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The EOSC needs a vehicle to
bring in the data, it is called
FAIR

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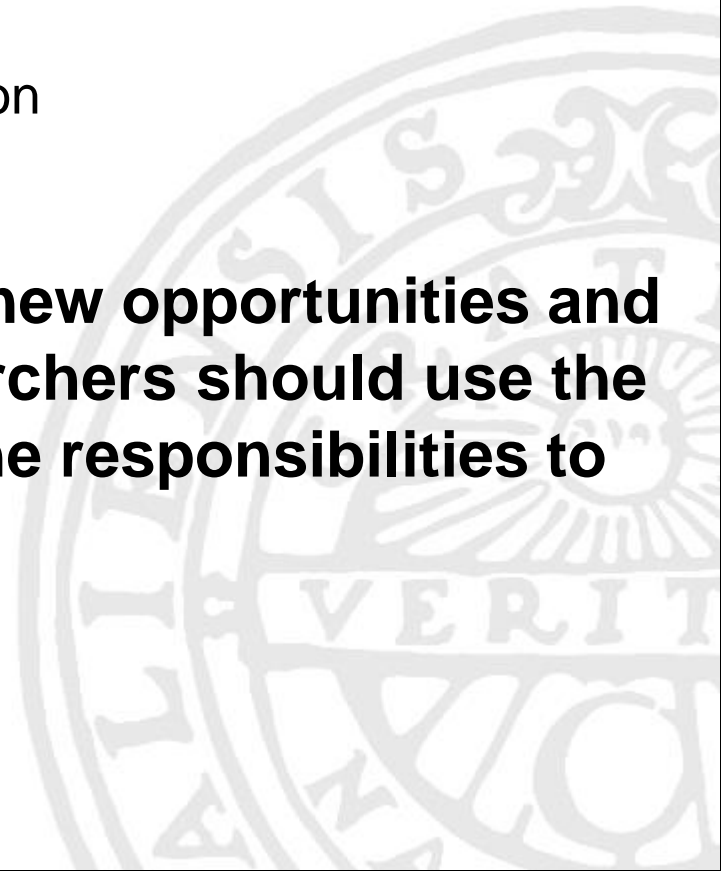
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Main Message

Digitalisation changes research in fundamental ways

- New types of research resources and new forms of research results
- New opportunities for sharing research resources and research results
- New opportunities for collaboration

Research communities get new opportunities and new responsibilities. Researchers should use the opportunities and take on the responsibilities to steer the development!





Open Science?

Open science is the idea that scientific knowledge of all kinds should be openly shared as early as is practical in the discovery process. Michael Nielsen – TEDx Waterloo 2011





Open Science?

Wides possible sharing/openness

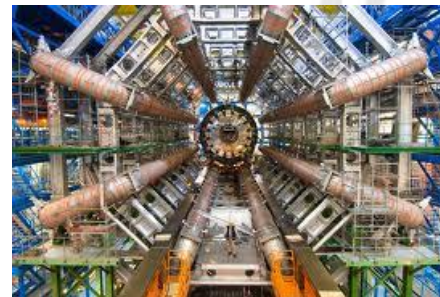
- publications
- data
- software and tools
- educational resources
- acces to infrastructures



```
// CMyafc29DView message handlers
void CMyafc29DView::OnBankoleLoad()
{
    // TODO: Add your command handler code here
    if(!a_bank.CreateDispatch("myafc29A.Bank"))
    {
        AfxMessageBox("myafc29A.Bank component not found");
        return;
    }
    else
    {
        AfxMessageBox("myafc29A.Bank component found lol!");
        /*
        * works for an ERE component only if the interface is registered
        * and the IID IID_IBank must match with your myafc29A project.
        * You can find this IID number by checking the MYMFC29A ODG file...
        */
        // {923011E3-C8E8-11CE-B337-98EA36DE9E4E}
        static const IID IID_IBank =
        { 0x923011e3, 0xc8eb, 0x11ce, { 0xb3, 0x37, 0x08, 0xea,
        0x36, 0xde, 0x9e, 0x4e } };
        LPDISPATCH p;
        HRESULT hr = a_bank._lpDispatch->QueryInterface(IID_IBank, (void**) &p);
        TRACE("OnBankoleLoad -- QueryInterface result = %x\n", hr);
        */
    }
}

void CMyafc29DView::OnUpdateBankoleLoad(OCmdUI* pCmdUI)
{
    // TODO: Add your command update UI handler code here
    pCmdUI->Enable(a_bank._lpDispatch == NULL);
}

