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**NOTE**

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| From: | ERAC Standing Working Group on Gender in Research and Innovation |
| To: | ERAC delegations |
| Subject: | Innovating innovation: Policy brief on gender and innovation |

Delegations will find attached to this Note the policy brief by the ERAC Standing Working Group on Gender in Research and Innovation "Innovating innovation: Policy brief on gender and innovation".

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# Innovating innovation: Policy brief on gender and innovation

Policy Brief

24 May 2019

ERAC Standing Working Group on Gender in Research and Innovation

**Innovation is one of the main drivers of economic growth, technological and social development and a stimulus for overcoming current challenges facing humanity. However, a gender perspective is rarely adopted either in innovation processes, innovation studies or in innovation policies.**

This policy brief, prepared by the ERAC Standing Working Group on Gender in Research and Innovation as part of its Work Programme 2018-2019, presents a short overview of the key factors and trends in the participation of women in innovation and the integration of a gender dimension in innovation processes. It delivers recommendation to policy makers, research funders and innovators with a view to achieving economic and societal. This brief argues that there is a need to consider a broad range of issues in innovation and to adapt the policy framing of innovation so that innovation can benefit women and men equally, addressing their respective needs and respecting their different life experiences and opportunities.

**Key messages**

Gender is relevant for the design, development and implementation of innovation, including innovation policy, because, inter alia:

- The usefulness, robustness and social responsibility of innovative solutions for all is enhanced through appropriate consideration of gender aspects;

- The implicit user of innovation continues to be constructed predominantly as male;

- Women continue to be severely under-represented in innovation and patenting activities in the EU and beyond;

- Industries and other economic sectors with higher proportions of women and those addressing life situations specific to women are often not recognized as sources of innovation;

- In innovation, gender aspects intersect with other axes of economic and social inequality and development of robust innovative solutions depends on a comprehensive approach;

- Gender and diversity are of particular relevance in the design of responsible approaches to digitalization, Artificial Intelligence, machine learning and big data analysis.

**Recommendations**

- The regulatory frameworks for innovation policy at the EU and Member State levels should explicitly address gender issues and ensure that gender is mainstreamed throughout the policy.

- Innovation policy and public funding to drive innovation should require that applicants and grantees address the gender dimension in the project design, development and testing, and they must also consider the gender dimension in the future implementation of new models, products, processes and services.

- Innovation policy and public innovation funders should encourage gender balance from teams receiving funding for innovation and entrepreneurship, while also requesting that they develop an organisational culture that is gender sensitive.

- Innovation policy must include social innovation and innovation in the public/civil sector, with a view to broadening the range of actors, industries and sectors, the spaces involved in innovation processes and what is recognized as sources of innovation. Also, all fields of research, including the humanities, arts and social sciences, should be seen as components of the innovation ecosystem.

- Innovation processes in both public and private sectors must consider the gender dimension, and innovation creation and implementation should be designed to avoid gender and other forms of bias.

- Innovation processes will benefit from being driven by the values of inclusion, empowerment and sustainability as well as competitiveness and growth.

- Successful innovation processes take on a participant perspective. This approach entails novel processes which are inclusive of all genders and which focus on people of different and diverse backgrounds as end-users.

- National authorities, in collaboration with business and enterprise, need to assume responsibility for defining an ethical regulatory framework that includes appropriate consideration of the gender dimension, particularly in emerging areas of research and innovation.

- Protection and pro-active steps are necessary to eliminate discriminatory algorithms and to ensure non-discrimination, openness and transparency in AI.

**Definitions**

**An innovation** is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). (OECD 2018)

**Open innovation** denotes the flow of innovation-relevant knowledge across the boundaries of individual organizations. This includes proprietary-based business models that use licensing, collaborations, joint ventures, etc. to produce and share knowledge. This notion of "openness" does not necessarily imply that knowledge is free of charge (i.e. "gratis") or exempt from use restrictions (i.e. "libre"). Pricing and use restrictions are often key conditions for access to knowledge. (OECD 2018)

**Social innovations** are new ideas that meet social needs, create social relationships and form new collaborations. These innovations can be products, services or models addressing unmet needs more effectively.[1]

