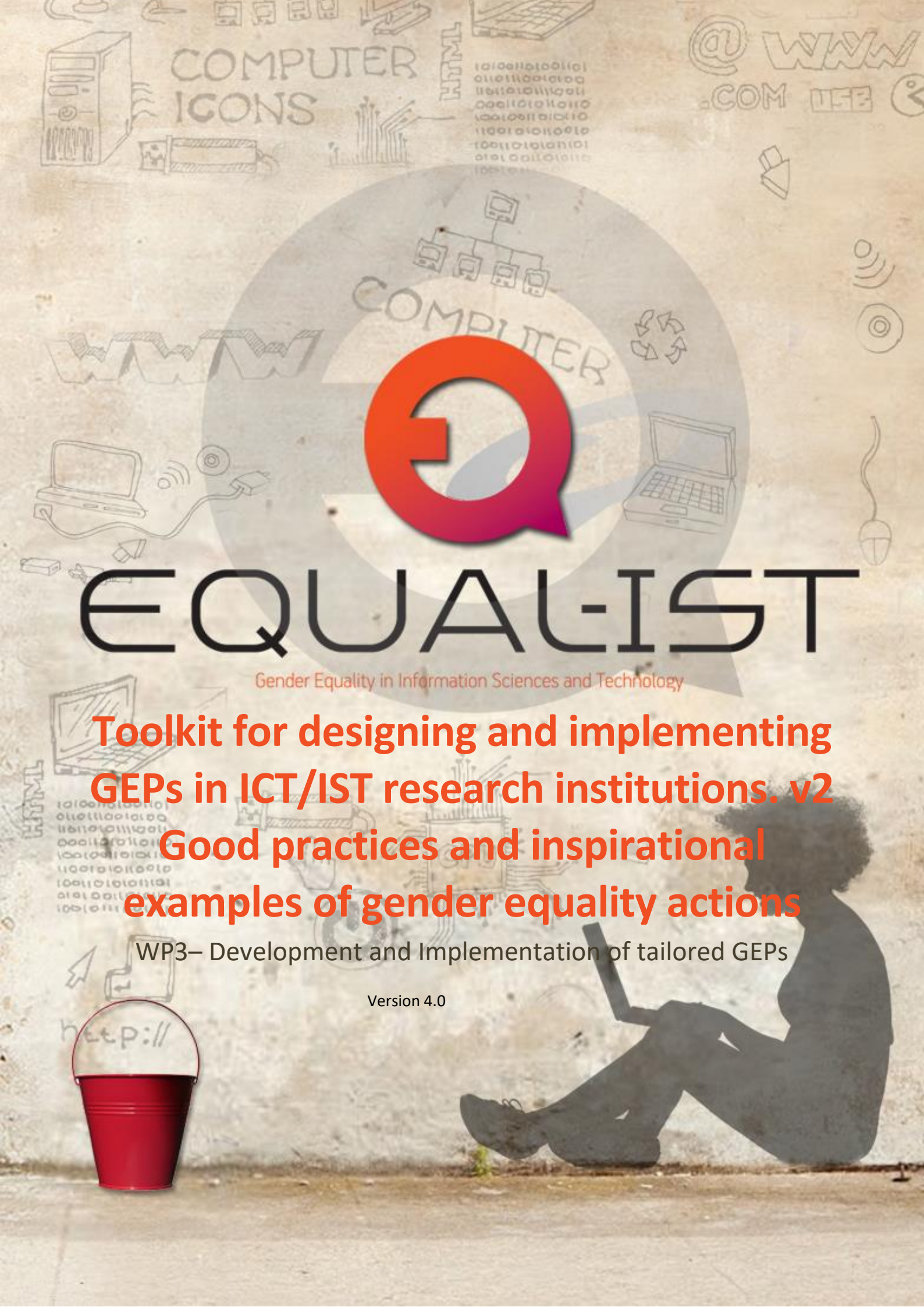
EQUAL-IST

Gender Equality in Information Sciences and Technology

Toolkit for designing and implementing GEPs in ICT/IST research institutions. v2 Good practices and inspirational examples of gender equality actions

WP3– Development and Implementation of tailored GEPs

Version 4.0



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Document History

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01	23/06/2018	First Draft		UNIVE and input from UNIMORE, KHNUE, UMINHO, WWU
02	26/06/2018	Second Draft	Improved document structure, format of good practices/measures/tools	VILABS, input from Lut Mergaert (Advisory Board Member)
03	30/06/2018	Improved version	Methodological note; paragraphs added	UNIVE, VILABS
04	05/07/2018	Final Version	Final proofreading, list of abbreviations	UNIVE

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List of abbreviations

ACM	Association for Computing Machinery
CHF	Swiss Franc
CRA-W	Computing Research Association's Committee on the Status of Women
CS	Computer Sciences
DIS	Department of Information Systems
EQUAL-IST	Gender Equality Plans for Information Sciences and Technology Research Institutions
EC	European Commission
EIGE	European Institute for Gender Equality
EU	European Union
GEAR Toolkit	Gender Equality in Academia and Research Toolkit
GEP	Gender Equality Plan
HCI	Human Computer Interaction
HR	Human Resources
iCIS	Institute for Computing and Information Science
ICT	Information and Communication Technologies
IDC	International Development Cooperation
ILO	International Labour Organization
IST	Information Sciences and Technology
IS	Information Systems
IT	Information Technology
KHNUE	Kharkiv National University of Economics
NGO	Non-Governmental Organization
PGA	Participatory Gender Audit
PRIMA	Promoting Women in Academia
RPO	Research Performing Organisation
SBE	School of Business Economics
STEM	Science, Technology, Engineering, and Mathematics
SU	Sialuliai University
UNIFE	University of Ferrara
UNIMORE	University of Modena and Reggio Emilia

UNIVE	Ca' Foscari University of Venice (Italy)
TUW	Technical University of Wien
WWU	Westfälische Wilhelms-Universität Münster

1 Presentation and structure of the Toolkit

The EQUAL-IST toolkit is intended to be an agile reading examples of good practices, concrete initiatives, tools and guidelines which have been found to be suitable for Computer Sciences and Information Systems Departments/Faculties to promote, make structural changes for gender equality at a University or Research Organization level. Stakeholders from research institutions on such disciplines (both academic/research and administrative staff as well as interested students) are the main targets of this toolkit.

The EQUAL-IST project has promoted and put into practice Gender Equality Plans as the most suitable way to initiate and sustain Gender Equality to ensure structural change in Research Institutions.An EIGE's study has shown that encompassing plans including a variety of measures and actions across several areas, are becoming widespread in the EU.It has been found that there were over 1 100 research and higher education institutions in the EU implementing a GEP in 2015, and over 1 500 GEPs being implemented by research and higher education institutions at the level of their departments or research institutes. States where a legal obligation is in place, are those where the large majority of Gender Equality Plans are found.

While comprehensive step-by step guide to the process of designing and implementing GEPs can be found in the EIGEs GEAR (Gender Equality in Academia and Research) Toolkit, the EQUAL-IST Toolkit is designed to tailor to ICT/IS research institutions with examples of specific actions and measures to promote gender equality. In fact, the majority of the presented examples in this report come from Research Institutions in the fields of ICT (Information and Communication Technology/IS (Information Systems) and CS (Computer Sciences). Actions implemented at the whole University level have also been included, taking care of referring to RPOs which include ICT/IS Departments or Faculties, with the purpose of stressing the value of complementing 'localised' measures at the Institute/Department level with measures that are taken by the central levels of the institution.

Methodological note

The Toolkit draws on existing literature and documentation collected via:

- Extensive desk research
- Analysis conducted through in-depth interviews with RPOs representatives with experience in implementing GEPS, in the framework of EQUAL-IST Deliverable 2.1 State of the Art Analysis
- Information provided by EQUAL-IST Advisory Board Members
- Additional exchanges via conference call with Informatics Europe and ACM
- Initiatives and measures presented during EQUAL-IST Webinars series
- Selection of actions deployed by EQUAL-IST partners during the first year of implementation of their Gender Equality Plans and reported in Deliverable 4.2 Internal assessment v.1

As aforementioned, the EQUAL-IST Toolkit offers agile examples of good practices, tools and guidelines but a limitation of this work worth to be highlighted is the non-homogenous quality screening of proposed cases.

We intend as 'good practice' the EIGE's definition of good practices in gender mainstreaming (EIGE, 2013, p.10 and 13):

> *"(…) practices able to work well, replicate in other contexts (transferable) and/ or provide a valuable learning experience would be considered good. These guiding principles are broad categories; nevertheless, they were vital crucial for maintaining a flexible conceptualization of the EIGE's working definition of good practices. Works well refers to an initiative's capacity to improve gender equality in a specific country, area and/or sector. Good practices that work well have a transformative value.*

> *The initiative must have engendered or potentiated better policies, a positive alteration of gender relations in the given context and/or a transformation of the organizational processes and practices with the full engagement of the actors involved in policymaking while reaching gender equality goals. In order for a good practice in gender mainstreaming to be assessed as working well, the practice should have produced an observable and demonstrable result (3) upon being operationally in effect for a significant period of time. (ibid., p.13).*

The following table illustrates 6 different types for the sources of information on which this Toolkit has built, with related quality screening levels and type of source of information which is detailed in paragraphs describing each presented practice/measure. No comparative and/or ranking purpose was underlying the research work on which this Toolkit is based.

We assign the definition of 'good practice' to actions and measures from sources and quality check methods from 1) to 4): in spite of the fact that sources of information are different and rely on different methodologies, they are either based on a set of explicit criteria (1, 2, 4) or on peer selection mechanisms (3). We refer to examples from the EQUAL-IST consortium (5) as to 'promising practices' due to the short implementation period so far. Therefore the sustainability criteria cannot be ensured to be fully met yet. We consider actions and measures whose sources are self-presentations from websites of the implementing institutions, as 'inspirational examples'.

	Source	Quality check methods	Measures/practices	Typology
(1)	EQUAL-IST D.2.1 State of the Art Analysis and EQUAL-IST webinars series	A methodology based on a set of quality criteria for Gender Equality Plans and 19 in depth interviews with representatives from RPOs	XXXXXXXXXX	Good Practices
(2)	GEAR Toolkit	Comprehensive and systematic study on good practices on gender equality in research in EU countries identified via a thorough methodology	X	Good Practices
(3)	Minerva Informatics Equality Award	Selection by the award committee of 7 CS Professors appointed by Informatics Europe.	X	Good practices
(4)	Scientific publications on gender in computing	Literature analysis and different research methodologies, mostly qualitative.	XXXXXXX	Good Practices and Evidence-based guidelines
(5)	EQUAL-IST GEPs implementation	Internal assessment of RPOs (D.4.2 v.1); inception report from the external evaluator. Quality criteria for assessment harmonised with (1)	XXXXX	Promising practices
(6)	Websites and documentation from implementing institutions (Desk Research)	Criteria for selection: innovativeness based on State of the Art Analysis; integration in National Policy Frameworks. Stability of proposed measures	XXXXXXXXXX	Inspirational examples

Table 1. Sources of information and quality screening for a typology of the presented measures/practices.

In the Appendix section, a detailed version of Table 1 is provided including reference to each practice, measure, guidelines presented in the Toolkit.

The figure below summarises the content of the toolkit based on the above-mentioned typology, showing how the majority (55,8%) of reported actions and measures fall in the 'good practices' category, 1/3 approximately (29,4%) are to be considered 'inspirational examples' and 14,75% 'promising practices'.

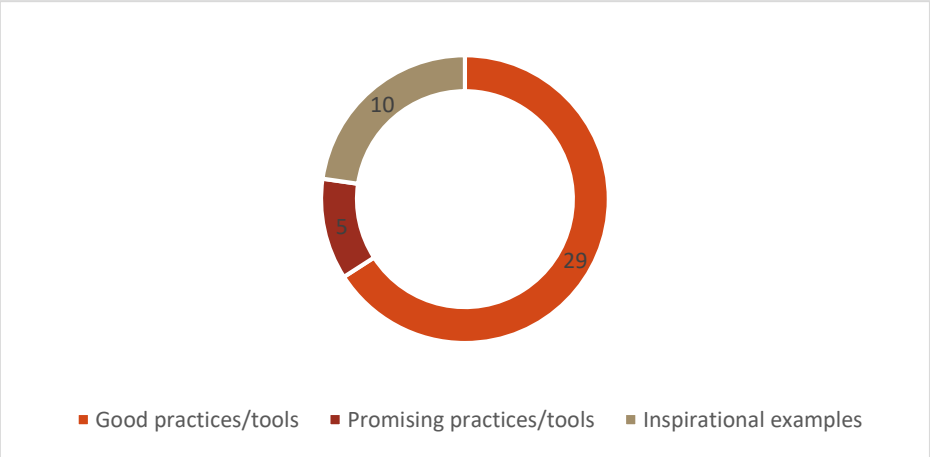

Figure 1. EQUAL-IST Toolkit content per typology

It is important to stress how presentation and dissemination of good and promising practices, as well as inspirational examples, need to be received in full awareness of how each experience is deeply rooted into its own specific regulatory, institutional, cultural and societal context. Therefore, any attempts of adaptation and replication have to start from a careful assessment of constraints and potentials for replication.

Toolkit's structure

The toolkit is introduced by a first chapter presenting the most updated available figures on the under representation of women in CS/ICT. It also illustrates the two main tools developed by the EQUAL-IST consortium for sustaining internal assessment, engagement and mobilization of stakeholders: an adapted Participatory Gender Audit methodology, and a crowdsourcing platform for identifying of internal challenges and generating ideas for suitable measures.

