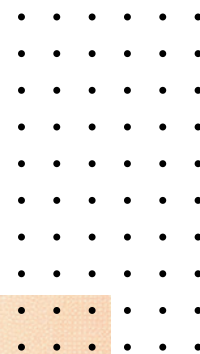


POLICY RECOMMENDATIONS

FOR GENDER BALANCE IN INFORMATICS



This publication is based upon work from COST Action EUGAIN CA19122 (European Network For Gender Balance in Informatics), supported by COST (European Cooperation in Science and Technology).



EUGAIN features more than 160 members from over 45 countries, including 5 non-European ones. Its main aim is to improve gender balance in Informatics through the creation and strengthening of a truly multi-cultural European network of academics working at the forefront of the efforts in their countries, institutions and research communities. It builds on their knowledge, experiences, struggles, successes, and failures, learning and sharing what has worked and how it could be transferred to other institutions and countries.



Informatics Europe, the Grant Holder institution of EUGAIN COST Action, unites and empowers the Education & Research Informatics community across Europe. It connects over 50,000 researchers from 200+ member institutions spanning 30+ countries. The organisation advocates for shared priorities and supports policy making in Education, Research and the Social Impact of informatics in Europe. EUGAIN builds upon the groundwork laid by the Informatics Europe Women in Informatics Research and Education (WIRE) Working Group, which has since evolved into the Diversity & Inclusion Working Group. More information: www.informatics-europe.org

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.

www.cost.eu



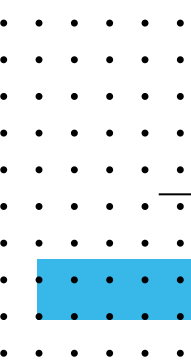
Funded by
the European Union

EXECUTIVE SUMMARY

This deliverable provides a set of policy recommendations directed to policymakers, at national and European level. This document contains concise and practical measures that policymakers can adopt to support gender equity in Informatics. While the COST Action is named “European Network for Gender Balance in Informatics”, we do see gender equity as the most important paradigm to strive for.

We have identified four target audiences: Schools, Universities, Public Administration and Private Sector. For each of these audiences, we have researched the current state of practice and investigated pathways to improving both education and career paths in a number of scientific studies.

In each of the following chapters you find a vision and mission statement, then an overview of the current reality, and finally a set of recommendations.



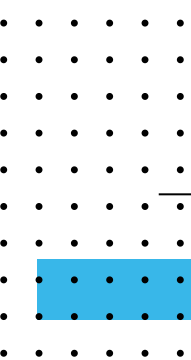
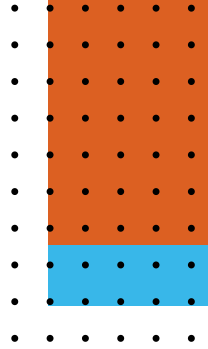
AUTHORS

- **Alicia Julia Wilson Takaoka**
Norwegian University of Science and Technology, Norway
- **Antinisca Di Marco**
University of L'Aquila, Italy
- **Berat Ujkani**
University of Mitrovica, Kosovo
- **Birgit Penzenstadler**
Chalmers tekniska högskola, Sweden, and Lappeenranta University of Technology, Finland
- **Claudia Maria Cutrupi**
Norwegian University of Science and Technology, Norway
- **Elva Leka**
Polytechnic University of Tirana, Albania
- **Enrico Nardelli**
Università di Roma "Tor Vergata", Italy
- **Fanni Bobák**
Ex Ante Consulting Ltd., Hungary
- **Francesca Alessandra Lisi**
University of Bari Aldo Moro, Italy
- **Giovanni Stilo**
University of L'Aquila, Italy
- **J. David Patón-Romero**
Simula Metropolitan Center for Digital Engineering (SimulaMet), Norway
- **Jane Hillston**
University of Edinburgh, United Kingdom
- **Karima Boudaoud**
Université Côte d'Azur, France
- **Lenuta Alboaie**
Alexandru Ioan Cuza University, Romania
- **Małgorzata Biernacka**
University of Wrocław, Poland
- **Miranda Harizaj**
Polytechnic University of Tirana, Albania
- **Nehir Yasan-Ak**
Akdeniz University, Turkiye
- **Salome Shakarishvili**
Ministry of Education and Science of Georgia, Georgia
- **Simona Motogna**
Babes Bolyai University, Romania
- **Sonay Caner-Yıldırım**
Erzincan Binali Yıldırım University, Turkiye



TABLE OF CONTENT

Introduction.....	01
School.....	02
Vision & Mission.....	03
Current Reality.....	04
Recommendations.....	06
References.....	14
University.....	15
Vision & Mission.....	16
Current Reality.....	17
Recommendations.....	19
References.....	23
Public Administration.....	24
Vision & Mission.....	25
Current Reality.....	26
Recommendations.....	28
References.....	31
Private Sector.....	32
Vision & Mission.....	33
Current Reality.....	34
Recommendations.....	36
References.....	42
Conclusion.....	43



INTRODUCTION

Women are underrepresented in Informatics at all levels, from undergraduate and graduate studies to participation and leadership in academia and industry. The main aim and objective of EUGAIN, the COST Action named “European Network for Gender Balance in Informatics” is to improve gender equity in Informatics at all levels through the creation of a European network of colleagues working on the forefront of the efforts for gender equity in Informatics in their countries and research communities.

We provide a set of policy recommendations directed to policymakers, at national and European level. We give **concise and practical measures** that policymakers can adopt **to support gender equity in Informatics**. We use Informatics to denote the scientific and technical discipline at the basis of the digital world, including also its impact on human beings and society. However, we often use the abbreviation information and communication technologies (ICT) for when we speak of the larger context and field of employment, or when we quote statistics. The focus of this body of work is on Informatics.

We have identified four target audiences: **Schools, Universities, Public Administration and Private Sector**. For each of these audiences, we have researched the current state of practice and investigated pathways to improving both education and career paths in a number of scientific studies. The detailed results of those studies are cited in the following chapters as well as available on our website <https://eugain.eu/results/>.

In each of the following chapters you find a vision and mission statement, then an overview of the current reality, and finally a set of recommendations.

With this deliverable we hope to inspire policy makers at all levels, from preschool instructor to minister of education, to take action and support for more gender equity in Informatics.

In all areas of work we need supportive, creative and welcoming environments. Furthermore, society gets called to clearly communicate to women that we are experiencing a moment of revolution due to the push of digitalization and if women are not actively working in the ICT sectors they will once again find themselves in a world defined by men and therefore less suitable for women. Furthermore, we recommend a split of care work and actions to allow women and men to take care equally of children and parents that need help on all levels of legislation.

Please enjoy your read 😊

SCHOOL

High Level Policy for Stakeholders



Image generated by DALL-E, OpenAI's image generation model

VISION & MISSION

School

Vision

Our vision is to establish Informatics as a fundamental and distinct subject within compulsory education across the European Union. We aspire to cultivate a generation of citizens proficient not only in the use of digital technologies but also in their creation and critical evaluation. We envisage a future where students are equipped to navigate, understand, and shape the digital society, free from prejudices and stereotypes that often infiltrate digital tools and systems. In this digitally empowered society, Informatics education is recognized as an autonomous scientific discipline, offering unique perspectives on both natural and artificial phenomena and fostering critical thinking, collaboration, and social responsibility.

