

Best Practices from Ph.D. to Professor

Career planning and mentoring



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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.



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Women are under-represented in academia, either because they do not consider an academic career as an option or because they drop out of the pipeline too soon.

In this booklet, we examine the main challenges that women face in advancing academic careers, and we propose concrete actions to address these challenges focusing on three main directions that have been shown to foster women's advancement:

- build a supportive environment,
- build career development initiatives and
- establish mentoring programs.

We argue that the prevailing culture in many academic institutions is not supportive towards women and outline concrete actions to implement a culture change. We highlight the varied career paths that exist in academia, and propose career development recommendations relevant to all career stages, and ones tailored towards key career junctures. We also provide step-by-step actions to set up successful mentoring programs and address different mentoring needs.

This booklet is aimed at both managers and individual women. It can help managers to start taking action towards supporting female students and faculty, and it can guide women who work in non-supportive environments or are just looking to understand the system.

Towards an Inclusive and Diverse Environment in Academia

In recent years, much attention has been given, and much time expended, on understanding the challenges and barriers that women face in securing their education, progressing that education to take up places in academia, and advancing within academic institutions.

The challenges faced are not only around diversity but also around equality and equity. This report discusses these challenges, and possible actions that can be taken to address them. It should be noted that many of the actions that we list in this report can also be beneficial to others, although our starting point is to improve the position of women in academia.

The EU has a treaty obligation to promote equality between women and men in all of its activities, which provides the basis for gender mainstreaming (Auditors 2021) and so we are mandated to address issues that women face, so as to ensure that they join, remain, and progress in academia. The loss of female talent in Informatics not only hampers the discipline but also undermines societal progress, particularly in an era where the economy is rapidly digitising, and Europe seeks to catch up on key technologies to ensure growth, competitiveness, sustainability, and inclusion (Smit et al. 2022).

The Need for a Change

Women persistently face challenges and barriers that disadvantage them - regardless of the institution they are working within. Table 1 outlines some of these barriers (please refer to it for a better understanding of them). From the *glass ceiling* (O’Connell and McKinnon 2021) to the *sticky floor* (Brown et al. 2020) the barriers, invisible or otherwise, prevail.

Invisible barriers continue to exist, even though there are no visible or explicit obstacles keeping women (and other minorities) from acquiring advanced job positions. While the glass ceiling tends to cripple women from securing key decision-making, and higher earning posts in the organisation, they also encounter the *glass elevator/escalator* (Williams 1992).

Women are also likely to be ‘caught in axis’ of *horizontal and vertical segregation* (Woodhams, Trojanowski, and Wilkinson 2022). The barriers within organisations remain scrutinised, however while *ceilings* and *floors* prevent upward mobility, women also face challenges before they ever join the organisation. When the process of recruitment is examined it has been found that there is unconscious bias around the recruitment space. When algorithms or humans know the gender of the person, or have a picture of the person, an unconscious bias that kicks in and impacts on how that person is perceived – positive or negative – with direct impact on job success. Caroline Criado Perez (2022) found that “men think of ‘a man’ 80% of the time they think of ‘a person’”, and the UN 2020 found that *90% of men/women globally are biased against women* (Programme) 2020). It has been found that *blind recruitment*, a process that removes identification details from applications, removes or prevents unconscious bias and might help with hiring more women to the workforce. Implementing blind recruitment processes has been shown to increase the diversity of hires by focusing solely on skills and qualifications, but this is not all to equalise the possibilities. We need to be aware of the systemic challenges women face across different spheres but also highlight the need for ongoing efforts towards achieving gender equality and inclusivity in the workplace.