```





Many researchers are sceptical to "openness"

- It is **my** data/software/infrastructure!!!!!!!
- I can not trust others results
- I can not trust that my results are not misused
- **"What's in it for me"?**
- **I do not have the resources and/or competence needed!**





Why should researchers care?

Opportunities/responsibilities for research:

- Increased responsibility:
 - Transparency and reproducibility
 - Reduce risk of fraud
- Increased efficiency:
 - (Rapid) sharing of resources
 - Reduce risk of duplication



Is “openness” needed for this?

Political statements: Research results from public funding should be openly accessible and possible to use by everybody.



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The Main Message - Again

Research communities get new opportunities and new responsibilities. Researchers should use the opportunities and take on the responsibilities to steer the development!

- What is important for a research career?
- How do you plan a research project? What resources and competences are needed?
- What policies and guidelines are needed, and what should they contain?



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FAIR Science?

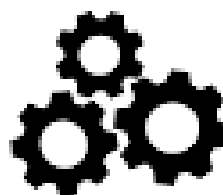
F
Findable



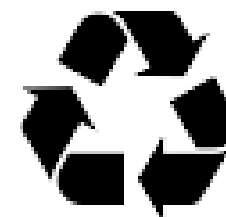
A
Accessible



I
Interoperable

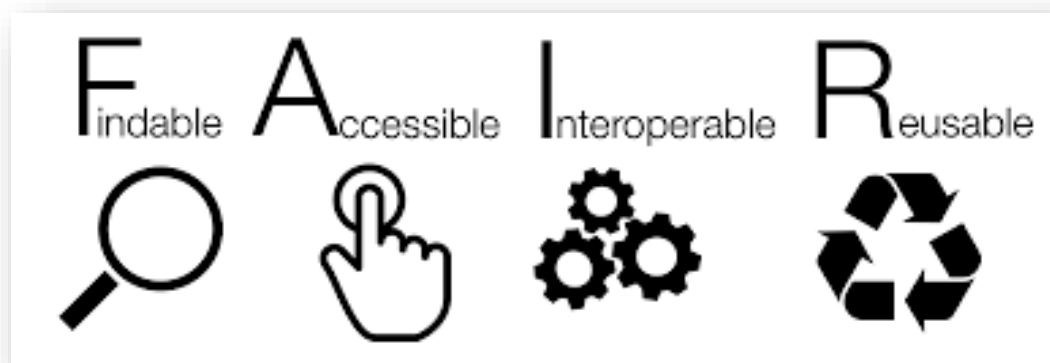


R
Reusable





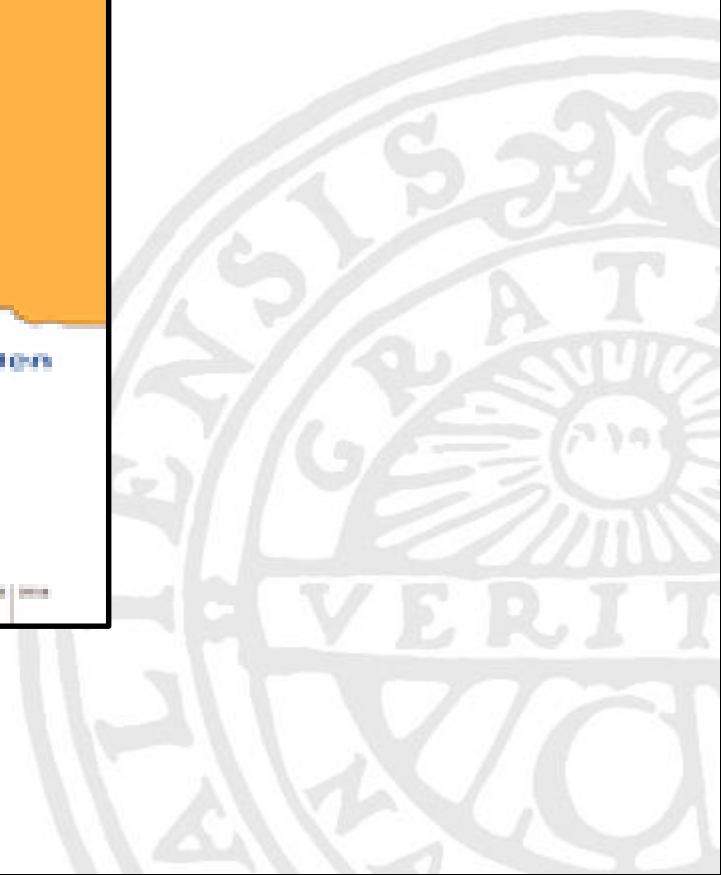