Mission

Our mission is to integrate Informatics into the school curriculum as an independent subject, emphasizing its scientific and creative aspects beyond mere technological usage. We are committed to developing comprehensive educational resources and gender-responsive pedagogical approaches, ensuring inclusivity and diversity in the classroom. Through these efforts, we aim to provide optimal educational experiences that promote gender equality and prepare all students, especially women, for a future in Informatics. We strive to create a supportive network of students, educators, and community members, all working together to break down barriers and pave the way for inclusive and equitable participation in the field of Informatics.



Image generated by DALL-E, OpenAI's image generation model



CURRENT REALITY

School

1. Persistent Gender Disparities:

- Despite ongoing efforts, significant progress in reducing gender disparities in Informatics has been limited (Lorenz et al., 2021; Charlesworth & Banaji, 2019; Master et al., 2021).
- The European Commission's report (EC, 2022) emphasizes the need for early engagement of girls in Informatics to combat stereotypes and increase interest.

2. Identified Main Causes:

- EUGAIN's investigation highlights four key areas: access, stereotypes, confidence, and sense of belonging (see Figure below).

3. Access

- Girls often lack exposure to Informatics, with limited access to technology and related extracurricular activities (Happe & Buhnova, 2021; Sahin & Misirli, 2023; Girls Who Code, 2019).
- Increasing access to early educational programs in Informatics has shown positive impacts on girls' interest in the field.

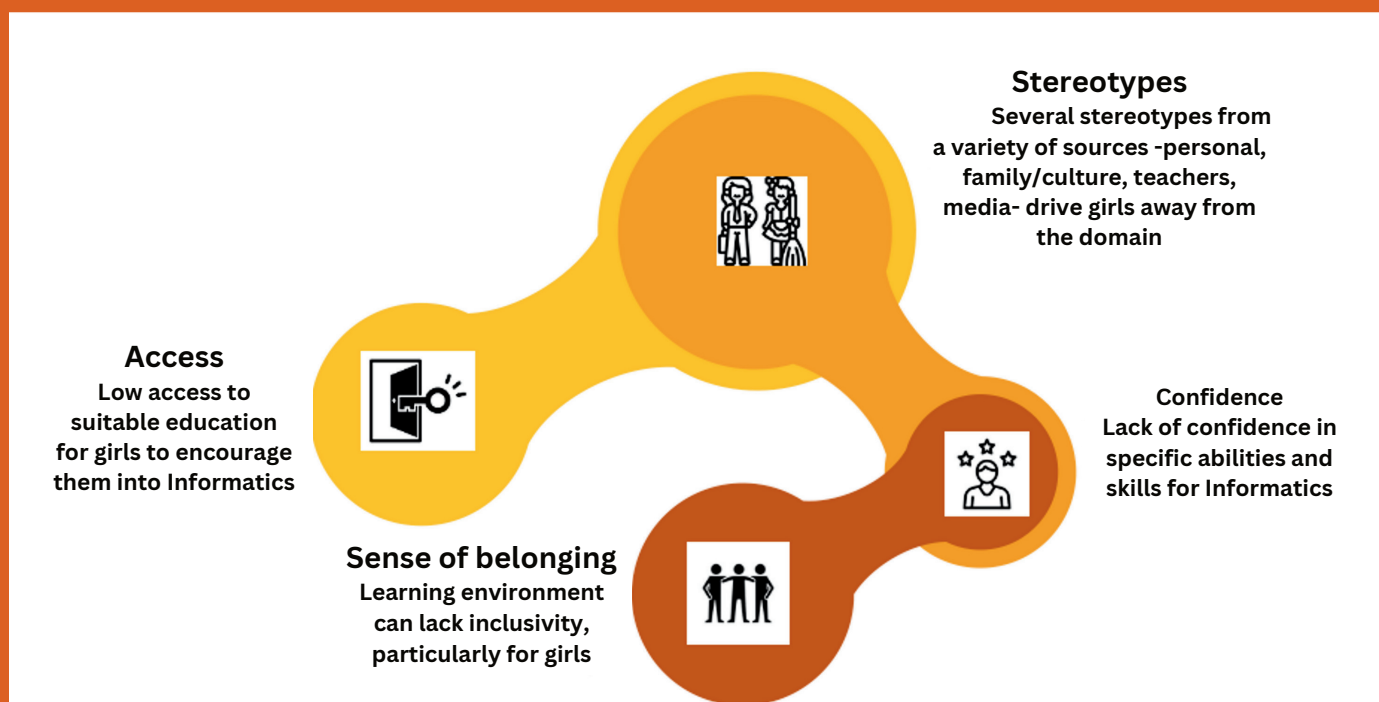


Figure: Main causes of persistent gender disparities



CURRENT REALITY

School

4. Stereotypes

- Informatics is often perceived as difficult or suitable only for "geeks/nerds", influenced by personal, familial, or educational misconceptions (Lorenz et al., 2021; Torres et al., 2021).
- Promoting relatable female role models is crucial to inspire and encourage girls in this field.

5. Confidence

- Societal messages and the lack of female role models in Informatics contribute to a lack of confidence among girls regarding their potential in this field (Lorenz et al., 2021; Happe & Buhnova, 2021).
- Creating an inclusive and empowering environment is essential to boost girls' confidence in pursuing Informatics.

6. Sense of Belonging

- Non-inclusive learning environments contribute to girls feeling isolated and incompetent in Informatics (Nardelli & Corradini, 2019; Vainiompaa et al., 2019).
- Diverse learning experiences and increased representation of women can impact girls' sense of belonging in the field.

Towards a better future

Addressing these challenges requires a holistic approach, involving societal attitude changes, stakeholder engagement, and policy reform. The goal is to create an educational landscape that encourages all students, regardless of gender, to explore and excel in Informatics.



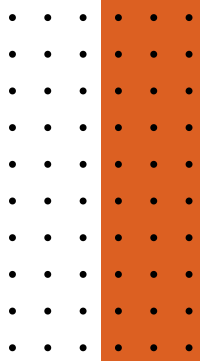


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For Ministries of Education



Legislation Reform for Inclusive Informatics Education

- Acknowledge Informatics as a fundamental subject and encourage an inclusive approach from the early stages.



Nation-Wide Informatics Curriculum

- Establish curricular guidelines for Informatics, balancing technical and social components.

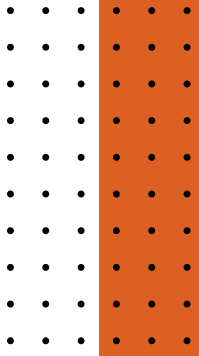


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For Ministries of Education



Allocate Resources for Teacher Education

- Ensure teachers are well-prepared to teach Informatics in a motivational and inclusive manner.