Finally, the *glass cliff* (coined by Ryan and Haslam 2005) emerges as a more subtle barrier than the others above. It explains the phenomenon whereby women who are able to break through the glass ceiling are actually more likely than men to find themselves in positions of risk at the top. For example, if the organisation is in crisis, management often turns to and

Table 1: Challenges Faced by Women in the Workplace: A List of Key Barriers

Challenge	Definition	Examples
Glass Ceiling (Morrison, White, and Van Velsor 1987)	Invisible barrier that prevents women from rising to higher positions in an organisation.	Despite equal qualifications, a woman may be overlooked for a promotion that is instead given to a male colleague.
Sticky Floor (Babcock and Laschever 2009)	Discriminatory employment patterns keep women in lower-ranked and lower-paid occupations.	Women get minimal chance for advancement roles, e.g. administrative positions, while male counterparts are fast-tracked into management.
Glass Elevator/ Escalator (Williams 1992)	The phenomenon of men being rapidly promoted over women into leadership positions, especially in female-dominated fields.	In fields like education or healthcare, male are more quickly promoted to senior positions than their female colleagues with similar or even superior credentials.
Horizontal and Vertical Segregation (Charles and Grusky 2004)	Horizontal segregation concentrates one gender in specific professions, while vertical segregation restricts advancement based on gender.	Women may be prevalent in nursing (horizontal segregation) but rarely advance to hospital administration roles (vertical segregation).
Recruitment Unconscious Bias (Moss-Racusin et al. 2012)	Biases affect hiring decisions when the gender of the candidate is known.	Men are envisioned as the default ‘person’ in professional settings, leading to a preference for male candidates in hiring.
Glass Cliff (Ryan and Haslam 2005)	Women are more likely to be placed in leadership roles during times of crisis, with a higher risk of failure.	Women are often chosen for leadership roles with higher risk, potentially reinforcing stereotypes of female leadership inadequacy.
Persistent Gender Bias ((UNDP) 2020)	Widespread bias against women, affecting perceptions and opportunities.	People worldwide hold biases against women, impacting their professional and personal lives.
Golden Skirt (Seierstad and Opsahl 2011)	Practice of appointing a single woman to prominent roles to symbolise gender diversity without genuinely addressing systemic inequality.	A corporation includes one woman on its executive team to showcase diversity but fails to implement broader inclusive policies or practices.
The ‘One Woman’ Scenario (Kanter 1977)	Repeatedly choosing the same women to represent gender diversity across projects/committees, limiting the visibility and opportunities for other qualified women.	A company repeatedly features the same female executive in all diversity promotions and panels, sidelining other capable women and reducing the impact of diversity efforts.
Second generation discrimination (Ibarra, Ely, and Kolb 2013)	Prejudice that results from earlier systemic gender biases, e.g. organisational practices, cultural norms, or societal expectations, often subtly manifesting.	Being (self)excluded from promotion for not being part of the informal working networks (old boy’s club).
Gendered experience (Hardey 2019)	Different perception of the same situation due to gender identity.	Microaggressions or expectations about lack of leadership skills are typical engendered.

promotes a woman, placing her in a likely position of failure. Research by Haslam found that, when shown resumes of male and female candidates, 300 interviewees chose the male candidate when the company was successful and the female candidate when the company was failing, suggesting that the ‘old boy’s network’ persists, and as soon as there is trouble the network won’t want to give the job to their ‘old boys’, so a woman will be appointed/promoted.

Change the Culture not the Women

While we have documented the key issues that women face when they access institutions, the rhetoric that women often hear is that ‘they should work hard’, ‘do their best’, ‘strive to excel’ etc., and they will succeed. However we know that despite the best efforts of women everywhere, the barriers persist (see also Schiebinger 1999). The onus should *not* be placed on women to succeed, when we know that the barriers and challenges exist within the organisation, and are systemic. It is the culture and the environment that we need to change and the onus needs to be on the organisations and institutions to do just that (Liff and Cameron 1997; Laursen and Austin 2020).

Thus, we need to change the culture of the organisation, and as a result change everybody’s perspective on the position of women in the organisation. For this, two things are important: (1) both management, and everybody involved in decision making in the organisation should acknowledge that change is needed, and that this will be beneficial for the organisation as a whole, and (2) at the same time the managers and senior leaders should provide support for women in the organisation to secure and improve their position. This document will discuss what can be done to realise this culture change, and it will interrogate and develop two lines of action to improve the situation for women in academia: *career development* and *mentoring*.

