Evaluation and Program Planning 79 (2020) 101751

Contents lists available at ScienceDirect

Evaluation and Program Planning

journal homepage: www.elsevier.com/locate/evalprogplan

Integrating the gender dimension in teaching, research content & knowledge and technology transfer: Validating the EFFORTI evaluation framework through three case studies in Europe

Rachel Palmén[a,*], Lidia Arroyo[a], Jörg Müller[a], Sybille Reidl[b], Maria Caprile[c], Maximillian Unger[b]

[a] Open University of Catalonia, Spain
[b] Joanneum Research, Austria
[c] Notus: Applied Social Research, Spain

ARTICLE INFO

Keywords:
Gender dimension in teaching and research content
Gender dimension in knowledge and technology transfer
Gender equality intervention in R&I
Evaluation
Public policy
Design
Implementation
Outcomes
Impact
R&I

ABSTRACT

Gender equality and gender mainstreaming in research is one of the six European Research Area (ERA) priorities. Integrating the gender dimension in research content and teaching is one of its three objectives. It is arguably the objective where least progress has been made. In this article we contribute to the evidence base by applying the EFFORTI evaluation framework to three empirical case study interventions that aim to integrate the gender dimension in tertiary education and research content. Comparison is based on an evaluation of the design of the intervention, those factors that have enabled/ hindered its implementation as well as an assessment of outcomes and impacts. The findings of the case studies highlight the importance of design, specifically regarding resources, legal status and the definition and operationalisation of the gender concept. Implementation hinges on top-level institutional commitment and mainstreaming gender studies with support of a central unit and crucially gender competence. A lack of recognition and status of gender studies and subsequent innovations was seen to hamper implementation. Outcomes and impacts included an increased awareness and interest in gender, increased gender competence, a push towards gender equality regarding representation and organisational change as well as an improved accreditation process and more and better research.

1. Introduction

In recent years, gender equality debates have paid increasing attention to overcome gender bias in science knowledge making, mainstreaming sex and gender analysis into basic and applied research (Schiebinger, 2008). At stake is a better quality of research process and outcomes. Incorporating gender and sex in the research process, in science knowledge making, and in the science value system is considered a key challenge to improve the quality and excellence of scientific endeavours. Various national standard setting institutions including the National Science Foundation (2009) in the USA and the German Research Foundation (2008) have for over a decade now recognised the gender dimension as an important criteria of quality research (Best, Sinell, Heidingsfelder, & Schraudner, 2016, p4). The benefits of integrating the gender dimension can also be extended to the field of knowledge and technology transfer, where its integration can help produce globally marketable transfer products (Best et al., 2016; Bührer & Schraudner, 2010; European Commission, 2011, 2013a; Ranga & Etzkowitz, 2010). Innovations developed as a result of integrating the gender dimension can create a range of new products, services and methods of production that not only better reflect the user base, but can also "expand the realm of the technologically and commercially possible (European Commission, 2013b)" (Best et al., 2016, p4).

As highlighted by the League of European Research Universities (LERU) (2015, p17), the European Commission Directorate-General for Research and Innovation has emphasised the need for sex and gender analysis in its funded projects for years. Different initiatives have contributed to a growing pool of toolkits and guidelines to support the scientific community to consider gender- and sex differences in research, across varying scientific disciplines. These include the IGAR Tool developed in the context of the European Research Area Network GENDER-NET,[1] the Gendered Innovations Site[2] at Stanford University, or the online training tools provided by the Canadian Institute of

* Corresponding author. Present address: Parc Mediterrani de la Tecnologia, Av. Carl Friedrich Gauss, 5, 08860, Castelldefels, Barcelona, Spain.
E-mail address: rpalmen@uoc.edu (R. Palmén).

[1] http://igar-tool.gender-net.eu/en.
[2] http://genderedinnovations.stanford.edu/.

https://doi.org/10.1016/j.evalprogplan.2019.101751
Received 20 May 2019; Received in revised form 8 November 2019; Accepted 8 November 2019
Available online 12 November 2019

Gender and Health.[3] Apart from raising awareness among scientists of the importance of the gender dimension during research, separate toolkits have been developed that target the needs of distinct stakeholders within the science systems. Thus, the SAGER guidelines have been produced specifically addressing the needs of (scientific) journal editors (Heidari, Babor, De Castro, Tort, & Curno, 2016) while the IGAR tool reserves a special section for Research Funding Organisations (RFO) interested in screening project proposals for their awareness of sex- and gender differences for their research.

These initiatives have been reformulated and strengthened in the current funding framework Horizon 2020. In the proposal template applicants are asked to describe, when relevant, 'how sex and gender analysis is taken into account in the project's content'. Despite these advances, the interim evaluation of gender equality as a cross-cutting issue in Horizon 2020 highlights various issues linked to a problematic implementation of integrating the gender dimension into research content. The evaluation states 'the wording of topics is often vague and gender is not explicitly mentioned' (European Commission, 2017 p30), it also notes that the concept of the gender dimension is 'not well-understood' and is 'often confused with gender balance in research teams', whilst it is 'not well evaluated' (European Commission, 2017). Despite regulations stating that gender training for projects are eligible costs –not one of the 111 projects carried out within gender-flagged topics included training on gender knowledge (European Commission, 2017, p30–31). Research also highlights how despite various national level policies in place – evidence on the implementation and effects of integrating the gender dimension into research content is lacking (Wroblewski, 2016b).

In order to show how the integration of the gender dimension in research and teaching can be evaluated, this topic was also taken into account in the development of the evaluation framework in EFFORTI.

All in all the EFFORTI Evaluation Framework provides the conceptual framework for the empirical case study work by embracing and operationalising complexity to ensure that the design and evaluation of gender equality interventions consider the complex systems that constitute the context in which the interventions operate (Kalpazidou Schmidt & Graversen, 2019). The conceptual evaluation framework addresses the three gender equality ERA objectives (more women in research and innovation, more women in leadership positions, and integration of the gender dimension in research content and curricula) for the different levels of intervention i.e. micro – individual/team; meso – organisational; macro – system/country. It identifies quantitative and qualitative indicators for the design and evaluation of gender equality interventions in research and innovation across European countries.

This paper is concerned with the third gender equality ERA objective: integrating the gender dimension in research content and curricula and uses the empirical case study work in three related interventions to contribute to the evidence base concerning the strengths and weaknesses of the design, those factors that have facilitated and hindered the implementation of the interventions and identified outcomes and impact. The EFFORTI framework was developed by compiling those indicators used in state of the art gender equality evaluations in R&I that covered various types of interventions. The theoretical framework proposed indicators to measure the outputs outcomes and impacts of gender equality measures and the case study work aimed to validate these indicators and identify new indicators if gaps existed. This was most of all necessary for those gender equality measures tackling the integration of gender dimension in research and teaching because in this field indicator development is least advanced compared to other fields of intervention.