National Media Campaign

- Promote Informatics in the national media to raise awareness and attract the younger generation to Science, Technology, Engineering, and Mathematics (STEM) activities.

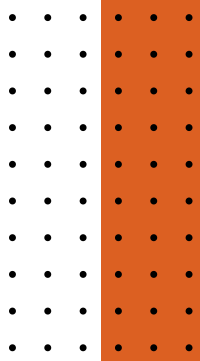


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS School

For Regional School Administrations

Appoint a Top-Level Official for Informatics Education

- Oversee the implementation of Informatics as a new subject.

Foster Public-Private Partnerships

- Collaborate with regional enterprises for enriching educational experiences.

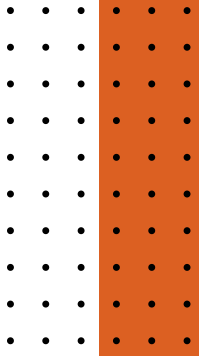


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For Regional School Administrations



Professional Development for Teachers

- Provide training for teachers to enhance their confidence and effectiveness.



Support Extracurricular Informatics Activities

- Organize workshops, summer schools, and tech camps to engage students.

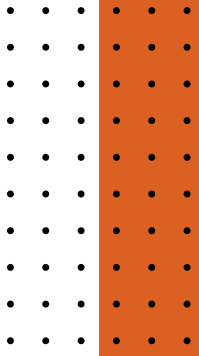


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For School Principals



Training Teachers in Inclusivity

- Focus on workshops that create a supportive learning environment and address unconscious biases.



Awareness Campaign

- Educate parents on the importance of Informatics and inspire girls through role models.

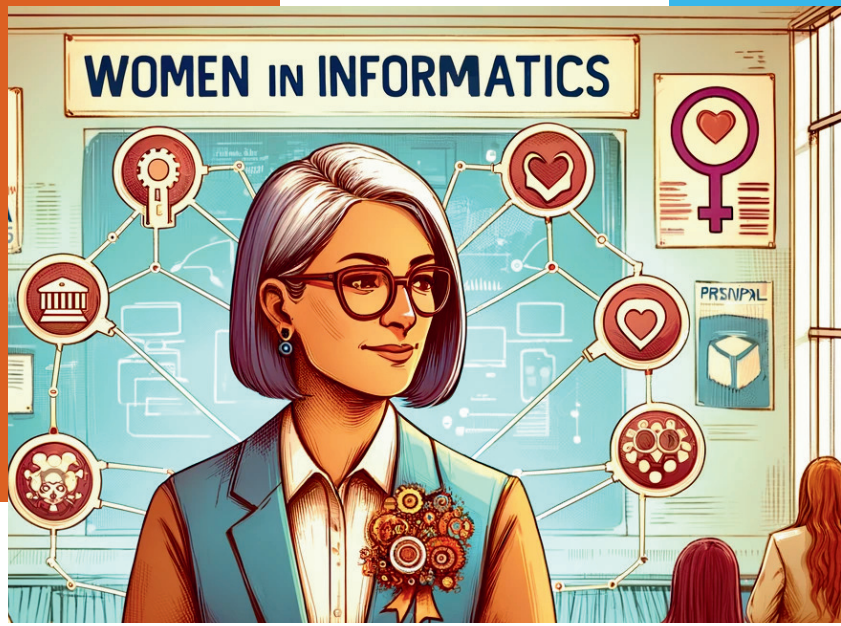
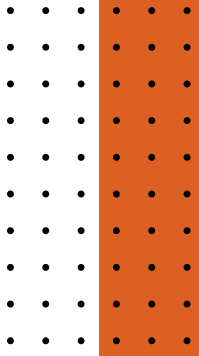


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For School Principals



Promote an Inclusive Classroom Culture

- Ensure a positive environment that values diversity and mutual respect.



Provide a Real-Life Perspective

- Work with local tech companies and nonprofits to provide real-world experiences in Informatics.

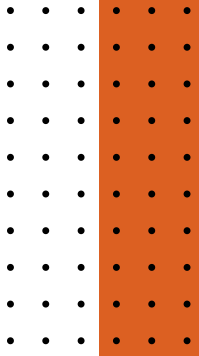


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For Teachers



Advocate Early Informatics Exposure

- Introduce Informatics principles early and make them engaging.



Inspire with Role Models

- Use personal experiences and stories to motivate students and break stereotypes.

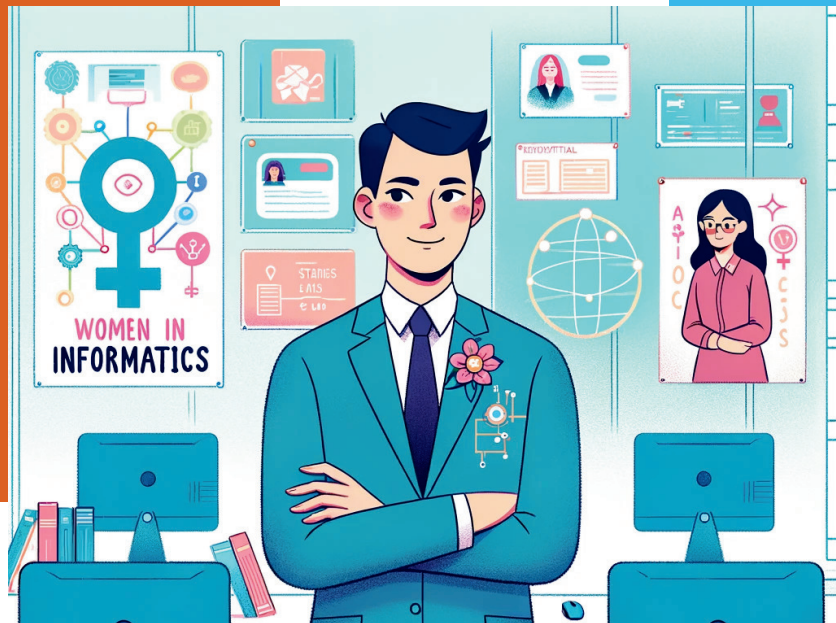
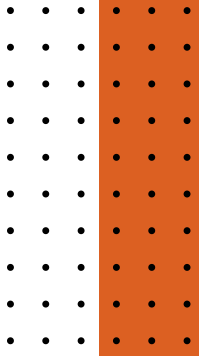


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

School

For Teachers



Emphasize Social Impact through Projects

- Engage students in interdisciplinary projects that address real-world problems.



Foster a Gender-Inclusive Environment

- Create a respectful and inclusive atmosphere in the classroom.

REFERENCES

Charlesworth, Tessa E.S., Banaji Mahzarin R. - Gender in Science, Technology, Engineering, and Mathematics: Issues, Causes, Solutions, *Journal of Neuroscience*, September 2019, 39 (37) 7228-7243; DOI: <https://doi.org/10.1523/JNEUROSCI.0475-18.2019>

European Commission/EACEA/Eurydice (2022). *Informatics education at school in Europe*. Luxembourg: Publication Office of the European Union.