Career Development

According to *the Encyclopedia of Career Development* (Greenhaus and Callanan 2006), career development is a multifaceted topic that can be explored from personal, organisational, social or legal perspectives.

From a personal perspective, career development is a process of exploration and action that an individual undertakes to fulfil professional aspirations. The strategies and decision making styles vary according to the individual’s abilities, personality, and values system. In contrast, organisations consider career development as a series of programs and practices that help participants achieve success in their careers. Such programs include academic advice, career counselling, mentoring, and health/well-being initiatives.

The legal and social contexts also have a direct impact on how individuals and organisations approach career development. For example, labour laws on employment security and unjust termination and social class, culture and ethnicity can have a strong influence career decision-making at both the individual and organisational levels (Greenhaus and Callanan 2006).

There is a consensus that women are not well-represented in academia, either because they do not consider it as an option at all or because they leave it prematurely (Gasser and Shaffer 2014; Goulden, Mason, and Frasch 2011). Providing women active career development support is key, as it has been demonstrated to increase motivation, empowerment, and resilience (London 1993).

In this booklet, we focus primarily on career development from personal and organisational viewpoints. We highlight the different career possibilities and paths that exist in the academic world and emphasise the main actions that individuals and institutions can undertake to support career development in academia.

A recent report by the European Commission 2021 concluded that women are still underrepresented in Science, Technology, Engineering and Mathematics (STEM), especially in the more senior ranks of academic careers, in which only 17.9% of the positions are occupied by women. The same report found that the field of Engineering & Technology is the one with the lowest proportion of women among grade A academic staff, except for five countries: Cyprus, Luxembourg, Malta, Slovenia, and Israel. Mentoring has been recognised as an important instrument for fostering academic women’s careers and reducing the underrepresentation of women. However, mentoring is a very broad term, which leads to a lack of agreement on what mentoring is and how the term can be defined (Meschitti and Lawton Smith 2017).

Table 2: Different definitions and views of mentoring

<i>“mentoring implies an exclusive relationship in which a more experienced person provides strategic advice to facilitate the professional and personal development of another, less experienced one”.</i>	Meschitti and Lawton Smith 2017
<i>“off-line help by one person to another in making significant transitions in knowledge, work or thinking”.</i>	Megginson, Clutterbuck, and Garvey 2006
<i>“a voluntary and reciprocal learning relationship that offers professional and career development for the mentee, and opportunities for the mentor to grow through sharing their knowledge. It is typically mentee-driven”.</i>	Victoria University of Wellington 2023
<i>“a form of voluntary help, which is not necessarily gratis, which favors development and learning, based on an interpersonal relationship of assistance and of exchanges in which an experienced person invests their acquired wisdom and their expertise, in order to favor the development of another person, who has to attain some competences and professional objectives”.</i>	Guerrier Guerrier 2004
<i>“mentoring should help the mentee to better understand the organizational context and career opportunities, avoid isolation, and access relevant networks”.</i>	Meschitti and Lawton Smith 2017

Table 2 outlines several definitions of the term, though mentoring can be broadly conceptualised as a single, formalised, dyadic, hierarchical relationship between a senior and junior faculty member (Zellers, Howard, and Barcic 2008). In this form, mentoring closely follows the definition of Kathy Kram (1985), an early mentoring researcher, who defined mentoring as:

“a relationship between an older, more experienced mentor and a younger, less experienced protégée for the purpose of helping and developing the protégée’s career”
Ragins and Kram 2007.

This breadth of the definition can be problematic Mullen 2009 and, hence, the word mentoring is often used interchangeably with such terms as advising and supervising, coaching, and sponsoring (for definitions see Table 3). While there are different nuances to each of these roles, all strive to promote career advancement.