EFFORTI proposes a wide-ranging framework for capturing the complexity of interventions and their impacts in complex systems. The EFFORTI conceptual evaluation framework opens the "black box" of the relationship between gender equality interventions and outputs, outcomes and impacts by developing a literature-based intervention logic model which factors in context to an analysis of the intervention. This may help to understand the complex dynamics and linkages between inputs and outcomes and impacts (Kalpazidou Schmidt & Graversen, in this special issue). This logic model was also further developed through the case study work where those assumptions that the logic model is based on are identified and tested by empirical evidence. It is a theory-based evaluation framework that goes beyond linearity and causality and focuses on contribution to achieve impact instead of attribution. The framework focuses on the questions (i) in which way and (ii) under which conditions an intervention contributes to the observed effects (Döring & Bortz, 2016).

Moreover, the framework suggests that data collection is conducted through rigorous procedures and a probabilistic perspective, moving away from using only traditional quantitative measures, towards including also qualitative indicators. However, the framework needs to be tailored to adjust to local conditions, and be designed with context sensitivity, considering the challenges in assessing impact of gender equality interventions in research and innovation (Kalpazidou Schmidt & Graversen, in this special issue).

In this paper we attempt to evaluate how three different interventions integrate the gender dimension in either tertiary education, research content or knowledge and technology transfer to build up the evidence base. Our framework enables a comparative analysis of three very different interventions in Europe, two in Austria and one in Catalonia, Spain and is based on an approach which enables a thorough assessment of the design, implementation and outcomes of the three different interventions.

2. Gender dimension in tertiary education, research content and knowledge and technology transfer

Integrating the gender dimension in education refers to fostering gender knowledge in all areas. It includes measures to mainstream gender issues in higher education curricula to enhance awareness and sensitivity as well as initiatives to foster specific gender programmes for researcher training, e.g. by creating collaborative alliance between different actors to establish new content and teaching/learning methods.

Becker, Jansen-Schulz, Kortendiek, and Schäfer (2006) describe four archetypical ways to integrate gender aspects into university education,

- Transdisciplinary approach: provision of single gender modules open for a variety of study programmes
- Integrative approach: implementation of theory, methods, and basic research results as a basic fundamental of teaching and research
- Particular-explicit approach: provision of programme specific gender modules or particular modules
- Explicit approach: provision of specific gender study programmes at all levels of tertiary education

Activities to integrate the gender dimension in education can include: Mainstreaming gender awareness in all curricula (LERU, 2015); Including methods of sex and gender analysis and related knowledge in all curricula (GENERA, 2019; LERU, 2015); Developing new knowledge and training methods for students and researchers in fields where sex and gender analysis is of special relevance (e.g. Karolinska Institute in health and biomedical research); Collecting and publicising research that has successfully integrated sex and/or gender perspectives (LERU, 2015).

Integrating the gender dimension in research content involves mainstreaming sex and gender analysis throughout all stages of research process, from research questions and design, carrying out research, to its dissemination. It includes Research Funding Organisations

[3] http://www.cihr-irsc.gc.ca/e/49347.html.

(RFOs) developing specific funding criteria to mainstream sex and gender analysis in R&I content and programmes (e.g. as in H2020), providing guidance and supporting specific gender-related research. Research Performing Organisations (RPOs) policies may focus on particular research strengths and priorities to foster gender-sensitive research (Palmén & Caprile, 2018). Activities to integrate the gender dimension in research content can include: Asking research applications to address 'how sex and gender analysis is taken into account in the project's content'"(Horizon 2020; Science Foundation Ireland); Raising gender awareness and competence for applicants, reviewers or evaluation panels, providing specific guidance and training (LERU, 2015); Supporting gender-related fields of research (Horizon 2020); Providing tools for researchers to understand and apply gender in research content methods in their research fields, for instance through training, workshops, seminars or showcasing good examples (GENERA, 2019, LERU, 2015); Creating incentives for researchers to consider methods of sex and gender analysis in applications, in particular in multidisciplinary collaboration (LERU, 2015); Including training in sex and gender analysis as eligible costs in applications (Science Foundation Ireland, 2016).

RFOs are taking measures to promote the integration of the gender dimension in their funding calls. One strategy is to establish explicit funding schemes for gender-specific research like the funding program FEMtech Research Projects carried out by the Austrian Research Promotion Agency. Another is to mainstream the inclusion of sex/gender analysis into already existing funding programmes (e.g. by including a specific criterion on the gender dimension in the selection procedure or by indicating the relevance of research results with respect to gender issues) as is done in the funding programme COMET-Competence Centres for Excellent Technologies run by the Austrian Research Promotion Agency. Furthermore, RFOs are offering instructions on how to include gender in various research contexts (Johnson, Sharman, Vissandjee, & Stewart, 2014, p2; FFG & bmvit, 2010, p7; Keuken, Haafkens, & Klazinga, 2007, p13; Gender-NET, 2015, pp. 6–7, 29–30).

We can add a third field of action which is particularly relevant to one of the case studies presented in this article: knowledge and technology transfer (KTT). This takes place between the scientific and business realms and enables theoretical results and findings to be transformed into highly marketable products (Best et al., 2016). It can be defined as a complex constellation of ideas, scientific findings, and production methods involving research institutions, industry and the public – so innovations reflect public preferences, thereby ensuring they are more accessible, useful, and appealing (Bercovitz & Feldman, 2006; Szulanski, 1999). Diverse groups should be involved in these processes to ensure that innovations incorporate and reflect diverse needs, preferences and perspectives and therefore must include men and women (Best et al., 2016; European Commission, 2013a).