Girls Who Code - 2019 Advocacy Report, https://girlswhocode.com/wp-content/uploads/2019/06/GWC_Advocacy_2019K12Report_PDF-min-1.pdf

Happe, Lucia, Buhnova, Barbora, Kaziolek, Anne, Wagner, Ingo. (2021). "Effective measures to foster girls' interest in secondary computer science education". In: *Education and Information Technologies* 26, pp. 2811-2829. DOI: 10.1007/s10639-020-10379-x

Lorenz, Birgy, Kikkas, Kaido, & Sömer, Tiia (2021, October). IT as a Career Choice for Girls: Breaking the (Self-Imposed) Glass Ceiling. In *ECEL 2021 20th European Conference on e-Learning* (pp. 266-274).

Master, Allison, Meltzoff, Andrew, N., Cheryan Sapna. 2021. Gender stereotypes about interests start early and cause gender disparities in computer science and engineering. *PNAS* 118(48):e2100030118

Nardelli, Enrico, Corradini, Isabella. (2019). "Informatics Education in School: A Multi-Year Large-Scale Study on Female Participation and Teachers' Beliefs", 12th Int.Conf. on Informatics in Schools: Situation, Evolution, and Perspectives (ISSEP-2019), pp.53-67, DOI: 10.1007/978-3-030-33759-9_5

Şahin Timar, Zeynep, Mısırlı, Özge. (2023). Effective Strategies for Encouraging Girls in Informatics. In: Antona, M., Stephanidis, C. (eds) *Universal Access in Human-Computer Interaction. HCII 2023. Lecture Notes in Computer Science*, vol 14021. Springer, Cham. https://doi.org/10.1007/978-3-031-35897-5_27

Torres-Ramos, Sulema, Fajardo-Robledo, Nichte, S., Pérez-Carrillo, Lourdes, A., Castillo-Cruz, Claudia, Retamoza-Vega Patricia, del R., Rodríguez-Betancourt, Veronica, M., Neri-Cortés Cristina. *Mentors as Female Role Models in STEM Disciplines and Their Benefits. Sustainability*. 2021; 13(23):12938. <https://doi.org/10.3390/su132312938>

Vainionpää, Fanny; Kinnula, Marianne; Iivari, Netta; and Molin-Juustila, Tonja, (2019). "GIRLS' CHOICE - HY WON'T THEY PICK IT?". In *Proceedings of the 27th European Conference on Information Systems ECIS*, Stockholm & Uppsala, Sweden, June 8-14, 2019. ISBN 978-1-7336325-0-8 Research Papers. https://aisel.aisnet.org/ecis2019_rp/31

UNIVERSITY

High Level Policy for Stakeholders

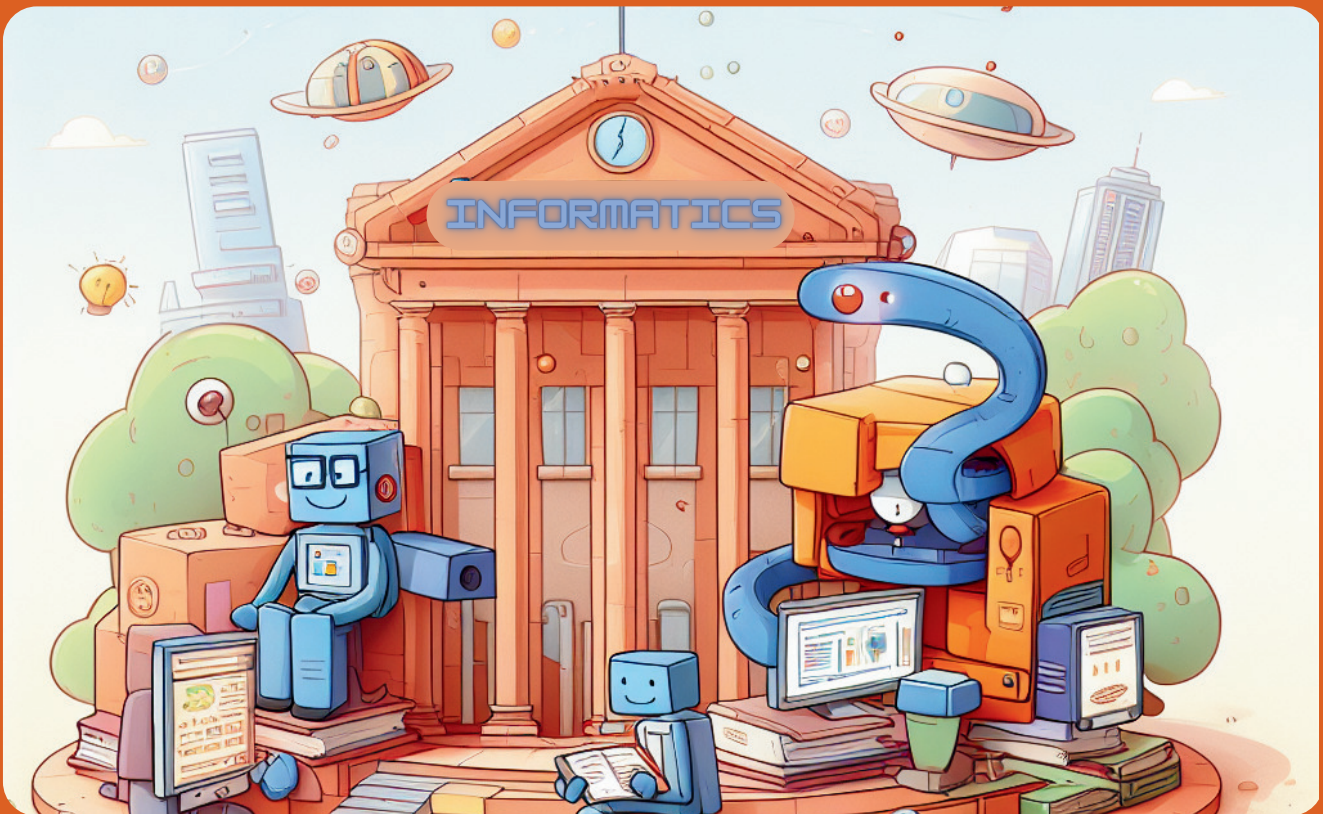


Image generated by DALL-E, OpenAI's image generation model

VISION & MISSION

University

Vision

Our vision is to transform universities into spaces that actively challenge the reluctance and embarrassment surrounding discussions of inclusiveness and equal opportunities. By breaking down these stereotypes and cultural barriers, universities can foster open dialogue and train individuals to become champions of inclusion and equality, upholding the principles that form the foundation of modern democratic societies.

Universities have a crucial role in empowering diverse talent and driving the agenda for gender balance and inclusivity. By celebrating diversity as a catalyst for innovation and societal well-being, universities will contribute to a more just and equitable world. We envision a future where universities not only acknowledge gender diversity but celebrate it, breaking down barriers within academia and beyond.