**The policy framing for gender and innovation**

Equality between men and women is a fundamental value of the European Union going back to the 1957 Treaty of Rome. The EU's and in particular the European Commission's commitment to gender equality has been reaffirmed most recently in the "Strategic Engagement for Gender Equality 2016-2019" which stresses the need to maintain the focus on the five thematic priority areas highlighted as important (increasing female labour market participation, reducing gender pay gap/earnings and pension gaps, promoting equality between men and women in decision making, combating gender based violence and protecting and supporting victims, and promoting gender equality and women's rights across the world). **Horizon 2020 Framework for Research and Innovation is listed among 2014 – 2020 EU funding programmes contributing to reaching the targets and objectives of this strategic engagement (European Commission 2015).**

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[1]    See http://ec.europa.eu/growth/industry/innovation/policy/social_en

Gender equality is a priority within the European Research Area and a cross-cutting issue in Horizon 2020. Gender is also one of the key elements[2] of Responsible Research and Innovation (RRI) that aims "to foster the design of inclusive and sustainable innovation".[3] RRI can be considered as an approach where different societal actors (such as researchers, citizens, policy makers, third sector organizations) work together during the research and innovation process to align the process and outcomes with the values, needs and expectations of society. RRI is therefore an approach aimed at reconfiguring the scientific process along the notions of responsibility, public participation and democratization of science.

Within ERA Priority 4 gender equality and mainstreaming in research in particular, the goal is "to foster scientific excellence and a breadth of research approaches by fully utilizing gender diversity and equality and avoiding an indefensible waste of talent". This goal is expected to be achieved through the "development of policies on gender equality, paying special attention to areas where women are underrepresented, promoting approaches to gender mainstreaming and incorporating gender perspectives in research" (European Commission 2017).

The Oslo Manual 2018 (OECD 2018) which delivers guidelines on collecting, reporting and using data on innovation includes social inclusion and gender equality among the outcomes that affect an economy, society or the environment.

Focusing on selected key aspects of Open Science and Open Innovation (OS/OI) policies and practices, a recent report by the EU-funded GENDERACTION project shows that most analyses and policy documents related to OS/OI adopt a gender blind approach, with such an approach being more pronounced in OS policies and practices than in OI (GENDERACTION 2018a). The report argues that the consideration of gender issues in the development of OS/OI policies could have a positive impact on the promotion of gender equality goals and elimination of gender biases. Furthermore, GENDERACTION Policy Brief on Open Science & Open Innovation identifies five priority actions and makes the following recommendations:

- To ensure that open innovation funded projects integrate sex/gender analysis where appropriate and that the teams respect gender diversity. [EC, MS, innovation funding agencies]

- To develop participatory innovation projects that guarantee gender diversity

- To ensure the integration of sex/gender analysis in order to avoid gender bias and to provide that all segments of population benefit from innovation processes.

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**2**    The RRI thematic elements are the following: public engagement, open access, gender, ethics, science and education.

**3**    See    https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation.

The recent Opinion on Open Innovation delivered in 2019 by the ERAC Standing Working Group on Open Science and Open Innovation recommends to "**[E]nsure access, participation and agency to various groups of actors (age, gender, ethnicity, health, social status etc.) in order to increase the inclusion, empowerment and sustainability of and by Open Innovation." (ERAC 2019).**

Furthermore, in its input to the ERAC Opinion on the Idea of a European Innovation Council, the Helsinki Group on Gender in Research and Innovation argued that gender equality and gender mainstreaming should be an integral part of the functioning of the European Innovation Council, and recommended that "[T]he EIC should … ensure that innovation development that is funded is not gender blind and does not lead to the production of results that fail to reflect the needs and interests of relevant segments of the population that are women. The ERAC Opinion on the Idea of a European Innovation Council states that "One cross-cutting issue is achieving a better gender balance as well as attracting international talents make full use of the total talent pool" and calls for addressing "women and entrepreneurship" (ERAC, 2016).

**To conclude, despite EU's regulatory as well as operative framework, innovation policy at EU level and in the majority of Member States and Associated Countries does not adequately address gender issues although promising new practices have recently appeared, including in key areas such as Artificial Intelligence.** For example, the Ethics Guidelines for Trustworthy AI delivered by the High Level Expert Group on Artificial Intelligence (European Commission 2019) argue that "AI systems can help to facilitate the achievement of the UN's Sustainable Development Goals" and list among the seven key requirements for Trustworthy AI that " Diversity, non-discrimination and fairness: Unfair bias must be avoided, as it could have multiple negative implications, from the marginalization of vulnerable groups, to the exacerbation of prejudice and discrimination.[4]