3. Measuring gender dimension

A cursory revision of the available toolkits and guidelines alludes to the complexity of integrating as well as evaluating the degree to which the gender dimension has been taken into account throughout the entire lifecycle of the research process. As a result one can distinguish between 'manual', peer review methods for assessing the integration of the gender dimension and an 'automated' text-mining based method. Automated metrics mainly count the frequency of specific keywords such as 'sex' or 'gender' in title, abstracts and/or main text of an article or academic course description. The occurrence of these keywords is then taken as a more or less imperfect indicator that researchers have considered sex and gender during their research. More sophisticated but still automated methods count the number of female versus male authors in curricular bibliographies or attempt a more context sensitive analysis taking into account the range of 'gender' keywords with discipline specific methods and content. The clear advantage of automated procedures is their low cost and scalability to a large corpus of data. The publications of entire disciplines can be scanned with relative ease by such automated metrics. A good example is the recent She Figures 2018 report, concerning the indicator 2.9.8 on the "Percent of a country's research output integrating a sex or gender dimension in its research content (SGDRC)" (EC, 2019, p 152). The indicator aims to give insights into the proportion of peer-reviewed publications available in the Scopus database that address gender and sex in their research. Based upon the absence or presence of certain gender and sex related keywords and/or abstract of the article, a publication is classified as either addressing (or not) the gender dimension. A similar approach has been pursued in Elseviers report on "Gender in the Global Research Landscape" which demonstrates that gender- and sex issues are addressed over an increasing spectrum of scientific disciplines, contributing to the growth in terms of size and complexity (Elsevier, 2017). However, automated metrics for assessing the incorporation of a gender dimension in research have to be used with a certain caution. Although attractive in terms of ease of use and their low cost, these more formalized assessment criteria remain on a superficial level and are not concerned with the actual quality of integration.

What existing guidelines and toolkits demonstrate is the fact that the assessment of the integration of the gender dimension in research is complex and differs across scientific disciplines. 'Manual' peer-review methods where (gender) experts revise the actual research or curricular content provide an important alternative to automated metrics, capturing the quality of integration. Specific guidelines have been established, emphasising the need for expert training to carry out such revisions and evaluations. Day, Mason, Tannenbaum, and Rochon (2017) for example, suggest considering six dimensions to evaluate the gender dimension in health research proposals with human participants, that range from planning and implementation to the dissemination phase of the research. Tomás, Yago, Eguiluz, Oliveros, and Palacios (2015) provides 10 items that can be used by researchers for a similar task. Both stress, however, that trained reviewers are necessary to carry out such tasks. When trained reviewers are available, important differences to more automated methods do emerge. Thus, as Will et al. (2017) argue in their article on bias and omission of the gender dimension in Neuroscience Research, the mentioning of 'sex' or 'gender' in the title or abstract as such is no guarantee that these dimensions have been considered in the actual research. Based upon a manual reviews of 6636 articles carried out by a team of 11 experts, a surprisingly low rate of 14 % of neuroscience studies that used both sexes in their research actually analysed their data by sex (Will et al., 2017, 8). The rest, although using and reporting both sexes did not pursue the implications of sex differences in their analysis.

4. Methods

As part of the EFFORTI project 19 gender equality interventions in R&I case studies were carried out across Europe (Austria, Denmark, Germany Hungary, Spain and Sweden).[4] This article is based on a comparison of the three EFFORTI case study interventions that aimed to integrate the gender dimension into tertiary education, research content and knowledge and technology transfer. The selection of empirical case studies followed the logic of theoretical sampling (Corbin & Strauss, 2015) as case studies aimed to integrate the gender dimension into teaching and R&I focusing on different points of the innovation cycle, from tertiary education, i.e. through the curriculum and teaching to research and technology transfer. Case studies also included national interventions and an institutional intervention. They targeted the higher education and business enterprise sectors and were located in

[4] These 19 case studies were delivered to the Commission (D4.1 Condensed reports of results on content level and methodological level for each case study) and are not publicly available.

two countries described as being relatively pro-active in terms of gender equality policies in R&I (Lipinsky, 2014). Case study work aimed to validate the EFFORTI evaluation framework. For each case study a theory of change was developed and validated with programme managers. This was based on three main axes: concept/design analysis, implementation analysis, and an impact assessment. Case study guidelines were developed which included research questions and reporting templates to later facilitate the comparative analysis. Each case study was comprised of documentary analysis and between 4–12 semi-structured interviews with policy-makers, programme managers, practitioners and beneficiaries.

4.1. Three empirical case studies spanning Austria and Catalonia, Spain

	Performance Agreements (Austria)	Gender Dimension Axis of GEP in a RPO (Spain/Catalonia)	FEMtech Research Projects (Austria)
Scope	National	Institutional	National level funding programme
Main Objective	Integrating the gender dimension in university teaching is one objective of the performance agreements	To promote a gender perspective in teaching and research content	Increase innovation capability, create new markets and expand existing markets
Targeted Sector	HES	HES	BES & HES
Type of Intervention	Gender Dimension in Tertiary Education	Gender Dimension in Tertiary Education	Targeted funding to improve the integration of the gender dimension in research
Target Group	Public Universities	The academic community specifically including researchers, teachers and students	R&D companies, non-university research institutes, universities

4.2. Integrating the gender dimension in teaching and research contents in a university Catalonia, Spain

The Catalan university aims to promote a gender perspective in teaching and research content. This was one of the first universities in Spain to introduce the gender perspective in education and research through the implementation of various gender equality plans. The Catalan university developed an equality plan in 2006, before it was legally obliged to do so (2007). It was also one of the first universities to create an 'equality observatory' and is one of the first universities in Spain that is currently working on its fourth gender equality plan. The gender dimension in research content also tends to be the weakest part of gender equality plans – but this has always been a central axis of this universities' three GEPs.

Catalonia has developed its own laws to integrate the gender dimension in research and teaching content: the Law 17/2015 for effective equality between men and women (DOGC, 2015). Article 28.1 of this law demands that universities "mainstream the gender perspective and studies about the contribution of women throughout history in all knowledge spheres and in academic and research activities are included in degrees, and post-graduate curriculum". Article 28.2 also states that universities "have to strengthen the work of women researchers and their participation in research groups, and make visible their contributions in scientific and technical fields, train their staff in the gender perspective…; and create modules or specific courses on the gender perspective and women in each academic discipline (Verge Mestre & Cabruja Ubach, 2017: 11). The Catalan University Quality Assurance Agency is the regional governmental unit which is officially responsible for guaranteeing the quality of Catalan universities' degree and Masters programmes. It is bringing this legislation into effect by demanding that the gender perspective is taken into consideration in those qualifications offered by Catalan universities requiring accreditation (AQU, 2018).

The Spanish ERA Roadmap implemented in 2016 outlines the legal framework and strategies related to gender mainstreaming. The Spanish commitment to the ERA is seen in the goals and measures incorporated under the Spanish Law of Science, Technology and Innovation adopted in 2011. The legal framework in provision 13 of this law includes: "Adopting measures that aim to foster the gender perspective in institutions and committees (including evaluation measures) and promoting the adoption of Equality Plans by the Public Research Organisations" (Spanish Roadmap for the European Research Area Development 2016-2020: 5).