Mission

Our mission is to support universities in delivering actions that aim to recruit and retain women and promote gender balance in Informatics. Universities should become dynamic environments for gender inclusiveness and diversity, encouraging the collaborative creation of educational and scientific settings that value and disseminate gender-related knowledge. We are committed to supporting both rectors and faculty to empower equal opportunities for their students and employees and ensure gender balance across all levels. The success of gender-inclusive practices will encourage the development of a more diverse community where women may thrive and contribute to scientific advancement that adequately represents the world in all its diversity.



Image generated by DALL-E, OpenAI's image generation model

CURRENT REALITY

University

1. Female Under-representation in Informatics

- Workforce Representation: Women held only 15.9% of Informatics roles in the EU in 2021, down from 17.2% in 2020. (Eurostat, 2022)
- Academic Pipeline: Similar underrepresentation is evident in academia, with women less present in Informatics.

2. Persistent Gaps in Academic Career

- Women are under-represented in Europe at the highest level of academia - with minor improvements between 2015 and 2018 (from 24.1% to 26.2%) in all fields. (Gvozdanovi´c and Maes, 2018)
- Research Roles: Women constitute 39.7% of researchers in higher education worldwide. (EC, 2021)
- European level data shows that in 2018, women represented more than 40% of academic staff, but women only occupied about 25% of the equivalent full professorship positions.
- Women also remain underrepresented in Europe among the heads of higher education institutions (23.6% in 2019), and as board members (31.1%) and leaders (24.5%). (EC, 2021)



CURRENT REALITY

University

3. Academic Leadership Positions

- Global Disparity: Gender parity in university leadership is low globally, with only 15% of rectors being women in Europe (Casad et al., 2021)
- While women are better represented among full professor positions in the Humanities (35% in 2018), there is a minimal presence of women in the field of Engineering & Technology (17.9% in 2018) for the same positions. (UNESCO, 2022)

4. Contributing Factors

- Barriers: The gender pay gap, stereotypes, biases, and inflexible conditions are some of the barriers faced by women (EC, 2021; Motogna et al., 2022)
- Academic Atmosphere: Challenges include lower social capital, unwelcoming environments, and discrimination. (Casad et al., 2021)

Towards a better future

The systemic and cultural difficulties in pursuing the academic career for women have disadvantages not only for their own careers but also for society in general. The Informatics as a scientific discipline and as a profession needs diversity to advance and flourish. To make this happen, the universities have an important role to play.



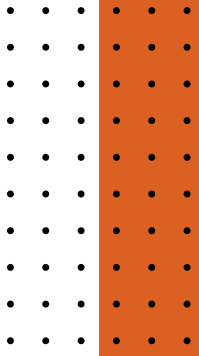


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

University

For Rectors and Department Heads



Inclusive Recruitment Process

- Collaborate with diverse channels to ensure job adverts reach a broad audience. Utilize inclusive language and highlight supportive policies to attract diverse candidates.



Equal Opportunities in Evaluation and Promotion

- Form gender-balanced evaluation committees and conduct unconscious bias training. Define clear, inclusive evaluation criteria that account for diverse career paths.

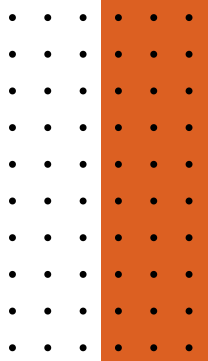


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

University

For Rectors and Department Heads



Systemic Actions to Retain Women

- Create an inclusive environment through anti-bias training and debates. Offer mentorship and promote visibility for women, alongside introducing family-friendly practices (Motogna et al., 2022).



Promotion to Tenure and Management

- Encourage women's development and awareness of gender issues with a supportive environment and gender equity plans. Fund initiatives for promoting gender balance.

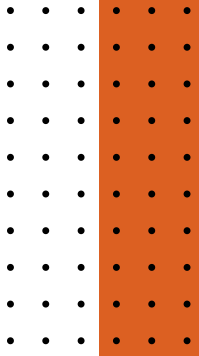


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

University

For University Professors



Diversification in Course Syllabus

- Include diverse authors and gender-related materials in the syllabus. Use inclusive language in course communications.



Fair Division of Tasks and Responsibilities

- Ensure equitable task assignment in team activities and manage workload fairly in individual settings to prevent gender bias.

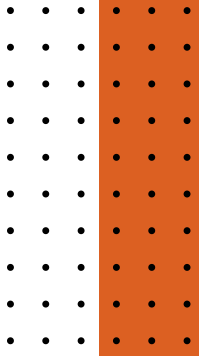


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

University

For University Professors



Gender Requirements in Evaluation Criteria

- Integrate gender considerations into evaluation criteria, encouraging students to reflect on gender impacts in their work.



Projects on Gender Balance

- Propose projects focusing on gender balance and issues to enhance awareness and develop skills considering gender impacts.

REFERENCES

Casad, Bettina J., Franks, Jillian E., Garasky, Christina E., Kittleman, Melinda M., Roesler, Alanna C., Hall, Deidre Y., & Petzel, Zachary W. (2021). Gender inequality in academia: Problems and solutions for women faculty in STEM. *Journal of neuroscience research*, 99(1), 13-23. <https://doi.org/10.1002/jnr.24631>

European Commission and Directorate-General for Research and Innovation (2021). *She figures 2021: gender in research and innovation : statistics and indicators*. Publications Office. DOI: 10.2777/06090.

Eurostat. (2022, October 11). More men with an ICT education employed than women. Eurostat News. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddm-20221011-1>

Gvozdanović, Jadranka, & Maes, Katrien (2018). Implicit bias in academia: A challenge to the meritocratic principle and to women's careers—And what to do about it. *League of European Research Universities (LERU) Advice Paper No, 23*.

Motogna, Simona, Lenuța Alboai, Ioana Alexandra Todericiu, and Catrinel Zaharia. "Retaining women in computer science: the good, the bad and the ugly sides." In *Proceedings of the Third Workshop on Gender Equality, Diversity, and Inclusion in Software Engineering*, pp. 35-42. 2022.

United Nations Educational, Scientific and Cultural Organization [UNESCO] International Institute for Higher Education in Latin America and the Caribbean [IESALC] and Times Higher Education (2022). *Gender Equality: How Global Universities are Performing*. <https://unesdoc.unesco.org/ark:/48223/pf0000380987>. Accessed 10 November 2023

VISION & MISSION

Public Administration

Vision

Our vision is to establish a transformative and equitable work environment within the public administration sector, particularly in Informatics roles. We aim to create a policy framework that not only addresses gender disparities, but also fosters long-term, sustainable gender-balance. The main pillar of this vision is the promotion of women based on merit, ensuring equal representation in Informatics and leadership roles in public administration. We are committed to driving societal change towards a more gender-balanced Informatics workforce, aligning with broader goals of sustainable development and inclusive governance.