**Gender equality issues in innovation: An overview**

Gender affects how innovation (including Open Innovation) is perceived, designed, developed, implemented and used. Research shows that the uptake of women's innovative ideas by venture capital is fractional compared to men's (Foss, Woll, & Moilanen, 2013, Criado Perez, 2019: Chapter 9); that women are not perceived as innovators to the same extent as men (Lindholm Dahlstrand & Politis, 2013; Marlow & McAdam, 2013); that masculine discourses and values still drive innovation (Blake & Hanson, 2016; Criado Perez, 2019; Marlow & McAdam, 2013; Nählinder, Tillmar, & Wigren-Kristoferson, 2012), including Open Innovation (Remneland Wikhamn & Knights, 2013), with the implicit user often imagined as male or not addressed at all (Alsos, Hytti, & Ljunggren, 2016; Criado Perez, 2019); and that the gender dimension of innovative solutions is not considered or conversely innovation involves mere "pinking" specific solutions without adequately attending to women's needs (Schroeder K. 2010, European Commission 2013, Schroeder, Sanchez DeMadariaga & Lyhne 2016, Quinlan & VanderBrug 2017).

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[4]     See https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai.

The majority of research studies and policy documents on innovation and Open Innovation are gender blind; they have also focused on male-dominated fields (Fagerberg, Mowery, & Nelson, 2005; Lundvall, 2010; GENDERACTION 2018a; GENDERACTION 2018b). Less attention is given to sectors where women predominate (care industries, service sector, public sector) (Amble, Axelsen, & Snerthammer, 2016). Also, the gendered consequences to innovation that affect women's work situation have not been considered (Criado Perez 2019). These include the design of instruments and gear fit for women, innovative solutions addressing women's life situations and health including childbirth. Another important example is how increased digitalisation will cause job losses among women in particular. The World Economic Forum (2018) predicts a higher negative impact on women's jobs compared to men's job in the future period due to digitalisation.

Gendered innovations and opportunities to innovate arising from paying attention to gender concerns should be considered as an opportunity to build a strong business case as well as to produce solutions and innovations that will be robust, without adverse effects now or in the future. The methods used should focus on using participatory research, design research etc. with the inclusion of balanced proportions of women and men. Such methodological approaches will yield solutions that may not come up if homogenous groups participate in the innovation design or if the notion of potential users is narrowly defined. Hence, issues of access, participation and agency are pertinent. Current definitions of innovation and Open Innovation in the EU focus on efficiency, competitiveness and growth of innovation-based economies. Other values such as inclusion, empowerment and sustainability should be also incorporated, together with having the right to share freely in scientific advancement and its benefits[5].

Secondly, attention needs to be paid to social innovation (in and of itself and at an intersection with "technical" innovation) for well-being and sustainability (Alsos et al., 2016; Alsos, Ljunggren, & Hytti, 2013; Amble et al., 2016). Social innovation attends to basic needs and challenges, the value of which may not be immediate and/or which may not carry economic profit or help to avoid costs. Social revenues are of the most significant value to society.

Furthermore, globally, it needs to be recognised that openness is a historically and geopolitically contingent concept. It will have very different meanings in areas where freely shared (open) indigenous knowledge has been previously abused and exploited, often by western corporations, without the local communities benefitting from such innovation (Subramanian & Pisupati, 2010; Gender Working Group, 1993). Similarly, open innovation may be regarded in some parts of the globe and communities as daily sharing knowledge practice for community building and local development rather than a techno-led practice for profit generation (Schroeder D, 2010). **Hence, innovation processes will benefit from being drive by values of inclusion, empowerment and sustainability as well as competitiveness and growth, in order to ensure the sustainable development and uptake of innovation and Open Innovation sought by the EU.**

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**5**      See article 27 of the Universal Declaration of Human Rights.

**Innovation as a process: Gender balance among innovators and in innovation co-creation**

Women are heavily underrepresented as inventors and innovators, with low percentages engaged in patenting and other forms of applied research and innovation outputs. The *She Figures 2018* (European Commission 2019: chapter 7) shows only modest growth for all technology domains at the EU-28 level. Analysis also shows gender gaps in the composition of patent team applications where 47% are awarded to male-only teams, followed by 33% of patents filed by one male inventor.

Attention to gender in innovation processes must intersect with other axes of social organisation, including age, health, disability, differences in the distribution of care work, race and ethnicity, social status, economic inequality, LGBT+ and others, as they all affect possibilities for access, participation, agency, empowerment and use.