The following chapters cluster good practices, measures and guidelines along the main areas of interventions for Gender Equality Plans identified by the of the EQUAL-IST project, which are coherent with the ERA objectives (gender balance in decision making, gender balance in research teams, gender in research content)[1]. The specificity of the EQUAL-IST conceptual approach relies on the increased role attributed to teaching, students' services and institutional communication. In fact, starting from extremely low numbers of enrolled students, all EQUAL-IST RPOs acknowledged as a fundamental goal the need of attracting and retaining more girls to ICT/IST studies to build and retain a pool of talents and build the preconditions for

[1] EC, DG Research and Innovation (2018). *Guidance to facilitate the implementation of targets to promote gender equality in research and innovation*. Luxembourg Publication Office of the European Union. Available for download at: http://ec.europa.eu/research/swafs/pdf/pub_gender_equality/KI-07-17-199-EN-N.pdf

increasing the share of female researchers and professors. Actions that involve 'students services' such as counselling and guidance to high school students serve the purpose of motivating more girlsto enroll in ICT/IT studies; adapting CS/ICT/IS teaching to gender-sensitive methods helps in preventing drop-outs. Institutional Communication also plays an important role, especially in spreading a public image of research in these disciplines as non -male dominated environments. Collection and analysis of gender-disaggregated data is considered as a cross-cutting area.

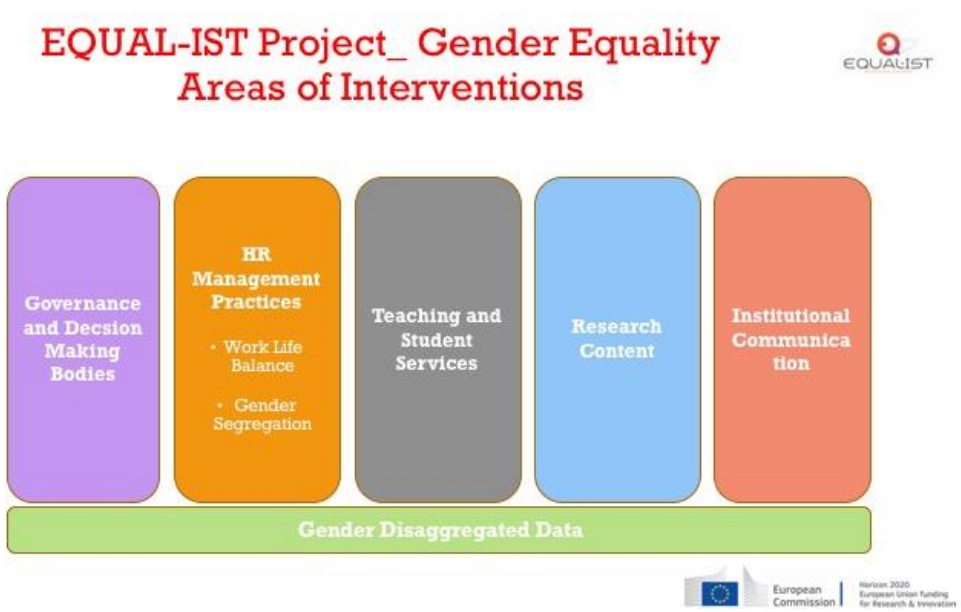

Figure 2: EQUAL-IST GEPs Areas of Interventions and structure of the Toolkit (sections 3-10)

A final section is dedicated to a list of relevant networks, conferences and events which are either entirely dedicated to gender equality in ICT/IS or where chapters/panels are focusing on such issues.

This version of the Toolkit is kept in a report form, and will be complemented by an online version of the EQUAL-IST toolkit presenting the same information more dynamically and interactively, allowing registered users to comment, submit their good practice and rate those proposed in the toolkit according to their perceived:

- relevance in for promoting structural change for gender equality in ICT/IST research organisations
- transferability to (other) ICT/IST research organisations
- being innovative.

References

EIGE (European Institute for Gender Equality). (2013). *Good practices in gender mainstreaming Mainstreaming gender into the policies and the programmes of the institutions of the European Union and EU Member States*. Luxembourg.

EIGE (European Institute for Gender Equality). (2016). *Integrating gender equality into academia and research organizations. Analytical paper.*

EC, DG Research and Innovation (2018). *Guidance to facilitate the implementation of targets to promote gender equality in research and innovation*. Luxembourg Publication Office of the European Union. Available for download at: http://ec.europa.eu/research/swafs/pdf/pub_gender_equality/KI-07-17-199-EN-N.pdf

2 Creating pre-conditions to foster gender equality: starting from evidence, mobilizing stakeholders

2.1 Women in ICT/IST research: hard facts

A starting point for advocating about the necessity of implementing gender equality policies in research institutions focusing on ICT in the broad sense (CS, IT, IS) relies on the fact that this is definitely one of the STEM fields where data reveals big gender gaps along the entire studying-accessing research positions-progressing in the career ladder to top leadership positions. Providing evidence of the current situation in Europe is made possible relying on recent studies promoted and funded by the EC.

A recent study funded by the EC has provided a granular picture of gender inequality in ICT and proved a negative trend in terms of employability in digital jobs for female graduate students in ICT-related disciplines.

The study has been based on several official EU statistical sources and has distinguished between strictly meant tertiary ICT studies (ISCFED 13, Information and Communication Technologies) and to the broader category of so-called ICT-related disciplines (including mathematics, statistics, computing and engineering).

Figures on purely ICT tertiary studies in 2015 tell us that men graduates in ICT 4 times more than women: in fact, in 2015, the female share of purely ICT graduates amounted to 1,2% *vs* 6,9% for men.

Looking at the wider field of 'ICT related disciplines', female representation among tertiary education graduates increases up to 2,4% with a 0,3% drop down from 2011 (vs. 9,6% for men, whose share dropped down slightly more, for a 0,4%).

The report has also looked into the relation between studying ICT related disciplines and employment, to demonstrate how the gender gap decreases even further when transitioning from the university to the digital jobs market[2]. The picture below represents first the f/m ratio of all graduates in ICT related disciplines (24,9% of women), and then highlights how only 13% of workers in digital jobs with an ICT related tertiary level degree is female.

[2] The study has considered digital jobs in a wide sense, including workers in the ICT sector but also workers with ICT-related occupations in any given sector. See full description of the statistics classifications reference in footnotes n.25 and 26 at pag. 35 of the report.

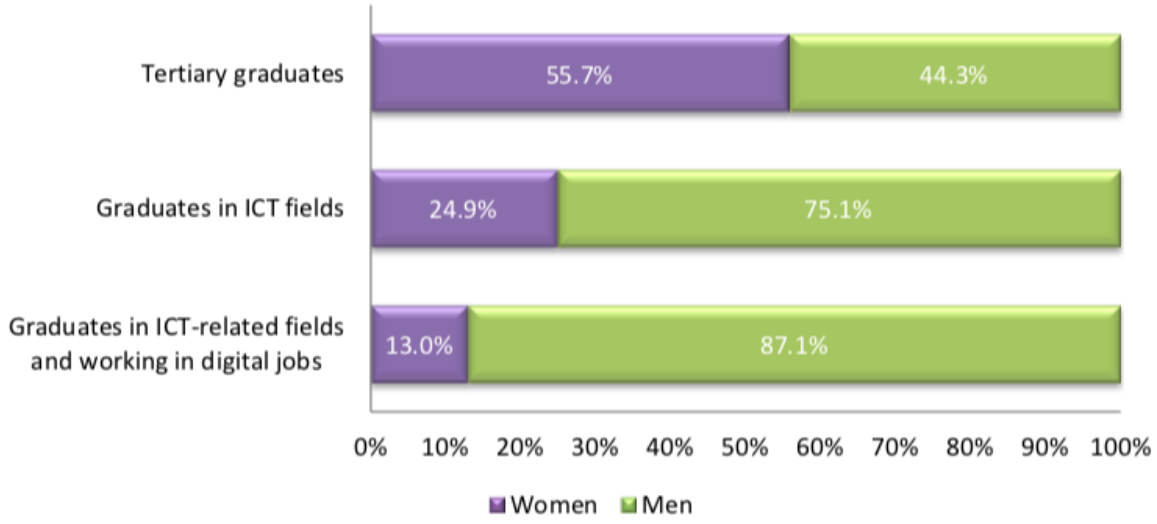

Figure 3: Share of men and women along the digital career path, 2015. Source: Women in the Digital Age Study, 2018, p. 40.

Looking at data on leadership positions in academic research are available from the SheFigures report, its most recent version being from 2015: the study has reported how women constitute on average 20.9% of Grade A (full professors) in EU academic institutions covering all disciplines. On the other hand, the available disaggregation by disciplines considers ICT as part of Engineering and Technology studies, where the percentage of women dramatically drops to 9.8%, showing some positive trends although at a very low pace.

References

Women in the Digital Age Study (2018). A study prepared for the European Commission DG Communications Networks, Content & Technology by IClaves.

EC, DG Research and Innovation (2016). *She Figures 2015*. Luxembourg: Publication Office of the European Union.

2.2 The EQUAL-IST gender auditing and crowdsourcing methodology

The entire EQUAL-IST project has been focused on promoting structural change for gender equality in research, starting up a 3 years process of internal assessment, consultation, GEP Design followed by two iterative implementations.

Emphasis has been placed on the importance of providing sound proof of the State of the Art of gender inequalities at each Research Organization and present ***gender equality and structural change as evidence-based policies.*** The overall EQUAL-IST approach has emphasised the participatory and bottom-up dimensions, both of the assessment and the GEP design phase, via two specific methodologies respectively, as illustrated by the picture below:

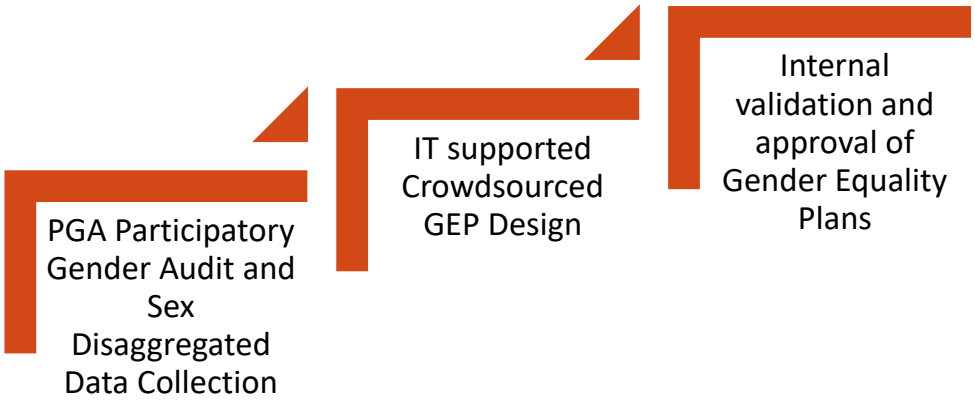

Figure 3. EQUAL-IST Participatory approach to internal assessment and design of GEPs

Thanks to the successful roll out of Participatory Gender Audits, the participating organizations have prepared the ground internally. A precise picture of the current state of the art and the main challenges ahead to tackle gender inequalities have been drawn: qualitative and quantitative analysis have been conducted and used as an initial step in raising awareness of top and middle managers, academic and administrative staff and students.

PGA, a methodology originally set up by ILO for promoting gender mainstreaming in IDC organizations and already adapted to achieve structural change for gender equality in Research within the EU funded project GenisLab[3], has been further refined and adjusted following two main directions:

- systematising quantitative data collection and proposing a set of indexes to cover the areas of intervention of the project
- shortening the auditing process to make it more compact and compatible with the peculiar settings and tight schedule of research contexts where participation cannot be 'enforced' by the management

The full EQUAL-IST methodology set up by UNIMORE is available in D.2.4, and it has been analysed in a dedicated scientific publication (Canali, Addabbo & Sangiuliano, 2018), while results of the Gender Audits implementation has also been analyzed and discussed (Sangiuliano, Canali & Madesi, 2018).

At the conclusion of the PGA process, each institution has identified a set of challenges affecting the identified areas of intervention, which have been exposed to a broader consultation and idea generation process facilitated by the use of a CrowdSourcing Platform. The on line platform presented different sections for each RPO, where all registered users could identify challenges but also submit proposals for actions to be included in the Gender Equality Plans, and vote up or down for already posted ideas. Final steps have been the internal validation of the entire process by GEP working groups, the design of the plans and approval from top management.

EQUAL-IST Gender Equality Plans are expected to cover an M14-M36 time framework and to have a similar structure (a GEP template with explanatory guidelines has been designed and distributed to partners). Content-wise, it has been suggested to balance among all the main areas of intervention, while reminding that HR management processes and Governance and Decision Making are the core area for structural change

[3] The Gender in Science and Technology LAB – GENIS LAB, FP7, project ID: 266636.

processes. Partners have agreed to aim at achieving a balance in the process of GEPs design between preparatory and supporting actions (ad hoc raising awareness, training and communication initiatives) and structural change actions (setting up of new regulations, bodies, procedures and measures as well as the incorporation of a gender approach into existing ones).

References

Canali, C., Addabbo, T. & M. Sangiuliano (2018). *A Methodology for Participatory Gender Audit in ICT/IST Research Institutions*, Proceedings of the International Conference on Gender Research, ISCAP Porto, 12-13 April 2018, ACPI, pp. 70-79. Book version ISBN: 978-1-911218-77-7.

Sangiuliano, M., Canali, C. & V. Madesi (2018). *Negotiating Gender Equality Policies in IST-ICT Research Institutions: reflections from the Participatory Audit to Design of Gender Equality Plans in the EQUAL-IST Project*, Proceedings of the International Conference on Gender Research, ISCAP Porto, 12-13 April 2018, ACPI, pp. 380-389. Book version ISBN: 978-1-911218-77-7.

2.2.1 The CrowdEquality Platform: a re-usable tool

In order to allow participatory, bottom-up and inclusive design of gender equality measures, the EQUAL-IST project has chosen an IT-facilitated methodology, namely crowdsourcing. Crowdsourcing points at a variety of methods based on engaging large groups (both internal and/or external to the promoting organisation/s) to contribute to and/or execute either a specific task or an innovation endeavour, including idea generation. Putting an IT artefact at the service of a structural change process for achieving gender equality was meant to convey a vision of gender equality policies as embedded in innovative environments, to be particularly meaningful and acknowledgeable in ICT/IS research contexts.