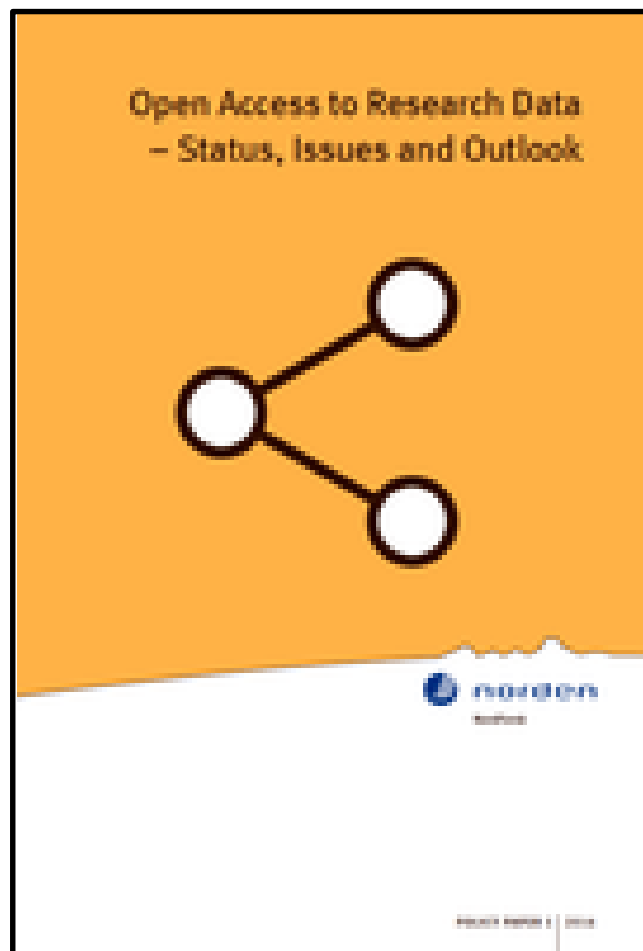
FAIR Data



- The Value of Data
 - *Nature Genetics* **volume 43**, pages 281–283 (2011)
 - 16 authors, one of them Barend Mons
- The FAIR Guiding Principles for scientific data management and stewardship
 - *Scientific Data* **volume 3**, 160018 (2016) (Nature publication)
 - 53 authors, one of them B.M.



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General findings

- Many actors are producing reports on sharing and re-use of research data. The reports have slightly different perspectives and aims, most of them include recommendations to different stakeholders. A consolidation process is needed!
- A more holistic view of research results is required among researchers, research institutions, funders and policymakers
 - management of research data and other types of research results
 - sharing of such results within communities
 - open access to such results



Other General Findings

- Fully open access to research data can often not be implemented
 - data where access is regulated by law or ethical concerns
 - data where access is regulated by contracts
 - there is often a lack of resources for opening up data
 - the incentives among researchers are often not there...
- **However, well-structured procedures and resources for maintaining and sharing data within or between (often distributed) research communities are still needed!**



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FAIR Science?

