EBRAINS Responsible Research and Innovation (RRI) Capacity Development Plan (D9.1 – SGA3)

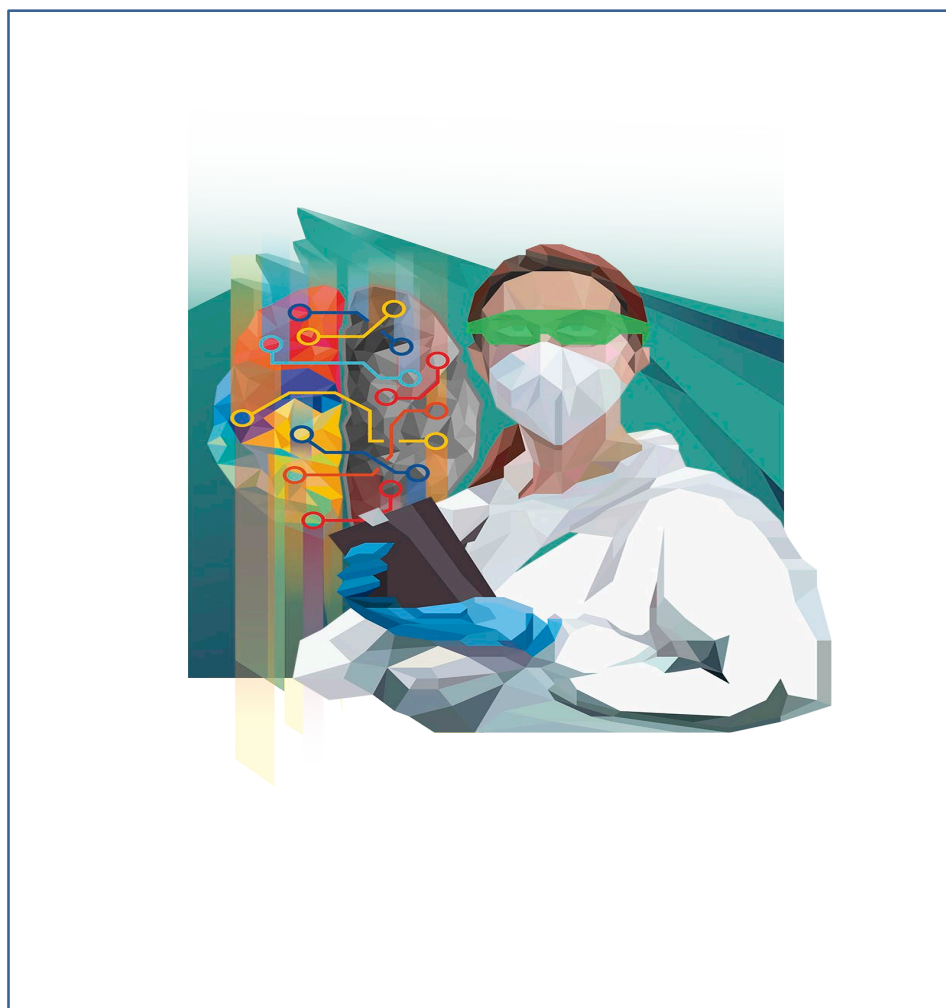**Figure 1: Thinking ethics and society through research and innovation**

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Description in GA:	In order to be able to implement the eventual RRI plan, the personnel of the HBP and EBRAINS will need to develop the capacity to work with and implement these policies. This delivery contains a plan detailing which capacities are needed and how they can be achieved.
Abstract:	The report contains the first draft of a training plan on responsible research and innovation for the Human Brain Project and EBRAINS.
Keywords:	RRI, Neuroethics, data, ethics, governance, training, education, responsible innovation
Target Users/Readers:	Consortium members, EBRAINS Internal and external Users, EBRAINS Data Providers, EBRAINS Infrastructure Providers, EBRAINS and HBP Management and Leaders.

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1. Introduction

The framework of Responsible Research and Innovation (RRI) offers a number of insights and practical ways to work with ethical and societal issues, along with gender and diversity, related to research and innovation. This report describes the different components and capacities needed to implement and use different elements of the framework. The report also contains a plan that details for training activities to develop such capacities in the HBP and the future EBRAINS infrastructure.

In this report, we first give a brief introduction to the RRI framework, and describe what 'RRI capacities' could be. By capacity we mean the knowledge, experience, skills needed by EBRAINS users, data and infrastructure providers, as well as EBRAINS leadership and management when working with the RRI approach, not only in theory but also in practice.

Next, we provide short descriptions of the capacity training and building activities planned within the work of HBP's Work Package 9 (WP9) on implementation of RRI, and its associated Tasks across the HBP. The descriptions of activities include explanation of the tools & methods to be used, potential participants and selection criteria, and expected outcome(s).

Finally, we present a tentative time line for the capacity training development, show possible synergies with other training and education activities in the HBP, and reflect on the legacy of the RRI in EBRAINS.

2.   Responsible Research and Innovation in the HBP

2.1   Responsible research and innovation

The HBP has incorporated work on responsible research and innovation (RRI) since its inception. This was partly a consequence of the Horizon 2020 principle that RRI was to be a part of all research and innovation activities. More importantly, the HBP, due to its subject area covering animal and human neuroscience and the link between neuroscience and technology development, clearly requires broad reflection on its social and ethical implications.

The capacity development plan for the HBP and EBRAINS builds on seven years of extensive and intensive work developing and implementing responsible research and innovation in the HBP during SGA1 and SGA2. During this period, the Ethics & Society (E&S) team of the HBP explored the ethical and societal implications of HBP research, in particular the work done by Stilgoe *et al.* (2013) and developed further for the use of the UK Engineering and Physical Sciences Research Council (Owen, 2014). According to this view of RRI, this includes anticipation of possible consequences, reflection of all aspects of research and innovation and engagement of stakeholders, all of which needs to be reflected on in action (i.e. the AREA framework). Topics ranged from data protection and privacy to dual use, AI, community building and consciousness. The team engaged both HBP researchers and external experts and publics to identify relevant issues, raise awareness, and to promote deliberation on joint solutions. These activities took place through workshops, seminars, public dialogue meetings, working groups, educational activities, the ethics rapporteur network and formal compliance management tasks. The E&S team published three joint opinions based on its work, and numerous peer-reviewed articles, reports, newsletters, online lectures and introduction videos.