Table 3: Differences between mentoring sponsoring and coaching

Mentoring involves the provision of guidance, feedback, and psycho-social support on an ongoing basis.	Ibarra, Carter, and Silva 2010
Sponsoring relates to providing specific strategic opportunities to an individual at a particular time.	Ibarra, Carter, and Silva 2010
Coaching tends to be short-term, self-reflective, goal- and skills-specific, and performance-driven and is useful when someone needs help to define what one needs/wants to improve and to achieve that goal or to acquire that.	Moorcroft and Crick 2014

References

- (UNDP), United Nations Development Programme (2020). *Tackling Social Norms: A Game Changer for Gender Inequalities*. Gender Social Norms Index (GSNI).
- Auditors, European Court Of (2021). *Special Report 10/2021: Gender mainstreaming in the EU budget: time to turn words into action*. URL: <https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=58678>.
- Babcock, Linda and Sara Laschever (2009). *Women Don't Ask: The High Cost of Avoiding Negotiation—and Positive Strategies for Change*. Princeton University Press.
- Brown, Jennifer V. E. et al. (2020). “From the sticky floor to the glass ceiling and everything in between: protocol for a systematic review of barriers and facilitators to clinical academic careers and interventions to address these, with a focus on gender inequality”. In: *Systematic reviews* 9, pp. 1–7.
- Charles, Maria and David B. Grusky (2004). *Occupational Ghettos: The Worldwide Segregation of Women and Men*. Stanford University Press.
- European Commission (2021). *She figures 2021: Gender in research and innovation: Statistics and indicators*. Publications Office of the European Union, p. 190.
- Gasser, Courtney E. and Katharine S. Shaffer (2014). “Career development of women in academia: Traversing the leaky pipeline”. In:
- Goulden, Marc, Mary Ann Mason, and Karie Frasch (2011). “Keeping Women in the Science Pipeline”. In: *The ANNALS of the American Academy of Political and Social Science* 638.1, pp. 141–162.
- Greenhaus, Jeffrey H. and Gerard A. Callanan (2006). *Encyclopedia of Career Development*. Vol. 1. Sage.
- Guerrier, Christine (2004). “Le mentorat appliqué au monde du travail: analyse québécoise et canadienne”. In: *Carrièreologie* 9.3-4, pp. 519–530.
- Hardey, Michael (2019). “Women’s Leadership and Gendered Experiences in Tech Cities”. In: *Gender in Management: An International Journal* 34.3, pp. 188–199.
- Ibarra, Herminia, Nancy M Carter, and Christine Silva (2010). “Why men still get more promotions than women”. In: *Harvard business review* 88.9, pp. 80–85.
- Ibarra, Herminia, Robin Ely, and Deborah Kolb (2013). “Women Rising: The Unseen Barriers”. In: *Harvard Business Review* 91.9, pp. 60–66.
- Kanter, Rosabeth Moss (1977). *Men and Women of the Corporation*. Basic Books.
- Laursen, Sandra and Ann E. Austin (2020). *Building gender equity in the academy: Institutional strategies for change*. Johns Hopkins University Press.
- Liff, Sonia and Ivy Cameron (1997). “Changing equality cultures to move beyond ‘women’s problems’”. In: *Gender, Work & Organization* 4 (1), pp. 35–46.