The CrowdEquality platform has been designed at the at the Department of Information Systems, University of Muenster. The design was backed by a state of the art analysis of existing literature on the use of IT artefacts for promoting gender equality and a benchmarking of existing crowdsourcing tools, their structure, features and functionalities. The design process of the platform itself has benefited from constant inputs from the EQUAL-IST partners, and it is analysed in a dedicated published paper (Gorbacheva & Barann, 2017). The picture below shows a 'challenge life cycle on the platform'.

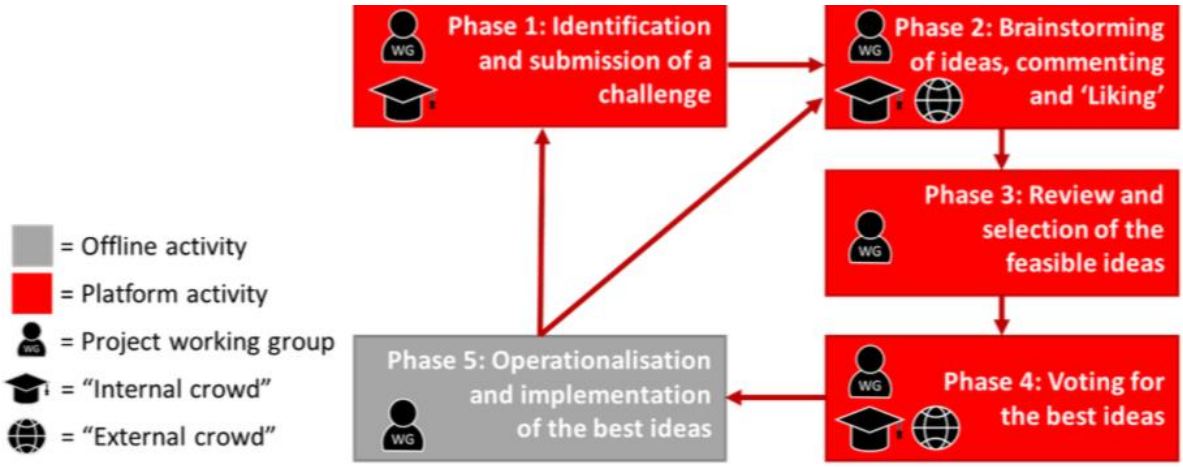

Figure 4. A Challenge life cycle on the CrowdEquality Platform (Source: Gorbacheva & Barann, p.1288)

Some of the CrowdEquality functionalities, which can also be found on similar tools, include the submission, overview, and detailed presentation of ideas, submission of feedback via comments, registration and login, user profiling, subscription to the notifications, user ranking and statistics etc. CrowdEquality additionally supports the submission of challenges faced by a research institution (RI). Only members of a respective RI can contribute at this stage, but all registered users can leave comments to the submitted challenges. This process is different from other similar platforms, where a challenge is subject to a centralised approval process before being published online. Once a challenge is submitted (Phase 1), it goes through the following life cycle phases:

- Collection of ideas addressing these challenges is open to internal and external crowds. Initial evaluation takes place via 'likes' and comments. (Phase 2)
- Collected ideas are being reviewed by the GEP Working Group. (Phase 3)
- The most promising idea, which is also feasible to be implemented, are selected to be voted on. (Phase 4)
- The best ideas, i.e. those which received the highest number of up-votes and the lowest number of down-votes, are chosen (offline) for their further implementation. (Phase 5)

A relevant feature of the Platform is a *selective anonymization*. Challenges related to gender inequality in organisations can be sensitive issues pointing at or reporting on (implicitly or explicitly) specific discriminatory behaviour. To this respect, the right to non-disclose sensitive information has been safeguarded: the Platform has provided both a so-called private area to each RI, which is accessible only to respective staff members registered with institutional e-mail accounts, and a common/public area, open to "external crowd". According to the implemented model, before information about challenges and ideas submitted to the private area of the Platform appears on the shared area for an open public discussion, it needs to be anonymised by removing all author-, country-, and RI-identifying information.

The Platform development has followed the principles of Inclusive Information System Design.

The CrowdEquality Platform is a re-usable tool technically based on the Drupal Content Management System. The code and Handbook with a complete list of requirements are available on GitHub. As the Platform has

been programmed using an outdated version of Drupal, the suggestion for re-usability is to install and use the existing version in a closed environment and as a playground test to easily replicate a customized and updated version. The focus needs to be on re-using the Platform concept.

References

Gorbacheva, Elena and Barann, Benjamin, (2017). *IT-enabled idea crowdsourcing - a mean to promote gender equity in IT research institutions*. In Proceedings of the 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, June 5-10, 2017 (pp. 1281-1298). ISBN 978-0-9915567-0-0 Research Papers. http://aisel.aisnet.org/ecis2017_rp/83

3 Governance and Decision Making Bodies

Having a Gender Equality Plan or gender equality measures approved at the Department/Faculty or School level is a good starting point, although the risk of poor implementation and missing long-term sustainability due to insufficient support from the hierarchies is still strong.

For this reason, embedding gender equality actions and possibly the GEP itself into core strategic documents of the whole university as well as individual Departments/Schools proves to be a mark of top management endorsement; it also increases the opportunities for accessing resources (financial but also human and structural) that can be useful during the implementation phase. Strategic documents to be taken into account to this respect are statutes, multiannual and annual strategic and operational plans, assessment/evaluation checklists and score cards, Code of Conducts. Gender equality/equal opportunities bodies (Commissions, committees, ombudspersons) can play an important role in designing and making gender equality interventions real, therefore setting up such 'gender equality machinery' constitute one of the possible strategies to put the issue on the Agenda at the institutional governance level.

Addressing the lack of women in decision making positions in Faculty/Departments'/University-level governing bodies, whereas access to positions is by appointment or elections, is also included in this section. These are positions to whom typically full professors only are eligible as candidates, therefore in scientific disciplines such as Computer Sciences and IST, where horizontal segregation further restricts the pool of potential candidates, vertical segregation at this level is accentuated.

3.1 Constructive synergies among Gender Equality Bodies and Integration into strategic institutional documents. The case of the University of Ferrara (IT)

The University of Ferrara is a good example of integrating Gender Equality within the Strategy setting documents. UNIFE has leveraged on enhancing constructive synergies among the many (Gender) Equality bodies (Equality Ombudsperson, Rector's Delegate on Equal Opportunities) that are in place and which typically risk working in separate silos.

Several years of collaboration among the different bodies of the UNIFE gender equality machinery led to the implementation of an internal Gender Budgeting process integrated with a Positive Actions plan (a GEP with a broader focus on different discriminations). The Gender Budgeting methodology was highlighted as national good practice by the Italian Department for Equal Opportunities, and a transferability project was set up. In terms of mainstreaming gender into UNIFE core governance practices, further success was achieved in June 2016, when Strategic Area No. 9 "Equality, equal opportunities and well-being for people who work and study in UNIFE" was embedded in the University official Strategic Plan. Such a dedicated section binds the University of Ferrara to respect and promote equality, equal opportunities and well-being in all its actions and policies.

The Strategic Area on equality and equal opportunities includes actions and measures on work-life balance for employees and students, promotion of initiatives aimed at ensuring equal representation of men and women in Universities bodies and integration of people coming from EU and non-EU countries. It also encompasses promotion of training to raise awareness about equality and equal opportunities, and research

projects aimed at promoting equality; strengthening of support services in favour of people with disabilities (students and employees). In this new scenario, the Presidents of the two equality bodies have now been charged to monitor the implementation of the University Strategic Plan.

In addition, the new Statutes of the University openly recognise and promote gender equality (Article 5), specifying that UNIFE "respects a gender-sensitive language in all administrative and academic resolutions and all internal act". Close interaction and a deliberate synergy among the actions of the different gender equality bodies at the University which also use a single communication platform is reported as a key factor to achieve what now seems to be a long-lasting result.

References and source of information

Interview and information from EQUAL-IST Project, D.2.1 State of the Art Analysis

3.2 A new Gender Equality Committee and gender mainstreaming in strategic University documents and provisions (Simon Kuznets Kharkhiv University, UA)

As KHNUE conducted its internal gender audit within the EQUAL-IST project, low interest in gender issues across different spheres and at all levels of the University emerged as one of the most important barriers to gender equality: setting up effective gender equality machinery was decided to be the most suitable action to tackle such a challenge. Some already existing instruments such as non-permanent commission responsible for tackling gender inequalities and Collective Agreement including basic gender equality's norms formed the baseline for further steps. KNHUE GEP stated that the development and implementation of a gender equality machinery were to be set as a goal and foresaw the creation of a new Commission on Gender Equality Issues, and its functioning was defined in detail including specification of skills, tasks, and budget.

This action has been conducted by the Trade Union Committee with the support of EQUAL-IST team and lawyer. Three persons of the University's staff has been involved as members of the Commission. The mechanism and provision of the Commission's functioning were developed, agreed and approved. An online form has been created and uploaded on the University's website targeting students and staff to report specific cases and issues to the Commission. As a first outcome, it is expected that the number of cases of gender-specific discrimination will be reduced. Training for members on legal aspects of gender-based discrimination is foreseen to complement their knowledge and competencies.

In parallel to this action, the Collective Agreement of University Administration and Trade Union Committee which is one of the University strategic documents and a legal act that regulates social and labour relations in the University, is planned to be amended. The new version of the Collective Agreement will include more concrete regulations on Gender Equality and in particular to establish the possibility of teleworking for academic staff having young children, large families, as well as for pregnant women. KHNUE strategy highlights how actions to improve internal governance by setting up a Gender Equality Body can complement and foster broader measures impacting on core areas of intervention such as HR management and Work Life balance.

3.3 Siauliai University GEP on Election Campaign Tactics and Strategy (LT)

Within the frame of the INTEGER project[4], Siauliai University has designed and piloted University Council Election Campaign Tactics and Strategy for the top decision-making body elections. It aimed at increasing the gender balance at top-tier decision-making levels and promoting women candidates. The election campaign of project INTEGER was coordinated by the Gender Studies Centre and the project's implementation team. Active candidate search and recruitment were conducted, legal officers were consulted and dissemination actions were planned and executed. According to the composition of the Council in 2010, among the 11 members elected to the Council of SU, there was no female representation. A "Tactics and Strategy Plan" was drafted and integrated thorough planning in each election's phase. Purpose of the initiative was to increase women's representation in 2014 SU Council election to reach a critical mass (up to 25%). The Plan started from a detailed analysis of the Council's election regulatory frameworks (national provisions, SU Statute, election regulations and procedures); in consultation with the legal officer of the University, new regulations taking gender equality into account were drafted. In parallel, the current Rector and Senate were informed about the goal of ensuring women's representation in the Council, leveraging on the participation to an EU funded Project such as INTEGER and on the University's duty to ensure equal opportunities as an employing organisation. Search, lobbying and recruitment of women candidates were conducted using both criteria of loyalty to the university, management expertise, and capacity/willingness to implement gender equality.

When the regulations for the SU council composition and elections were approved, section 17.1 was revised following recommendations from the INTEGER team, so that the requirement to have ten years of experience in management and supervising was lowered to 5 years. This opened broader possibilities for women to become candidates.

Furthermore, individual election campaigns were designed for each one of the women candidates, emphasising their high professional capacities, active scientific work, internationality, credit, academic (professional) activity as well as work-life balance, their qualities, development of units they have managed. The entire election process was monitored, and the action proved to be successful and led to a 36% increase of women in the Council's composition. The achieved structural change was the revision of the pre-requisite of 10 years in a management position which was lowered down to 5, opening up the hierarchy to be more inclusive not only towards women but also younger candidates, and under-represented minority groups.

References and source of information

EIGE, GEAR (Gender Equality in Academia and Research) Toolkit

EQUAL-IST Deliverable 2.1 State of the Art Analysis

[4] INTEGER. Institutional Transformation for Effecting Gender Equality in Research. FP7 SIS, project ID: 266638

4 HR Management Practices. Work-life Balance

4.1 Establishing an internal childcare service

Setting up flexible child care services on campus is a possible action to be included in GEPs which has been proposed by several EQUAL-IST partners during the PGA processes.

Some Research Institutions such as the Southampton University in the UK has opted for a Childcare Centre at Campus for kids aged 0-5, by way of having the services run by a private foundation. The offer is sustained by fees paid by the parents, and the provider is bound to ensure that priority is given to students, the University staff and the public. Lowest fees are students and progressively increased for University staff members and the public. In the UK, Tax-Free Childcare provisions are in place, so that the government will pay £2 for every £8 parents pay to childcare providers (up to £2.000 per year per child, up to a £100.000 yearly taxable income per parent) and which are gradually replacing employers supported childcare vouchers. Flexible attendance formulas are foreseen at the Childcare Centre, so that daily, monthly, semester or annual attendance is made possible when applying.

At Sumy University in Ukraine, a child care Centre was co-funded within an EU project on Family-friendly policies and mainly originated from students' needs but was also opened to staff members from the University afterwards. It is promoted as a good practice throughout the country and also has flexible arrangements which allow parents to leave their kids at the kindergarten even if only for few hours when they need to travel or attend events or duties out of town.

At Freiburg University (DE) 4 Child Care Centers have been created to serve each different campus and offering overall 113 spots to children with priority given to research staff. In addition, 30 more spots are pre-book for University staff at other Child Care centres run by an NGO with whom the University has set a cooperation agreement.

If a Research Organization is interested into understanding whether an internal childcare facility for employees would represent a solution to improve work-life balance for parents, how it could be set up and run, which would be the costs, an option is, to begin with a dedicated Feasibility Study. Some of the ICT and IST Faculties and Departments from the EQUAL-IST consortium (KHNUE, UNIMORE) have found it useful to include such feasibility studies into their Gender Equality Plans.