These activities and outcomes of the HBP Ethics and Society group are an essential building block in EBRAINS: *"EBRAINS builds on the world-leading work on responsible research and innovation conducted during the HBP, exemplary for its integration of legal compliance, ethical awareness, and strong European values into research and research infrastructures. The common understanding of ethical standards for neuroscience developed in the HBP is based on an ongoing global discussion on the feasibility of such standards. The aim is to propagate them globally by demanding that EBRAINS users have a minimum level of ethical user practices, independent of national/cultural context."* (HBP ESFRI proposal, p. 34)

The capacity development plan proposed here takes the legacy of Ethics and Society work as its starting point. It outlines a programme for systematically training HBP researchers and EBRAINS data and infrastructure providers, together with EBRAINS leadership and management, to develop the necessary capacities for identifying and proactively managing the ethical and societal issues raised by the research. The programme combines attention to content (what) and process (how).

The RRI work of the HBP was furthermore informed by the EC's view of RRI, notably the six pillars or keys of RRI (European Commission, 2013). Despite some differences between these concepts of RRI, sometimes discussed in terms of responsible innovation versus responsible research and innovation (Owen and Pansera, 2019), we believe that they are fundamentally consistent and express the idea of providing research and innovation governance structures that aim to incorporate stakeholder views into research and bring science and society more closely together. The EC's Rome Declaration (2014) holds: "Responsible Research and Innovation (RRI) is the ongoing process of aligning research and innovation to the values, needs and expectations of society." This is consistent with von Schomberg's (2013, p. 63) definition of RRI as "a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)."

The former SP12 and current RRI team of the HBP has published extensively on the various aspects of RRI to explain conceptual basics and empirical and practical work based on it. The final remark that is required to clarify the scope of the present Deliverable is that HBP RRI, while informed by the EC's pillars of RRI, does not cover all of them in equal measure. This is caused by the structure

of the Project, where several of the RRI activities are dealt with in separate structures. This is notably true for open science and science education. The HBP as a big data neuroscience project puts large emphasis on data-related work which also sits at the heart of the EBRAINS infrastructure. Questions of Open Access or more generally of the FAIR access principles are therefore dealt with the infrastructure development team. This work involves members of the RRI team, for example in terms of data governance, data protection or data compliance, but it is overseen by the infrastructure work. Similarly, the HBP has a separate education section which, among other activities, develops initiatives in science education.

The capacity building activities described in this Deliverable touch on all parts of the HBP, and will be implemented in collaboration with all WPs. It will, however, focus on and build on the existing strands of RRI work in the HBP, as will be outlined in the next sections.

2.2   The Purpose of the RRI Capacity Development Plan

RRI is an important and even defining feature of the HBP. Building up the understanding and mechanisms to deliver various aspects of RRI has formed an integral part of the HBP and it is important that these achievements are retained in the infrastructure phase. As described in the ESFRI proposal (p. 34) "EBRAINS builds on the world-leading work on responsible research and innovation conducted during the HBP, exemplary for its integration of legal compliance, ethical awareness, and strong European values into research and research infrastructures."

This **purpose of RRI capacity building** is to provide the means for EBRAINS communities to continue to act responsibly after the end of the EC-funded period. This is reflected in the SGA3 DoA (section on WP9):

> "In SGA3, activities of WP9 are therefore directed at increasing collaboration, understanding, implementation and capacity-building on RRI in: HBP, EBRAINS, international brain projects, and increasing engagement and uptake of societal input for the development of EBRAINS"

Task T9.2 includes the following description:

> "Anticipation and examination of the long-term societal impact of a richer understanding of the brain is crucial to developing a future HBP and EBRAINS infrastructure that is designed with a capacity to understand, reflect and act on such issues. In other words: crucial to a responsible infrastructure operating with and for society."

Task T9.5 includes this reference to capacity building:

> "Responsible Innovation and Use Hub (RIU-HUB), outputs and deliverables in relation with the EBRAINS infrastructure, contributing to the EBRAINS RRI toolkit. It will contribute to capacity building by providing the scientific background and practical methodological approaches and techniques."

These sections, in conjunction with the general description of RRI in the DoA provide input into the definition of this Deliverable which states:

> "In order to be able to implement the eventual RRI plan, the personnel of the HBP and EBRAINS will need to develop the capacity to work with and implement these policies. This delivery contains a plan detailing which capacities are needed and how they can be achieved."

The importance of developing this capacity is reflected in the ESFRI proposal (p. 52) which includes a KPI on the "Number of researchers who have received training or instruction on RRI in EBRAINS" as well as a KPI on the "Number of citizens and stakeholder categories in discussions on ethical and societal aspects of EBRAINS".

2.3 An RRI Training Programme

Because of the nature of the research and organisation of HBP and EBRAINS the training programme needs to cover ethical, societal, and legal issues on data protection, data governance, dual use, AI, (neuro)ethics, philosophy, gender equality, diversity and public engagement.

The training must also introduce ways for proactively addressing ethical and societal issues, and therefore must introduce methods of foresight, philosophical reflection, and public engagement.

The capacity training should develop the knowledge, experience, skills and tools to:

• Understand the ethical, legal, and societal issues related to the HBP and EBRAINS

• Systematically identify and describe such issues

• Identify and involve relevant experts, stakeholder and members of the lay public in processes to anticipate and deliberate on content and solutions to such issues

• Communicate responsibly on the research and activities of the HBP and EBRAINS

The training plan outlines our current thinking on how the elements could be structured and used in the HBP and EBRAINS. The capacity development plan itself is a work in progress. Next steps involve getting a better understanding of HBP and EBRAINS researchers and staff preferences regarding how to receive training, what capacities are needed where, and how the training programme can build on other educational activities and the organisational structure of the HBP and EBRAINS.

Once implemented, this training programme and its outcomes, will position the EBRAINS research infrastructure as the first of its kind designed with responsible research and governance practices at its core.

EBRAINS will operate in a fast changing world. If 2020 does anything, it is to illustrate how fast our lives may change, and the complexities of responding to societal challenges. Obviously the COVID-19 pandemic is one example, but also social movements like Black Lives Matter and Metoo - mobilising large groups in society on issues of social justice and equality - provide a good illustration of the social, political, security, and economic complexity, and somewhat unpredictable context in which EBRAINS will operate. Users, developers, and leaders of EBRAINS must be equipped to understand and act on the all types of existing and emerging challenges.

Having now outlined the conceptual background and the purpose of the capacity development activities described in this deliverable, the next chapter explains the methodology used for determining its content.

3. Considerations on capacity development for EBRAINS

3.1 Content and process of delivery

This section describes the methodology of constructing the content of this deliverable. Based on the recognition of the importance developing capacity for RRI, the section discusses the following questions:

- Who needs RRI-related capacities (audiences)?

- Which capacity should they have (topics)?

- How can this capacity be developed (structure of capacity building)?

- How do we ensure this plan is fit for purpose (validation of the plan)?

3.2 Identification of Audiences

We start with the audiences of the capacity building work, as the choice of audience to a large extent determines the answers to the other questions.

