

NMR Infrastructures in Europe

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European Research Policy

European Added Value



- to close a perceived 'technology gap' with USA and Japan
- to promote European competitiveness



1984 - 1° EU Framework Programme



2000 - European Research Area (ERA)



2007 - Green Paper 're-launched' the ERA



- Exchange of competent researchers
- **World-class research infrastructures**
- Excellent research institutions
- Effective knowledge-sharing
- Well-coordinated research programmes and priorities
- Opening of the European Research Area to the world

- Creation of an 'internal market' for research – an area of free movement of knowledge, researchers and technology, to contribute to increase **cooperation**, to stimulate **competition** and to provide a **better allocation of resources**
- Improved **co-ordination** of national research activities and policies
- Development of a **European research policy** addressing a wide range of aspects, from funding of the research activities to definition of priorities.

Within the evolution of the EU policy, support for User Access to **Research Infrastructures (RIs)** has evolved: from the initial scheme for Individual National Facilities to the Integrated Infrastructures Initiatives (I3) starting from FP6 (2002-2006)

The I3 scheme

"Strengthening the foundations of ERA"

To encourage and support initiatives undertaken by several countries for RIs, in areas of common strategic interest, and to develop synergy between their activities.

- **Joint Research Activities** mainly for technology advancements
- **Transnational Access** to foster research optimizing European resources
- **Networking** the scientific and societal communities for addressing the European Grand challenges

Transnational Access

Collective and coordinated approach for the **provision of access** in a coherent manner, so as to **improve the overall services offered to the research community**.

It is crucial that the infrastructures also provide adequate scientific, technical and logistic **support to users**, particularly first-time and unexperienced ones.

Research Infrastructures: crucial pillars of the ERA

- **optimize the use of resources** for increasingly growing facilities
- **overcome fragmented centers investments**
- **join forces** to reach the critical mass necessary for addressing the European big pressing societal challenges
- **Are strategic** for increasing competitiveness



High Return on Investment

2002: European governments set up ESFRI, the European Strategy Forum for Research Infrastructures, for developing the European roadmap for the next generation of large, European Research Infrastructures



Facilities, resources or services of a unique nature that have been identified as strategic to conduct top-level activities in all possible fields of research at pan-European level.



Landscape analyses: to identify gaps

ESFRI Roadmaps

ESFRI published the **first Roadmap** on large-scale Research Infrastructures in 2006 (updates in 2008, 2010 and 2016). ESFRI selects and fosters projects contributing to reinforce the **European landscape** of RIs of pan-European dimension and to **foster innovation in all research areas**.

ESFRI also encourages the development of **national roadmaps** and of dedicated **national budgets** for the construction of Research Infrastructures with a European/international dimension.



ESFRI RIs have a common European legal framework for their activities.

Member States commit to fund the construction, set up, and maintenance of the new Infrastructures, either as single site or distributed Infrastructures.

EC supports the **Preparatory** (and for some RIs the **Implementation**) **Phase** and funds **Design Studies** in specific research areas recognised as gaps in European landscape by ESFRI

Global Research Infrastructures

2007: The G8+O5 Science Advisers recognized that Global Research Infrastructures can have a strong potential for cooperation and are the only way to address very large scale research challenges.