The Spanish Strategy of Science, Technology and Innovation 2013–2020 provides the framework for elaborating the Spanish ERA Roadmap. Approved in February 2013, the Strategy has a shared vision with Europe 2020 Strategy, the Innovation Union Flagship and the Horizon 2020 Framework Programme enabling funding instruments to achieve strategic objectives. The Strategy aims to facilitate mid-to-long term planning of R&I policies at the national state administration level as well at the level of autonomous communities. Specific measures to promote the development of ERA in its core principles and in its crosscutting priorities are defined. One of the Strategy's five core principles is the gender perspective in public R&I policies. It aims to correct the loss of human capital linked to the uneven incorporation of women and their professional development in R&I fields, both in the public and private sector. It also recognises gender mainstreaming in R &I research as relevant to the creative process and innovative results (ERA Roadmap, Spain).

4.3. Integrating the gender dimension in tertiary teaching through performance agreements

This case study aims to analyse the impact of the performance agreements between the government and Austrian public universities as a useful tool to promote gender aspects either as study fields/ or modules in tertiary education. Performance agreements are the central governmental steering instrument for public universities on the basis of which funding is allocated. They are negotiated between the Federal Ministry of Education, Science and Research and each individual public university and they define development targets in the area of research, teaching as well as further societal targets for a three year period. Targets are set according to the current Austrian University Development Plan and each individual university's development plan that covers a mid-term strategic planning period of about 5 years. For the period 2016–2018, goals were set in the field of gender dimension in teaching for the first time. Some universities have already committed themselves to explicitly defining targets for the inclusion of the gender dimension in research and teaching. The formulation of a specific requirement by the government to emphasise gender content in university teaching is an attempt to scale-up respective activities that already take place at some universities, to the whole university sector.

As different universities have chosen different strategies to implement the integration of the gender dimension in teaching and research content this case study is an embedded case study - which looks at how three universities have implemented three different models.

4.4. FEMtech research projects

FEMtech Research Projects is a funding programme for projects integrating the gender dimension in research content. The calls address technology- intensive companies, non-university research organisations, universities and universities of applied sciences. It initiates gender-sensitive projects in research, technology and innovation to develop tailor-made, innovative solutions. FEMtech Research Projects promotes the implementation of gender throughout various stages of

the research design, beginning with the research question, through data collection, data analysis and documentation. Tenders are open to all topics in the area of applied research, technology/product/process development, as well as usability studies, environmental analyses and feasibility studies. Gender balance in the project team is desired but not required (Holzinger & Schaffer, 2011, p6), whilst a female project leader is not required. Applicants must demonstrate gender expertise (professional, methodological, social and self-competence) in their project teams (FFG, 2012, p11, 2013, 2014c, p 13). The project proposals are evaluated in a first step formally by the Austrian Research Promotion Agency (FFG) and in the second by a jury of international experts.

In Austria national measures and policies regarding gender equality in R&I are heavily oriented towards international and European standards and strategies with the UN charter of human rights, the new UN System-wide Strategy on Gender Parity and above all the respective targets of the European Research Area Roadmap 2015–2020 (priority 4 Gender Equality and Gender Mainstreaming in Research).

The Austrian ERA Roadmap, implemented in May 2016, outlines a policy mix of strategies, instruments and measures in order to pursue national targets to promote gender equality and gender mainstreaming according to “priority 4” of the ERA Roadmap. In the Higher Education Sector these targets have to be followed mainly within the performance agreement period 2016–2018 and future periods. Progress in government initiatives in order to foster the integration of the gender dimension in tertiary teaching is assessed against the subsequent targets:

- Implementing a networking platform between researchers and practitioners in order to exchange up-to-date gender specific research findings and possibilities of their application
- Awards in the field of gender research
- Integration of gender content into projects in the field of R&I and curricula

In Austria, the central legal framework to promote gender equality in tertiary education and research content mainly consists of the Federal Equal Treatment Act (Bundesgleichbehandlungsgesetz) and the respective paragraphs in the University Law 2002 (UG Novelle BGBI 2014/2015). As the Austrian public research sector is dominated by the 22 public universities, the latter is crucial for implementing gender in research content and particularly teaching; and is therefore particularly relevant for the EFFORTI case study concerning the performance agreements at Austrian universities.

In addition, equality between men and women in R&I is anchored in the RTDI directive (Bundesministers für Verkehr, Innovation und Technologie; Bundesministers für Wissenschaft, Forschung und Wirtschaft 2015) and therefore has to be considered in all funding programmes that are based on this directive.

On the policy level, three ministries have specific responsibilities for R&I: the Federal Ministry for Transport, Innovation and Technology (BMVIT), the Ministry of Education Science and Research (BMBWF) and the Ministry for Digital and Economic Affairs (BMDW). The ministries work (relatively) independently but are responsible for various funding programmes; providing some specific funding for promoting gender equality in R&I (content). These Ministries mainly drive the policy debate and development of new policy measures in R&I (Streicher 201, 61; EFFORTI Country Note 2017, 17). Generally, the political motivation for gender equality policies in R&I in Austria seem to lie more in the aspiration to move from European innovation follower to innovation leader than the prioritisation of gender equality in the political agenda/will. This political setting proved to be particularly important for FEMtech Research Projects, as it is highly dependent on the respective Ministry regarding its amount of funding and programme extension.

5. Results

In this section we evaluate the three case studies in terms of their design, implementation, and subsequent outcomes and impacts. A comparative analysis of three distinct case studies – all considered as ‘good’ practices at integrating the gender dimension in teaching and research content within Europe aims to provide an analysis that goes beyond the specificities of the case studies to inform future programme designs and evaluations of interventions aiming to integrate the gender dimension in teaching and research content. We present the findings of the case studies according to the EFFORTI case study framework by assessing the strengths and weaknesses of the design of the case studies and how these affected subsequent outcomes and impacts, we also provide an assessment of the implementation process- including those facilitating and hindering factors, whilst we highlight the outcomes and impacts of the case study interventions.

5.1. Design

An analysis of the strengths and weaknesses of the design of the interventions in relation to their subsequent outcome and impact revolved around three main concepts: resources, legal status and gender concept in terms of definition and its operationalisation.