The purpose of identifying relevant audiences is to ensure that specific, targeted and relevant offers can be made to these audiences. The definition of different audiences thus needs to reflect their specific knowledge needs. For the sake of practical feasibility of developing a capacity development plan, the definition of audiences should not be too fine-grained, however, to allow for the development of a comprehensive programme that can be delivered using the resources available for the RRI team.

Three main types of audiences, who play key, but different roles with regards to the development of the EBRAINS infrastructure, are:

- Users:

  These are individuals who make use of the infrastructure, for example by accessing data, models or making use of other infrastructure services, such as neuromorphic or high performance computing.

- Data providers:

  Describes those users who use EBRAINS to store and share their data (including human brain data, animal brain data, models, tools, software)

- Infrastructure providers:

  Refers to those individuals who work for institutions that provide parts of the infrastructure, e.g. compute or storage facilities.

In addition to these three sets of users, one audience that is of crucial importance for the future integration of RRI into EBRAINS is:

- EBRAINS and HBP management and leadership:

  Includes those individuals who have influencing and decision-making power within the HBP and EBRAINS, such as members of the governing bodies and the future EBRAINS' board of directors.

3.3 Selection of Topics & Themes

The RRI section of the HBP has developed a number of conceptual and practical activities that form the basis for integrating RRI into EBRAINS, and thus of the activities described in this capacity

development plan. Three key areas of work led to the development and publication of Opinions. The three key areas were: Data Governance, Responsible Research and Innovation, and Neuroethics. The opinions and related work cover the basis for several topics in the capacity development work. The Opinions covered the following topics:

- Data Protection and Privacy

- Dual Use

- Artificial Intelligence

In addition to these three main topics derived from the HBP Ethics and Society Opinions, further input into the development of the content of the capacity development plan comes from previous and ongoing RRI work and activities in the HBP, discussions with external audiences (including lay publics), as well as conceptual considerations, and the academic discourse. The initial list of topics obtained after several rounds of discussion within the RRI team includes the following:

- Introduction to EBRAINS data governance

- Data protection in EBRAINS

- Ethics compliance requirements for EBRAINS data

- Introduction to RRI in EBRAINS

- Engagement with stakeholders and the public

- Foresight and anticipation of social and ethical issues

- Methods of evaluating EBRAINS innovation

- Understanding dual use of concern & misuse in the infrastructure

- Diversity and inclusion

- Diversity in Research

- Researcher Awareness

- Neuroethics

In order to structure the capacity development activities, we decided to cluster them into themes, which cover a larger set of skills and knowledge. These themes are then comprised of a number of modules covering aspects of the theme. The theme would cover interrelated topics that are expected to appeal to particular audiences and the modules make up the detail required to master the field.

This structure is inspired by traditional university offerings where courses (e.g. computer science) are made up of a number of modules (e.g. programming languages, interface design or computer architecture). In its first iteration, the capacity building plan presents these courses as themes, where future iterations will see the themes being changed into courses, as the development of the modules allows for a uniform course structure.

For now, the capacity building plan presents the following three **main themes** and associated modules:

- **Data governance**
  - o Introduction to EBRAINS data governance
  - o Data protection in EBRAINS
  - o Ethics compliance requirements for EBRAINS data
- **Responsible research and innovation**
  - o Introduction to RRI in EBRAINS
  - o Introduction to Public Engagement
  - o Foresight and anticipation of social and ethical issues

- o Methods of evaluating EBRAINS innovation
- o Understanding dual use of concern & misuse in the infrastructure
- o Diversity and inclusion
- o Diversity in Research
- o Researcher Awareness
- **Neuroethics**
  - o Neuroethics: Methods and Content
  - o Foresight and anticipation of social and ethical issues

3.4   Structure of Capacity Building

Having identified possible audiences and the overall structure of courses and possible modules to be included, the next step was to describe the content of the modules. Following general academic practice, the RRI team developed a template consisting of headings that each module would be expected to cover. The modules were allocated to the relevant subject experts in the RRI teams who then developed the first draft of the module description covered in the next chapter.

3.5   Validation of the RRI Capacity Development Plan

The methodology described in this chapter describes how the initial draft of the capacity development plan has been developed. It is important to underline, however, that this plan is a living document that can react to changes in the environment and the relevant academic discourses.

The capacity development plan will only be successful and taken up by the intended audiences, if the added value for them is clear and if it is communicated in ways that render it attractive to them. The current state of the document is therefore to be understood as a starting point for a debate bringing in various stakeholders and potential audiences.

More specifically, in order to validate the plan and develop it further, the following steps will be undertaken:

- Discussion of the plan with Ethics Rapporteurs (ER)
- Discussion of the plan with the HBP Ethics Advisory Boards (EAB)
- Review of the plan in relevant working groups (data governance, dual use)
- Review of the plan in the HBP Science Infrastructure Board (SIB) and Directorate (DIR)

It will be important to work closely with colleagues across the project that follow similar aims or could collaborate on aspects of the work. This includes, the:

- Community building programme
- HBP education programme
- Project Coordination Office (PCO)/public relations

In developing the outline and suggestions for the capacity development plan, we drew on several sources. The work with responsible research and innovation of the HBP Ethics and Society group forms the basis for content development. Literature (grey and academic), together with relevant legal texts, including conditions of research set out in Horizon2020, also form a background as well as part of our training programme. In addition, we draw on feedback from the HBP Ethics Advisory Board (EAB) and the HBP Ethics rapporteur network. We will also run a survey to discover how aware researchers are of ethical, legal and societal issues, on how they perceive the need, as well as their preferred ways of receiving capacity training on responsible research and innovation practices.

Resources, implementation routes, ways of assessing outcomes, and the training programme itself have been considered when developing the training programme.

3.6 Process of developing the capacity plan

The capacity development plan is delivered as a report of the HBP Responsible Research and Innovation work package (WP9). However, developing an RRI training programme requires collaboration and input from across the HBP. In the initial development, the report therefore also contains input from colleagues working with RRI themes and activities in other parts of the HBP. These include, neuroethics and philosophy, ethical and societal issues of commercialisation, data governance and compliance management.

These groups continue their involvement in the development and delivery of the training and capacity development programme. The results of the training programme will be presented together with finalised modules for use by EBRAINS on the EBRAINS website by the end of the HBP.

3.7 Training Template

In developing the first draft version of the training modules, the following headlines were used in the short descriptions of each topic.

- Description
- Audience
- Learning outcomes
- Delivery mechanism
- Assessment
- Suggested timing of delivery
- Links to materials and methods

4. Content of the RRI training sessions

In this section we present an overview of the proposed training modules and their possible content.

