The European RI/CF in ERA: An Introduction

LEVEL EQF6 ■ EQF7 □ EQF8 □

ECTS	3
LA Aims	The course aims at introducing the students to the topic of RIs/CFs, both from the conceptual side and from the practical (i.e., managerial) perspective. After an introductory unit on the concept and general issues of RI/CF and on the socio-economic impact of RIs/CFs, three specific parts of the course will address specificities and management problems for three areas of research: Social Sciences and Humanities, Physical Sciences and Engineering and Life Sciences. In each part, the theoretical content is illustrated through references to existing RI/CF and cases studies.
Learning Goals	Upon completion of this LA students will have demonstrated a basic knowledge of what a research infrastructure (RI) and a core facility (CF) are. In particular, they are expected to have learnt: (a) the elements of common definitions of RIs/CFs; (b) how RIs/CFs support methods and scientific communities; (c) the difficulties and challenges behind different types of RIs. (d) the taxonomy of socio-economic benefits and costs associated to RI/CF, and real-world examples of applications of such taxonomy (e) the CBA model as applied to Ris/CFs (f) the measurement issues associated to various types of benefits and costs; (g) the definition and use of the NPV test for evaluation of the socio-economic impact of Ris/CFs.
Specific Learning Outcomes (LOs):	The following are the main LOs expected for this course: ● The learner is able to explain the fundamentals of the concept of RI/CF; ● The learner can explain in detail the Pros & Cons of the different types of RI: I. Distributed research infrastructure II. Single-sited research infrastructure III. Virtual infrastructure. ● The student has a basic knowledge of what is meant for socio-economic impact of RI/CF. In particular, they are able I. to list and discuss the various types of benefits and costs associated to RIs/CFs; II. to classify benefits and costs associated to specific RIs/CFs using the proposed taxonomy III. to identify some difficulties and challenges in the measurement of benefits and costs associates to RIs./CFs

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	• Given a specific proposal, the learner can describe the steps to get on the ESFRI Roadmap process • In regard to the three ERC sectors, the learner is able to define, at a general level, the difference in relation to the following aspects: I. The goal and type of RI II. The approach used to collect FAIR data III. The specific Methods and Tools utilized IV. The Networks in which the RI is included V. The Impact of Research VI. The Society engagement

Main characteristics of the course

Format	Synchronous Online Course Delivery
Pedagogical methods/tools:	Lectures and group practicals
Assessment methods:	Formative assessment - making use of the actual work that students produce in the classroom and/or practical test such as challenges; online tests Summative assessment – Online test with close questions
Evaluation:	Preparation on a number of topics covered in the course, ability to make independent choices of critical analysis, mastery of specific terminology. with questions, all answers have to be correct
LA Leader	**UniBo**
LA Participants	**UniParis1, UMIL**

Course Description

The course does not require any specific knowledge background.
The course is organized in 5 teaching units consisting in lectures and group practicals with case study:

UNIT	TITLE	TEACHER
1	Introduction to RI/CF	Antonino Rotolo - UniBo
2	The socio-economic impacts of RI/CF	Lorenzo Zirulia - UMIL
3	RI/CF for Social Sciences and Humanities	Silvye Jolly – UniParis1

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4	RI/CF for Physical Sciences and Engineering	Daniele Bonaccorsi - UniBo
5	RI/CF for Life Sciences	Gerardo D'Errico -UMIL

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Unit 1: Introduction to RI/CF

Learning Goal	Learning model	Time
What are a Research Infrastructure and a Core Facility? • *Describe what a Research Infrastructure is.* • *Be aware of different perspectives on the definition of research infrastructures*	Lecture: Antonino Rotolo - UniBo	25 min
Interoperability • *Describe what is data for research purposes, and identify your own data* • *Describe Standards, explain their importance and how researchers make use of them.*	Lecture: Antonino Rotolo - UniBo	25 min
Breakout Rooms - Students are invited to discuss the following topic: • *How do you see future RI/CF in your university discipline? Can you give examples of how RI/CF are important in your curriculum?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min
Methods and Tools • *Understand the kinds of methods research infrastructures can facilitate* • *Be aware of the kinds of tools offered by research infrastructures, where to find them, and the benefits they can bring to research*	Lecture: Antonino Rotolo - UniBo	25 min
Networks • *Know what networks exist within the research infrastructure ecosystems*	Lecture: Antonino Rotolo - UniBo	25 min
Breakout Rooms - Students are invited to discuss the following topic: • *What tools do you expect from RI/CF based on your university experience?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min
Research Impact	Lecture: Antonino Rotolo - UniBo	25 min

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• *Give a definition of impact and know how it can be measured for an individual researcher* • *Understand the mutual beneficial relationship between researchers and research infrastructures*		
Critiques and Issues • *Be aware of some of the debates and critiques surrounding research infrastructure*	Lecture: Antonino Rotolo - UniBo	25 min
Breakout Rooms - Students are invited to discuss the following topic: • *How do you see research in 30 years based on what we have learned so far?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min