- London, Manuel (1993). “Relationships between career motivation, empowerment and support for career development”. In: *Journal of occupational and organizational psychology* 66.1, pp. 55–69.
- Megginson, David, David Clutterbuck, and Bob Garvey (2006). *Mentoring in action: A practical guide for managers*. Kogan Page Publishers.
- Meschitti, Viviana and Helen Lawton Smith (2017). “Does mentoring make a difference for women academics? Evidence from the literature and a guide for future research”. In: *Journal of Research in Gender Studies* 7.1, pp. 166–199.
- Moorcroft, Melanie and Mary Ann Crick (2014). *A Guide to Mentoring*. The University of Auckland.
- Morrison, Ann M., Randall P. White, and Ellen Van Velsor (1987). *Breaking the Glass Ceiling: Can Women Reach the Top of America’s Largest Corporations?* Addison-Wesley.
- Moss-Racusin, Corinne A. et al. (2012). “Science faculty’s subtle gender biases favor male students”. In: *Proceedings of the National Academy of Sciences* 109.41, pp. 16474–16479.
- Mullen, Carol A (2009). “Re-Imagining the Human Dimension of Mentoring: A Framework for Research Administration and the Academy.” In: *Journal of research administration* 40.1, pp. 10–31.
- O’Connell, Christine and Merryn McKinnon (2021). “Perceptions of barriers to career progression for academic women in STEM”. In: *Societies* 11.2, p. 27.
- Programme), UNDP (United Nations Development (2020). *2020 Gender Social Norms Index (GSNI)*. New York.
- Ragins, Belle Rose and Kathy E Kram (2007). *The handbook of mentoring at work: Theory, research, and practice*. Sage Publications.
- Ryan, Michelle K. and S. Alexander Haslam (2005). “The Glass Cliff: Evidence that Women are Over-Represented in Precarious Leadership Positions”. In: *British Journal of Management* 16.2, pp. 81–90.
- Schiebinger, L. (1999). *Has Feminism Changed Science?* Harvard University Press.
- Seierstad, Cathrine and Tore Opsahl (2011). “For the few not the many? The effects of affirmative action on presence, prominence, and social capital of women directors in Norway”. In: *Scandinavian Journal of Management* 27.1, pp. 44–54.
- Smit, Sven et al. (2022). “Securing Europe’s Competitiveness: Addressing Its Technology Gap”. In: URL: <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/securing-europes-competitiveness-addressing-its-technology-gap>.
- Victoria University of Wellington (2023). *Alumni as Mentors Programme, Careers and Employment*. <https://www.wgtn.ac.nz/careers/employment/alumni-as-mentors>. Accessed: 2023-05-29.
- Williams, Christine L (1992). “The glass escalator: Hidden advantages for men in the “female” professions”. In: *Social problems* 39.3, pp. 253–267.
- Woodhams, Carol, Grzegorz Trojanowski, and Krystal Wilkinson (2022). “Merit sticks to men: gender pay gaps and (In) equality at UK Russell Group Universities”. In: *Sex Roles* 86.9-10, pp. 544–558.
- Zellers, Darlene F, Valerie M Howard, and Maureen A Barcic (2008). “Faculty mentoring programs: Reenvisioning rather than reinventing the wheel”. In: *Review of educational research* 78.3, pp. 552–588.

Organising the Culture Change

Many academic organisations and institutions know that a culture change is needed, but they find it hard to take concrete steps to achieve this. Acknowledging the need for a change is the first step, but putting it into practice is a bigger challenge. For this, an intrinsic motivation for change is needed from senior leaders (Draude 2023; Ely and Thomas 2020).

Considerations to Realise a Culture Change

If the need for a culture change is not felt intrinsically, then activities to improve the position and opportunities for women might lead to *negative reactions*. A change in how things are organised can disturb the existing members of a department (or other organisational unit), and they may begin to work against change covertly or openly.

Every change goes through five stages of grief (Kübler-Ross 1969): denial, anger, bargaining, depression, and then acceptance. Until the organisation has completed these stages, change will not be properly implemented. So, when pushing for a culture change, it is important to take this into account and to manage the stress that members of the organisation might feel - they have existing ideas of how one should get the degree and position, and how one should be trained or supported. These existing ideas and unconscious biases might be conflicting with what one wants to achieve with the culture change, and need to be addressed. In the end, everyone needs to change their values, attitude, and behaviours.

It should also be noted that the *size and composition* of a group or department can play a role in this process. Heterogeneous groups members might have different backgrounds and expectations, and cultural differences can make the culture change even more difficult.

To realise a culture change, lessons can be drawn from the Concerns Based Adoption Model (CBAM)¹ that showcases the need for *learning using concerns* (G. E. Hall and Hord 2015). According to this model, there are seven stages of concern: from not being concerned at all – “*I think I heard something about it, but I’m too busy right now with other priorities to be concerned about it.*” – to refocusing – “*I have some ideas about something that would work even better.*”, and all the other stages in between. The stage of concern an organisation and its members are in, influences the attitude and behaviour of group members towards change.