4.1 Modules and Target Audience

Overview of the separate modules of each course, and an indication of target audience for each module. Following the overview is an overall description of the capacity building activities of each module.

Table 1: Modules and target audience

Themes & Modules	Target Audience			
	EBRAINS Internal and external Users	EBRAINS Data Providers	EBRAINS Infrastructure Providers	EBRAINS and HBP Management and Leaders
DATA GOVERNANCE				
4.2.1 Introduction to EBRAINS data governance	x	x	x	x
4.2.2 Data protection in EBRAINS	x	x	x	x
4.2.3 Ethics compliance requirements for EBRAINS data		x		
RESPONSIBLE RESEARCH AND INNOVATION				
4.2.4 Introduction to RRI in EBRAINS	x	x	x	x
4.2.5 Introduction to Public Engagement				x
4.2.6 Foresight and anticipation of social and ethical issues	x	x		x
4.2.7 Methods of evaluating EBRAINS innovation	x		x	x
4.2.8 Understanding dual use of concern & misuse in the infrastructure	x	X	x	x
4.2.9 Diversity and inclusion	x	X	x	x
4.2.10 Diversity in research	x		x	
4.2.11 Researcher Awareness	x		x	
NEUROETHICS				
4.2.12 Neuroethics: Methods and Content	x			x
4.2.6 Foresight and anticipation of social and ethical issues	x			x

4.2 Description of capacity training in each module

4.2.1 Introduction to EBRAINS Data Governance

Description

EBRAINS is a research infrastructure providing integrated data services, tools and resources to support research data, covering data provision and access; from long-term archiving to special focus on find-ability and computability of both long-tail and big data. Data Governance is therefore critical

to EBRAINS as a RI that wants to engage in responsible management of data, improve its quality, and control its security, access and uses, both during SGA3 and beyond. This module will provide participants with an easy to understand and practical guide to Scientific Research data management for scientific discovery in a way that adheres to ethical, legal and social principles and provisions. It will cover the entire research data life cycle from collection, processing, application, sharing, retention to deletion.

Audience

With practical ethical and legal hints and tips, the module is ideal for EBRAINS system and infrastructures administrators, HBP and external research communities and individual researchers to fully and responsibly exploit EBRAINS services.

- **Internal:**
  - HBP Management
  - HBP Researchers/data providers
  - EBRAINS curators
  - EBRAINS service providers
- **External**
  - EBRAINS data providers
  - EBRAINS data users

Learning outcomes

This module will provide participants with practical information/knowledge to:

- Understand what data governance is
- Be able to understand key Data Governance (DG) roles and responsibilities related to their data related activities in the HBP/EBRAINS
- To understand regulatory, ethical and social principles applicable to their data-related activities in the HBP/EBRAINS
- Be able to align data governance principles to their key data related activities

Delivery mechanism

This module will include webinars/workshops and a number of online materials for self-study.

Suggested timing of delivery

Webinar/workshop organised once every 6 months.

4.2.2   Data Protection in EBRAINS

Description

This module will deconstruct the data protection principles in the General Data Protection Regulation, providing general awareness for scientific research as well as specific legal requirements for technical and organisational measures that balance the competing interests of research and innovation with privacy and data protection.

Audience

The immediate audience for this module will be researchers working with personal data as well as those collaborating with the research infrastructure to integrate personal data to the EBRAINS platform. The learning outcomes would be relevant to the entirety of the project as it relates to data protection. It will be particularly relevant for:

- EBRAINS data providers

- EBRAINS platform users
- EBRAINS Researchers
- EBRAINS and HBP Management and Leadership
- Research institutions

Learning outcomes

At the end of this module, participants should:

- Have background knowledge of the GDPR and requirements for processing of personal data.
- Understand data protection principles and practical operational measures that can be applied in day-to-day data processing.
- Be able to integrate technical and organisational measures for data protection in scientific research

Delivery mechanism

A series of online webinars and training workshops that will recorded and available online.

Assessment

Multiple-choice questions.

Suggested timing of delivery

Monthly webinars, recorded and available online.

4.2.3   Ethics Compliance Requirements for EBRAINS data

Description

This module will provide a comprehensive overview of the ethics compliance requirements for data on the EBRAINS platforms. The module will introduce the requirements for both human and non-human animal data, and will highlight the ethical, moral, and legal justification for these requirements and will give participants the appropriate tools to apply to their own work, and their work in the future.

Audience

The audience for this module will be any person or group looking to submit data to the EBRAINS platform, though the learning outcomes would certainly be applicable outside of that group. It will be particularly relevant for:

- EBRAINS data providers
- EBRAINS data users
- Other research professionals

Learning outcomes

At the end of this module, participants should:

- Have a working knowledge of the compliance requirements for data submitted to EBRAINS platforms which they can apply to their own work.
- Understand the motivations behind those compliance requirements.
- Be able to apply these lessons learned in future data uploads.

Delivery mechanism

A series of online webinars, allowing for many participants and facilitating the recording of the content for reference in the future.

Assessment

Development of an ethics compliance self-assessment tool.

Suggested timing of delivery

Two webinars, every two weeks, over the course of one month, recorded and then made available online.

4.2.4   Introduction to RRI in EBRAINS

Description

This course has been developed to increase the knowledge and understanding of the Responsible Research and Innovation (RRI) framework and to guide the initial steps in applying RRI principles developed for EBRAINS.

The course will:

- Introduce the concepts, ideas, rationale, and aims of RRI with an emphasis on RRI in distributed e-infrastructures like EBRAINS
- Provide space for deliberation and critical reflection of work undertaken in EBRAINS
- Guide the implementation of RRI in participants' work

Audience

The audience for this Introductory RRI course includes

- members of the HBP and EBRAINS management and leadership
- EBRAINS users including data providers
- EBRAINS infrastructure providers

Learning outcomes

At the end of this course, participants are expected to demonstrate knowledge and understanding of:

- Normative/theoretical framing of RRI concepts, ideas, rationale and aims
- Ethical, social, and professional issues concerning EBRAINS
- Relevant RRI resources and tools developed specifically for EBRAINS and where to find them

Delivery mechanism

The course is designed to be delivered as a 0.5-day face-to-face workshop (up to 20 participants).

Online delivery will be planned to cater for COVID-19 related uncertainty.

Assessment

Multiple-choice quiz at the end of the course.

Suggested timing of delivery

Training sessions will be held biannually, typically in conjunction with relevant HBP or external events, to allow participants to attend.

Link to Materials and Methods

This course is an introductory course that will provide pointers to other aspects of RRI developed by WP9 such as:

- Engagement with stakeholders and publics
- Foresight and anticipation of social and ethical issues
- Understanding dual use of concern & misuse in the infrastructure

- Equality, diversity and inclusion
- Researcher Awareness

4.2.5   Introduction to Public Engagement

Description

The module provides an introduction to theory and practice of public engagement. It shows the different aims and outcomes one can achieve, and it trains the participants in matching aims and desired outcomes with a method and process for public engagement.