Mission

Our mission is to develop and implement comprehensive policies and legislation that support and enforce gender equality, known as policy leadership. We aim to set an exemplary standard for gender balance in government roles, serving as role models in administration to inspire societal change. Through education and awareness, we will launch public awareness campaigns and educational programs to challenge biases and highlight the importance of gender equity in the workforce. We intend to form partnerships with educational institutions to foster an interest in computer science among students, thereby creating a talent pipeline for public administration's Informatics roles. Furthermore, we commit to accountability through monitoring by establishing a system to track and evaluate the progress and effectiveness of our gender equity initiatives. This commitment to transparency and continuous improvement is crucial for assessing and refining our governmental strategies towards achieving our mission.



Image generated by DALL-E, OpenAI's image generation model

CURRENT REALITY

Public
Administration

1. Lack of Diversity in Informatics

- There is a significant digital divide influenced by factors like race, gender, age, economic status, education level, household type, and geography, moderated by digital literacy support (Tirado-Morueta et al., 2018). Due to digital divide women are excluded from actively participating in current life.
- Informatics remains a highly gendered area, contributing to social inequality (Ferreira & Silva, 2016).
- Digitalization impacts the efficiency and effectiveness of women in Informatics (Samanta, 2022).

2. Under-Representation in Leadership

- Women are under-represented in decision-making and leadership roles in Informatics or high-tech companies (Figueroa-Domecq et al., 2020).



Image generated by DALL-E, OpenAI's image generation model



CURRENT REALITY

Public
Administration

3. Structural Barriers

- Women face barriers such as inadequate public policies, gender discrimination by employers, and insufficient technical skills training (Mbarika et al., 2007).
- No equal opportunities in case of parenthood.

4. Gender Employment-Gap

- Gender inequality in public sector employment, including remuneration and gender discrimination (Johnston, 2019).

5. Limited Budget for Gender Balance Initiatives

- Challenges in implementing effective measures due to restricted budget allocations for promoting gender balance in Informatics.

Towards a better future

The situation reflects a complex interaction of factors like digital literacy, workforce participation, gender pay gaps, and under-representation in decision-making and leadership roles.

A comprehensive approach is required, including digital literacy support, policy interventions to address gender discrimination, and efforts to enhance women's technical skills and representation in Informatics roles.



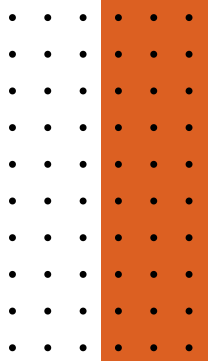


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

Public Administration



Legislation and Policy Changes

- Identify gaps in legislation to support a gender-balanced ecosystem in Informatics.
- Mainstream initiatives in legislation and policy affecting women and gender equality.
- Implement gender-based instruments in HR policies for equal opportunities.
- Elaborate social standardized supportive system for parental care policy.
- Strengthen the Gender Impact Assessment with effective instruments.
- Launch National and European-Wide awareness campaigns for dispelling stereotypes and promoting inclusivity.

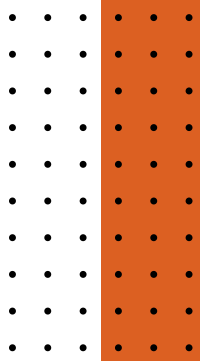


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

Public Administration



Skill Development and Empowerment

- Equip girls and women for the transition from Informatics learning to earning.
- Raise competencies by boosting skills, particularly in Informatics, through training programs and professional development.
- Emphasize continuous up-skilling in rapidly changing technologies, especially in underrepresented roles.



Financial Support and Monitoring

- Ensure a gender-balanced state budget to support initiatives for gender equality in Informatics.
- Regularly monitor and evaluate gender balance improvements, through intelligent solutions.
- Guarantee targeted funds and grants to support women-led tech projects, encouraging female initiatives in the tech sector.

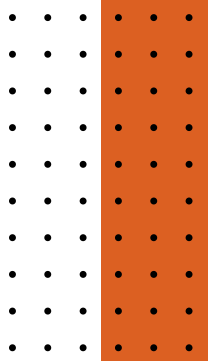


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

Public Administration



Public-Private Partnerships and Programs

- Develop specialized programs for advancing women’s engagement in innovation and technology through public-private partnerships.
- Establish platforms and initiatives that connect women and girls with inspiring role models and mentors in the tech industry.



Promoting Inclusion and Career Paths

- Implement representatives to refine gender imbalance in leadership and decision-making roles.
- Promote gender-balanced Informatics workforce in the job market.
- Conduct anti-bias training for decision-makers to reduce gender biases and stereotypes.
- Improve communication policies and tools for inclusion and career paths of women in Informatics.
- Overcome institutional cultural barriers hindering the inclusion and advancement of women.

REFERENCES

Ferreira, Eduarda, & Silva, Maria J. (2016). Portuguese research on Gender and ICT: The place of education. Proceedings of the 2016 International Symposium on Computers in Education (SIIE 2016), 1–6. <https://dx.doi.org/10.1109/SIIE.2016.7751827>

Figueroa-Domecq, Cristina, Palomo, Jesús, Flecha-Barrio, Maria D., & Segovia-Perez, Monica (2020). Technology double gender gap in tourism business leadership. *Information Technology & Tourism*, 22(1), 75–106. <https://dx.doi.org/10.1007/s40558-020-00168-0>

Johnston, Karen (2019). Women in public policy and public administration?. *Public Money & Management*, 39(3), 155–165. <https://dx.doi.org/10.1080/09540962.2018.1534421>

Mbarika, Victor W., Payton, Fay C., Kvasny, Lynette, & Amadi, Atieno. (2007). IT Education and Workforce Participation: A New Era for Women in Kenya?. *The Information Society*, 23(1), 1–18. <https://dx.doi.org/10.1080/01972240601057213>

Samanta, Sasmita (2022). Impact of Digitalisation on Efficiency and Effectiveness of Women - A Case Study. *International Journal of Finance, Entrepreneurship & Sustainability*, 2(1), 92–98.

Tirado-Morueta, Ramon, Aguaded-Gómez, Jose I., & Hernando-Gómez, Ángel (2018). The socio-demographic divide in Internet usage moderated by digital literacy support. *Technology in Society*, 55, 47–55. <https://dx.doi.org/10.1016/j.techsoc.2018.06.001>

PRIVATE SECTOR

High Level Policy for Stakeholders



Image generated by DALL-E, OpenAI's image generation model

VISION & MISSION

Private Sector

Vision

Our vision is to achieve a transformative shift towards a balanced Informatics workforce in the private sector. Our vision is to create a work environment that excels in competitiveness and efficiency, while also fostering creativity, well-being, and flexibility. We aim to establish a landscape where diversity in Informatics is not just welcomed but celebrated, leading to a more holistic and inclusive industrial practice in the field.

Mission

Our mission revolves around two fundamental pillars: 1) Promotion of Inclusion and Career Paths, and 2) Improving the Work Environment.

First of all, we are committed to elevating the visibility of role models in Informatics, celebrating the achievements of women in the field. Our goal is to cultivate a supportive, creative and welcoming work environment that attracts and retains diverse talent.