Sources and references

Websites of the Research Institutions (Southampton and Freiburg University)

EQUAL-IST D2.1 State of the Art Analysis (Sumy University)

4.2 Raising awareness and dissemination on work-life balance measures

If work life balance is identified as a challenge or an area which requires improvement, preliminary actions could be useful such as **training academic/administrative leaders and staff members on such issues**. A customised approach tailored to the Research Institution could be followed having both HR departments and Gender Equality machinery collaborating in designing a training/raising awareness offer, eventually inviting

external experts on specific contents upon need. Contents for such training/raising awareness events can span from:

- presentation of EU and national policies and/or studies on work-life balance, with focus on research working environments
- informative/dissemination sessions on existing work-life balance provisions in place at a given RPO
- debunking the myth that flexibility in academic/research environments is facilitating work-life balance for women by default
- strategies to promote small changes in organisational culture through measures ensuring that teams/departments/projects' meetings are not scheduled during late afternoon hours or on Fridays/Mondays when travelling is required.
- innovative approaches to work-life balance leveraging on parents' self-organization and time-share supported by HR departments, such as those promoted in the framework of the H2020 Families Share Project

Given the complexity of national/regional/institutional provision on work life balance, a single one-stop- shop source of information on work life balance provisions at a given RPO can also represent a useful informative tool. An example of comprehensive on line information on work life balance rights, provisions and services is the one set up by the University of Freiburg: Family Friendly Working Conditions from A-Z

References

A recent global survey on work life balance in academic institutions by Times Higher Education, 2018.

Rafnsdóttir, G. L. and T.M. Heijstra. (2013). Balancing Work–family Life in Academia: The Power of Time, Gender, Work & OrganizationVolume 20, Issue 3, 283-296.

Catalyst Course on Get Beyond Work-Life Balance (Inclusive Leadership Training)

Seltzer, R. (2015). The Coach's Guide for Women Professors: Who Want a Successful Career and a Well-Balanced Life. Stylus Publishing.

4.3 Telework

Telework is often applied as a tool to facilitate work-life balance also in Universities, although in some national contexts it has been found that working conditions can vary a lot between administrative and academic staff members. Administrative staff members are typically bound by 'traditional' public administration employment conditions and obligatory desk presence at the office, while academic/research staff typically enjoys more flexibility but also tend to work more often extra hours. Telework contracts or integration of telework arrangements in standard contracts have been widely studied and found to be a valuable tool for enhancing work-life balance; most frequently highlighted advantages are:

- saving commuting time
- being particularly suitable during certain periods of life when the care duties' burden is more intense

There is evidence that telework can represent a useful provision also in ICT/IS research organisations. In general, it is proven that highly skilled workers are more likely to use telework (Eurofund, 2010) showing how only professional, managerial and technical occupations have more than 10% of employees involved in telework. A Study in Estonia assessed how, on a population of the senior workforce in a technology research institute (Arvola, 2006) teleworking was free of any negative impacts on academic productivity. Also, the best scheme for teleworking was demonstrated to be maximum 1-2 days per week, to avoid the isolation from workplace dynamics and decision-making processes which can be suffered when staying away from the office for a substantial amount of time.

Resources:

Arvola, R. (2006). *Telework as a Solution for Senior Workforce: Research at Tallinn University of Technology*, Tallinn School of Economics and Business Administration, Tallinn University of Technology.

European Foundation for the Improvement of Living and Working Conditions (2010). *Telework in the European Union*

4.4 An example of comprehensive work-life balance policies: the University of Bern (CH)

The University of Berne provisions grounded in the legislation of the Canton of Berne and involve four main bodies of the institution: the office for Gender Equality, the HR Personnel Department, the Welcome Center, and the Counselling. Childcare service provision and support, leaves and part-time/flexible working schedules, infrastructural facilities in the University's built environment, special subsidies for early career researchers with parenting duties, policy level actions are all covered areas.

As far as childcare services are concerned, an ad hoc Foundation set up by the University offers childcare services to its employees and students in 3 kindergartens targeting kids from 3-6 years old. Moreover, the University covers child care costs for personnel travelling to attend conferences, events, meetings. Part-time work, job sharing, telecommuting and annual working time are promoted. When on leave or on part-time for parental reasons, financial aid is provided as well as the postponement of exams for students.

Infrastructural interventions in University buildings include a relaxation room, a breastfeeding room, a parents/children room, changing tables in toilets, high chairs in the cafeteria and barrier-free access to buildings facilitating prams and wheelchairs.

Following the 'dual career' principle in attracting talents from abroad, the University HR department offers counselling and guidance to partners of newly hired personnel in charge minimum three years starting from postdoc positions.

Furthermore, grants and support for students and early career researchers with parenting duties and also for studying abroad with a child are made available. These subsidies have been made possible by a federal state fund which was issuing a tender each year until 2016 to sustain doctoral students who had to interrupt or reduce their research activities due to their family situation. The program was then replaced by the Prima Programme (Promoting Women in Academia) introduced as a new promotion tool for excellent postdoc

researchers launched by the Swiss National Science Foundation in 2017. It is aimed at excellent female researchers at the postdoc level who have the potential for an academic career. PRIMA grants cover the grantee's salary and project costs (max. CHF 150,000 per year) for two to five years. PRIMA grants for excellent female researchers have been integrated with Flexibility Grants. Such grants offer a double option to researchers with parental duties: funding to help to cover the external childcare costs charged to the researcher and/or to help finance the salary of a support person, allowing the grantee to reduce his/her work quota. The two measures can also be combined.

Finally, as a sign of its full endorsement of work-life balance principles, the University has signed the "Family at the University" Chart supported by several German-speaking Higher Education Institutions.

References and sources of information

http://www.vereinbarkeit.unibe.ch/index_eng.html

5 HR Management Practices. Recruitment and career promotion

A vast literature has shown how complex dynamics are implied in research and academic career promotion from a gender perspective. Women might be penalised for their maternal leaves periods when evaluating their scientific productivity on a certain period, even though recent research promoted by Elsevier Publishers found that even if women publish fewer research papers, this is not reflected in respective downloads and citations (Elsevier). Furthermore, there is studies have pointed at how women tend to be over-represented in teaching-intensive academic environments (Angervall & Beach, 2018) and that, more in general, gender bias is entrenched in scientific productivity standards and definitions, so that cumulative disadvantages/advantages, opportunity structures, gatekeeping mechanisms are strongly gendered and tend to disadvantage women (EC, 2012).

A publication from Informatics Europe has distilled a set of recommendations which have been found to be relevant in ICT/IST contexts but can also be applied to a broader University level to ensure that equality of opportunities is offered to men and women in promotion and recruitment. Guidelines suggest the following action points:

- When assessing a female member of staff for promotion, subtract 18 months from the number of their career years per child and take into account any periods of part-time employment.
- balance didactic and scientific responsibilities of all members of staff and make the priorities for evaluating an individual's performance (e.g. research excellence, student satisfaction with courses, contribution to departmental duties) explicit.
- Anticipate the retirement of (male) professors by making an inventory of and training potential female successors.
- keep track of national and international networks for female researchers.
- offer incentives for groups when they employ a female member of staff. For example, give extra travel funds to the group; or allocate funds to hire a PhD-student, research assistant or special equipment for the staff member herself.

References and sources of information

Angervall, P. and D. Beach (2018). *The Exploitation of Academic Work: Women in Teaching at Swedish Universities*. Higher Education Policy March 2018, Volume 31, Issue 1, pp 1–17.

Elsevier Research Intelligence (2017). *Gender in the global research landscape. Analysis of research performance through a gender lense across 20 years, 12 geographies and 27 subject areas.*

European Commission, DG Research & Innovation (2012). *Meta-analysis of gender and science research. Synthesis Report*. Luxembourg: Publications Office of the European Union.

Informatics Europe (2013). *More women in Informatics Research and Education)*

5.1 Guidelines for gender-sensitive recruitment practices in ICT/IST research institutions

Hiring procedures and practices play a crucial role in generating both vertical and horizontal segregation. Recruiting early stage researchers (postdocs) or associate/full professors can be subject to gender bias which needs to be contrasted, and this is the case also in the field of Computer Sciences. In fact, a study in the US on computer sciences hiring networks has unveiled how gender inequality is persistent, although often in subtle forms (Way, Caluset & Larremore, 2016). Even if scientific productivity is the core variable together with the prestige of the candidate's doctorate title, the correlation between gender, scientific productivity, postdoc training and mobility, suggests that gender is indirectly implied in hiring processes.

Although from different scientific domains, large-scale research in Sweden has taken stock of sexism within peer review processes, calculating how affiliation with a committee member or being male provided with the candidate with an equivalent of 20 papers in middle impact peer-reviewed journals or 10 papers on top ranking reviews (Wenneras & Wold, 1997). A more recent study (Van Den Brink & Benschop, 2014) introduces the notion of 'gatekeeping in mobilising masculinities' to describe how male gatekeepers identify with men in their networks, and how gatekeepers from both genders tend to prefer that candidate who embodies the masculine success model in their environment.

The following guidelines for measures to make recruiting more gender sensitive are highlighted by the handbook "A Practical Guide to Gender and Diversity for Computer Sciences Faculty" (Franklin, 2013) and from the Informatics Europe Report (second set):

Franklin, 2013, pp.51-55.

- Inform peer review panellist and committee member about gender bias in recruitment
- Create rough equations to calculate the scholarly impact considering the given criteria and provide them to members: as although not binding this might lead them to review their attributed scores twice
- Pay attention to bias which is often contained in recommendation/reference letters as research has shown how different adjectives are used to introduce female (communal) and male candidates (agentic, leadership-oriented) (Madera, Hebl and Martin, 2009).
- Double check scores and promote double-blind reviews.

- Ensure the composition of the nomination committee is as balanced as possible. For example, ensure that at least 30% of the committee consists of women, with a minimum of 2.
- Invite at least the same number of women as men to interview.
- Invite women to the interview not only to see whether they are best for the position but also to give them experience in conducting interviews and increase their status at their institution.

Informatics Europe (2013), pp. 9-15.

- Advertise openly for all positions.
- Describe positions in a broad way. State job criteria objectively.
- State in the recruiting description that the university/department/institute is committed to facilitating the combination of work and childcare.
- State that flexible terms of employment are possible, such as working part-time (0.8), flexible working hours and teleworking.
- Distribute advertisements widely. For example, send them to women's networks email lists, such as a national "women in computing" network or a network of female professors.
- Approach candidates directly. For example, send the advertisement personally to (at least) three women you would like to see in the position. Ask them to apply, or ask them to send it to three other women who they think would be suitable.
- Allow three months for applications to be submitted as time is needed for the advertisement to reach the right women, and they need time to respond.
- Take action if too few suitable women apply. For example, extend the deadline for applications and re-advertise the position (inter)nationally.
- Provide help with solving the "two-body problem", that is finding a position for the applicant's partner.

References and sources of information

Madera, J.M., Hebl, M.R. and R.C. Martin (2009). *Gender and letters of recommendation for academia: agentic and communal differences*, Journal of Applied Psychology, vol. 94, issue 6, pp. 1591-9.

Van den Brink, M. & Y. Benschop (2014). *Gender in academic networking: the role of gatekeepers in professorial recruitment*, Journal of Management Studies, vol 51, Issue 3, pp.460-492.

Franklin, D. (2013). *A Practical Guide to Gender Diversity for Computer Science Faculty*. Morgan & Claypool Publishers.

Way, S.F., Clauset, B. & A. Larremore (2016). *Gender, Productivity, and Prestige in Computer Science Faculty Hiring Networks*. Proc. 2016 World Wide Web Conference (WWW), 1169-1179.

5.2 Engendering recruitment practices: tools on unconscious bias

The **Equality and Diversity Officer of the Royal Society, the UK Academy of Sciences** and a Research Funding Organization, have released another video which unveils how unconscious bias works in a very effective and convincing manner. It provides suggestions on how to handle interviews and candidates' selection as well as panel's discussion so that evaluators can monitor each other and increase their accountability toward gender equal recruitment. The short video has been made part of an information pack which is handed over to recruitment panels' members and part of the assignments they have to undertake before performing their duties. https://royalsociety.org/topics-policy/publications/2015/unconscious-bias/

The **University of Lausanne (CH)** has taken into serious consideration the issue of gender bias in recruitment procedures and held a two days gender awareness training in 2013 targeting HR staff and members of recruitment/appointment panels. A toolbox was also finalized including a set of advice and concrete cases and video clip 5 minutes to raise the awareness of members of recruitment boards, on subtle and unconscious gender bias. The discursive strategy used in the video is not to make them feel guilty, giving good examples of how everybody can become aware of non-conscious bias which is influencing decision making in everyday life. Very concrete tips on how to change the recruitment practices in order to make them more impartial are also provided. The toolbox is available in French.

Source of information

Royal Society Website https://royalsociety.org/topics-policy/publications/2015/unconscious-bias/

Equal-IST D2.1 State of the Art Analysis (Lausanne University)

http://www.unil.ch/egalite/home/menuinst/activites-et-soutien/recrutement-egalitaire/boite-a-outils.html

5.3 Establishing gender targets or quotas for appointing full professors or researchers

Quotas for the under-represented sex can be an effective measure to be included in a GEP although it is often subject to criticism as it the case for so-called "positive discrimination" measures: criticism arises even when, as it is always the case, preference to a candidate of the under-represented sex is attributed when equal merit is already assessed. Indeed, affirmative actions have been applied to a variety of contexts from electoral politics to appointment to 'boards of directors' positions and recruitment (Bacchi, 2016).

The Helsinki group has reported how implementation of quotas and targets in 2016 indicated that 14 MS (AT, BE, DE, DK, EL, ES, FI, FR, LU, MT, NL, SI, SE, UK) and one associated country (CH) reported having quotas or targets set at national or regional levels for gender balance in some decision making bodies (i.e. supervisory or executive boards, recruitment committees and evaluation panels, not including targets or quotas which may exist at local level or in individual universities or local research organizations); 11 Member States (BE, BG, CY, EE, EL, HR, IE, IT, LT, LV, PT) and one Associated Country (BA) are planning new initiatives such as targets or quotas for the period 2017- 2020.

More specifically and as far as Research and Innovation are concerned, in 9 Member States (AT, BE- Flanders, CH, DE, FR, IE, NL, SE, UK) national level regulations to foster quotas and target in Research Institutions have been set among core measure to achieve gender equality in R&I.