The training includes:

- Theory on public engagement and citizen participation
- Practical exercises in determining desired needs and outcomes
- Introduction to the many public engagement methods that exist, and how one can evaluate and choose between them
- Tips and tricks for recruiting and engaging different types of stakeholders, from experts to lay people
- Template for developing concrete manuals for public engagement events

Audience

Audience for this module include HBP and EBRAINS leadership and management. In HBP, the training could also be offered to HBP researchers through the HBP education programme.

Learning outcomes

Participants in the module will learn how to:

- Recognise topics, and areas where engagement makes sense
- Analyse and match purpose and method of engagement for a meaningful process
- Identify relevant experts and other stakeholders for engaging in a topic
- Identify and recruit a sample of lay citizens for engagement
- Analyse and make use of the results from an engagement process

Delivery mechanism

The module can be given online or face-to-face. In either case, the module consists of a mix between lectures and practical exercises. The module will be developed in first instance as an online module, that can be taken by an individual or group. It will last no longer than 3 hours. Feedback from participants will be used to fine-tune materials for delivery in the EBRAINS RRI Tool kit (SGA3 Deliverable D9.5, due M34) that will be available online.

Suggested timing of delivery

Online module consisting of lectures and practical exercises is expected by M27, further development and public access may be included with the submission of the deliverable D9.5 "Implementing RRI in EBRAINS: website, RRI toolkit and capacity building activities".

Links to Materials and Methods

Materials will include introduction texts to public engagement, and could include:

- Abelson, J., Forest, P.-G., Eyles, J., Smith, P., Martin, E., & Gauvin, F.-P. (2003). Deliberations about deliberative methods: issues in the design and evaluation of public participation processes. Social Science & Medicine (1982), 57(2), 239–51. https://doi.org/10.1016/S0277-9536(02)00343-X

- American Academy of Arts and Sciences, (2019). *Encountering Science in America*. Report part of the project 'The Public Face of Science'. [online] https://www.amacad.org/publication/encountering-science , last accessed July 16, 2020

- Arnstein, Sherry R. (1969) 'A Ladder Of Citizen Participation', Journal of the American Planning Association, 35: 4, 216-224. https://doi.org/10.1080/01944366908977225

- Burgess, M.M. 2014. From 'trust us' to participatory governance: Deliberative publics and science policy. *Public Understanding of Science* 23(1): 48–52.

- Davies, S. R. (2008). Constructing Communication: Talking to Scientists About Talking to the Public. Science Communication, 29(4), 413–434. https://doi.org/10.1177/1075547008316222

- OECD (2020), Innovative Citizen Participation and New Democratic Institutions: Catching the Deliberative Wave, OECD Publishing, Paris, https://doi.org/10.1787/339306da-en

- Stilgoe, J., Lock, S. J., & Wilsdon, J. (2014). Why should we promote public engagement with science? Public Understanding of Science, 23(1), 4–15. https://doi.org/10.1177/0963662513518154

Grey literature and other resources:

- Science, Society and Engagement – An e-Anthology, a publication of the EU Engage2020 project (http://engage2020.eu/media/Engage2020_withVideo.pdf)

- The Engage 2020 Action Tool for deciding on what method to use for public engagement: http://actioncatalogue.eu/

- Example manuals developed and used in the HBP public engagement activities

4.2.6 Introduction to Foresight and Anticipation of Social and Ethical Issues

Description

This module provides an overview of theory in foresight, and gives practical examples of foresight exercises for anticipation and reflection on societal and ethical issues related to HBP and EBRAINS research.

The training will include:

- Introduction to foresight theory in RRI

- Introduction to neuroethical and societal issues

- Examples of possible long-term societal and ethical implications of brain research

- Overview of approaches to anticipate ethical and societal issues

Audience

Audience for this module include

- HBP researchers

- EBRAINS users

- Data and infrastructure providers

- EBRAINS leadership and management

In the HBP, the training could also be offered to HBP researchers through different HBP educational activities.

Learning outcomes

By the end of the course, participants in this module will learn to:

- Be aware of the potential ethical and social issues raised by their research
- Understand what qualifies as an ethical or societal issue
- Identify ethical and societal issues related to their research
- Understand the need to address or manage societal issues or concerns

Delivery mechanism

The module will be delivered as an online webinar, but could also take place as a half day face-to-face activity. The module consists of a mixture of lectures and practical exercises.

Assessment

Cases and multiple-choice questions.

Suggested timing of delivery

The module will be held at least biannually, the first time in 2021. If possible, it will be held in conjunction with other HBP education or training events.

Links to Materials and Methods (examples)

Materials include examples from the following HBP Foresight Lab reports:

- Foresight report on Future Neuroscience[1]
- Foresight Lab report - Future of Computing and Robotics[2]
- Foresight Report on Future Medicine[3]

Materials from stakeholder engagement in the HBP

- The AI 360 foresight workshop on AI (https://sos-ch-dk-2.exo.io/public-website-production/filer_public/25/81/2581b77f-c39b-4359-b835-4f5163214378/ai360_humanbrainproject_recommendations_report_final.pdf)

Academic literature:

- Swierstra T., Stemerding D., Boenink M. (2009) Exploring Techno-Moral Change: The Case of the ObesityPill. In: Sollie P., Düwell M. (eds) Evaluating New Technologies. The International Library of Ethics, Law and Technology, vol 3. Springer, Dordrecht. https://doi.org/10.1007/978-90-481-2229-5_9
- Lucivero, F., Swierstra, T. & Boenink, M. Assessing Expectations: Towards a Toolbox for an Ethics of Emerging Technologies. Nanoethics5, 129 (2011). https://doi.org/10.1007/s11569-011-0119-x
- De Laat B (2000) Scripts for the future: using innovation studies to design foresight tools. In: Brown N, Rappert B, Webster A (eds) Contested futures: a sociology of prospective techno-science. Ashgate, Aldershot
- Grin J, Grunwald A (2000) Vision assessment: shaping technology in 21st century society towards a repertoire for technology assessment. Springer

4.2.7   Methods of Evaluating EBRAINS Innovation

Description

This module will be co-developed with the HBP Innovation Team and the Orbit platform at DMU. It will draw on emerging work in the context of T3.8 in WP3, and introduce a methodology that will facilitate RRI reflection on the ethical, social, political and economic aspects of innovation processes

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[1] https://www.kcl.ac.uk/ghsm/assets/foresight-report-on-future-neuroscience.pdf
[2] https://www.kcl.ac.uk/ghsm/assets/Foresight%20Lab-Future%20of%20Computing%20and%20Robotics.pdf
[3] https://www.kcl.ac.uk/ghsm/assets/foresight-report-on-future-medicine.pdf

in EBRAINS. Participants will learn to actively apply this methodology to individual products, services or technologies that emerge in the context of EBRAINS. The module will introduce assessment procedures and criteria which will help participants to identify key ethical and social issues related to the exploitation, commercialisation and international transfer of EBRAINS innovations. Participants will develop a clear strategy and plan to respond to identified issues and to address these in the context of future planning and decision making.