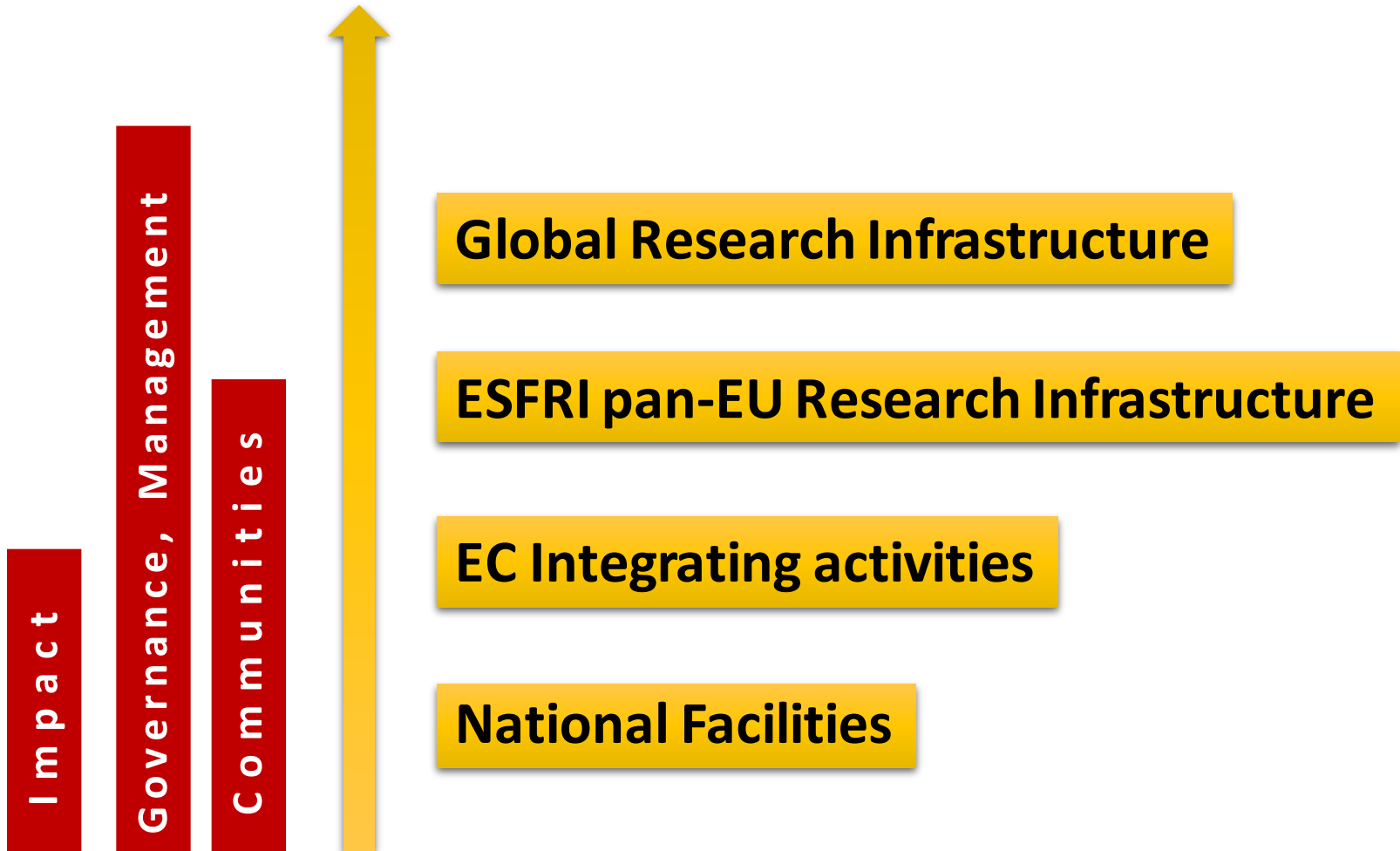


European Expert Group on Cost Control and Management Issues of Global Research Infrastructures



2010: Report of the European Expert Group on Cost Control and Management Issues of Global Research Infrastructures –12 key recommendations

Infrastructures



Funding policy in Europe

Construction and equipment acquisition and its upgrade for RIs are funded **exclusively at National level** (National government, funding agencies, regional government, private institutions...).