It is also important to consider the *incentive for the organisation* to act and create a culture change. For example, from Rogers 1975 we learn that only if the members agree that (i) the current situation is a serious issue for the organisation which should be addressed, and (ii) the organisation is able to realise the necessary change, and it will lead to visible benefits, then a culture change can then be realised.

There can be various *reasons for an organisation* to realise that a change is necessary. This may be external factors, such as the university losing grants due to a lack of women participating in the projects, the realisation that scientific results are valid only for the male population, or the high demands from industry for more trained computer scientists, which cannot be filled by men only.

The realisation could also come from organisational changes or developments, such as: two institutes or groups being merged; having a new leadership or management body; presence of social pressure (root out sexism, ageism, racism, or intolerance); new practices from human

¹See <https://sedl.org/cbam/>.

resources; technological changes (where women are equivalent or more suitable to do some tasks), or simply a change of generations.

Finally, it must be understood that culture as such is a feeling and cannot be changed directly. However, you can *change your values*, which leads to a necessity to change habits and behaviour. It is necessary to point out and praise small steps, take time for changes to take root, and to be ready for setbacks. To encourage people to accept the changes, management should explicitly support the need for a change in culture.

Concrete Actions to Implement a Culture Change

The first step to work towards a culture change is to *raise awareness* of the problems and the need for a culture change among current employees and leaders. This can be achieved by organising *training* or *open table sessions* to talk about unconscious biases, the challenges that women face, such as: glass ceilings, sticky floors, etc., but also about sexism, ageism, racism, or intolerance. These sessions should be aimed at everybody in the department and participation should be mandatory. The main goal of such sessions initially should be to create awareness and solutions do not have to be found immediately. There should be an open and safe atmosphere, where all participants feel they can share their personal experiences. Ideally, such sessions are led by somebody from outside the organisation, who can handle negative reactions and ensure that an open and safe atmosphere is maintained.

Additionally, the members of the department should learn about the literature that shows the value of diversity, not only on the benefits of leadership diversity, but also the evidence that diverse teams perform better, etc. Given that we are working in academic organisations, this information should be given with a sound scientific basis.

Once the majority of (or all) the members of your organisation have become aware of why a culture change is necessary, the next step is to develop concrete actions that can be taken to improve the situation. First of all, this requires a more concrete understanding of what are the organisational issues that hinder women (and other diverse employees) in their developments. This should be a organisation-wide action, where all the different stakeholders are involved (management, the human resources department, female/diverse employees, and all other employees). All stakeholders can mention possible problems they have encountered and an open discussion about this should be held. If the issues are clear, an action plan can be developed to address the concrete problems. This can be a change in policies, redefining evaluation criteria, changes in the organisational structure, etc.

One action can be to improve the communication, both internally and publically, about the internal organisation, and to make sure that this communication explicitly demonstrates the inclusive values of the organisation. Concrete suggestions on how this can be carried out include:

- Set a standard that the organisation's newsletters and websites show for example a 50 % female presence;
- Identify female role models (with a diverse background), and showcase the importance of their (scientific) contributions (see e.g., <https://www.aliceandeve.nl/> and Huizen et al. 2020 for an example of how the contributions of women in computer science can be celebrated).
- Have management explicitly make a statement about the importance of diversity and inclusion, which is communicated both internally and externally (e.g., on the organisation's website);

- Have the organisation explicitly contribute to celebration days, such as International Women’s Day.

Another field of action is to offer *training* to make all employees aware of challenges related to diversity and inclusion, such as *active bystander training*², diversity proof selection³, unconscious bias training, etc. (Llorens et al. 2021). Participation in these training programs should be mandatory, and the managers should also take part in those training themselves. New employees should also have an opportunity to take part in such training, i.e., this should be a continuous process, not a single moment of action.