Audience

The audience of this module will be:

- EBRAINS infrastructure providers

- HBP and EBRAINS management and leadership

- EBRAINS users

Learning outcomes

After participating in this module, participants will:

- Understand the significance to apply methods of RRI reflection in the context of the exploitation, commercialisation and international transfer of EBRAINS innovations

- Be familiar with an online methodology / RRI assessment tool that facilitate reflection on the ethical, social, political and economic aspects of innovation processes in EBRAINS

- Be able to actively apply the methodology to individual products, services or technologies that emerge in the context of EBRAINS

- Be able to identify the responsibilities of EBRAINS and EBRAINS users / researchers to respond to identified concerns

- Be able to develop a clear strategy and plan through which identified issues can be addresses and integrated into planning and decision making related to the exploitation of the individual products, services or technologies that have been assessed.

Delivery mechanism

The module will be delivered online. Short lecture casts will be recorded (five or six units of 10-16 minutes each) and introduce participants to the methodology and how to use it. The methodology itself will be available online, and can be applied by everyone who is interested. An alternative way of delivery would be through short workshops, which allow for direct interaction with the facilitator and participants. These workshops could be offered on a regular basis to EBRAINS users and other interested researchers (possibly facilitated in collaboration with the ORBIT infrastructure, which has considerable experience in this regard).

Assessment

Participants develop a strategy and plan on how to integrate generated insights into ongoing planning and decision making. This will include the identification of knowledge gaps and further activities (e.g. specialist consultancy, stakeholder engagement, interdisciplinary collaborations, etc.) through which identified issues can be responded to.

Suggested timing of delivery

In year 3 of the HBP: Either ongoing (as self-learning based online module), or in regular intervals (if offered through the ORBIT platform).

4.2.8   *Understanding Dual Use of Concern & Misuse in the Infrastructure*

Description

This module on [dual use and misuse] [4] issues draws on extensive expertise and experience accumulated during the HBP by pursuing diverse activities in these areas from workshops, webinars, education activities, Opinion on Responsible Dual Use, project-wide Dual Use Working Group to scientific publications and collaborations. These diverse activities have not only been well-received within and beyond the HBP but also provide immense wealth of knowledge about the challenges faced and capacities needed in these areas by infrastructure users, data and infrastructure providers as well as management and leadership. The module will address these challenges and capacity needs by addressing topics such as:

- Understanding dual use
  - o Beyond civil-military dichotomy – dual use research of concern; beneficial and harmful uses
  - o Responsible Dual Use – applying RRI & AREA frameworks to identify dual use of concern
  - o Political, Security, Intelligence, Military & Commercial uses of concern
- Understanding potential misuse issues and ways to address them
- Addressing the dilemma of open science vs security

Furthermore, to ensure that the module meets the needs of relevant groups, its content and design will be tested and refined in collaboration with the HBP Dual Use Working Group.

Audience

Primary audience are

- HBP and EBRAINS researchers
- students and EBRAINS users
- EBRAINS data and infrastructure providers
- HBP and EBRAINS management and leadership

Furthermore, events and learning materials will be open to anyone interested in these topics 1) to increase awareness about EBRAINS and 2) to disseminate legacy and good practices developed in the HBP widely.

Learning outcomes

After participating in this module, participants should have

- Background knowledge of dual use and misuse issues in research infrastructure
- Understanding of potential political, security, intelligence, military and commercial uses of concern
- Ability to apply RRI & AREA frameworks to anticipate and reflect on potential dual use of concern and misuse issues as well as to address them in their own activities and areas of competence

Delivery mechanism

The module can be delivered online as well as face-to-face. A number of complementary methods will be used to increase learning outcomes including lecture/s, interactive exercises, Q&A and online teaching materials (e.g. factsheets, FAQs, quiz). To ensure wide reach, webinar recording/s will be made available on a YouTube channel, relevant HBP and EBRAINS websites and will also be distributed via social media channels. Feedback will be gathered (e.g. through the HBP Dual Use

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[4] https://www.humanbrainproject.eu/en/social-ethical-reflective/dual-use/

Working Group) and delivery mechanisms and methods adjusted to the audience's needs in a responsive and flexible manner.

Assessment

It is not a straightforward matter how to assess capacities to identify and address dual use and misuse issues and what the purpose of such assessment would be. Creative ways can be sought to incorporate assessment in the module in ways that enhance the learning process, e.g. participation in and contribution to a group exercise to identify and address dual use and misuse issues in research infrastructure or taking an online multiple-choice test that provides additional learning opportunities and immediate feedback can be assessed positively. Any constructive contribution to the module such as asking questions related to dual use and misuse issues in their own area of activity can be seen as evidence of capacities in this area.

Suggested timing of delivery

Responsive to the demand and based on resources available. After the first online module delivered and made available online, further activities are planned based on response, interests, needs, feedback and consultation with the HBP Dual Use Working Group and HBP team working on RRI capacity development.

Links to materials and methods

- Dual Use resources[5] developed in the HBP
- HBP Ethics and Society 'Opinion on Responsible Dual Use'[6]
- Selected scientific publications on Dual Use in the HBP
    - The Governance of Dual-Use Research in the EU: The case of neuroscience[7]
    - Ethical and Social Aspects of Neurorobotics[8]
    - The Limits of Dual-Use[9]

4.2.9 Diversity and Inclusion

Description

Diversity comprises dimensions protected by law as well as scientific, organisational and individual dimensions, such as field of expertise, role within the HBP (and EBRAINS), or cultural background. Team diversity is an essential requirement for innovation and EBRAINS should serve as a European lighthouse example for inclusive interaction and collaboration.

Although many HBP partner organisations offer support and trainings related to gender and diversity management, these trainings vary and it is considered as crucial to develop a shared understanding to develop the HBP further to the EBRAINS infrastructure.

The following description builds on the specific competences of Convelop and was further developed for the HBP during SGA2 and successfully implemented and available either at the HBP Website[10], e.g. the inclusive mentoring programme, guiding materials, leadership letter or in internal documents such as (s)election procedures.