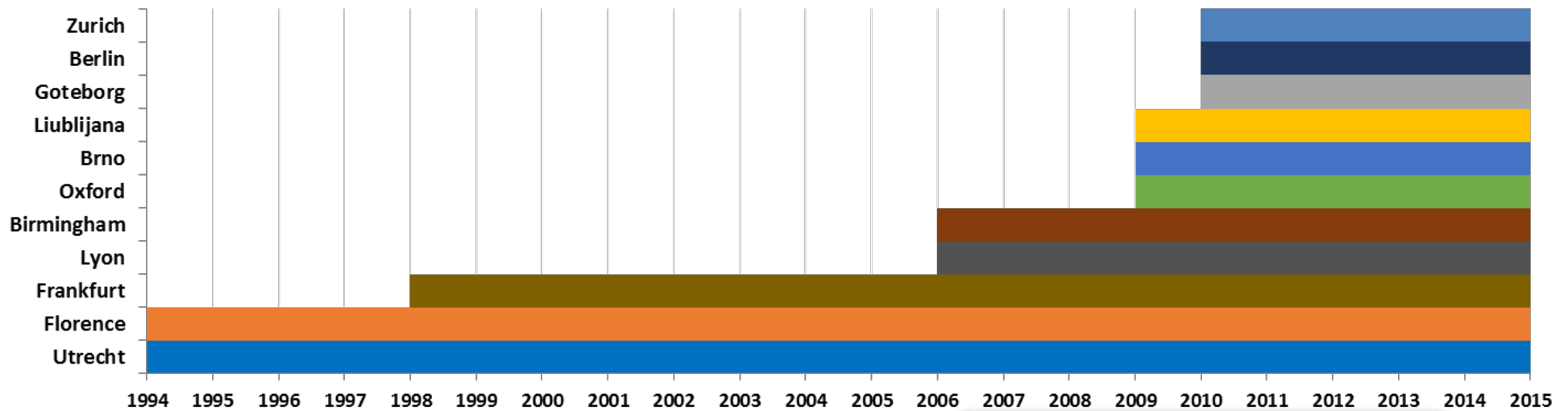
Few **selected research infrastructures**, with a pan-European governance and legal structure, receive EC support for the preparation, implementation, long-term sustainability and efficient operation.

Access to RIs by scientists can be (based on competitive calls) supported by **EC funds** as a contribution for travel and subsistence costs.

Running costs - routine maintenance, technical staff, consumables – are covered by **a variable combination of national and European sources**.

History and development of Biological NMR access in Europe

NMR infrastructures started offering Transnational Access since 1994 under FP3



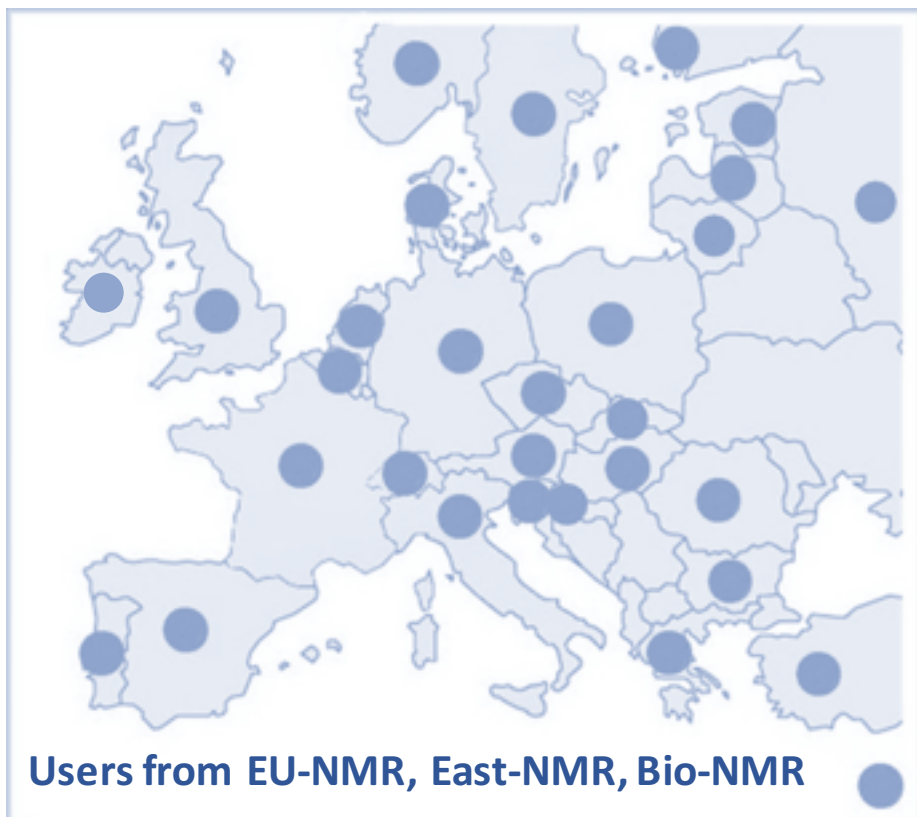
Infrastructures funded at National level



Scientific community which needs top level instrumentation and unique expertise

EC supports TA costs, reimbursing Access Unit Fees calculated by each facility in terms of consumable, routine maintenance and supporting staff (scientific & technical). Maintenance and capital investment are NOT covered.