Due to common resistances encountered, as quotas and affirmative actions can be perceived as anti-meritocratic measures and/or leading to stigma against its beneficiaries (Bacchi, 2006), they are often implemented with a softer formulation in research institutions: the University sets a target percentage to be reached in a given timeframe to set the balance right. Such a target can be set to be taken into account in selection processes (applied to the share of interviewed candidates) or in recruitment (researchers, associates and/or full professors) or appointment (committees, panels, governance bodies). In recruitment, a gradual approach is pursued where the Institution begins focusing on the assistant and associated professors first in order to enlarge the pool of suitable candidates for full professorship (Wallon, Bendiscioli & Garfinkel, 2015).

Some institutions have also opted in for implementing targets or quotas for having the underrepresented sex appointed in Committees or Panels in charge of recruitment/appointment of researchers or professors. Especially if combined with other measures, this has proven to have a positive impact. However it has to be highlighted that a potential side effect can be a work overload for the few women in high positions who would be requested to sit on many committees, with negative impact on their careers and/or research productivity. In fact, being engaged in multiple panels/committes could risk to limit the amount of time they can invest in research and penalise their scientific productivity. Such harm could be mitigated by, for example, provisions to relieve from administrative duties and support for research and non-research related academic duties.

Another type of measure falling into the 'affirmative actions' category is establishing female only positions for the appointment of researchers and/or professors in disciplines where there is a dramatic under-representation of women, as it is often the case in ICT and IST (see par. 5.33 and 5.3.4).

The Helsinki Group for Gender Equality in Research has stressed how the effectiveness of quotas or targets for boards, committees and panels can be enhanced by incentives or sanctions.

As far as sanctions are concerned, the French example is brought to the attention, where failing in showing progression for complying with the 40% obligation leads to sanctions via financial penalties proportional to the observed gap. For what incentives are concerned, the cases of Ireland, Netherland, Norway and Spain are brought to the attention:

- Netherlands: higher education institutions applying for funding from Science Foundation Ireland's Starting Investigator Grant Scheme can double the number of the 6-12 applications they submit if 50% of the applicants are female. Furthermore, tenure-track calls at universities, and the 'Aspasia Programme' of the Research Council in the Netherlands gives funds to universities if they nominate a woman.
- Norway: universities have gender equality budgets funding different measures and initiatives. At national level, these include the Special Programme supporting gender balance in top position and research management, seed money and others.
- Spain: the Andalusian Government has a financial model for universities with 10% of the research and innovation funding conditioned to results in strategic targets such as the proportion of women in Grade A and Principal Investigators positions.

References and sources of information

Helsinki Group on Gender in Research and Innovation (2017). *Guidance to facilitate the implementation of targets to promote gender equality in research and innovation*. *Guidance prepared by the Helsinki Group and the European Commission in consultation with the ERA stakeholders*. https://www.tcd.ie/tcgel/assets/pdf/Helsinki_Guidance_for_Targets.pdf

Bacchi, C. (2006). Arguing for and against Quotas: Theoretical Issues. In *Women, Quotas and Politics*, ed. Dahlerup, Drude. London: Routledge, 32–52.

Wallon, G., Bendiscioli, S. & Garfinkel, M. S. (2015). *Exploring Quotas in Academia*. EMBO.

5.3.1 Soft Quotas at Lausanne University (CH)

At the University of Lausanne, the internal gender equality machinery cooperated with the HR Management Department to define systematic indicators and criteria for each stage of the recruitment process stressing the transparency argument. The result was a substantial increase in the number of female assistant professors and associate professors.

A soft quota has been set as a target so to aim at having women for at least 40% of the newly appointed academic positions (junior to full professorship) from 2013 to 2016. The University didn't reach this target but got to 30% instead, which was considered as clear progress and success, so that the target was confirmed in the new Gender Action Plan 2017 - 2020. The Plan itself comprised a set of actions including raising the awareness of appointment committees on gender bias, define guidelines for professorial appointment procedures, closely monitor the procedures in practice and the statistical records of progress, and set up dedicated support measures at the Department/Faculty levels.

The undertaken measures was a target explicitly formulated as a women's quota, not in a neutral way as 'benefiting the under-represented sex'. A preference rule (in case a choice has to be made between two equally qualified candidates, a woman should be preferred) is mentioned in internal regulations of UNIL, but it's not legally binding to be applied to the hiring process.

References and source of information

EQUAL.IST D2.1 State of the Art Analysis, Interviews

University of Lausanne Website

5.3.2 'Cascade Quotas' by the German Research Council (DE)

The "**Cascade Quotas**" promoted by the DFG /Deutsche Forschungsgemeinschaft, German Research Council Foundation) is a 'smart' way to overcome resistances towards gender quotas. It envisages flexible quotas for female participation at full professorship level, therefore the quota is calculated on the actual percentage of women at the level immediately below, it is flexible, and it doesn't imply any sanctions in case the target is not reached. This measure is part of "Research oriented gender equality standards", which have been developed by the German Research Foundation" approved by majority of the Universities part of the General Assembly of the funding organization in 2008, and implemented since 2013: standards have become a criteria taken into consideration in the approval of funding to RPOs and Universities.

"The *Kaskadenmodell* is a quota system for the hiring of women at all levels of the academic career in order to ultimately increase the number of women in the very highest (i.e., full professor) positions. According to the DFG, it is flexible because the values to be reached are based on the proportion of women at the career level directly below for each area and are determined for each institution individually. No sanctions are foreseen if the quotas are not met. The main German scientific bodies have expressed their support for the *Kaskadenmodell* and its imple- mentation, and since 2012 German universities and research institutes have been obligated to implement a gender quota according to it (Gemeinsame Wissen- schaftskonferenz, 2013). (…) It is still too early to see the effects of the use of the *Kaskadenmodell* as the deadline for its implementation is not until 2017/2018" (Wallon, Bendiscioli & Garfinkel, 2015, page. 8). Some federal States

such as North Rhine-Westphalia State implemented their quota regulation for universities in 2014, based on the DFG cascade model.

Although this measure has the advantage of being perceived as more realistic and feasible, starting from current status quo for promoting a small steps strategy in change, concerns have been raised about potential pitfalls, such as risks incorrect calculations, and for setting not ambitious goals and slowing down achievements in gender balance.

Reference and source of information

Wallon, G., Bendiscioli, S. & Garfinkel, M. S. (2015). *Exploring Quotas in Academia*. EMBO.

DFG Deutsche Forschungsgemeinschaft website

5.3.3 Female only tenure-track positions at Wien Technical University and the Faculty of Informatics (AT)

The Technical University of Wien has a long story in initiatives to attract, retain and support the career of female scientists, including in CS and has extensively implemented 'affirmative actions' type of measures.

For example, already in 2003 and until 2007, a Women Postgraduate College reserved 5 positions per year for women to be selected for enrollment in a PhD on Internet Technologies, from 2003-2007.

Last year, three research assistant positions for female master students had been created last year to allow master students to collaborate with established research groups on specific topics during their thesis writing. Privately funded 'Siemens scholarships' for bachelors and Master female students with exceptionally high grades were also established.

More recently, as part of the 'Female Support Plan' of the TUW from the Rectorate, each Faculty was asked to provide their Gender Equality Plans, and an internal committee rewarded 4 of the 8 Plans with either an assistant or tenure-track full professorship (2+2 in total). The Informatics Faculty was rewarded with one tenure-track associate professorship, and the selection for female computer scientists was opened last year the first time, receiving 550 applications. This initiative got broad visibility and inspired other Austrian universities to take similar measures.

It has to be noted how national regulations were facilitating such measures: in fact, the Austrian Law sets a 50% target quota for women in all university bodies as well as for university personnel categories where female under-representation is demonstrated. Under this framework, universities are asked to set up and implement women promotion plans, including targets.

Still, several concerns were expressed internally at TUW about such an affirmative action is not constitutional. Other arguments were raised as 73% of women scientists declared in a survey they were against special support measures, as they wouldn't like to be identified as a 'socially handicapped' group. To contrast such criticisms, the University governing bodies keep highlighting data and figures about the extremely low rate of women computer scientists along with the compliance of such measures with all regulations. Also, affirmative actions are also complemented by a series of other activities to attract female students and to raise the awareness of academic staff members who were sceptical towards affirmative actions. In this regard, for example, a provision has been set to require that each year a gender training seminar has to be attended by one male member of the faculty. Moreover, regarding work-life balance support, a kindergarten

was set up and whenever there is an event after 5 pm, and childcare services are offered offered to participants, and both measures prove to be useful for both men and women.

The Technical University Wien Informatik Female Support Plan is available for download in German.

References and source of information:

EQUAL-IST Webinar, *Enhancing female researchers careers in ICT/IST: structural change at the intersection between Department/Faculty and University level measures*, 23rd May 2018, presentation by Prof. Gerti Kappel, TUW.

TUW Faculty of Informatics website

5.3.4 Interlinking several mainstreaming measures and affirmative actions to promote female researchers' careers at the Institute of Computer Sciences Radboud University (NL)

The Institute for Computing and Information Sciences of the Radboud University in Nijmegen (iCIS) started in 2007 to take concrete measures to increase the number of female researchers. The Faculty of Science of which the Institute belongs decided to appoint at least one female member in the advisory appointment committees, equal or senior to the advertised position. Additionally, the staff of the institute proactively started to ask for potential female candidates to apply. At the beginning of this policy, the Institute had to depend on female staff from other institutes and other universities.

Although iCIS managed in attracting some very talented female staff members, it was clear that it was not enough. Searching for ideas and 'best practices' to boost the recruitment of women, iCIS opted for starting from offering gender training involving senior staff members, male and female, together with female junior staff, in two sessions with the EGERA-EU FP7 Project[5] in September 2014 where Radboud University was a partner. The result of these sessions was the Workbook Gender Awareness Training, presenting a set of recommendations on active recruitment of female researchers (including international and multidisciplinary recruitment, measures to reserve staff positions to talented female researchers, active support of female staff researchers by their managers and mentoring. As an outcome, the Institute has incorporated such recommendations in its recruitment policy in that same fall of 2014.

At Faculty level, a Workgroup on gender diversity was created under the supervision of a full professor from iCIS, Frits Vaandrager. Starting from a report presented by the Working Group on Diversity in autumn 2015, a Gender Policy 2016-2020 has been developed in the whole Faculty of Science (available in English and downloadable at this link).

Every few years an update has to be given of all the full professors and those by special appointment. In the autumn of 2015, iCIS estateblished a few professorships for talented females, including an associate professor from iCIS, but also one for an associate professor of another university. The executive board gave green lights for both appointments, so two more female professors were hired.

[5] EGERA Effective Gender Equality in Research and Academia, FP7 SIS, Project ID: 612413.

In May 2016, iCIS' position was made clear in the gender targets of the Faculty of Science. Of the 15 female full professors aimed at in 2020, five will be at iCIS. In this respect, iCIS is taking a leading position within the Faculty of Science as far as gender equality policies are concerned.

Since the decision to appoint a female in the advisory appointment committee, four female staff members have started (2 full professors, two assistant professors); after the implementations of the recommendations in the Workbook Gender Awareness Training: 1 associate professor has been promoted to full professor; One assistant professor has been promoted to associate professor and more recently to full professor, two new assistant professors and one full professor have started at iCIS.

iCIS -Radboud University good practice is meaningful as it shows how in order to get to have female only positions integrated as a recruitment/appointment measure, support from a Gender Equality Body at the Faculty level is important, aimed at raising the awareness, promoting and integrating gender into recruitment policies and procedures, setting gender targets/quotas. Active engagement of senior members from the academic staff with management roles also shows to play a crucial role in iCIS achievements towards gender balance, which was awarded the 2017 Minerva Informatics Equality Award by Informatics Europe.

Also in this case, national regulations and measures were supportive of the University initiative: in the Netherlands, the government has set a target of 30% for women in board-level positions at universities and research institutions. (Helsinki Group, 2016).

References and sources of information

Informatics Europe Minerva Equality Informatics Awards Website,- iCIS Radboud Submission

EQUAL-IST Webinar Enhancing female researchers' careers in ICT/IST on 24th May 2018, presentation from Prof. Lejila Batina's iCIS Radboud University

Radboud University Faculty of Science website

Helsinki Group on Gender in Research and Innovation (2017). Guidance to facilitate the implementation of targets to promote gender equality in research and innovation. A guidance prepared by the Helsinki Group and the European Commission in consultation w

5.4 Measures for individual support to career progression

5.4.1 Networking and Mentoring

The most frequently used methods are to this respect **Networking** and **Mentoring.** Often criticised for aiming at 'fixing women rather than fixing the organisation' (Burkinshaw & White, 2017) individual support measures are indeed insufficient to achieve substantial results. Still, they are perceived as beneficial from women, especially within male-dominated scientific milieus where they might experience isolation. Furthermore, as the role of networks and social capital in academic and research career is demonstrated (Van den Brink & Benschop, 2014), networking and mentoring initiatives can contribute to counterbalance male-dominated academic and research networks acting in favour of gender equality.

Early career researchers and non-tenured professors can benefit from mentorship relations: the mentee-mentor relation allows to get advice from women (or men) who have achieved their professional and academic goals in the fields of ICT/IST and are willing to provide support and encouragement to younger talented researchers. Women to women mentoring schemes can have the advantage of providing the mentee with an inspirational female role model who might have also dealt with work-life balance issues and provide advice on this sensitive area of concern. Mentors usually work pro bono or being rewarded in some forms (visibility, fees, etc.). It is important to set clear agreement/terms of service so that expectations from mentees do not exceed the actual availability of the mentor. If the mentors are coming from the industry sector, sponsorship schemes can be set up between the University and the involved company(is).

It is worth highlighting that several qualitative studies have proven how this form of support can be of use in Computer Sciences research institutions (Gardiner, Tiggeman, Kearns & Marshall, 2007; Cozza, 2011).

E-learning platforms have the potential for effectively supporting mentoring experiments.

