wide range of domains with science and technology innovation at its core. We deliver the G20 2016 Innovation Action Plan. We commit to pursue pro-innovation strategies and policies, support investment in science, technology and innovation (STI), and support skills training for STI - including support for the entry of more women into these fields - and mobility of STI human resources. We support effort to promote voluntary knowledge diffusion and technology transfer on mutually agreed terms and conditions. Consistent with this approach, we support appropriate efforts to promote open science and facilitate appropriate access to publicly funded research results on **findable, accessible, interoperable and reusable (FAIR) principles**. In furtherance of the above, we emphasize the importance of open trade and investment regimes to facilitate innovation through intellectual property rights (IPR) protection, and improving public communication in science and technology. We are committed to foster exchange of knowledge and experience by supporting an online G20 Community of Practice within the existing Innovation Policy Platform and the release of the 2016 G20 Innovation Report.

13. To seize the opportunity that the new industrial revolution (NIR) presents for industry, particularly manufacturing and related services, we deliver the G20 New Industrial Revolution Action Plan. We commit to strengthen communication, cooperation and relevant research on the NIR, facilitate small and medium-sized enterprises (SMEs) to leverage benefits from the NIR, address employment and workforce skill challenges, encourage more cooperation on standards, adequate and effective IPR protection in line with existing multilateral treaties to which they are parties, new

The devil's in the details

To be Findable:

- F1. (meta)data are assigned a globally unique and eternally persistent identifier.
- F2. data are described with rich metadata.
- F3. (meta)data are registered or indexed in a searchable resource.
- F4. metadata specify the data identifier.

To be Accessible:

- A1 (meta)data are retrievable by their identifier using a standardized communications protocol.
- A1.1 the protocol is open, free, and universally implementable.
- A1.2 the protocol allows for an authentication and authorization procedure, where necessary.
- A2 metadata are accessible, even when the data are no longer available.

To be Interoperable:

- I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- I2. (meta)data use vocabularies that follow FAIR principles.
- I3. (meta)data include qualified references to other (meta)data.

To be Re-usable:

- R1. (meta)data have a plurality of accurate and relevant attributes.
- R1.1. (meta)data are released with a clear and accessible data usage license.
- R1.2. (meta)data are associated with their provenance.
- R1.3. (meta)data meet domain-relevant community standards.

To be Findable: (見つけられるために)

- F1. (メタ) データが、グローバルに一意で永続的な識別子 (ID) を有すること。
- F2. データがメタデータによって十分に記述されていること。
- F3. (メタ) データが検索可能なリソースとして、登録もしくはインデックス化されていること。
- F4. メタデータが、データの識別子 (ID) を明記していること。

To be Accessible: (アクセスできるために)

- A1. 標準化された通信プロトコルを使って、(メタ) データを識別子 (ID) により入手できること。
 - A1.1 そのプロトコルは公開されており、無料で、実装に制限が無いこと。
 - A1.2 そのプロトコルは必要な場合は、認証や権限付与の方法を提供できること。
- A2. データが利用不可能となったとしても、メタデータにはアクセスできること。

To be Interoperable: (相互運用できるために)

- I1. (メタ) データの知識表現のため、形式が定まっていて、到達可能であり、共有されていて、広く適用可能な記述言語を使うこと。
- I2. (メタ) データがFAIR原則に従う語彙を使っていること。
- I3. (メタ) データは、他の(メタ) データへの特定可能な参照情報を含んでいること。

To be Re-usable: (再利用できるために)

- R1. メタ (データ) が、正確な関連属性を豊富に持つこと。
 - R1.1 (メタ) データが、明確でアクセス可能なデータ利用ライセンスと共に公開されていること。
 - R1.2 (メタ) データが、その来歴と繋がっていること。
 - R1.3 (メタ) データが、分野ごとのコミュニティの標準を満たすこと。

What is FAIR?

- ◎ Principles that concisely summarise technical details for ease of use
 - ◎ Originally intended for research data, but also applied to publications
 - ◎ The crucial point lies in the detailed provisions for each of F.A.I.R.
- ◎ 技術的詳細を簡潔にまとめた原則として使いやすい
 - ◎ 元々は研究データのために考案されたが、出版物にも援用される
 - ◎ 肝心なのはF.A.I.R.それぞれの細則

Thanks!

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