Users of Biological NMR access in Europe



During about 20 years of service, a cluster of 11 National RIs in “Biological NMR” offered well above 10,000 days of access and the expertise to more than 500 projects and nearly 1000 scientists, mostly from European countries. Bio-NMR (2010-2014) provided more that 5600 days of access.

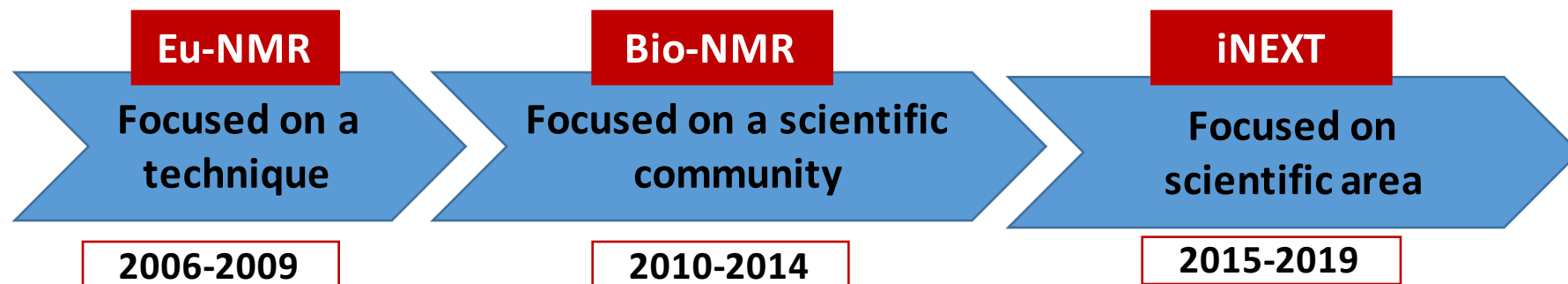
NMR-base European RIs Projects: bottom-up aggregation, providing a common management and common technical standardization

Projects are selected through **peer-reviewed system by an external panel**

User groups **feedback for both the quality of service provision and their requests for addressing new/emerging needs is fundamental for service improvement**

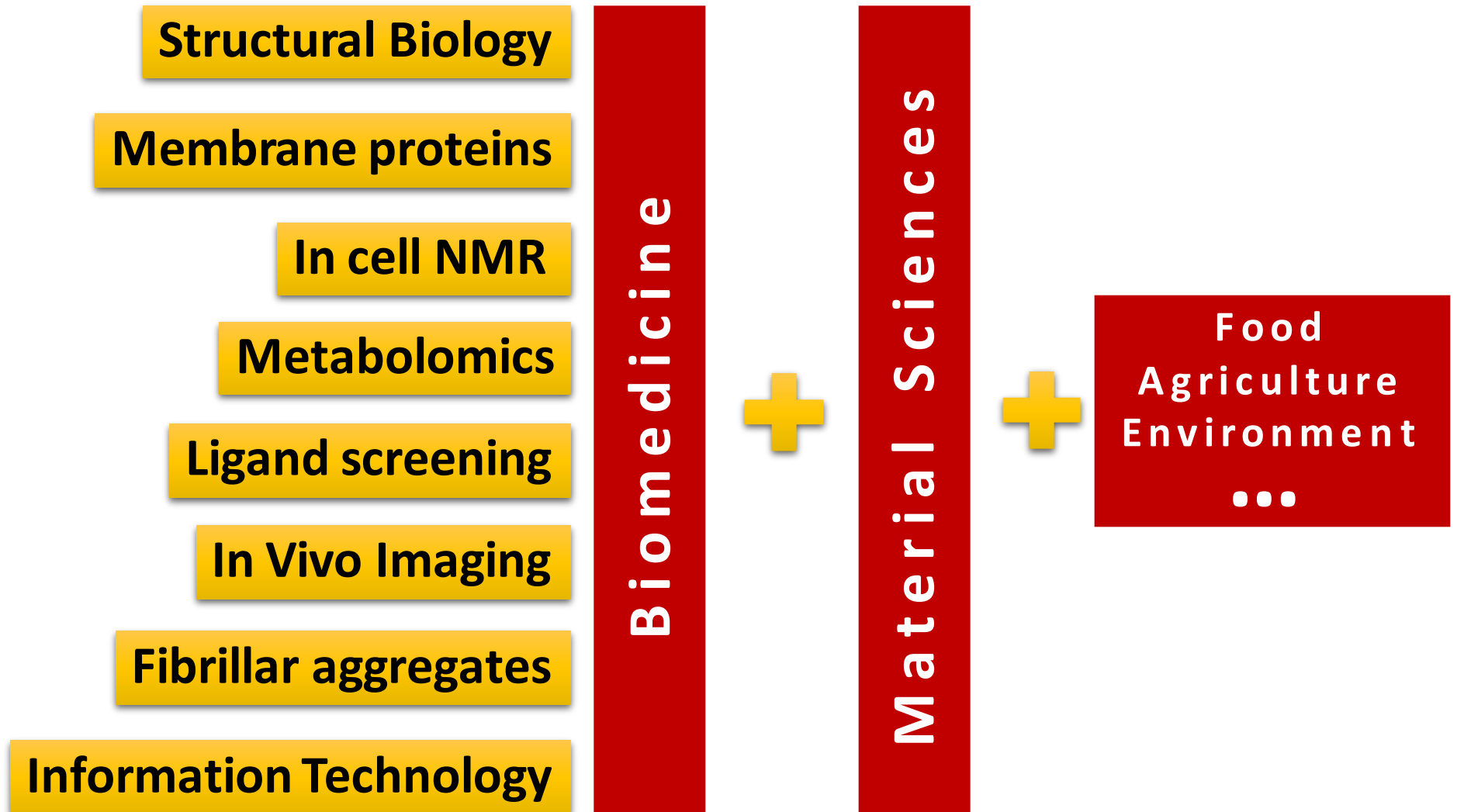
EC Support Policy & Users communities evolution