The Systers Network (USA)

Although not initiated by a University, the three networks promoted by the Anita Borg Institute and CRA-W (Computing Research Association's committee on the status of Women in computing research in the US) are targeted at women in a computer sciences research, at different stages of their scientific, academic career. They are operated via mailing lists where discussions are clustered into moderated conversations where women can seek and offer advice: conceived as a peer to peer form of networking, members of the lists can take advantage of the common challenges they share with women researching in the same discipline and being in similar positions/roles.

CRAW also offers Mid-Career Mentoring workshops, for middle stage researchers in academia as well as in industry or government research lab. Mentoring Workshops provide participants with advice to getting prepared for promotion to a more senior position, develop leadership and collaborative skills in research, and work-life balance.

References and sources of information

Burkinshaw, P. and K. White (2017). *Fixing the Women or Fixing Universities: Women in HE Leadership Administrative Science*, *7*, 30, pp.1-14.

Co-sponsored Systers Networks Website

CRA-W Website

Gardiner, M. Tiggemann, M., Kearns, H. & K. Marshall (2007)**.** Show me the money! An empirical analysis of mentoring outcomes for women in academia, Higher Education Research & Development, 26 (4) pp: 425-442.

Cozza, M. (2011). Bridging gender gaps, networking in computer sciences. Gender Technology and Development, 15-2, pp. 319-337.

Van den Brink, M. & Y. Benschop (2014). *Gender in academic networking: the role of gatekeepers in professorial recruitment*, Journal of Management Studies, vol 51, Issue 3, pp.460-492.

6 Teaching and Curricula

6.1 Guidelines for integrating a gender dimension in CS teaching

In order to minimise drop- out rates from girls enrolled in ICT/IST studies as well as to motivate them and support their study careers, it is very important to ensure that teaching, examination- assessment and counselling activities are gender sensitive.

In this respect, professors and lecturers shall be made aware of gender inequalities, and possible bias in teaching computer sciences/information technologies and this goal could be achieved by way of the different type of actions such as:

- Focus groups with teachers and professors
- Raising awareness training activities
- Designing and delivering guidelines/toolkits (this could actually come as a result of the two above mentioned steps so that it reflects the perceptions and the inputs collected by teaching staff)

The guidelines and tips below come from the book by Diana Franklin, *A practical Guide to Gender Diversity for Computer Science Faculty* (Franklin 2013).

Lecturing

- Emphasize class identity students instead of male/female
- Emphasize the importance of practice rather than ability, as it is proved how better performance comes by students who believe that the two aspects equally contribute to intelligence. Backed by this belief, students are also less subject to the negative impacts of gender stereotypes
- Interact and ask (similar type of) questions to both girls and boys in the classroom to equally training them to answer and raise confidence levels

Programming Assignments

- Pair Programming: it has been proven how working in pairs is a tool for increasing retention and programming confidence. It works better with two students on the same computer who repeatedly switch the role of “driver” and “navigator”. The suggestion is made to not pair boys and girls together especially when there is a wide coding experience difference between the two as this might reinforce the gap and not help the less experienced student (often the girl) to emerge.
- Working Groups: cluster the girls together instead of splitting them into different groups as this might lead to underestimating their status and amplifying their mistakes in addition to the sense of isolation,
- Provide clear instructions to group work stressing the importance of fair communication style and equal participation chances in group conversations

Tests and exams

- At the beginning or prior to the test, explicitly remind students of gender equal performance in test's results. As studies demonstrated the so-called "stereotype thread" is increasing anxiety in test taking among girls and minority groups students this can be counteracted or neutralised
- Add female test administrators whenever possible

Laboratories and Discussions

- Keep the student-to-student interaction monitored to avoid male 'nerd type ' highly experienced students taking over by showing off their advanced skills and complaining about how easy assignments are

Office/consultation hours

- Be aware of gender bias in communication: as female students often tend to diminish themselves, teachers easily risk not to distinguish what a student think of herself and what she is doing. Also in this context emphasising practice more than ability is important.
- Emphasize the positive side of failing in a learning process and share your failures and the difficulties you had to tackle might have a positive impact

References and source of information

Franklin, D. (2013). *A Practical Guide to Gender Diversity for Computer Science Faculty*. Morgan & Claypool Publishers.

6.2 Changing curricula: contextualizing computer sciences and interdisciplinary approaches at Carnegie Mellon University and Harvey Mudd College (USA)

At the Carnegie Mellon School of Computer Sciences and based on a study on experiences of enrolled students with CS classes, it was noted that a curriculum contextualizing technology in real-world uses and impact is appealing to female students (Margolis & Fischer, 2003). Few elements for such an approach have been highlighted, as:

- setting up curricula exploiting connections between computer sciences and other disciplines: bio-informatics, multimedia design, computer science economics and data science, etc.
- Providing early experiences allowing to situate technology in realistic settings, such as 'designing virtual worlds' 'wearable computers' integrating students from different courses (software design, marketing and economics, industrial, electronic, graphic design) and facilitating interaction with 'outside' potential clients.

Furthermore, studies found that women's perceptions of CS as a field are broadening and that many women see CS as a creative field where artistic/creative talents are an asset. (Lehman, Sax and Zimmerman, 2017) efforts can be made to emphasise the creative aspects of the computing disciplines and communicate this with prospective students.

With a similar approach Harvey Mudd College in Claremont, California, and upon the initiative of its director Pro. Maria Klawe has proceeded in revising the syllabus of the CS curriculum making it more appealing to

female students, so to express computing concepts expressed contextually, with a stronger emphasis on interdisciplinary and team-based projects and also to reflect features of a real work environment (EC, 2018).

References

Lehman, J.K., Sax, L. J., & H. B. Zimmerman (2017). *Women planning to major in computer science: Who are they and what makes them unique*? Computer Science Education, vol. 26, no. 4, 277–298.

Margolis, J. & A. Fischer (2003). *Unlocking the clubhouse: women in computing*, MIT Press

Women in the Digital Age Study (2018). A study prepared for the European Commission DG Communications Networks, Content & Technology by IClaves.

7 Gender-sensitive student services for attracting more girls to ICT/IS studies

The challenge of gender segregation and the extremely low female rates enrolled at Computer Sciences and Information Systems Universities can be tackled by several types of actions. Major goals for gender equality actions in this area imply attracting more junior students to continue their studies in ICT and offering support to existing undergraduate students to promote the most talented ones and retain them within the discipline. Universities and RO are increasingly taking initiatives to address low numbers of enrolled girls among CS/ICT/IS students (see practices presented in Chapter 7.1). Such actions try to intervene and raise the awareness on a complex set of rooted cultural/societal gender stereotypes: gender bias identifying ICT with masculinity are permeating early school education, STEM teaching practices and parents' attitudes (Graz-Velasquez, Joyce & Debry, 2009). In addition, several studies focused on the experience of current students highlighting how female bachelor students in CS have lower levels of self-confidence compared to their male counterparts which can negatively impact on their plans to continue their studies (Lehman, Sax & Zimmerman, 2017; Master, Cheryan & Meltzoff, 2015). Such findings indicate how action can also be taken to support currently enrolled girls through programmatic and pedagogical means, such as those in chapter 7.2.

It is worth highlighting how important it is to take **an intersectional approach** to this particular area of intervention. In fact, gender is always intersected with class, age and ethnicity differences as well as along other social dimensions such as sexual orientation, disability (Kvasny, Trauth & Morgan, 2009). The male-nerd imagery typically reflects middle class-white- abled- stereotypes. If this is not taken into account, actions aimed at attracting more girls to ICT/IS studies will likely address middle class, white girls mostly and fail to be inclusive toward girls from lower class families and families with migrant backgrounds.

References:

Gras-Velazquez, A., Joyce A. & M. Debry. (2009). WHITE PAPER. Women and ICT why are girls still not attracted to ICT studies and careers? Insight Observatory for New Technologies and Education, European Schoolnet and CISCO.

Kvasny, L., Trauth, E.M. & A.J. Morgan (2009). *Power Relations in IT Education and Work: The Intersectionality of Gender, Race and Class*, Journal of Information, Communication and Ethics in Society, Vol. 7 Issue: 2/3, pp.96-118.

Lehman, J.K., Sax, L. J., & H. B. Zimmerman (2017). *Women planning to major in computer science: Who are they and what makes them unique*? Computer Science Education, vol. 26, no. 4, 277– 298.

Master, A., Cheryan, S. and A.N. Meltzoff. (2015). *Computing Whether She Belongs: Stereotypes Undermine Girls' Interest and Sense of Belonging in Computer Science*, Journal of Educational Psychology.

7.1 Attracting perspective female students to enroll into ICT/IST studies

Several Universities are investing in raising the awareness of middle/high school girls and attracting them towards studying ICT/IST at the University. Most frequently used methods offer first-hand experience with coding and its potential applications in several domains as well as on inspiring female role models from the academia and the industry.

All reference examples highlighted below show how important it is for Universities to establish partnerships with local and national stakeholders from the civil society, local authorities and companies to sponsor and support initiatives aimed at increasing the number of girls to ICT/IST studies. University services are offering counselling and/or organising 'Open Days' for high school's students are typically involved in such activities, jointly with Departments/Faculties and Gender Equality bodies.

7.1.1 The Digital Girls Summer Camp at the University of Modena & Reggio Emilia (IT)

The **'Ragazze Digitali' (Digital Girls) Summer Camp** is organised annually by the Department of Engineering 'Enzo Ferrari' of the University of Modena and Reggio Emilia (Unimore) in collaboration with the association European Women Management and Development (EWMD), since 2014. Now at the fifth edition, the summer camp has the main goal of encouraging female students to enrol in Computer Science/Informatics programs and to attract girls towards computer science through a creative and innovative approach based on team-based activities.

During the summer camp, which lasts four weeks between June and July, the girls learn how to program video-games in Python. Laboratory activities focus on a **learning-by-doing approach** with a two-fold goal: 1) smoothly and nicely introduce girls to computer science and a "smart" technological world; 2) give girls a better understanding of what ICT is and how it can be applied to different and multidisciplinary fields. Moreover, during the summer camp dedicated seminars with speeches by external experts and women who have reached leadership positions because of scientific studies will help to **promote existing female role models**. The goal of such seminars is to expose girls to examples which are disruptive with respect to the well-known social gender stereotypes, and to present the concrete opportunities that ICT-related competences may offer in terms of studies and careers at the local and national level. **Participation to the summer camp is free, and no previous competencies are required** regarding coding or ICT skills.

The summer camp "Ragazze Digitali" is an **innovative** project: in Italy, it represents the first and only summer camp entirely dedicated to girls. Its long duration (4 weeks) and the fact that it is free for the participants makes this initiative unique, not only in Italy but also in Europe and, at the best of our knowledge, in the world. The total number of female students taking part to the five last Summer Camps editions (from 2014 to 2018) of the summer camp is 282, with a substantial growth trend, while more than 3.000 girls have been engaged in the raising awareness events before the Camp.

The further distinctive point is that the summer camp has been included in the Gender Equality Plan of the University as a positive action towards gender equality with the **support of the European Project Horizon**

2020 (2016-2019) EQUAL-IST "Gender Equality Plans for Information Sciences and Technology Research Institutions".

Source of information

Ragazze Digitali web site

EQUAL-IST D.4.2 Internal Assessment of Gender Equality Plans, v.1.

7.1.2 Integrating a gender approach into the annual "University Day" and initiating a Girls' Day at WWU Muenster (DE)

The "Hochschultag" event is promoting the IS study programme at the WWU.

"Hochschultag" ("University Day") is the annual information day at the WWU, which all secondary-school students are invited to attend. In order to promote the IS study programme at the WWU at "Hochschultag 2017" as an inclusive place welcoming students of all genders, it was decided to conduct a panel, where both male and female IS students could tell in an informal way to the participating secondary-school students about the IS study programme at the WWU. The objective was to have current students sharing their personal experience about studying at the WWU and living in Muenster, as well as replying to questions from secondary-school students.

Gender parity was considered when inviting speakers in order to communicate to the event participants in an indirect way that there is gender diversity among the students studying at the School of Business Economics (SBE) and promote the image of the SBE as a diverse and inclusive place for all. It was especially important that a female IS student participated in the event and could act as a role model to female secondary-school students.

After the student presentations, the secondary-school students had an opportunity to ask questions, as well as to reach the students in person upon the completion of the formal part of the event. The speakers received, as incentives to participate, goody bags with various gifts from the SBE and the ERCIS network. As the initiative was piloted in 2018, it faced some organisational pitfalls which led to a low number of participants, but the model was found valuable by the DIS study coordinator and Hochschultag Info Days coordinators so that it was decided to replicate it next year.

All materials are available at https://uni-muenster.sciebo.de/s/ne7LleJKHYobnZ8.

Initiation of the "Girls' Day" event promoting the IS study programme at the WWU.

"Girls' Day" is the annual information day in Germany, which female secondary-school students are invited to attend. It was decided to initiate the "Girls' Day" event at the DIS within "Girls' Day 2018" in order to promote the IS study programme at the WWU as an inclusive place welcoming students of all genders.

The event took place on 26th April 2018. 20 girls aged 11-17+ registered to the event, but only 18 of them aged 11-15 showed up. It was decided to start the event with a joint lunch at the cafeteria followed a short walk around Leonardo-Campus, where the WWU Working Group members of the EQUAL-IST project told participants about the campus, the DIS, the IS study programme at the WWU etc. Next, two IS students (1 man and one woman, speakers at "Girls' Day 2017") introduced to the girls the IS study programme at the

WWU, shared their personal experience about studying at the WWU and living in Muenster, as well as replied to girls' questions. The girls were then divided into 5 groups with 3-4 girls in each group (based on their age) and visited 5 interactive Stations based on interactively trying out several IS artefacts from WWU/DSI research projects. Projects and technologies were focusing on appealing issues such as virtual reality glasses, survey about trust and technology using a touchscreen, E-Bobby car and charging stations for electric cars, fitness trainer app for a smartwatch and a guessing game "FakeYou" dealing with the fake news problem.