5.1.1. Resources

In two of our case studies (FEMtech Research Projects and the Catalan University) unrealistic expectations of the interventions were held, given the amount of available budget. For example in the case of FEMtech Research Projects, despite the increase of funding to 2.4 million euros in 2017,[5] reaching the target number of funded projects (between 10 and 12) would only be possible, if most of the funded projects do not make full use of the maximum amount of funding. Considering that FEMtech Research Projects contribute to technological development and include social science research to address the gender dimension, this is probably unrealistic. To fund 10–12 projects a funding amount of 3–3.6 million euros would be needed (Reidl & Barenek, 2018, p3). Similarly, in the case of the Catalan University a lack of financial and human resources was identified as one of the main obstacles to successfully integrating the gender dimension into the curriculum. The Observatory co-ordinates work in this field with a budget of approximately 60,000 euros per year – the evaluation of the plan highlights how funding is scarce relative to other comparable budget items in the same field. The university boasts 80 different study plans – to develop the required gender competence in each of these study areas would require extensive resources and capacity for training (Palmén & Arroyo, 2018, p8).

In the case of the Performance Agreements - a major limitation in the design of the measure was linked to the internal allocation of resources. As the internal distribution of funds falls outside the government’s scope, a lack of ring-fenced funding allocation to integrate the gender dimension was seen as problematic. Universities are only asked to fulfil general requirements regarding the gender dimension in teaching in line with their overall duties for which they receive lump-sum funding. This causes several problems for the implementation of activities including a lack of direct incentives - as resources are not specifically allocated to foster the gender dimension in teaching and content. The lack of ring-fenced allocated resources also hinders the use of standardised monitoring indicators to track implementation (Unger, 2018, p8).

5.1.2. Legal status

A lack of sanctions was identified as negatively contributing to the

[5] from about 1 million euros in 2008 and 2009 to 2.4 million euros in 2017 [Wroblewski, 2016a, 2014b, p4; FFG, 2014a, p3, 2017, p4])

implementation of, and the outcomes and impacts of two of the case studies. The lack of compulsory measures was identified as problematic for the Catalan University as Gender Equality Plans are not legally binding. Ensuring the implementation of the measures was therefore judged to be a difficult task. As non-compliance cannot be sanctioned, implementation often depends on the good will (and time/resources) of the responsible body or person. Similar arguments were made in the case of the Performance Agreements as these do not have the status of legal contracts. Whilst progress according to the Targets stipulated in the agreements is monitored, room for sanctions is limited. There have been no financial cut backs due to individual universities not fulfilling their targets since 2007 when Performance Agreements were first deployed.

5.1.3. Gender concept: definition and operationalisation

In all of our case studies we can see how the gender concept was defined and operationalised has affected the outcomes and impact of the interventions. In the Catalan University it was recognised that the best way to maximise the integration of the gender dimension into teaching and research content is to mainstream it by including it as one of five basic university competences thereby incorporating it in all studies. It was an important decision which was taken before the new requirement to integrate the gender perspective for degree accreditation by the Catalan University Quality Assurance Agency (AQU). Regarding the Performance Agreement case study, the Austrian public universities show a great deal of heterogeneity regarding the design of respective programmes and courses etc. Most universities report that they explicitly address gender issues in some kind of teaching activities, ranging from mandatory modules to optional activities (Unger, 2018, p3) but no quality standards or minimum requirements exist to ensure the effectiveness of these activities.

In the case of FEMtech Research Projects the gender concept was improved and sharpened over the years. In 2016 a review was conducted which led to a revision of the tender. Now proposals have to be more precise, especially regarding the presentation of gender expertise and the gender concept. Gender is now more strongly included in the evaluation of the applications during the selection process by the jury and in the reporting of already accepted projects. This, together with an increased competition for funding led to a more thoughtful consideration of the gender dimension in those projects that were funded and thereby improving the quality of research and results.

5.2. Implementation

The analysis of those factors enabling smooth implementation of the intervention revolved around three main concepts which facilitated implementation: top-level institutional commitment, central co-ordination as well as distributed responsibility combined with gender competence. One of the main factors hindering implementation was a lack of recognition and status of gender studies.

5.2.1. Top-level institutional commitment

In all three cases one of the key enabling factors is the institutional commitment at the level of the rectorate and top management positions towards gender equality policies. Support at the level of the rectorate complimented by a designated person responsible for gender equality in each faculty was one of the major facilitating factors identified by interviewees in the Catalan case study. On the contrary, in the case of FEMtech Research Projects in Austria a lack of support from decision makers in the ministry was identified as one of the main limitations for the future implementation of the programme. The relevance of gender as a topic is being currently questioned and therefore the already relatively low funds for the funding programme are being reduced. FEMtech Research Projects also suffers from a lack of support from decision-makers in industry.

In the case of the Performance Agreements – the intervention was seen as a useful tool for securing top-level institutional commitment. In the three universities studied within this case study the implementation of gender related teaching modules were mostly driven by the individual engagement of single professors and respective entities within universities such as institutes, departments or strategy units. Hence, initiatives tend to be built around a single professor driving this topic. The continuity and sustainability of the initiative is therefore highly dependent on the rectorate's commitment and the continuity of funding. Whilst in the majority of cases activities had begun before the Performance Agreements – these agreements were seen to have a positive effect on these types of initiatives by helping to increase the institutional commitment of the rectorate (Unger, 2018, p28).

5.2.2. Mainstreaming gender studies throughout study programmes with support from central unit

For the two tertiary education case studies we can see how successful strategies for implementation combined a central co-ordination unit which had gender competence and expertise with gender mainstreaming throughout study programmes. Despite the multitude of different approaches that the universities in Austria have implemented – one of the three researched universities can be regarded as taking a particularly successful approach attempting to transfer knowledge from gender studies to the teaching of other disciplines – with the outcome that gender awareness measures in relation to gender equality and decision-making are defined/scheduled in all study programmes.[6] Besides developing and promoting gender critical teaching in all degree programmes, the centre organises optional modules in "feminist science-gender studies" as well as an extension curriculum in "gender studies", which includes courses for the equivalent of 24 ECTs.[7] The certificate is well regarded by students as it acts as an additional qualification in the labour market. Both the extension curricula and the optional subject are accessible for students of all disciplines and programmes. There is also a mandatory course to be attended by all university students.

In the case of the Catalan university, the Observatory for Equality is a key actor driving forward the incorporation of a gender dimension in teaching and research. This gender knowledge hub is comprised of gender experts who carry out research and training on gender equality and the gender dimension throughout the university. The Observatory, established in 2005 has developed research to identify gender inequalities within the university. This has been crucial in establishing the different measures to integrate the gender perspective in teaching and research. One of the measures is developing and implementing the "Minor in Gender Studies" that consists of a gender specialisation certificate, i.e. an academic qualification for students from different degrees through the provision of a cross-curricular training plan. In order to implement the key decision taken from the Rectorate to integrate the gender dimension as a basic university competence, the role of the Observatory is key as they offer training to provide expert knowledge to the different departments that lack gender expertise.