In the last 10 years the EC policy towards Ris has been evolving: while in the initial Frameworks the projects were **bottom up**, since 2010 the calls are **top-down**, with well defined areas of applications.



Consequently the community of users evolved. The new approach directly reflects in a **lower (if not null!) NMR knowledge by the users**, and the consequent significant increase of request of both support and expertise from the Ris staff.

NMR technology has the potentialities for high scientific and societal impact





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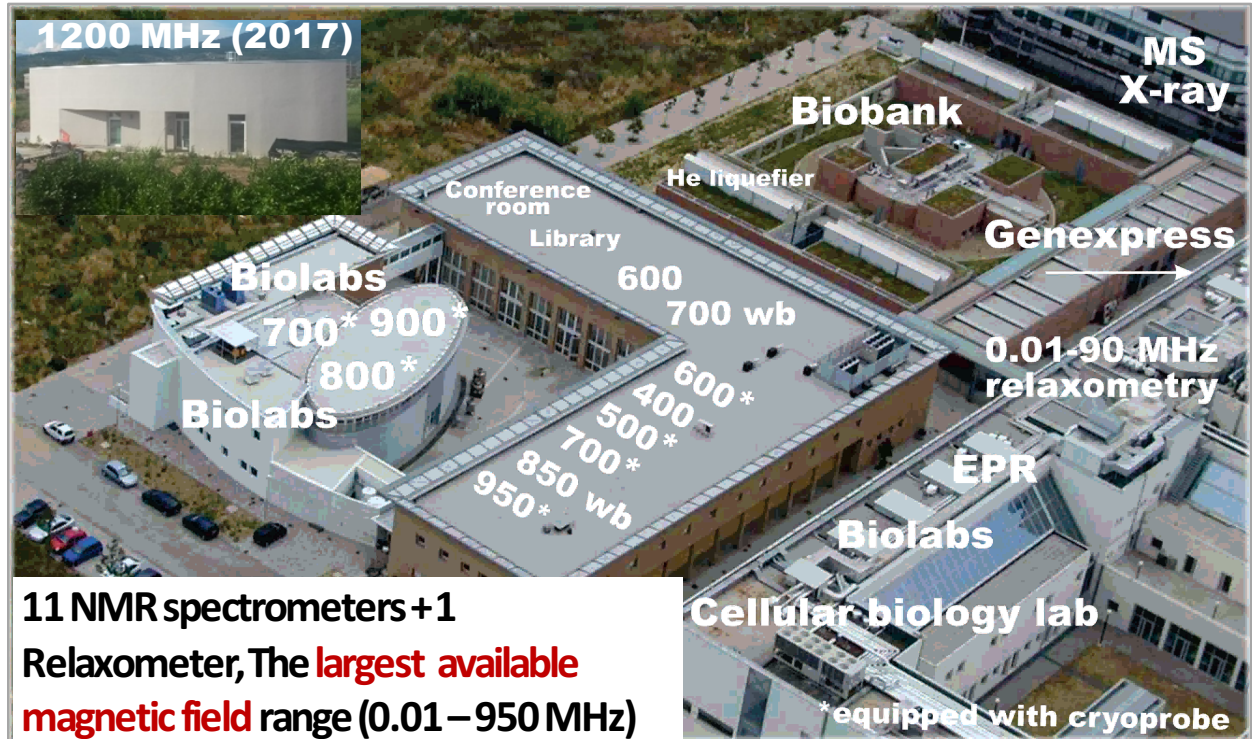
A center for research, knowledge transfer, and higher education of the University of Florence