F
Findable



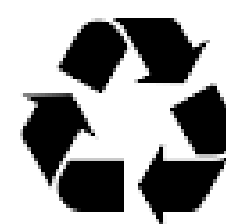
A
Accessible



I
Interoperable



R
Reusable





Analysis and issues

- The importance of structured data management, data management plans and data access policies
 - even when open access is not possible/not implemented
 - throughout the life-cycle of research projects – change of mind-set among several types of actors
 - data management plans and data access policies
- The need to acknowledge diversity
 - one-size-fits-all-solution fails!
- The need to understand the researchers perspective - barriers and enablers
 - uptake will depend on anchoring in the research communities

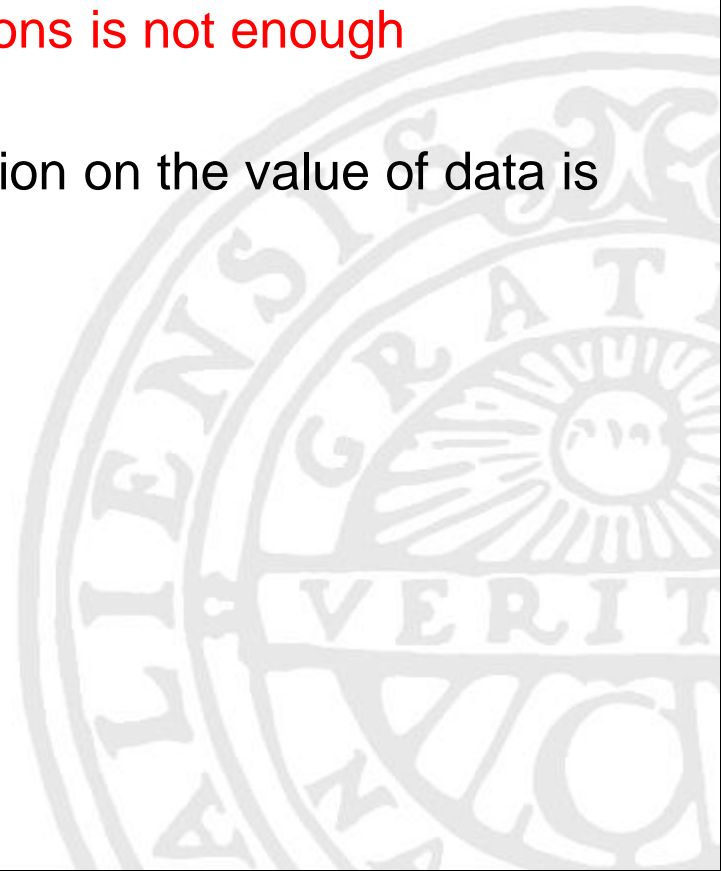


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Analysis and issues



- The need for deciding on what data to store and preserve
 - economic and practical realities matter
 - data connected to publications is not enough
 - only data is not enough
 - an evidence-based discussion on the value of data is needed





Analysis and issues

- The need to define the legal framework
 - who owns research data collections?
 - ownership might come with both opportunities and responsibilities
- The need for defining roles, mandates and interfaces
 - historically often a single actor: research group/community
 - specialised actors can increase quality and cost-effectiveness
 - c.f. the development of research libraries
 - many actors are initiating activities, sometimes overlapping