Issues to be addressed in innovation policy:

- **Underrepresentation of women among entrepreneurs, SME owners and founders:** Policy support for specific funding instruments targeting SMEs without any attention to existing gender inequalities risks perpetuating these inequalities and excluding women from developing and exploiting innovation solutions with great commercial and societal potential.

- **Higher concentrations of women in public and civil society sectors:** Policy support and funding opportunities need to target areas with high innovation potential in other than productive and for profit sectors with a view to addressing existing societal challenges (particularly targeting care and service industries)

- **Women's participation in the co-creation processes as users and producers of knowledge and innovation**: Special attention needs to be paid to the inclusion of women as users and producers (grassroots and local communities, indigenous/ethnic minority communities, patients etc.) in co-creation processes and open innovation in order to ensure that women's needs are reflected and recognized. Innovations can affect men and women differently.

**Innovation as an output: Gender dimension of innovation**

It has been repeatedly shown that there are social and economic costs related to the failure to integrate the gender dimension (withdrawal of drugs or products from the market, damage to brand, adverse health effects, lost innovation opportunities etc.). In this context, the European Economic and Social Committee, acting under Rule 29(2) of the Rules of Procedure, adopted an Own-initiative Opinion on Women in science (2015/C 012/02) on 15 October 2014 advocated that "*the integration of sex and gender analysis increases the relevance and quality of research and innovation. It also adds value to society and business by making research responsive to a broad and diverse user base and by creating more inclusive innovation processes*".

Existing work carried out by the European Commission to support Gendered Innovations (European Commission, 2013) and understanding the benefits of sex and gender analysis underscore the vital need for integrating the gender dimension in technological design and innovation in particular, as these activities directly impact society in various roles of users, clients, patients etc. The integration of the gender dimension has been repeatedly stressed in relevant policy documents, most recently also in the Competitiveness Council Conclusions on Advancing Gender Equality in the European Research Area (Council of the European Union, 2015).

Issues to be addressed:

- **Innovation as a masculine concept**: Research shows that innovation and innovation discourses tend to be gendered masculine which is often reflected in the ways we think about particular challenges and solutions to them; often, the implicit user of an innovative solution is pictured as male, which determines the functionalities and operation of particular solutions.

- **What is defined as a societal challenge / mission:** This is related to women's access, participation and agency to (open) innovation processes; without substantial involvement of women in these processes, there is a risk that solutions will not reflect concerns and needs of women (e.g. specific health issues, differences in health diagnostics, differences in robot/human interactions, safety issues etc.)

**Artificial intelligence and robotisation: Urgent need to address gender, racial and ethnic bias reproduction**

Current research shows that machine learning and artificial intelligence will – without active measures to eliminate – reproduce gender and other biases. Proactive steps must be taken to include women in coding and designing of machine learning and AI technologies (Caliskan, Bryson, & Narayanan, 2017; Costanza-Chock, 2018; Leavy, 2018; Zhao, Wang, Yatskar, Ordonez, & Chang, 2016). Analyses show that in voice-driven platforms such as virtual assistants (Siri, Alexa) that these feminine avatars are taught to be servile, flirty, receptive to sexual harassment cues and as such they reproduce gender stereotypes and may contribute to women's unequal status in society (Coren, 2019; Fessler, 2017; Mitchell, 2017). Some dimensions of robotics may, in certain specific circumstances, equally induce gender bias, namely collaborative and mobile robots, and thus should also be explicitly addressed (for additional examples see Criado Perez 2019).

Facial analysis fares better with men and fair-skinned people compared to women and dark skinned people (Buolamwini & Gebru, 2018; Horwitz, 2018; Schwab, 2018). Google search engines display different job ads to men and women, with high paying jobs shown disproportionately to men (Datta, Tschantz, & Datta, 2015; Gibbs, 2015).

Beyond the above gender stereotypes, digitalisation may affect very concrete tasks in professions in the overall labour market, for both men and women. The perception of women´s tasks in professions more susceptible to AI and robotics should be nuclear – in the double sense of a higher risk of job displacement and the raising of new job opportunities. The unprecedented quickness of future developments can become an uncontrolled driver for inequality, increasing pressure on this approach.

**Hence, protection and active steps are necessary to ensure openness and transparency for AI instruments and robotisation where required.**

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