Besides, we strive to implement educational initiatives that address and reduce gender bias, focusing on societal and institutional patriarchy and psychological biases affecting gender perceptions. Additionally, we are dedicated to supporting family-friendly practices, including flexible home office and remote work options, and accommodating primary childcare responsibilities.

Through these efforts, we aim to support gender equity, reduce biases, and create a work environment that truly embodies inclusivity and diversity in the private sector of Informatics.



Image generated by DALL-E, OpenAI's image generation model

CURRENT REALITY

Private
Sector

1. General Overview

- Gap in Industry: Despite progress in women's rights and workplace equity, the ICT industry still faces a significant gap in actual gender equity.
- Unbalanced context: The ICT workforce is not representative of our general population, and a more diverse workforce can help overcome the shortage of qualified ICT people.

2. Challenges for Women in ICT

- Barriers to equity: Women are a minority in the ICT industry and face challenges like inequality of opportunities and discrimination. These issues impact both product development and women's professional aspirations in ICT (Albusays et al., 2021; Glass et al., 2013; Singh et al., 2013).

3. Efforts for Gender Balance

- Road to success: Various initiatives have been undertaken across different fields to balance gender representation in ICT. However, progress remains slow (Jaccheri et al., 2020; United Nations, 2021).



Image generated by DALL-E, OpenAI's image generation model



CURRENT REALITY

Private
Sector

4. The Gender Equality Paradox

- Relevance for changes: ICT industry faces a gender imbalance even in countries known for gender equality.
- Engine of change: Persisting gender stereotypes and norms are identified as major contributing factors (Breda et al., 2020).

5. Drop-out Rates and Job Satisfaction

- Losses in talent: High drop-out rates among women in ICT, with 50% leaving the industry within 12 years, despite high job satisfaction rates (Glass et al., 2013; Hewlett et al., 2019).

6. Identifying and Addressing Barriers

- Getting to know the challenges: Recognition of barriers women face in ICT and the absence of specific best practices to eliminate these barriers (Patón-Romero et al., 2023).
- Desire for new solutions: Need for well-founded and effective proposals to address these challenges.

7. Impact on the ICT Industry

- Importance of women in ICT: The lack of women and the challenges they face in ICT have significant negative impacts on the industry.

Towards a better future

Addressing these challenges is essential for reforming the industry and increasing women's participation, motivation, expectations and continuity in ICT.



RECOMMENDATIONS

Private Sector

To Promote Inclusion and Career Paths



Role Models

Definition of Role Models:

- Start with the basic understanding: A role model, as defined by the Cambridge Dictionary, is "an individual admired for their behavior, which others aspire to emulate."

Importance of Ethical Leaders:

- Emphasize the value of leadership: "It's crucial to have leaders, particularly ethical ones", as highlighted by Brown and Treviño (2013). They significantly influence both self-perception and how others view us.

Role of Adult Role Models Across Lifespan:

- Discuss lifelong impact and mentorship: Adult role models play a pivotal role throughout life, including post-retirement. As Whitbourne (2010) notes, "fulfillment is attainable at any age, allowing role models to impart wisdom continually".

Celebrating Female Contributions:

- Highlight the need for recognizing achievements: Acknowledging female contributions is vital, especially considering Dreher and Ash's (1990) findings that male employees often receive more recognition. Celebrating women as role models is a step towards empowerment.

Digital Storytelling as a Tool:

- Suggest practical methods: Digital storytelling is an effective method to honor role models. This can include general infographics about female contributions in a company or individual stories, either as anonymized personas or identified individuals.

Example of Role Model Promotion:

- Provide a concrete example: Consider, for instance, a 'Role Model Flyer' for a working group leader in EUGAIN (see Figure B.). This flyer could highlight both career achievements and personal strengths, serving as an inspiration to others.



Figure B.

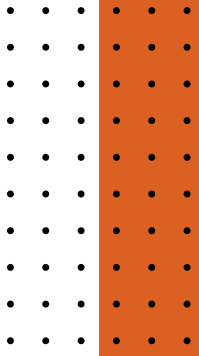


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS Private Sector

To Promote Inclusion and Career Paths



Job Ads

Beginning with the goal: In crafting job advertisements, our aim is to attract a diverse pool of candidates, especially women.

Framing Position Descriptions:

- Emphasize inclusive language: We recommend carefully framing and phrasing position descriptions to appeal to female applicants. Highlighting a collaborative and supportive work environment is key in conveying a welcoming atmosphere.

Utilization of Gender-Inclusive Tools:

- Introduce practical tools: To assist in this endeavor, for example the [GenderMag](#) project offers tools designed to ensure language inclusivity, helping to avoid stereotypes in user-facing software and other communications.

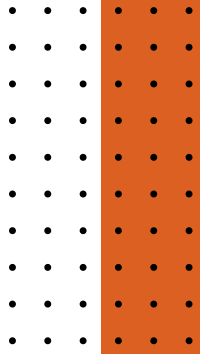


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS Private Sector

To Promote Inclusion and Career Paths

Job Ads

Explicit Welcome to Female Applicants:

- State a direct invitation: Including a simple statement like “we strongly welcome female applicants” can be impactful. This explicit encouragement is particularly meaningful in fields where women are underrepresented.

Importance of Acknowledgment:

- Highlight the significance of recognition: Although it might seem trivial to some, acknowledging the underrepresentation of women in certain fields can make a substantial difference to potential female candidates, offering them the encouragement needed to apply.

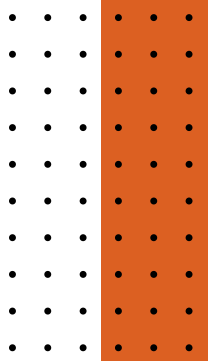


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS Private Sector

To Promote Inclusion and Career Paths

Explicit Targets

- Apply explicit targets as a temporary measure in areas like upper management to correct gender imbalances.
- Carefully communicate the purpose of explicit targets to avoid negative perceptions like imposter syndrome.

Maturity Models

- Use maturity models to show clear levels of gender equity achievements and goals.

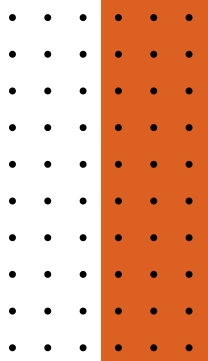


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS Private Sector

To Improve the Working Environment



Self Development

- Courses for women to expand skills and networks.
- Special emphasis on early skill acquisition.
- Education on societal and institutional patriarchy and psychological biases affecting gender views (Soman, 2009; Brannon, 2016).



Mentoring

- Implement active mentoring across all career stages, focusing on women-to-women empowerment and advice (Mitchell, 2018).
- Acknowledge different career development phases and provide appropriate support (O'Neil, 2005).
- Incorporate failure as a part of personal development and learning (Boyd, 2015).

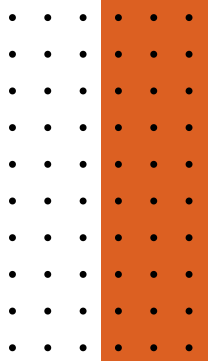


Image generated by DALL-E, OpenAI's image generation model

RECOMMENDATIONS

Private Sector

To Improve the Working Environment



Family Support

- Support flexible work arrangements, including home office and remote work for family care.
- Adapt work schedules to accommodate primary childcare responsibilities.
- Create tools that encourage family management by men.