5.2.3. Gender competence

The case of the Catalan University demonstrates that gender competence is key for rolling out the integration of the gender dimension throughout the curriculum. The Observatory develops, monitors and evaluates the gender equality plans for the university. It acts as a gender expert and competence hub – providing the knowledge, skills and

[6] The main responsible actor for implementation at the University of Klagenfurt is the Centre for Women and Gender Studies.

[7] The optional module 'feminist science -gender studies', designed as cross sectional and interdisciplinary, is not an autonomous field of study but offers students from any degree a certificate in 'gender knowledge' after completing 16 ECTs – it is overseen by an advisory council that consists of representatives from all study programmes (Unger, 2018, p25).

training needed to integrate the gender dimension throughout the study plans. The case of FEMtech Research Projects shows that the level of attainment of gender competence is crucial for assuring the quality of the implementation of the measure. In one of the analysed projects, a gender expert was integrated as a sub-contractor responsible for the gender relevance of the project however in the other two projects the project leader was responsible for integrating the gender dimension in the project (Reidl & Barenek, 2018, p21). How these different gender experts were integrated into the project and their subsequent roles affected the implementation of the intervention which subsequently affected outcomes and impacts. The more central role that the gender expert occupied within the project tended to ensure better results (see also Wroblewski, 2016a, 2016b).

5.2.4. Lack of recognition and status of gender studies and innovations

In terms of research, both case studies in tertiary education identified the lack of academic recognition of gender studies as an implementing obstacle. A major caveat highlighted in the Austrian case study was that gender is not a regular subject according to ISCED classification of study fields which first limits its visibility, second discriminates the subject in the allocation of resources (as these have to be typically anchored at the regular subject/institute level) and third limits the visibility of outcomes and impacts as these are typically attributed to a parent institute/faculty. The lack of visibility of gender studies was also highlighted in the case of the Catalan University - researchers that participated in working groups and discussion groups highlighted the invisibility of their scientific production and a lack of support for their research work. In this case study - some academic staff also questioned the relevance and value of gender studies. It was highlighted how the freedom of academic staff (that each lecturer decides what to teach and how to teach) could be an obstacle to rolling out the gender dimension in every study plan. Whilst some teachers were receptive, others were not. The students, however, that participated in the evaluation of gender policies of the university attributed a great importance to actions that aim to introduce the gender perspective in teaching. The proportion of students that have valued these measures as 'very important' is above average, particularly in relation to teaching and the measures linked to making research visible.

5.3. Outcomes and impacts

The outcomes and impacts related to these three interventions included an increased awareness and interest in gender, increased gender competence an increased commitment to gender teaching and research, more and better research, and an improved accreditation process.

5.3.1. Increased awareness and interest in gender

In the case study linked to the Performance Agreements an increased awareness at all levels of the universities' hierarchies was detected. Students' increased awareness of gender issues in research was seen to lead to an increased motivation for further study. This was seen to also promote an increased awareness in the private sector – as graduates later become employed and absorbed into the labour market.

As FEMtech Research Projects is expected to address a wide variety of scientific communities a social network analysis was carried out. This shows that the group of beneficiaries has increased from call to call. The analysis demonstrates that over 7 calls, some universities and later on non-university research organisations have established themselves as key players that form nodes within the network of beneficiaries. These key players have carried out several research projects with alternating partners. It can be assumed they have a multiplier function in involving other organisations in dealing with the gender dimension in research. Consortia have the potential to include newcomers and make them familiar with the topic of the gender dimension in research. Including unfamiliar cooperation partners such as gender experts in research projects within FEMtech Research Projects has sometimes resulted in sustainable and interdisciplinary cooperation. In this case study, increases in the levels of awareness was highest amongst partners from the business and enterprise sector – some of whom were not yet gender aware (Reidl & Barenek, 2018, p31–32).

5.3.2. Increased gender competence

In the Performance Agreement and the Catalan university case studies it was recognised that students are upskilled and acquire a wide range of different gender competences whilst they then go on to use these skills in their future careers. The FEMtech Research Projects case study shows, that an outcome of the funding programme is an increased gender competence of researchers, which is used to write better research proposals in other funding schemes. The gained knowledge and competences regarding gender and/ or new research methods were used in teaching, trainings and other research projects. Most interviewees also mention a greater awareness of researchers regarding interdisciplinary and/or participative research through taking part in the funding programme. For a research organisation, participation in research projects with a gender focus also means that it can provide a reference for further gender project proposals. (EFFORTI, 2019 Impact Story: (Targeted) funding to improve the integration of gender dimension in research.)

5.3.3. Gender equality in terms of representation and organisational change

In all three case studies integrating the gender dimension into tertiary education and research content and knowledge and technology transfer had outcomes linked to more equal representation and institutional transformation. Two unintended outcomes from FEMtech Research Projects were linked to gender equality in terms of representation and organisational change. Contrary to conventional funding lines, two thirds of the projects are led by women, although it is not a criterion that influences the funding decision. Sometimes, a FEMtech Research Project is the first opportunity for young female researchers to lead a research project and thus represents an important career move (Reidl & Barenek, 2018, p30). Participants from FEMtech Research Projects also went on to submit a proposal for FEMtech Career to foster organisational change.

In the Austrian performance agreement case study an increased awareness for gender aspects in research teaching in the period 2016–18 at all levels of university's hierarchies ranging from explicit non-discrimination policies, support for female students etc. was found to be a positive outcome. However, as pointed out previously, the actual commitment and the nature of respective activities is highly diverse, due to the institutional autonomy of Austrian universities as well as from a lack of dedicated funding.

In the case of the Catalan University – in the second GEP incorporating the gender perspective in research and teaching was articulated in relation to research contents – but in the third plan this is considered insufficient- and it was linked back to an institutional transformation perspective. Impacts are also related to including the discourse of equality and gender in scientific and academic activities for an 'inclusive excellence'. It applies the UNESCO definition of 'inclusive excellence' which involves "attention to diversity in a dynamic, comprehensive way that is less dependent on technical and organizational inertias that limit learning and has more flexible and accessible curricular that are gender-sensitive and consider cultural diversity". It is recognised that 'inclusive excellence' cannot be achieved through isolated efforts but a range of different and complex measures must form an integral part of the university's mission.