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A FAIR Europe

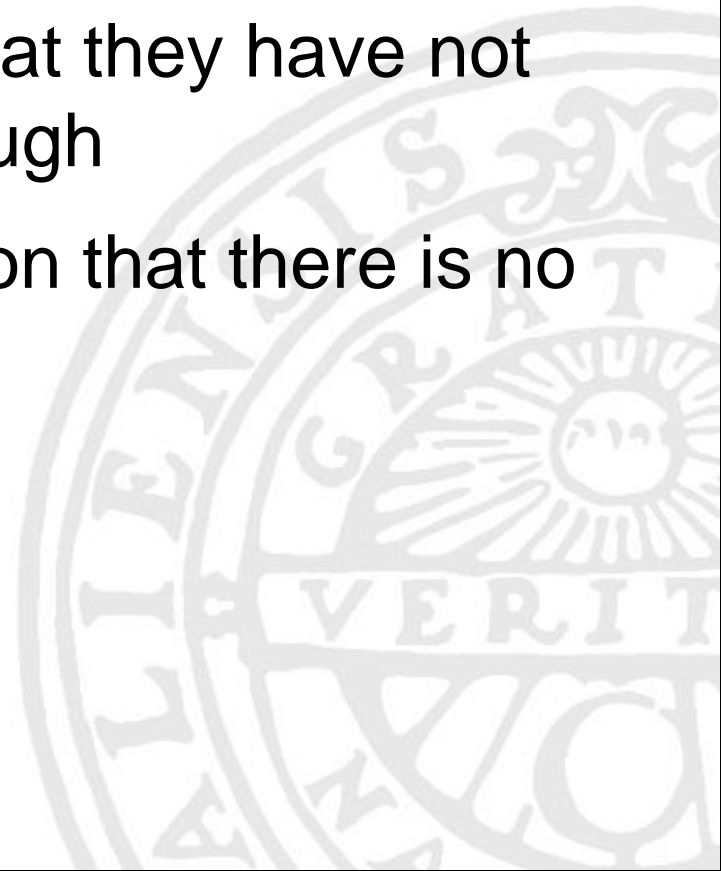
- In September 2015 Barend Mons was appointed chair of the High Level Expert Group on the European Open Science Cloud
- In August 2016 Horizon 2020 Commission expert group on Turning FAIR data into reality (E03464)
 - 1) Map best practices to turn FAIR components into reality
 - 2) Propose indicators to measure progress on each of the FAIR components
 - 3) Give input to a proposed action plan on how to make data FAIR
 - 4) Contribute to the evaluation of the Horizon 2020 DMP template and future revisions of the template, in light of harmonisation with funders across the EU, including the development of additional sector/ discipline specific guidance (if desired)
 - 5) Provide input into the issue of costing and financing of data management activities (on EU/ Member State/ international level).
- June 2018 **FAIR Data Action Plan**
Interim recommendations and actions from the European Commission Expert Group on FAIR data



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The FAIR Principles

- Guidelines, not rules and not even a blueprint for implementation
- This does not mean that they have not been well thought-through
- In fact, there is a reason that there is no implementation plan...





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FAIR (data)

To be Findable

- F1. data are assigned a globally unique and persistent identifier
- F2. data are described with rich metadata (defined by R1 below)
- F3. metadata clearly and explicitly include the identifier of the data it describes
- F4. data are registered or indexed in a searchable resource

To be Accessible

- A1. 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. data use a formal, accessible, shared, and broadly applicable language for knowledge representation.
- I2. data use vocabularies that follow FAIR principles
- I3. data include qualified references to other data

To be Reusable

- R1. data are richly described with a plurality of accurate and relevant attributes
 - R1.1. data are released with a clear and accessible data usage license
 - R1.2. data are associated with detailed provenance
 - R1.3. data meet domain-relevant community standards

<https://www.force11.org/group/fairgroup/fairprinciples>



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Top Down

- Top-down requirements:
 - European Commission
 - Other funding agencies
 - University/Institute managements