Engagement and Collaboration

- Encourage collaborative teams and informal mentoring.
- Promote collaboration as a leadership style and create awareness on agency (Fine, 2007).

REFERENCES

- Albusays, Khaled; Bjorn, Pernille; Dabbish, Laura; Ford, Denae; Murphy-Hill, Emerson; Serebrenik, Alexander; & Storey, Margaret-Anne. (2021). The Diversity Crisis in Software Development. *IEEE Software*, 38(2), 19–25. <https://dx.doi.org/10.1109/MS.2020.3045817>
- Boyd, Diane E.; Baudier, Josie; & Stromie, Traci. (2015). Flipping the Mindset: Reframing Fear and Failure to Catalyze Development. *To Improve the Academy*, 34(1–2), 1–19. <https://dx.doi.org/10.1002/tia2.20028>
- Brannon, Linda. (2016). *Gender: Psychological Perspectives* (7th ed.). Taylor & Francis.
- Breda, Thomas; Jouini, Elyès; Napp, Clotilde; & Thebault, Georgia. (2020). Gender stereotypes can explain the gender-equality paradox. *Proceedings of the National Academy of Sciences*, 117(49), 31063–31069.
- Brown, Michael E.; & Treviño, Linda K. (2014). Do Role Models Matter? An Investigation of Role Modeling as an Antecedent of Perceived Ethical Leadership. *Journal of Business Ethics*, 122, 587–598. <https://dx.doi.org/10.1007/s10551-013-1769-0>
- Dreher, George F.; & Ash, Ronald A. (1990). A Comparative Study of Mentoring Among Men and Women in Managerial, Professional, and Technical Positions. *Journal of Applied Psychology*, 75(5), 539. <https://dx.doi.org/10.1037/0021-9010.75.5.539>
- Fine, Marlene G. (2007). Women, Collaboration, and Social Change: An Ethics-Based Model of Leadership. In Chin, Jean Lau; Lott, Bernice; Rice, Joy; & Sanchez-Hucles, Janis (Eds.), *Women and Leadership: Transforming Visions and Diverse Voices* (pp. 177–191). John Wiley & Sons. <https://dx.doi.org/10.1002/9780470692332.ch8>
- GenderMag Project. (n.d.). Home page. Retrieved from <https://gendermag.org/>
- Glass, Jennifer L.; Sassler, Sharon; Levitte, Yael; & Michelmore, Katherine M. (2013). What's So Special about STEM? A Comparison of Women's Retention in STEM and Professional Occupations. *Social Forces*, 92(2), 723–756. <https://dx.doi.org/10.1093/sf/sot092>
- Hewlett, Sylvia Ann; Sherbin, Laura; Dieudonné, Fabiola; Fagnoli, Carolyn; & Fredman, Catherine. (2019). *Athena Factor 2.0: Accelerating Female Talent in Science, Engineering & Technology*. Coqual.
- Jaccheri, Letizia; Pereira, Cristina; & Fast, Svetlana. (2020). Gender Issues in Computer Science: Lessons Learnt and Reflections for the Future. *Proceedings of the 22nd International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC 2020)*, 9–16. <https://dx.doi.org/10.1109/SYNASC51798.2020.00014>
- Mitchell, Adrienne L. (2018). *Woman-to-Woman Mentorship: Exploring the Components of Effective Mentoring Relationships to Promote and Increase Women's Representation in Top Leadership Roles*. [Doctoral dissertation, University of La Verne].
- O'Neil, Diana A.; & Bilimoria, Diana. (2005). Women's career development phases: Idealism, endurance, and reinvention. *Career Development International*, 10(3), 168–189. <https://dx.doi.org/10.1108/13620430510598300>
- Patón-Romero, José David; Block, Stefanie; Ayala, Claudia; & Jaccheri, Letizia. (2023). Gender Equality in Information Technology Processes: A Systematic Mapping Study. *Proceedings of the 2023 Future of Information and Communication Conference (FICC 2023)*, 310–327. https://dx.doi.org/10.1007/978-3-031-28073-3_22
- Singh, Romila; Fouad, Nadya A.; Fitzpatrick, Mary E.; Liu, Jia Pu; Cappaert, Kevin J.; & Figueredo, Claudio. (2013). Stemming the tide: Predicting women engineers' intentions to leave. *Journal of Vocational Behavior*, 83(3), 281–294. <https://dx.doi.org/10.1016/j.jvb.2013.05.007>
- Soman, Uthara. (2009). Patriarchy: Theoretical Postulates and Empirical Findings. *Sociological Bulletin*, 58(2), 253–272.
- United Nations. (2021). *The World's Women 2020: Trends and Statistics*. United Nations - Department of Economic and Social Affairs.
- Whitbourne, Susan Krauss. (2010). *The Search for Fulfillment: Revolutionary New Research That Reveals the Secret to Long-Term Happiness*. Ballantine Books.

CONCLUSION

In this deliverable we presented sets of policy recommendations for the four target groups of Schools, Universities, Public Administration and Private Sector. We hope you find the guidance applicable and straight-forward and are taking away new ideas.

Further reporting on the results of our studies is available on our website <https://eugain.eu/results/>.

For the Schools, we advocate for (1) in national and regional school administration to create legislation reforms and nation-wide Informatics curricula, (2) on the school principals level to foster inclusive teacher training and parental awareness campaigns, (3) and for each teacher to inspire with role models and to emphasize social impact through projects.

For the Universities, we call for (1) rectors and department heads to establish inclusive recruitment processes and equal assessment in evaluation and promotion, and (2) for university professors to diversify the syllabi and projects on gender equity.

For Public Administration, we strive for (1) legislative and policy changes including gender mainstreaming and campaigns to dispel stereotyping, (2) skill development and empowerment to raise competencies, (3) public-private partnerships and programmes, (4) financial support and monitoring, and (5) promoting inclusion and career paths.

For the Private Sector, we recommend to improve the work environment by (1) self development in terms of upleveling skills and network, (2) mentoring across career stages and phases, (3) family support and engagement and collaboration, and the inclusion and career paths by (5) role models, (6) inclusive job ads, (7) temporary explicit targets, and (8) maturity models.

Finally, we wish to thank you, the reader, for caring about this important topic of gender equity in Informatics (and in general) and applaud you on your way forward for taking action.

Please reach out and let us know how we can support you in your contributions. www.eugain.eu

COST ACTION CA19122 European Network For Gender Balance in Informatics

This publication is based upon work from COST Action EUGAIN, CA19122, supported by COST (European Cooperation in Science and Technology).

COST (European Cooperation in Science and Technology) is a funding agency for research and innovation networks. Our Actions help connect research initiatives across Europe and enable scientists to grow their ideas by sharing them with their peers. This boosts their research, career and innovation.



Image generated by DALL-E, OpenAI's image generation model



<https://cost.eu/>