Teaching Materials

5 minutes video pills presenting RI and CF, all the PowerPoint material used for the lecture will be made available to the students at the dedicated website
https://drive.google.com/drive/u/0/folders/1ZJL0YCfR_GQFsrd-IGAbE-G505BzDAZ- (the folder will be populated during the piloting of the courses)

Bibliography/Sitography/Videos

http://training.parthenos-project.eu/sample-page/intro-to-ri/
https://campus.dariah.eu/curriculum/the-parthenos-complete-guide-to-research-infrastructures

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Unit 2: The socio-economic impacts of RI/CF

Learning Goal	Learning model	Time
The first part aims to introduce students with the topic of socio-economic impact of RI/CF, with a focus on the *conceptual* foundations.	the theoretical content is illustrated through references to existing RI/CF and cases studies of socio-economic impact analysis	**2 hours**
The socio-economic impacts of RI/CF: introductory notes • *The cost and benefits of science* • *Paradigms: little science, big science, RI/CF*	Lecture: Lorenzo Zirulia - UMIL	30 min
The socio-economic impact of RI/CF: the cost benefit analysis view • *A taxonomy of socio-economic benefits and costs associated to RI/CF* • *Illustrating the taxonomy through examples of RI/CF* • *Preliminary conclusions*	Lecture: Lorenzo Zirulia - UMIL	90 min
The second part aims to provide a more detailed account of the cost-benefit *model* as applied to RI/CF, with a focus of the measurement issues of socio-economic benefits and costs.	the theoretical content is illustrated through references to existing RI/CF and cases studies of socio-economic impact analysis	**2 hours**
The socio-economic impact of RI/CF: the cost benefit analysis (CBA) model • *The CBA model for RI/CF: definition* • *The basic ingredients: use benefits, non-use benefits and costs*	Lecture: Lorenzo Zirulia - UMIL	30 min
The cost benefit analysis (CBA) model for RI/CF: the cost side • *The cost side: measurement issues* • *The LHC case*	Lecture: Lorenzo Zirulia - UMIL	15 min
The cost benefit analysis (CBA) model for RI/CF: the benefit side • *The benefit side: scientific publications* • *The benefit side: human capital*	Lecture: Lorenzo Zirulia - UMIL	60 min

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• *The benefit side: technological impact on firms* • *The benefit side: production of good and services* • *The benefit side: RI/CF as cultural goods*		
Introducing the Net Present Value (NPV) test • *The NPV test: definition* • *The NPV test: use and interpretation*	Lecture: Lorenzo Zirulia - UMIL	15 min

The present Unit has been built from a module of the course "European Research and Innovation Policies" (Prof. Massimo Florio; UMIL), offered at the EQF7 level.
In line with the target audience (EQF6), the emphasis is NOT on the purely technical aspects of cost-benefit analysis but more on the conceptual dimension of benefits and costs of RIs.

Teaching Materials
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Bibliography/Sitography/Videos
Florio, M. (2019). *Investing in science: Social cost-benefit analysis of research infrastructures*. Mit Press (Introduction and Chapter 1).
Interested students may be referred to the other chapter of Florio's book for more detailed discussion of the content of this Unit, including the references to original sources of cases studies/examples.

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Unit 3: RI/CF for SSH

Learning Goal	Learning model	Time
The first part aims to introduce students with the topic of RI/CF for SSH in the conceptual side. The second part includes three case studies to familiarize students with the concepts seen previously through practical perspectives from guest speakers.		**2 hours**
Introduction to SSH • *Characteristics of Social Sciences, and Humanities* • *Description of the list of disciplines adapted from the UNESCO International Standard Classification of Education (ISCED 2011)*	Lecture: Sylvie JOLLY (UniParis1) Video watching	30 min
Research in SSH • *Values and societal challenges* • *Data Openness and FAIRness* • *RI/CF for SSH: types and usefulness*	Lecture: Sylvie JOLLY (UniParis1) Video watching	30 min
SSH RI and the EU strategy • *Definition of ERA* • *ESFRI SCI WG, Roadmap, Projects and Landmarks*	Lecture: Sylvie JOLLY (UniParis1) Video watching	60 min
The second part includes three case studies to familiarize students with the concepts seen previously through practical perspectives from guest speakers.		**2 hours**
Case Study 1 • *OPERAS RI and the GoTriple platform*	Case analysis and discussion by a Guest Speaker (TBC) *Suzanne Dumouchel* *Partnership coordinator of OPERAS RI* *Director of EOSC Association* *Head of European Cooperation at DDOR (CNRS)* *https://cnrs.academia.edu/SuzanneDumouchel/CurriculumVitae*	60 min

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Case Study 2 • *University of Paris 1 Panthéon-Sorbonne RI/CF ecosystem*	Case analysis and discussion by *Sylvie JOLLY*	30 min
Case study 3 • *Una Europa/UNA.Resin: a R&I ecosystem on Cultural Heritage under construction*	Case analysis and discussion by a Guest Speaker *Ekaterina Smoliakova* *Project Manager UNA.Resin*	30 min

Teaching Materials

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Bibliography/Sitography/Videos