5.3.4. More and better research

In the Performance Agreement case study a greater interdisciplinarity in research projects, gender sensitive, use-inspired R&I projects and innovations as well as a broader consideration of gender-sensitive paradigms in R&I processes were identified as key outcomes. Similarly, in the funding programme FEMtech Research Projects, the

most commonly produced result of the funded projects is a review of a product or service from a gender perspective, but also guidelines for research and practice, research methods and new gender-sensitive products and services are developed. All of these outputs can possibly contribute to the development of tailor-made, innovative solutions. Of the 55 projects funded in FEMtech Research Projects, starting points for further research were identified, i.e. how project results would be used in the future. 18 projects planned an application of project results in practice and another 12 are committed to applying the project results. Moreover, one interview partner reported a market launch of services developed in FEMtech Research Projects. Follow-up projects are mentioned in only three project descriptions but were an important issue in the interviews. Seven interviewees report having already submitted another FEMtech project or a follow up project in another funding programme. Not only further research but another impact was linked to the better quality of proposals. Some interviewees identified that they could improve the scientific quality of the gender part of research proposals in other funding schemes.

5.3.5. Improved accreditation process

In the Catalan case study an improved accreditation process of graduate and post-graduate studies which takes into account the gender dimension in curricula was identified. This process advanced by the university, has been officially recognised by the Catalan University Quality Assurance Agency (AQU). The Agency requires the incorporation of the gender dimension in the curricula for the accreditation process of all universities' degree and Master level programmes. This new requirement in the accreditation process represents an improvement in the quality of teaching in the Catalan University system as it acts as a guarantee that the transmitted knowledge is non-gender biased (AQU, 2018). To assure the quality of incorporating the gender perspective, the Agency provides guidelines to comply with the evaluation criteria. This process requires a self-evaluation of the current reality within the university's faculties. The diagnosis includes an assessment of incorporating the gender dimension in the Studies Plan, teaching materials, teaching innovation and the presence of women as lecturers (AQU, 2018). It requires a revision of all teaching materials and processes within each degree and coordination, whilst enhancing transparency and providing an up-date of the transmitted content. The Observatory has received requests from different Faculties to help them to integrate the gender dimension in their fields.

6. Discussion

The EFFORTI evaluation framework has proved a useful framework to enable the comparison of three different interventions which aim to integrate the gender dimension into tertiary education, research content, knowledge and technology transfer. A comparison of the design, implementation, outcomes and impacts of three different interventions in these fields highlights some common issues which must be taken into consideration in the design and evaluation of interventions aiming to integrate the gender dimension in either teaching or research content.

Regarding the design of the interventions – it was recognised how sufficient resources need to be allocated to develop the competences required for a successful integration of the gender dimension throughout study plans. For research content, knowledge and technology transfer – recognition of the real costs of combining a social science approach with technological development cannot be underestimated. Resource allocation on the basis of integrating the gender dimension into teaching and research content was seen as problematic when the subsequent allocated resources were not specifically earmarked to further this aim – also compounding difficulties in tracking and monitoring activities carried out in this field. A lack of sanctions was also a common topic that was seen to negatively affect outcomes – that should be considered at the design stage of an intervention.

How the gender concept is primarily defined at the design stage and then operationalised (through implementation) was seen to impact on the success of the intervention – for example a responsive programme management that enabled the refinement of the criteria for the gender concept and expertise was positively welcomed and seen to have a beneficial effect on outcomes. Mainstreaming gender studies throughout study programmes with support from a central unit was identified as a useful strategy to operationalise integrating the gender dimension through tertiary education. This backs up the approach taken up by Austrian ministry - where transdisciplinary and integrative approaches are in favour compared to explicit education programmes. This is partly because gender studies does not stand as a subject on its own but relies on the inputs, perspectives, and questions raised by different disciplinary problems. Furthermore, anchoring gender studies and research to a specific discipline increases their impact, by first adding to discipline specific knowledge and thinking and second by improving the methodological toolkit of gender research and studies. One must also take a cautionary approach when comparing different universities approaches in integrating the gender dimension in tertiary education. For example, whilst different institutions report having mandatory courses for gender and diversity issues in the curricular – mandatory means different things to different institutions.

In terms of successful implementation, top-level institutional commitment was identified as a key factor. This backs up more general literature on structural change in research organisations which highlights it as a necessary condition (EC, 2012). In one case study institutional commitment on part of top-management was a requisite for successful implementation and in the other it was identified that a lack of commitment from the ministry was hampering its roll-out. The Performance Agreements intervention as a national 'steering' instrument was seen crucially to encourage institutional commitment for integrating the gender dimension in tertiary education and research content.

The mainstreaming of gender studies into all courses of study at universities would subsequently also benefit the successful implementation of gender-sensitive research projects such as those funded by FEMtech Research Projects. Gender competence was seen as crucial to successful implementation of the funded projects. Wroblewski (2016a, 2016b) analysed, that gender-competent project leaders implemented gender better and at an earlier stage than their conventional counterparts; gender experts with a strong standing in the project team, a responsibility for content issues and a clear distribution of tasks were also more successful (and vice versa) (Wroblewski, 2016a, pp.19–20). Our case studies underline the importance of providing sufficient resources for strengthening the gender competences of university lecturers and researchers in order to successfully integrate the gender dimension in teaching and research content. A lack of visibility, recognition and status of gender studies and innovations was seen to negatively impact on the implementation of these interventions. Gender studies is not a regular subject according to the ISCED classification of study fields, this limits its visibility as well as discriminating against the subject in the allocation of resources whilst limiting the visibility of outcomes and impacts.

Wroblewski states "Ideally, the thorough implementation of gender can lead to three impacts; firstly, giving gender a better standing in non-university research, secondly, raising awareness for the relevance of gender in research and lastly, improving the quality of the research projects' results" (Wroblewski, 2016a, p.27). Our case study findings back this up highlighting an increased awareness and interest in gender, increased gender competence, and more and better research as key outcomes and impacts. Additionally our case study findings also pointed to more gender equality in terms of a push towards more equal representation and organisational change as well as an improved accreditation process.

The network analysis of one of our case studies demonstrated a raised awareness of integrating the gender dimension into research content as the call progressed throughout the years and consortium

partners reconfigured with partners with no previous experience in the FEMtech Research Projects programme. This is especially significant given the target sector is the business enterprise sector where partners from this sector were shown to be less gender aware. Increased gender competence was also seen to have a potential impact on the business and enterprise sector as students become upskilled and use their skills in their future careers. Increased knowledge and competences regarding gender/and or new research methods were seen to aid the better writing of proposals in other funding schemes and better training/ teaching and research projects.