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[5] https://www.humanbrainproject.eu/en/social-ethical-reflective/dual-use/
[6] https://sos-ch-dk-2.exo.io/public-website-production/filer_public/77/61/7761fdcd-b0a0-40a2-a6bd-904d68d52b87/opinion_dual_use_hbp_ethicssociety.pdf
[7] https://tandfbis.s3-us-west-2.amazonaws.com/rt-files/docs/Open+Access+Chapters/9780367368814_oachapter11.pdf
[8] https://link.springer.com/article/10.1007/s11948-020-00248-8
[9] https://issues.org/the-limits-of-dual-use/
[10] https://www.humanbrainproject.eu/en/about/gender-equality/measures-and-materials/

The expected impact is to consider gender and diversity and counteract discrimination as this is a moral and ethical requirement, reduces turnover rates and raises interest of potential contributors to join and collaborate (attracting and retaining highly qualified personnel and partners). Furthermore, it is an essential requirement for innovation and contributes to a positive branding of the HBP and EBRAINS. The module thus provides insights in different aspects related to interaction, collaboration, and leadership:

- "Who am I and if so how many?" the power of homophilia and unconscious biases
- Inclusiveness in virtual interaction, e.g. VC, Forums; commenting each other's contributions, publication practices
- Inclusiveness in inter- and trans-disciplinary virtual collaboration
- Inclusive working environments, structures and procedures

Audience

- HBP and EBRAINS researchers and managers
- EBRAINS users
- HBP and EBRAINS leadership (team leaders, Principle Investigators, Task or Work Package leaders)

Learning outcomes

The following competences will be achieved during the training:

- Awareness of biases and their impact, respectful interaction, inclusive collaboration
  - o Understanding individual diversity traits, the impact on how we perceive others and are perceived by others
  - o Learning about different working styles, values and norms and their impact on collaboration
  - o Contributing to mutual beneficial interactions in diverse virtual teams
  - o Knowing whom to turn to in case of explicit biases or discrimination
  - o Creating inclusive working conditions, especially for virtual teams
  - o Recognising and solving conflicts that arise from diversity, addressing discriminatory communication and actions

Delivery mechanism

The Diversity and Inclusion Capacities will be built through a mix of workshops and webinars, and the mentoring programme. The Module will be developed as online modules with additional reference material.

Assessment

Self-assessment and reflection via case studies.

Suggested timing of delivery

Responsive to the demand and based on resources available. After the first online module delivered and made available online, further activities are planned based on response, interests, needs, feedback and consultation with the HBP Diversity and Equal Opportunities Committee, the Education Programme, and HBP team working on RRI capacity development.

Links to materials and methods

- https://www.humanbrainproject.eu/en/about/gender-equality/events-and-news/
- https://www.humanbrainproject.eu/en/about/gender-equality/measures-and-materials/
- the materials will be further developed towards an interactive toolkit including videos

4.2.10   Diversity in Research

Description

Gender and other diversity aspects are not only important for teamwork but are also essential as research content. In line with the European Commission's RRI guidelines and the gender agenda for Horizon 2020, the HBP aims to play a pioneering role in promoting awareness and advancing how gender and diversity are considered in research and innovation.

It is thereby considered that "diversity in research is strongly linked to data curation, the EBRAINS infrastructure and publication practices. The following description builds on the specific competence of Convelop and was further developed for the HBP during SGA2 and successfully implemented: Diversity in Research workshops and webinars (see the related section on the HBP Website[11]), and guiding materials, including the HBP Publication Guideline[12] and the HBP Research Guideline[13].

The module on Diversity in Research will explore diversity definitions and operationalisations, how diversity can be incorporated in research design and publication practices, interdisciplinary research. The expected impact is to ensure the diverse legacy of the HBP by the implementation of state-of-the-art research and by attracting and retaining highly qualified personnel and partners. To consider diversity in research does not only lead to novel scientific findings and innovation, but also to contribute to a positive branding of the HBP and EBRAINS.

The capacity building is based on materials, methodological approach and delivered (virtual) workshops: development of a toolkit to support scientists in integrating and considering diversity traits throughout their research process to increase the ambassador function of lead scientists.

Audience

- HBP and EBRAINS early career stage scientists
- HBP and EBRAINS experienced scientists, PIs

Learning outcomes

- Awareness of biases and their impact on scientific priorities and findings (which priorities are set, male bodies as norm, female as deviations, missing data on minorities)
- Understanding definitions of gender, diversity, inter-sectionalism and how to operationalise them in specific fields of science
- Applying gender and diversity in project design and research processes
- Identifying knowledge gaps and integrating specific diversity expertise, collaborating across disciplines.
- Integrating gender and diversity aspects in lectures and scientific advice for students

Delivery mechanism

The capacities will be built with a mixture of workshops and webinars.

Assessment

Self-assessment and reflection via case studies.

Suggested timing of delivery

Responsive to the demand and based on resources available. After the first online module delivered and made available online, further activities are planned based on response, interests, needs,

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[11] https://www.humanbrainproject.eu/en/about/gender-equality/events-and-news/

[12] https://sos-ch-dk-2.exo.io/public-website-production/filer_public/2a/1b/2a1b9ee3-a0e3-4d6f-86ee-678540e744a9/hb_publicationstrat_190524-1207.pdf

[13] https://sos-ch-dk-2.exo.io/public-website-production/filer_public/23/1e/231e7bc7-bd5c-4c90-92b1-35aa403f0f13/hbp_guideline_diversityinresearch_190204-1207.pdf

feedback and consultation with the HBP Diversity and Equal Opportunities Committee, the Education Programme, and HBP team working on RRI capacity development.

Links to materials and methods

- https://www.humanbrainproject.eu/en/about/gender-equality/events-and-news/

- https://www.humanbrainproject.eu/en/about/gender-equality/measures-and-materials/

- The materials will be further developed towards an interactive toolkit including videos

4.2.11   Researcher Awareness

Description

Researcher Awareness is a core aspect of Responsible Research and Innovation in action, which aims to enhance capacity for the 'ongoing' ethical and social reflection and corresponding action among researchers and technicians beyond the minimum requirements of legal and ethical compliance. With that aim, this module offers a wide selection of methods, tools, concepts and perspectives to integrate reflexive knowledge into research and innovation activities.

Audience

The audience for this module includes HBP and EBRAINS researchers and users, data and infrastructure providers.

- Internal:
  - HBP Ethics Rapporteurs / Researchers / Technicians / data and infrastructure providers
  - EBRAINS Infrastructure providers
- External:
  - EBRAINS Researchers/data providers
  - EBRAINS Infrastructure providers

Learning outcomes

By the end of the course, participants in this module will manage a selection of methods, tools and perspectives to identify and critically reflect, individually or as an organisation, on:

- Underlying purposes of, motivations for and values underpinning research and innovation

- Risks, uncertainties, areas of ignorance and ethical dilemmas

- Own institutional practices, behaviours and approaches to knowledge production for research and innovation

Delivery mechanism

The module can be given as an online or face-to-face activity. The module will include online materials for self-study and practical exercises.