The organisation should also promote the empowerment of women by explicitly acknowledging their contributions, and providing support wherever needed. A concrete way to provide support is to establish an ambassador’s program, whose members can be ambassador for the women in the organisation. Women in the organisation also should be facilitated to get together and exchange experiences, for example, by creating a women’s leadership club where they can share best practices. It is important that the organisation of such activities is actively supported, e.g., by providing secretarial support, explicitly counting it is an organisational task, and encouraging new female staff to join such meetings. Finally, it is important to pay attention to how women are treated in the organisation, and to ensure that they are not overloaded with administrative tasks. This is always a challenge: if the organisation has small numbers of women, then they are invited to sit on many/every committee to ensure the diversity of the committee. This results in women carrying a disproportionate burden, leaving them with less time to attend to their research. It is important to pay attention to this and ensure that somebody supports the women to identify which organisational tasks are beneficial to them, so that they can make a choice about which tasks to take on, while keeping also time for activities such as research and education. Finally, setting up a mentoring program, as described above, is one of the actions that can be developed as part of the culture change.

Another point where concrete actions can be taken are in *recruitment and promotion procedures* (Huisman and Serebrenik 2021; Cardel et al. 2020). First of all, it is important to ensure that enough women apply. This can be done by explicitly encouraging women - or other minorities - to apply. A concrete measure is to ask every member of the hiring committee to suggest some names of suitable female candidates, and then ask them to contact them. Identifying potential female candidates is best handled as a long-term process, so it is also important to scout potential candidates for the years to come (identify the pipeline). Further, the conditions for the application can be made such that women feel encouraged to apply. Allow e.g., a minimum of three months for applications to be submitted, as reaching potential women for the position takes more time. In the vacancy text, avoid a long list of specific requirements, but rather describe in an open and global manner what you are looking for, to avoid that women do not apply because they do not fulfil all requirements listed. During the hiring process, the hiring committees should be trained to avoid biases. Hiring committees should always have at balanced representation of women and men and should avoid scenarios where women are a small minority within the committee.

Similar advice applies to the promotion process (Huisman and Serebrenik 2021). The goals for promotion should be clear and transparent: all members of staff should be aware of them, and the organisation should facilitate discussions about career ambitions on a regular basis. If a committee decides about a promotion, this committee again should be trained about their biases. Moreover, within the organisation there should be an open discussion about the recognition and

² *Active bystander training*: a training that helps to challenge antisocial behaviour at work.

³ *Diversity proof selection*: a training that helps to make interactions and decision-making at the workplace occur in a neutral and objective manner (gender, question formulations, power relations, examples from practice, soft skills).

rewards policies: traditionally academics get promotion based on publications, citations, and projects. However, organisations should also value other achievements such as collaborations, team science, industrial or societal impact. Educational achievements should be explicitly considered, as should service, namely for mentoring students and/or peers. In the end, the decision on whether to promote somebody should be a balanced decision based on all these factors. Career gaps should be taken into account: whether somebody has been working for a while in industry, or took a care leave for a certain period, career gaps should be taken into account when evaluating the person and should never be used against them.

Culture change also requires that the *daily practices* of the organisation become inclusive. The organisation should provide possibilities for flexible working hours and acknowledge that, in particular for working parents with small children as sometimes last-minute flexibility is needed. The working environment should be adapted to the needs of diverse people (for example, a female member of staff might need a quiet place for breast feeding/pumping, childcare facilities, parental and care leave). Working and meeting hours should be aligned with, for example, school hours, and people should never be expected to work during evenings or weekends.

Setting up a Career Development Program

Women can benefit from career development programs at all stages in their career. For the sake of structure, we divide an academic career into three stages: 1) a training stage (graduate students and postdoctoral fellows); 2) an early-career stage (assistant professors, lecturers, etc.); and 3) a mid-to-late career stage which starts after getting the first promotion in academia. We provide recommendations that are relevant for all three career stages and those specific to key career junctures.