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https://roadtofair.hypotheses.org/327
- ESFRI Glossary
https://www.esfri.eu/glossary
- ESFRI Roadmap
https://www.esfri.eu/esfri-roadmap
- ESFRI Roadmap 2021 | Landscape Analysis | Social & Cultural Innovation domain
https://roadmap2021.esfri.eu/landscape-analysis/section-1/social-cultural-innovation/
- OPERAS RI
https://operas-eu.org/
- GOTriple Platform
https://gotriple.eu/
- An Animated Introduction to Social Science
https://www.youtube.com/watch?v=DSIdaTSG2Gg&t=237s
- A Day in the Life of a Data Archivist
https://www.youtube.com/watch?v=7gvvQ5i7B34&list=PLSzjTR7L6XhGb8h3SMG3e8-HOdnQ13PyW&index=10
- Make Your Research Data F.A.I.R
https://www.youtube.com/watch?v=kIwHJ6DkFdc&list=PLSzjTR7L6XhGb8h3SMG3e8-HOdnQ13PyW&index=12
- RIs addressing challenges: Culture | 1st ESFRI Stakeholders Forum Meetup | 15.9.22 | Brussels
https://www.youtube.com/watch?v=ktvFCGd7J14
- CESSDA Presentation
https://www.youtube.com/watch?v=1EyS4u-anVo
- GoTriple promotional video October 2021
https://www.youtube.com/watch?v=4HCNt1nZ2I0
- Discovery (TRIPLE Video Tutorial Series)
https://www.youtube.com/watch?v=PHv2NLYQQbs

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Unit 4: RI/CF for Physical Sciences and Engineering

Learning Goal	Learning model	Time
What are a Research Infrastructure and a Core Facility? Specific aspects in Physical Sciences and Engineering • *Describe what a Research Infrastructure is in Physical Sciences and Engineering.* • *Be aware of different perspectives on the definition of research infrastructures in Physical Sciences and Engineering* • *Gaps, Challenges and Future Needs*	Lecture: Daniele Bonacorsi - UniBo	30 min
Breakout Rooms - Students are invited to discuss the following topic: • *What tools do you expect from the RI/CF discussed so far based on your university experience?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min
Case Study 1 • The Open Physics Hub at the Physics and Astronomy Department	Lecture: Daniele Bonacorsi - UniBo	30 min
Breakout Rooms - Students are invited to discuss the following topic: • *What experiment or scientific activity would you plan for Open Physics Hub?* • *How do you design the governance of it?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min
Case Study 2 • *National Research Centre in High-Performance Computing, Big Data and Quantum Computing, Bologna, Italy*	Lecture: Daniele Bonacorsi - UniBo	30 min
Breakout Rooms - Students are invited to discuss the following topic: • *What experiment or scientific activity would you plan for Open Physics Hub?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min

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• *How do you design the governance of it?*		
Case Study 3 • *CERN, Geneva, Switzerland*	Lecture: Daniele Bonacorsi - UniBo	30 min
Breakout Rooms - Students are invited to discuss the following topic: • *What experiment or scientific activity would you plan for CERN?* • *How do you design the governance of it?*	Breakout rooms: students in smaller sub-rooms or sub-groups and feedback from a rapporteur	30 min

Teaching Materials

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Bibliography/Sitography/Videos

https://roadmap2021.esfri.eu/landscape-analysis/section-1/physical-sciences-engineering/
https://site.unibo.it/openphysicshub/en
https://www.supercomputing-icsc.it/en/icsc-home/
https://www.home.cern

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Unit 5: RI/CF for Life Sciences

The Unit aims at providing a historical overview focusing on the design, development and management of a core microscopy facility for users with different interests in Life Sciences and of how the facility's development process was led. How the work organisation and tasks of the lab manager and technical staff are carried out, and how the financial management of a core facility is run.

Learning Goal	Learning model	Time
How to build a bio-imaging facility. ● *The student know the reasons that led to the creation of a facility of this type which was raised mainly from the need of researchers involved in the study of "life sciences" to be able to access the use of state-of-the-art instruments, that would be difficult to be purchased by single labs.* ● *The student will also acquire technical knowledge about the different types of instrumentation made available and will understand the reasons for the need to have different types of microscopes.*	Lecture: Gerardo D'Errico (UMIL)	90 min
Learn how to organise the work of the technicians and the management of the users. ● *The student will be educated about the different types of services offered and how to manage internal users (from the university field) with different technical and scientific backgrounds as well as in the case of private companies. It will be taught in which situations the service may concern an autonomous use of the devices compared to when instead it will be necessary to take advantage of technical support.*	Lecture: Gerardo D'Errico (UMIL)	90 min
Learn how to financially manage the facility ● *The student will learn the management model adopted for credit recovery, the purchase of new equipment as well as the need to allocate*	Lecture: Gerardo D'Errico (UMIL)	60 min

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resources for its maintenance will be presented.		

Teaching Materials

The teaching does not have a dedicated book and all the material will be provided by teachers. All the PowerPoint material used for the lecture will be made available to the students at the dedicated website https://drive.google.com/drive/u/0/folders/1ZJL0YCfR_GQFsrd-IGAbE-G505BzDAZ- (the folder will be populated during the piloting of the courses)

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