Assessment

Self-assessment and reflection via case studies.

Suggested timing of delivery

Webinar and workshop organised once every 6 months.

Links to materials and methods

https://www.humanbrainproject.eu/en/social-ethical-reflective/ethics-support/researcher-awareness/

4.2.12   Neuroethics: Methods and Content

Description

The Neuroethics in EBRAINS course has been developed to increase the knowledge and understanding of EBRAINS users of Neuroethics topics and methodologies. The goal is to build the capacity to identify, assess, and better manage scientifically relevant ethical and philosophical questions raised by the research. The course will:

- Introduce the field of neuroethics, with special focus on its interdisciplinary nature, its methodology, and its relevance to research infrastructures such as EBRAINS.

- Engage and invite conversation and joint reflection on topics found in the interfacing of neuroscientific research and ethics, philosophy and society and on the relevance of such discussion to research infrastructures.

- Provide guidance on how to integrate neuroethical reflections in the participants' work.

- Discuss neuroethical issues (both conceptual and practical) raised by two cutting edge topics in neuroscience:

  o criteria for consciousness (directly relevant to address issues raised by disorders of consciousness) and

  o digital twins and virtual brains (directly relevant to address issues raised by brain disease)

Audience

Audience for this course includes HBP and EBRAINS researchers, particularly but not only, those involved in consciousness and digital twins research, as well as master and graduate students affiliated with HBP and external research communities and individual researchers who would benefit from cultivating the capacity to reflect on how to address the issues raised in their research.

Learning outcomes

At the end of this course, participants are expected to:

- Demonstrate knowledge and understanding of neuroethics content (i.e. rationale and categories) and methodology

- Have the capacity to identify and address ethical and conceptual issues relevant to EBRAINS

- Be able to use the relevant neuroethics conceptual tools for EBRAINS

- Understand the need to Integrate neuroethical reflection and engagement in their research

Delivery mechanism

The course is designed to be delivered as a half-day face-to-face workshop (up to 20 participants) or an online webinar.

Online delivery will be planned to cater for COVID-19 related uncertainty.

Assessment

Group discussion Reflection on cases specially prepared to assess relevant reflexive capacities.

Link to materials and methods

Materials will include introduction texts to neuroethics and neuroethics methodology, including:

- The Need for a Conceptual Expansion of Neuroethics[14]

- Neuroethics and Philosophy in Responsible Research and Innovation: The Case of the Human Brain Project [15]

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[14] https://www.tandfonline.com/doi/full/10.1080/21507740.2019.1632972
[15] https://link.springer.com/article/10.1007/s12152-018-9372-9

- [Neuroethics: A conceptual Approach](#)[16]
- [Externalization of Consciousness. Scientific Possibilities and Clinical Implications](#)[17]

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[16] https://www.cambridge.org/core/journals/cambridge-quarterly-of-healthcare-ethics/article/neuroethics-a-conceptual-approach/34ADB8E176E971E60CA7812B4754D884

[17] http://link.springer.com/chapter/10.1007/7854_2014_338

5. Plan for RRI Capacity Building in the HBP

The table below summarises the plan for training across all themes and modules for a particular user group.

Table 2: Overview of capacity delivery and timing

Module	Capacity Delivery
4.2.1 Introduction to EBRAINS data governance	Webinars & workshops
4.2.2 Data protection in EBRAINS	Webinars & recorded training workshops
4.2.3 Ethics compliance requirements for EBRAINS data	Webinars
4.2.4 Introduction to RRI in EBRAINS	Half-a-day face-to-face workshop (up to 20 participants), possibly online
4.2.5 Introduction to Public Engagement	Online module consisting of lectures and practical exercises
4.2.6 Foresight and anticipation of social and ethical issues	Webinars & possibly a half-a-day face-to-face workshop, with lectures and practical exercises
4.2.7 Methods of evaluating EBRAINS innovation	Short online lectures, possibly a short workshop
4.2.8 Understanding dual use of concern & misuse in the infrastructure	Webinars & workshops (lectures, interactive group exercises, Q&A, online learning materials)
4.2.9 Diversity and inclusion	2x4 Virtual Workshops, 3 in person workshops and 6 "Trigger Modules"
4.2.10 Diversity in research	3 in person workshops, 3 lectures and an award
4.2.11 Researcher Awareness	The module can be given as an online or face-to-face activity. The module will include online materials for self-study and practical exercises.
4.2.12 Neuroethics: Methods and Content	1-day face-to-face workshop with up to 20 participants. Virtual if face-to-face not possible

The next steps in the development of the Capacity Delivery Plan are the creation of a timeline for the delivery of the capacity development described in each module, as well as a mapping of possible joint trainings with other partners in the HBP (e.g. the innovation team, HBP education programme, HBP PIs). The innovation team and HBP PIs could be collaboration partners for developing content and spreading the information about different modules. Specific modules could also be developed as part of other lectures or workshops in the HBP and EBRAINS. Finally, the "Call for Expression of Interest for EBRAINS Infrastructure Training events", published by the HBP education programme, is also an opportunity for future development.

6. Legacy of the RRI Capacity Training in EBRAINS

There is lack of consensus on how to understand a Research Infrastructure (RI). Although the ESFRI Road Map 2021 suggests a view of RIs that highlight technological components potentially masking the relevance of "human, social, and organisational" aspects, in its application to become part of the ESFRI Road Map, the HBP calls for attention to the human, social, and organisational dimensions, and to activities that address ethical, legal and societal aspects.

"EBRAINS builds on the world-leading work on responsible research and innovation conducted during the HBP, exemplary for its integration of legal compliance, ethical awareness, and strong European values into research and research infrastructures. The common understanding of ethical standards for neuroscience developed in the HBP is based on an ongoing global discussion on the feasibility of such standards. The aim is to propagate them globally by demanding that EBRAINS users have a minimum level of ethical user practices, independent of national/cultural context." (HBP ESFRI proposal, p. 34)

The explicit attention to ethical, legal, societal (and organisational) aspects of developing and operating a Research Infrastructure and to strategies to address such concerns presents a significant development and innovation in the understanding and build-up of a European research infrastructures. Our contribution to EBRAINS and our expected general legacy is the existence of an RI that recognises that a richer understanding of ethical reflection (complementary of scientific research), responsibility, and responsible research and innovation are essential components. This is particularly important for EBRAINS as it seeks to become a paradigm of good practices.

This is the legacy we have in mind when developing training and capacity development for EBRAINS.

7.   References

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