Speakers and Station leaders at "Girls' Day 2018" were contacted in advance and asked to develop two types of the programme for their Station, more playful and simple programme for younger girls and a more serious one for older girls. The event concluded with an informal get together with cakes and beverages, where the participants could share their experiences and ask questions. The girls were also asked to fill in the event evaluation survey (see the "*Evaluation*" section). High-level analysis of the survey data showed overwhelmingly positive feedback from the participants.

This activity will be implemented again within "Girls' Day 2019", and it is intended to continue the implementation beyond the runtime of the EQUAL-IST project.

All materials are available at https://uni-muenster.sciebo.de/s/eSNFJEFtAYYbU0K.

All materials are available at https://uni-muenster.sciebo.de/s/Pd5Xy5amskHeAkR.

7.1.3 The EQUAL-IST Webinar on attracting and motivating girls towards ICT studies and professions

The Webinar was part of the **EQUAL-IST Webinar Series**: "Towards the implementation of the Gender Equality plans", and took place on the 16th of January 2018 via the "GoToMeeting" app. Knowledgeable speakers such as Bianka Siwinska from the Educational Foundation "Perspektywy," Line Berg from the Norwegian University of Science and technology and Ester Van Schaick from VHTO and WiTEC presented their projects in the field. Although only the experience from NTNU is directly implemented by a Research Organization, the other two run by NGOs can provide interesting insights and methods as well that could be considered for adaptation to an ICT/IS research organisation.

Presentations have been video recorded and are made available on the EQUAL-IST website dedicated web page.

7.2 Supporting current female students in ICT/IS

Different specific programs can be set up to support, encourage current female students enrolled in ICT/IST to prevent them from dropping out and sustain their study career while at the same time preventing isolation and offering role models.

A comprehensive study from Carnegie Mellon School of Computer Sciences has shown the emergence of a so-called 'experience gap' for girls: the prevailing male-oriented geek culture in CS classes along with lack of previous experience in programming for girls proved to be discouraging and leading to drop-offs before or

after graduation. Overall, girls' experience in CS resulted in being stressful in spite of good achievements at exams and preventing female students to opt in for postgraduate courses (Margolis & Fischer, 2003).

Some of the most frequently undertaken actions which could be incorporated into Gender Equality Plans are:

- Extra introductory courses to facilitate 1st year students without previous programming experience to catch up
- Mentoring schemes
- Travel grants to attend women in ICT international events

7.2.1 Extra courses introduction to programming for 1st year students at Carnegie Mellon (USA)

At the Carnegie Mellon School of Computer Sciences, a curriculum was set between 1995-1998 that provided first year students with different ways to enter the curriculum depending on their level of experience. A course was designed combining a discovery-based, real-world orientation with an introduction to programming: such course was set up in parallel with a more advanced course for students with substantial prior experience. An important success factor for this initiative has been found to be that the rest of the curriculum for the first year was not tightly scheduled nor deep in prerequisites: this allowed students who would go for an extra semester to get programming experience to catch up easily. This first experiment was afterwards evolved into a series of flexible mini-courses, and this was only the beginning of a comprehensive set of initiatives to change admission pre-requisites (not to make previous coding experience important) and to ensure good gender-sensitive teaching.

Source of information

Margolis, J. & A. Fischer (2003). *Unlocking the clubhouse: women in computing*, MIT Press.

7.2.2 The Mentor NET in STEM programme (USA)

The MentorNET e-mentoring program from the US is targeting undergraduate students in the STEM. It is not run by a University, as MentorNet is a non-profit, a division of Great Minds in STEM-GMiS, but it provides an interesting example of how mentoring can support before graduation as well as showing an interesting 'virtual mentoring' methodology. Entirely run via an online platform, it is a matching algorithm to facilitate the pairing of mentees/mentors profiles based on set criteria and preferences. After matching and having accepted a detailed reference agreement to set mutual expectations, a mentorship cycle lasts 4 months, and over that period, 16 prompts for discussions are proposed by the platform to stimulate interaction and dialogue between mentees and mentors, where 15-20 minutes per week in communication on the platform are spent by both parts. The program has been in place since 1997, involving more than 33.000 mentors-mentees pairs and evaluation surveys have shown how 70% participants have stayed in STEM career. It is offered to STEM Universities, corporates and professional associations.

Source: MentorNET website

7.2.3 The Sisters mentors program for students e at the School of Computer Sciences -Carnegie Mellon University (USA)

The School of Computer Science at Carnegie Mellon University and its Women@SCS network has several mentoring programs to provide support and advice for both undergraduate and graduate female students, leveraging on a flexible woman-to-woman mentoring model.

- **Undergraduate BigSister/Little Sister** is a programme for matching 'fresh-women' with an undergraduate upper-class woman, aiming at creating and strengthening a sense of community among CS female students. Youngest mentees can, therefore, get connections, advice, support, friendship, while 'big sisters' can share their experience and views of SCS. Schedule and plans of activities for meetings are left to the decision of each pair. To complement bilateral meetings, the network is proposing events during the year course so that all mentors and mentees involved in the program can meet and exchange.
- **Grad/Undergrad Sisters**
  This program matches junior and senior undergraduate students with graduate students in SCS, even for undergraduates who are not considering to enrol for graduation (yet) but are curious to know about how being a grad student looks like, or how the application process works, etc.
- **PhD Sisters**
  The PhD Sisters program matches first and second year PhD women with senior PhD women at SCS to pursue the goal of establishing long-term mentoring relations in the PhD women community.

Source of information

Sisters Mentors Website

8 Research content

As in most of the hard STEM fields, the understanding of how gender can be a relevant research dimension to be taken into account into Computer Sciences and IS research content is still limited and not widespread. Still, there was increased attention, and research papers and books have been published on this topic in the last years, and the GenderedInnovations initiative from Stanford University contributed to disseminate and give visibility to such endeavours. The inner neutrality of algorithms and coding as such is often mentioned to question the need for gender-sensitive CS/ICT and IS research. Two main arguments can be used to demonstrate the importance of taking gender into account also in computer sciences research content-wise.

Gender diversity shapes end-users needs and approaches towards technologies

Science and Technology Studies have demonstrated how technology products are always informed by implicit 'gendered scripts' (Rommes, Slooten, Oost & Oudshoorn, 2004) which is biased terms of gender and other socio-demographic characteristics: this implies that 'gendered' views and representations about who the users are, what their needs, skills and expectation are influencing human-computer interaction design (Breslin, 2018). Studies have been conducted on the gender dimension in software end-user engineering, robotics, video games design, and more recently, artificial intelligence and machine learning (Caliskan, Bryson & Narayanan, 2017) and need to be taken into consideration to design information systems and tools which do not reproduce gender bias.

Gender Diversity and creativity of research teams

It has been widely proven that more diverse teams in all working environments lead to greater creativity and this is also the case in IT programming and developing teams. Having research groups which bring to the table different backgrounds and perspectives is a plus.

Intersection of gender with other differentiation/discrimination axis is important in order not to re-assert a standpoint where women are deemed to be all equal and their needs and behaviors reconducted to stereotyped version of 'femininity' like it is often the case when IT products for women only are designed and brought to market: cooking, fashion, beauty-oriented products are the majority among the ones included in the Bloomberg list "18 best apps every modern woman should have" .

A gender-sensitive ICT design should negotiate between acknowledging gendered behavioural patterns that shape male/female users' approaches and needs, being at the same time able to scrutinise how gender is interrelated to age, social class, ethnicity etc., and challenge stereotyped beliefs.

There is enough evidence to be brought to the attention of computer scientists within these domains to deliver workshops, courses and/or toolkits which could raise the attention of researchers in ICT/IST. Such actions could be part of GEPs within the Research Content and Delivery area of intervention.

References

Breslin, S. & B. Wadhwa (2017). *Gender and Human-Computer Interaction*, in Norman, K.L., & J. Kirakowski (eds), The Wiley Handbook of Human Computer Interaction, Wiley Blackwell, Chicester, pp.71-87

Caliskan, A., Bryson, J.J. & A. Narayanan. (2017). *Semantics derived automatically from language corpora contain human-like biases*, Science, 14 Apr 2017 pp. 183-186.

Rommes, E. W. M., van Slooten, I. A., van Slooten, I., van Oost, E. C. J., & Oudshoorn, N. E. J. (2004). *Designing Inclusion - The development of ICT products to include women in the Information Society*. Enschede, The Netherlands: UT.

8.1 Gender in Informatics research content: machine learning

Gender (and racial) bias in machine learning has recently become a subject of several studies in the US in particular. Bolukbasi et al. published a paper in 2016 titled *"Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings"* .

The authors showed how word embedding works by linking words to a vector of numbers, which algorithms can use to calculate the probability. By looking at what words tend to be around other words, like "engineer," the model can be used to figure out what other word fits best, like "he." Translation algorithms are working off these biases, and so are other services like Google Search, as well as Netflix, Spotify recommendations.

The study proved how even word embeddings trained on Google News articles exhibit female/male gender stereotypes to a great extent and provided a methodology for modifying and removing gender stereotypes, such as the association between the words receptionist and female while maintaining desired associations such as between the words queen and female.

It also defines metrics to quantify both direct and indirect gender biases in embeddings, and develop algorithms to "debias" the embedding.

As the authors meaningfully, state: "one perspective on bias in word embeddings is that it merely reflects bias in society, and therefore one should attempt to debias society rather than word embeddings. However, by reducing the bias in today's computer systems (or at least not amplifying the bias), which is increasingly reliant on word embeddings, in a small way debiased word embeddings can hopefully contribute to reducing gender bias in society. At the very least, machine learning should not be used to amplify these biases, as we have seen inadvertently can naturally happen."

Joy Buolamwini, an MIT Media Lab researcher, studied the performance of three leading face recognition systems — by Microsoft, IBM and Megvii-China — by classifying how well they could guess the gender of people with different skin tones. These companies were selected because they offered gender classification features in their facial analysis software — and their code was publicly available for testing.

Correlations between co-occurring labels and visual input risk are unintentionally encoding social biases found in web corpora. A study on data and models associated with multilabel object classification and visual semantic role labelling found that:

(a) Datasets for these tasks contain significant gender bias

(b) models trained on these datasets further amplify existing bias. For example, the activity cooking is over 33% more likely to involve females than males in a training set, and a trained model further amplifies the disparity to 68% at test time.

Joy Boulamwini founded the Algorithmic Justice League, and she is now working on raising the awareness of how algorithmic bias like human bias can result in exclusionary experiences and discriminatory practices.

References

Bolukbasi, T., K.W. Chang, J. Zou, V. Saligrama & A. Kalai (2016). *Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings*, Cornell University Library, Computer Sciences, Computation and Language arXiv:1607.06520

Boulamwini, J. & T. Tebru (2018). *Gender Shades: intersectional accuracy disparity in commercial gender classification*, Conference on Fairness, Accountability, and Transparency, New York, NY, February 2018.

8.2 Gender in ICT product design: gendered innovations for mobility apps

Within the Gendered Innovations project (run by Stanford University and partnered by the European Commission) the EC commissioned an evaluation of an FP7th project named IC-IC (Interconnectivity through Info-connectivity) to assess whether and how the designed services and solutions could benefit from taking into account a gendered approach and women's needs. The overall aim of IC-IC was to meet air travellers' needs when accessing and transiting to/from and through airports in several EU capital cities by way of increasing their access to information. The evaluation focused on one potential area for adding value to the project, researching the needs of caregivers travelling with dependents and the availability of airport infrastructure to convey all the necessary information to them. The evaluation demonstrated how including "care givers" among the thousands of interviewed airports' customers could lead to broadening the number and type of mapped airport facilities (lactation rooms, playground, accessible pathways, diaper changing stations). Similar considerations were made for train/bus/metro stations connecting the airport to the main cities and different types of specific services in the arrival zone (like pediatric health services, playgrounds etc.). Adding different types of caregivers to the already employed 'personas' (the fictional characters around which the ICT service design process is built) would have allowed to make the info mobility application richer and more able to provide tailored sets of information to air travelers (men and women) with dependents, more often kids, customized to their needs. Recommendations were provided for the need to look at the gender dimension as intersected with other social characteristics (age, ethnicity-spoken language, employment etc.) for a more nuanced picture of users' needs.

Source of Information:

www.genderedinnovations.stanford.eu

8.3 The Gendered Innovation approach developed by the H2020 GENOVATE project, CDST- Lulea University (SE)

The Centre for Distance-Spanning Technology at Lulea University has been conducting pioneering work in engendering IT innovation by implementing several projects. Within the SATIN project, a digital toolkit has been released to facilitate gender and diversity mainstreaming in a project, as well as digital tools for web designers and product developers aimed at not conveying cultural constraints, stereotypes and prejudices in

development processes and end products. In the framework of the FP7 Genovate project[6], a broader approach has been used to address gender mainstreaming in innovation systems, and a specific toolkit has also been published on these topics to illustrate how academic institutions, social innovators, funding agencies, knowledge transfer partnerships, and intermediaries can use gender equality and diversity in their daily work. This work is now continuing thanks to the newly approved project *Gender Smart Arena*, aiming at an inclusive and innovative business model that provides better business for companies in the IT industry. The project aims at strengthening the cooperation between SMEs, universities and the public sector, focusing on practical gender mainstreaming to result in enhanced innovation capacity and increased competitiveness. It will foster a gender-conscious business model invoking norm-critique and norm-creation to develop opportunities for value creation.

References and Source of Information

EQUAL-IST, Deliverable 2.1 State of the Art Analysis

Lulea University of Technology, CDT (Centre for Distance Spanning Website)

[6] GENOVATE. Transforming organizational culture for gender equality in research and innovation. FP7-SIS, Project ID 321378.

9 Institutional Communication

Working on making institutional communication gender sensitive can be highly beneficial and have an indirect impact on all the above-mentioned areas of intervention. This is a cross-cutting area that can be addressed through a variety of actions depending on the extent of what the internal staff is already aware of gender equality in communication issues:

- Training and raising awareness on gender-sensitive institutional communication and or gender and language
- Gender-sensitive guidelines to language use and communication (strongly depending on national languages and their grammars, although the majority of tools and materials are in English Language use)
- Restyling of Web Sites and online communication platforms to avoid bias and use inclusive visual and textual communication that represent ICT/IST research as an inclusive scientific domain and working environment
- Multiple communication materials, both digital and paper-based.