CERM is a unique Research Infrastructure for Structural Cellular Biology and NMR in the Life Sciences

NMR technology applies to different fields of Research: Health, Chemistry, Material Sciences, Agrifood.
At CERM, competences and technologies comprise:

- Structural Biology
- Molecular Biology
- Cellular Biology
- Metabolomics
- Biomaterials
- Bioinformatics
- Computational Biology

- > 3500 m²
- Around 70 people among researchers, dedicated technical and administrative staff
- Access provision to external users since 1994



- Success story: **Structure-based design of a Vaccine against Meningococcus B which elicits complete protective immunity**
- Success story: **Studies of enzymes entrapped in bio-inspired silica for heterogeneous catalysis.**

The Italian Core Center of ESFRI Instruct



Impact of CERM RI

Periodically, EC and National and Regional Governments assess the **socio-economic impact** of Ris.

In **Italy** a survey was carried out in 2014 in the frame of the definition of the Italian Roadmap to Ris.

It emerged that access to the services of CERM by various Italian companies, including SMEs, stimulated the development of new products with an **employment impact** of circa 250 new employees (at various levels). In addition, CERM activities lead to the creation of spin-off companies and to patent registration.

UHF NMR in USA – Some questions

How large is the NMR user community?

How large are the potential user communities of UHF NMR?

Will the RIs be limited to UHF NMR?

Which model of RI to adopt: single site or distributed?

Which governance?

Which areas can benefit from UHF NMR?

Which criteria will be adopted for user selection?

The service provision will be free of charge or against a fee?