Bottom up

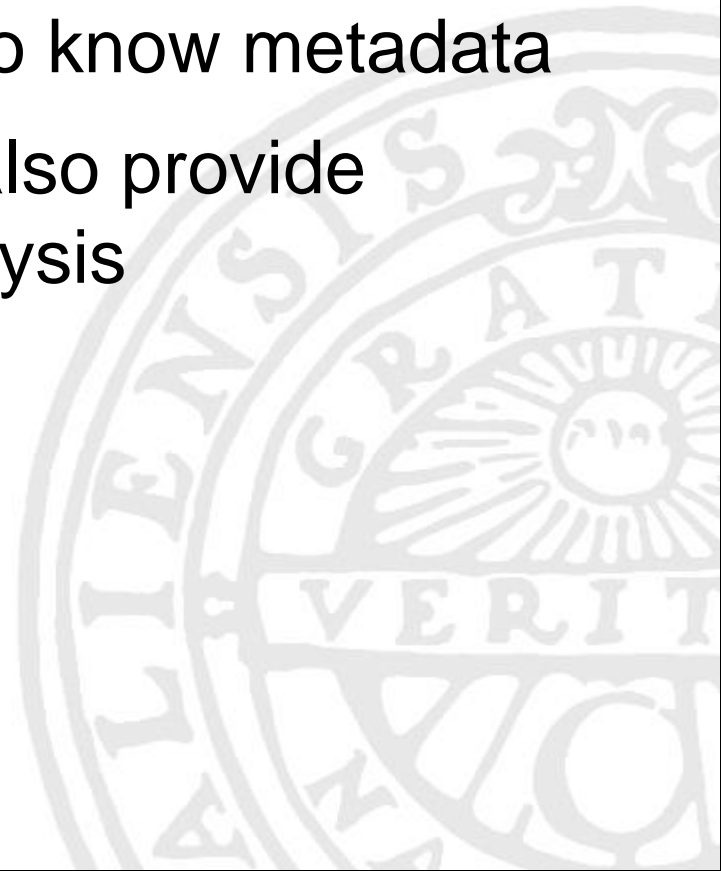
- Bottom up requirements from research communities:
 - per subdiscipline
 - per data type
- Expert scientists set an example
 - acceleration of the research process
 - more valued output (than just publications)
 - more recognition
 - more collaboration



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In the middle

- Executive organisations / providers of services in the field of data storage and management
- Knowledge experts who know metadata
- Data centers that can also provide resources for data analysis





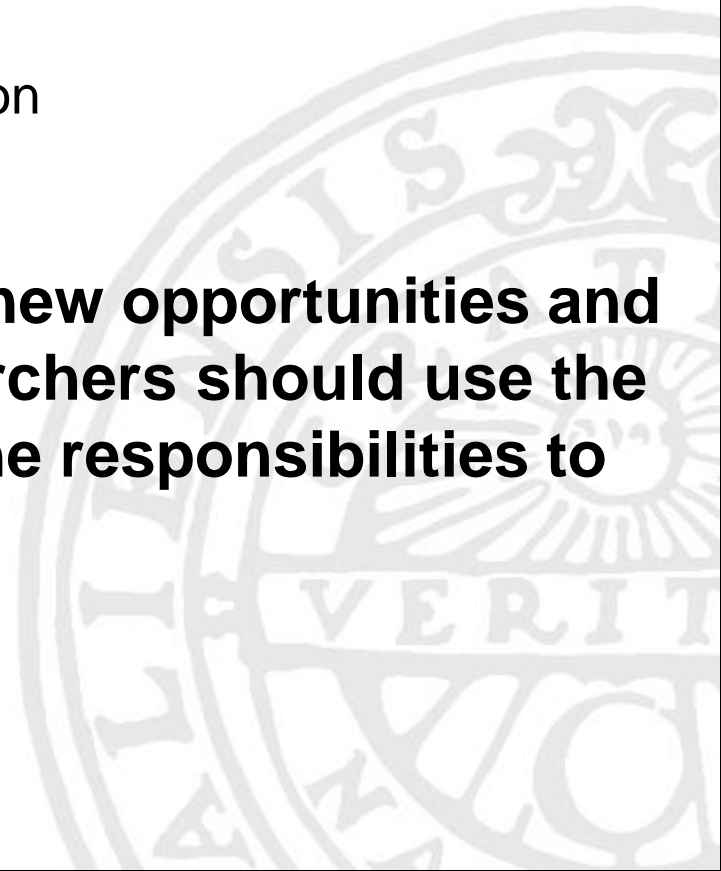
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Thank you!