Interesting resources and tools have been presented during the EQUAL-IST Webinar on Gender Sensitive Communication.

Taking part in International/EU level communication campaigns on gender equality can be an effective way to engage the University hierarchies leveraging on the need for international visibility. It gives the opportunity to top management to publicly commit to gender equality policies in research and structural change and to highlight and value what the University is already doing. The case of the SciencePO President actively participating as a Champion to the global HeForShe campaign was important within the EGERA [7] project framework to increase top-down support to the GEP and facilitate its implementation.

References

Unesco (2012). Gender-Sensitive Indicators for Media. FRAMEWORK OF INDICATORS. TO GAUGE GENDER SENSITIVITY IN MEDIA OPERATIONS AND CONTENT (part B on Gender portrayal in media content).

UNDP. Principles of Gender Sensitive Communication. Certification Programme UNDP Gender Equality Seal Initiative.

9.1 EQUAL-IST Webinar on Gender Sensitive Communication

The Webinar was held on the 3rd of November 2017 via the "GoToMeeting" app and was about "Gender Sensitive Communication".

Presentations on "Gender, language, empowerment" by Giuliana Giusti, Professor of Linguistics at the University Ca' Foscari of Venice and on the "Available tools for promoting gender-sensitive communication", by Maria Sangiuliano, Research Fellow at Università Ca' Foscari of Venice – Department of Computer Sciences and senior gender expert.

[7] EGERA. Effective Gender Equality in Research and Academia. FP7-SIS. Project ID: 612413

The first presentation provided insights on how linguistic structures are formed by gender bias: drawing mostly on examples from English and Italian. In general, it explored the multiple ways in which language interacts with the construction of gender identity since linguistic meta – competencies can enhance language use in an equal opportunity perspective.

The second presentation was focused among others on the UNESCO Gender and Media Guidelines, the UNDP Principles on Gender Sensitive Communication and the Antwerp Chart on Gender Sensitive Communication in and by Academic Institutions from the H2020 Project. Reflections on how these guidelines could be applied to ICT-IST research organisations have also been shared.

Presentations can be accessed at the EQUAL-IST Website

9.2 She will be a computer scientist! A video to challenge the idea that CS is not for girls and to brand the CS Faculty as gender inclusive

Ca' Foscari University has worked on the issue of gender-sensitive communication from multiple angles and various tools. A 5 weeks Language, Gender Identity and Italian Language Massive On-Line Course (in Italian) open to both students and staff members have been designed and delivered by Prof. Giuliana Giusti in 2015, with the aim of developing a reflective awareness of the relationship between Language and Identity with reference to Gender. Practical shortcomings which are highlighted in the course regard the ability to apply this awareness to use communicative strategies by allowing the presence of women to emerge in every social setting and cultural discourse.

More specifically with regards to challenging a gender-biased communication of CS, the Faculty of Computer Sciences has promoted a collaboration with Commission for Gender Equality at the Veneto Region, to deliver a dedicated project aimed at counteracting gender stereotypes about ICY studies and careers. A parallel goal of the project is to promote a public image of the Faculty and the Department itself as a gender-inclusive environment. The She Will BE Computer Scientist! website and set of videos and interviews targeting high school students to motivate them to undertake university studies in Computer Sciences has been released and widely disseminated region and nationwide.

9.3 The Antwerp Charter on Gender Sensitive Communication

The Charter was developed in the framework of the EU Funded EGERA project[8] aiming at raising the awareness of, and sensitivity to, these issues by providing suggestions for the elimination of bias from all communication, thus creating a supportive and inclusive academic institutional environment for all. The EGERA consortium has identified exposure to cultural stereotypes as one crucial reason behind gender segregation in research: the gender-biased ways in which women are portrayed and the way stereotypes are conveyed in language affect organisational practices and create non-supportive environments. The Charter asks representatives and top managers of Research Institutions a commitment in taking the initiative for

[8] EGERA Effective Gender Equality in Research and Academia, FP7 SIS, Project ID: 612413.

contrasting gender biased communication addressing oral, written, visual communication and both levels of peer to peer and hierarchical communication.

It was signed by all rectors from the EGERA consortium and has been broadly disseminated in the EU and beyond.

10 Gender Disaggregated Data

Availability of Gender Disaggregated Data is core to design and implement gender equality policies, to set up target indicators which are responsive towards the institutional context and can be thoroughly monitored to assess their impact over time and be eventually adjusted. Resistances are frequently met at different levels of the organizations and formulated with varying arguments, among those a false assumption that in today's Western societies gender inequalities are not an issue any longer. For this reason, it is extremely important that **Gender Equality Policies are formulated, proposed and implemented as evidence-based policies**: this is why the collection and analysis of sex-disaggregated data and gender sensitive statistics are crucial.

Research Organizations can act to build the preconditions and needed capabilities to deliver gender statistics. Most suitable initiatives to this respect are:

- **Raising awareness and training** of officers in charge of data collection and analysis
- **Upgrade of existing IT tools/software** to support data collection and analysis to ensure that the gender indicators and variables are included. According to the experience of the Slovenian Academy of Science, partner in the GARCIA Project, promoting the use of gender sensitive statistics while at the same time taking the opportunity of upgrading the statistics software in use at the RPO was extremely beneficial. Such a strategy facilitated in creating consensus towards gender equality policies which was in this way associated to organizational innovation in a very concrete way (Source: EQUAL-IST, D2.1 State of the Art Analysis.
- Setting up of dedicated **Gender Equality Observatories** (see par. 10.1)

References and Sources of Information

The EIGE online Gender Statistics Database

UNECE/World Bank Institute. (2010). Developing Gender Statistics: a practical Tool. A manual prepared by the UNECE Task force on Gender Statistics Training for Statisticians with contribution from various experts. Geneva

A Gender and Intersectional approach to statistics: the gender and population group video targeted at statisticians

EQUAL-IST, D2.1 State of the Art Analysis.

10.1 Setting up a Gender Equality Observatory

10.1.1 The University Observatory on Equal Opportunities Padua University (IT)

The Observatory of the Padua University is one of the sustainable outcomes of the Gender Equality Plan set up within the EU funded GenderTime project[9]. It is a permanent body of the University cooperating with the Equal Opportunities Commission, the Unique Committee of Guarantee and the Evaluation Committee

[9] GenderTime. Transferring Implementing and Monitoring, FP7 Project Number: 321491

supported by Management Control Unit. It collects and analyses gender-disaggregated data and information on women presence and role at all levels and careers, as well as on measure in place to promote equal opportunities. In this way, it supports gender equality policies design and implementation increasing its efficiency and credibility as evidence-based policies.

The Observatory analytical work is grounded in a system of gender equality indicators which was elaborated based on research conducted under the GenderTime Project. Interestingly, the Observatory has joined forces with the Commission for Equal Opportunities and the CUG (Unique Committee for Guarantee) in proposing a Gender Budget at the University level to be included in the University Strategic Action Plan. The Gender Budget has been finalized and published in 2016, and the Observatory has been one of the main contributors to its delivery, together with a dedicated Committee and Task Force. The set-up of the Observatory, as well as gender budgeting, were made possible by a strongly synergetic effort among different components of the Gender Equality Machinery of the Padua University and a cross-sectoral effort shared by several academic branches and administrative units. Interesting to note is the fact that driving the process and currently coordinating the Observatory was Prof. Silvana Badaloni, from the Department of Information Engineering, also Scientific Coordinator for the University of Padua within the GenderTime project.

References and sources of information

EQUAL-IST Project Deliverable 2.1 State of the Art Analysis

GenderTime Project

http://www.unipd.it/osservatorio-ateneo-pari-opportunita

Badaloni, S. & L. Perini (2016). *A model for building a gender equality index for academic institutions*, Padova University Press.

10.1.2 UMINHO University (PT)

The Software Engineering School of the Uminho University in Portugal promoted the creation of an online Gender Observatory to make any activities on gender equality in research in the country visible, making strategic gender indicators and analytical tools for the formulation of policies and actions related to the promotion of Gender Equality.

Most of the actions carried out in the Uminho GEP will be included in this Observatory as well. Some information presented on the platform includes, namely:

- Infographics of the diagnosis of students' and academics'/administrative staff' (situation at UMINHO (Link: http://observagenero.dsi.uminho.pt/infograficos/),
- Portuguese Legislation and Public Policies (Link: http://observagenero.dsi.uminho.pt/legislacao-e-politicas-publicas/)
- Collaborative Map with Initiatives with Gender Equality Plans of Portugal (Link: http://observagenero.dsi.uminho.pt/mapa-colaborativo-das-iniciativas-com-plano-de-igualdade-de-genero/)
- A timeline with the main actions related to Gender Equality performed over the years in Portugal as well as some infographics too, playfully, show the reality of Portugal in what concerns Gender Equality http://observagenero.dsi.uminho.pt/timeline/

This action is considered a promising practice stemming out of the first iteration of Gender Equality Plans within the EQUAL-IST project as it highlights how important it is to give high visibility to gender-disaggregated statistics on equality in a given research organizations, framing it within the broader context of gender equality indicators and policies at the national level. It is strategic also in the sense that it makes all institutions developing gender equality policies visible on the same platform, eventually triggering a positive competition among them. Furthermore, and in parallel with this action, Uminho's team is working for designing a new Information System to be used internally at the University level, to make gender/sex-disaggregated data collection on HR and students easier and automated therefore embedded into routine monitoring practices.

Source:

EQUAL-IST Project, Deliverable 4.2 Internal Assessment v1.

11 Relevant international conferences and networks

ACM-W (Association for Computing Machinery- Women in Computing)

ACM-W supports, celebrates, and advocates internationally for the full engagement of women in all aspects of the computing field, providing a wide range of programs and services to ACM members and working in the larger community to advance the contributions of technical women. It organises annual conferences, celebrations and awards through its chapters in the US, Europe and India.

ACM also hosts the Special Interest Group on Computer Education where gender issues are also increasingly taken into consideration. The group promotes/supports annual international conferences such as ICER Conferences (International Computing Education Research) and ITiCSE (innovation and Technology in Computer Science Education)

Women in Informatics Research and Education (Informatics Europe)

Part of Informatics Europe, a network of over xx departments of Informatics, "Women in Informatics Research and Education (WIRE)" promotes actions that help improve gender balance at all stages of the career path in Informatics (Computer Science, Computing). WIRE is organising the Annual Minerva Equality Informatics Award and has issued two editions of the good practices booklet *Women in Informatics Research and Education*.

Anita Borg Institute

Founded by computer scientist Anita Borg in 1987, is a social enterprise active in 80 countries supporting women in technical fields, as well as the organisations that employ them and the academic institutions training the next generation. The organisation runs a full roster of programs to help women grow, learn, and develop their highest potential.

AnitaB.org is the promoter and organier of the renowned Grace Hopper Celebration, the world largest gathering of women technologists, produced in collaboration with ACM.

AISWN (Association of IS Women's Network)

The AIS Women's Network is a college of the Association for Information Systems (AIS). The purpose of the College is to promote a network for supporting women scholars in information systems and to enables mentorship relationships that are crucial to speed the success of women in the information systems field.

The European Network for Women in Digital

After the publication of the Report Women in Digital Age in 2018, the EC Commissioner Maryia Gabriel, in charge of Digital Economy and Society committed to a series of actions to tackle the issue of the under-representation of women in IT research and professions.
The Digital4Her conference took place on 19 June 2018 where measures were taken to get more women into the digital sector. 20 IT companies co-signed a declaration committing to provide an inclusive and gender-balanced work culture and environment. The European Network for Women in Digital, an online database was launched at the event, through which organisations working on girls/women in the digital sector can network and collaborate on ideas and experiences in this field. A short working report on gender representation in audiovisual media was published on this occasion.

Appendix _Detailed version Table 1 Sources of Information and Quality Screening

	Source	Quality check methods	Measures/practices/guidelines	Corresponding paragraphs in the Toolkit *	Typology
(1)	EQUAL-IST D.2.1 State of the Art Analysis and EQUAL-IST webinars series	Methodology based on a set of quality criteria for Gender Equality Plans and 19 in depth interviews with representatives from RPOs	XXXXXXXXXX	2.2; 2.2.1; 3.1; 4.1(b); 5.2 (b); 5.3.1; 5.3.3; 7.1.3; 8.3; 10.1.1	Good Practices
(2)	GEAR Toolkit	Comprehensive and systematic study on good practices on gender equality in research in EU countries identified via a thorough methodology	X	3.3	Good Practices
(3)	Minerva Informatics Equality Award	Selection by the award committee of 7 CS Professors appointed by Informatics Europe.	X	5.3.4	Good practices
(4)	Scientific publications on gender in computing	Literature analysis and different research methodologies, mostly qualitative.	XXXXXXX	5.1; 5.3.2; 6.1; 6.2.(a); 6.2(b); 7.2.1; 8.2	Good Practices & Evidence based guidelines ∞
(5)	EQUAL-IST GEPs implementation	Internal assessment of RPOs (D.4.2 v.1); inception report n from the external evaluator. Quality criteria for assessment harmonized with (1)	XXXXX	3.2; 7.1.1; 7.1.2(a); 7.1.2 (b); 10.1.2	Promising practices
(6)	Websites and documentation from implementing institutions (Desk Research)	Criteria for selection: innovativeness based on State of the Art Analysis; integration in National Policy Frameworks. Stability of proposed measures	XXXXXXXXXX	4.1(a); 4.1(c); 4.1; 4.4; 5.2(a); 5.4.1; 7.2.2; 7.2.3; 9.2; 9.3	Inspirational examples

*whereas a paragraph contains more than one practice, those have been indicated with letters a), b) c), following the presentation order

∞ paragraphs 5.1 and 6.1 include guidelines extracted from scientific publications rather than specific practices