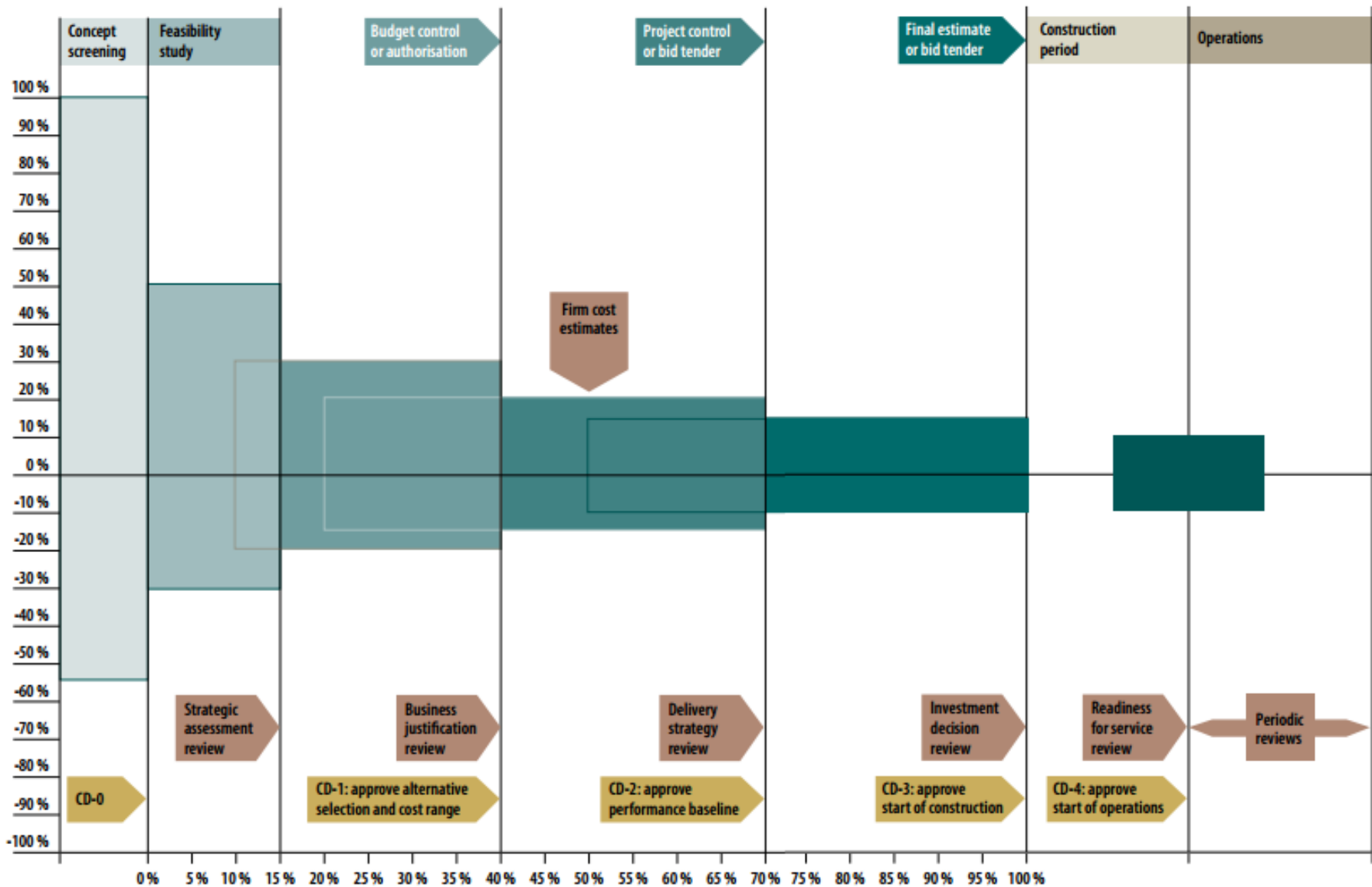
Provision of service to Industrial user?

The service provision will be through user visits, remote or both?

THANKS FOR YOUR ATTENTION!

Infrastructures design

Figure 1: Critical stages of project design and realisation



- References:
- Relevant References are: UK OGC gateway review process: http://www.ogc.gov.uk/what_is_ogc_gateway_review.asp
 - DOE requirements for Project Management, DOE Order 413.3B
 - Program and Project Management for the Acquisition of Capital Assets (Approved 11-29-2010) http://www.directives.doe.gov/directives/current-directives/413.3-BOrder-bf-at_download/file
 - AACEI Cost Estimating Classification Guidance: <http://www.aacei.org/technical/rp.shtml#17R-97>

Illustrative example of cost evolution and approval stages following design evolution for a generic project.

In this graph, CD-0 to CD-4 refer to the US DOE Critical Decision Process, while the arrows above refer to the equivalent UK OGC Gateway Review Process. The division in critical stages (top of the graph) has been carried out following the AACEI Cost Estimating Classification Guidance.

Some key recommendations

- 3 The governance, management, and supervisory structures must have clearly defined and differentiated authority and responsibilities. They must be able to immediately impact the project and to quickly resolve conflicts.
- 4 A clear and structured organisation is necessary, with direct, transparent reporting lines and the full use of management and project control tools.
- 5 Independent scientific and technical evaluation and external professional auditing of financial and management performance must be carried out and acted upon.
- 6 To harmonise expectations and reduce risk, a standardised, stepwise, and phased approach to the preparation and approval of an RI project is necessary.

••••
7 The management must be chosen on the basis of clearly specified competencies, including project management and technical skills. Within its remit, management at all levels must be given full independence, responsibility and accountability for its specific budget.

••••
8 Up-to-date, bottom-up planning, control and reporting systems based on work breakdown structures and financial management tools covering technical, financial and schedule issues, are mandatory. Management at all levels must have full responsibility and be accountable for their specific budget.

••••
9 Best-practice systems for project control and risk management have to be fully embedded in the project management, covering technical, financial and schedule issues, together with mitigating measures in case of deviations.

Potential users of Biological NMR in Europe