Unintended outcomes of the FEMtech Research Projects Programme included a higher percentage of female project leads as well as applications of funds for organisational change. For the Catalan University "changes towards inclusive higher education must be measurable in terms of the criteria for inclusive excellence. After Kira Hudson Banks, there are four elements that make up inclusive excellence: (a) access to equality, manifested by the numbers and success of students, teaching staff and administration and services staff that are underrepresented; (b) diversity in the formal and informal curriculum in terms of content related to diversity in academic programmes and the social dimension of the campus; (c) the atmosphere on the campus in terms of offering support to all students to help them get on, and (d) student and learning and development, including the acquisition of knowledge about different social groups and the development of cognitive complexity" (2009,150). The Catalan Case Study recognised how 'inclusive excellence' requires complex and diverse measures aimed at the entire community, and need to 'form an integral part of the university's mission'.

Projects funded through the FEMtech Research stream either contributed to the development of new gender-sensitive products and services or existing ones were reviewed from a gender perspective to improve them. Also guidelines for research and practice and research methods were developed to contribute to tailor-made, innovative gender-sensitive solutions. The research results of these projects are used to develop further research questions, submit follow-up projects, plan applications in practice and sometimes even launch new products and services on the market.

In the case of the Catalan University, there is an improved accreditation process of degree and Master level programmes. The requirement to incorporate the gender dimension in order to obtain the official recognition by the Catalan University Quality Assurance Agency (AQU) represents an advancement of the quality of teaching in the Catalan University system because it represents a guarantee that the knowledge transmitted is not gender biased.

7. Conclusions and lessons learned

Our evaluative framework enables us operationalise complexity by a) factoring in context, b) identifying the strengths and weaknesses of the design of the interventions c) establishing those elements that enable/ hinder a 'successful' implementation of the interventions and d) identifying relevant indicators for assessing outcome and impact.

Assessing the quality of considering a gender dimension in research is not an easy task. Beyond the simple counting of keywords, training experts across the scientific disciplines is necessary to provide a more in-depth understanding how and when the gender dimension has been integrated into research and higher education.

In terms of design the gender concept matters. In the case of the Catalan University a gender mainstreaming approach was identified as providing the most effective approach for integrating the gender dimension in teaching and research content. In the case of the Performance Agreements we can see how there is a great deal of heterogeneity of approaches. In terms of FEMtech Research Projects programme the concept became more well-defined during implementation – demonstrating the benefits of responsive approach to programme management. There were also great variations in definitions used by the different projects.

Regarding implementation – gender competence is key. Building competences of researchers in the gender dimension is however a long-term process that requires in some cases challenging accepted 'norms' in certain scientific disciplines and therefore may take a great deal of time. Outcomes and impacts in this instance may be gradual -slightly increased awareness may eventually lead to a better 'more inclusive' way of doing science.

Funding

This work was supported by the European Union's Horizon 2020 Research and innovation programme award EFFORTI under grant agreement No. 710470.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Thanks to all research participants who gave their time to be interviewed. Thanks also to the reviewers whose comments improved the article.

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Rachel Palmén is a senior researcher at the Gender and ICT Research Group (Internet Interdisciplinary Institute (IN3- UOC) and at Notus: Applied Social Research. After gaining her PhD at Sheffield Hallam University, she has worked on various European Research Projects on gender and science leading workpackages in "GenPORT – Your gateway to gender and science resources" (2013–2017); "EFFORTI -Evaluation Framework for Promoting Gender Equality in R&I" (2016–2019), "TARGET- Taking a Reflexive approach to Gender Equality for Institutional Transformation" (2017–2021) and "ACT - Communities of Practice for Accelerating Gender Equality and Institutional Change in Research and Innovation across Europe" (2018–2021).

Lidia Arroyo is a researcher at Gender and ICT Research Group (Internet Interdisciplinary Institute- Open University of Catalonia) and she is also an Associate Professor at Autonomous University of Barcelona (UAB). She holds a Diploma of Advanced Studies (DEA) in the doctoral degree of Sociology at UAB. She has participated as a researcher in the following European Projects: "GenPORT – Your gateway to gender and science resources" (FP7, 2013–2017), "EFFORTI -Evaluation Framework for Promoting Gender Equality in R&I" and "ACT - Communities of Practice for Accelerating Gender Equality and Institutional Change in Research and Innovation across Europe" (H2020, 2018–2021).

Jörg Müller is currently at the Internet Interdisciplinary Institute (IN3 – UOC) in Barcelona, Spain where he forms part of the Gender and ICT research program. He obtained his PhD in Communications at the European Graduate School (EGS) in Saas-Fee, Switzerland and holds a degree in Sociology and Computer Science from the Free-University in Berlin, Germany. He coordinated the FP7 project "GenPORT – Your gateway to gender and science resources" (2013–2017) and is currently coordinating the H2020 project GEDII – "Gender-Diversity-Impact" (2015–2018) and "ACT - Communities of Practice for Accelerating Gender Equality and Institutional Change in Research and Innovation across Europe" (2018–2021).

Sybille Reidl is Senior Researcher at the Institute for Economics and Innovation Research of JOANNEUM RESEARCH. Her main research areas are evaluation of gender equality policies and initiatives in R&I and integration of gender and other diversity dimensions in technology development projects. She is currently involved in the H2020 projects "ACT - Communities of Practice for Accelerating Gender Equality and Institutional Change in Research and Innovation across Europe" (2018–2021) and "SPEAR - Supporting and Implementing Plans for Gender Equality in Academia and Research" as evaluating partner.

Maria Caprile is director of research at Notus: applied social research, Spain. She holds an MA in Sociology (University Pompeu Fabra at Barcelona). Over the last 15 years, she has directed large EU funded comparative studies on gender in research and the knowledge society, such as 'Meta-analysis of gender and science research' (2008–2010) commissioned by the European Commission and the FP7 project 'SHEMERA' (2011–2014). She is currently participating in two H2020 projects: TARGET (2017–2021)– providing support for implementing institutions to effect institutional transformation for enhancing gender equality; and ACT (2018–2021) - participating in the development of the conceptual approach and the self-assessment and monitoring tools to support the implementation of gender equality plans in research organisations through a community of practices approach.

Maximilian Unger is a researcher at the Institute for Economic and Innovation Research (POLICIES) of JOANNEUM RESEARCH in the Research Group Technology, Innovation and Policy Consulting (TIP) in Vienna. He graduated in economics from the Vienna University of Economics and Business in 2012. His work focuses on research, innovation and higher education policy topics and the analysis of policy measures.