To be or not to be an academic

Statistics of the Royal Society Great Britain 2010 show that fewer than 1% of PhD students become professors. While some of these students may have never had the intention to pursue an academic career, this statistic is still very alarming. In informatics, academic institutions are in a fierce competition to recruit and retain the best and brightest due to the abundance of less competitive and more lucrative alternative career opportunities in industry. Below are some initiatives that academic institutions can adopt to inspire female Ph.D. students to pursue a career in academia:

- *Organise events to encourage female PhD students to become professors.* This may include seminars that showcase faculty members who chose academia over industry and/or informational interviews and job shadowing opportunities. These events should highlight the unique opportunities available in academia such as sabbaticals, industry collaborations, startups, intellectual freedom, flexible schedule, work-life balance, meaning, long-term stability particularly after tenure, and staying at the forefront of a field.
- *Plan regular informal get-together meetings with successful female academics* to help dissipate some of the concerns about academic careers, in particular the additional responsibility, uncertainty and risk of attracting grants, running a lab, getting tenure, etc.. Promote a transparent communication that highlights that academic success does not come as a series of constant successes, but that the road may have setbacks and failures too, e.g. CV of failure (Stefan 2010).
- *Support students to seek varied opportunities* such as serving as a teaching assistant, participating in conference organisation and embarking on internships in industrial research

labs. This will help them get, early on, a glimpse of the different possibilities after the Ph.D. and start building their network for future collaborations.

- *Organise hands-on training sessions* to help students learn how to write and publish academic papers, communicate in an articulate way, navigate the relationship with supervisors, and teach effectively, etc.

A foot in the door

Entry jobs in academia are diverse and can vary depending on the geography, the institution, the economic outlook, and the individual's interest (Musselin 2009). For example, some Ph.D. holders land their first assistant professor position right after graduation, while others need to first hold one or more postdoctoral positions. Some choose to embark on a teaching-only or research-only career while others prefer a combination of both. The first position is typically on a fixed-term contract, but it can also be on a permanent contract. Compared to senior faculty, early-career faculty are at a higher risk to leave the pipeline Hollywood et al. 2020. Below, is a list of recommendations (Sorcinelli and Billings 1992) that can help academic institutions retain and nurture early-career faculty.

- *Increase support for research and teaching* through internal grants/funds to purchase equipment, books, pay for travel and hire research/teaching assistants and lab technicians, pedagogical support from the institution's teaching centre or senior faculty, and a reduction of the teaching/service workload for junior faculty.
- *Establish early-career grant development programs* that match junior faculty with senior faculty who have similar research interests, from different institutions. The Excellence in Africa (EXAF) initiative is a great example (*EPFL Excellence in Africa Annual Report 2001*).
- *Put a fair and transparent promotion process* in place that clarify the promotion criteria, measures of success, and timeline while maintaining enough flexibility to evaluate faculty work from different disciplines. Additionally, regular feedback should be provided to early-stage faculty to help them identify strengths and potential opportunities of improvement. While *strategic ambiguity* (Cate, L. Ward, and Ford 2022) remains a common flaw in promotion processes within academia, particularly when promotion concerns tenure, minorities including women tend to be more affected by this because they do not have access to the 'hidden rules' located in informal social networks.

Success comes in different forms

Although some women choose to follow the conventional lock-step career track, moving from continuous full-time education to continuous full-time work, many find this progression to be incompatible with their personal choices (Bian and Wang 2019), and opt instead for career trajectories that are protean (D. T. Hall 1996; D. T. Hall 2004), i.e. they are governed by individual rather than organisational choices, and boundaryless (Inkson et al. 2012), i.e. going beyond the boundaries of a single organisation.

However, most academic institutions still adopt the lock-step career model as a yardstick for advancement and promotion (Yassinskaya et al. 2010) which contributes heavily to the leaky pipeline. To limit this leakage, higher education institutions need to support women in advancing according to their chosen career trajectory, while adopting a more holistic approach to

the measurement of success which can be a continuum in the professorship, taking on leadership positions in the institution and/or engaging in an entrepreneurship endeavour. In the following, we outline some specific actions that organisations and/or scholars can undertake to support mid-level career development.

- *Help women overcome the even more ambiguous and hidden rules*, as they strive to progress to professorship (June 2016), by supporting them in increasing their international visibility and impact, championing their applications to leadership positions within professional associations and inviting them to speak at high-profile conferences.
- *Encourage women who choose to become senior academic leaders* such as dean, provost or president, to build/hone the key competencies for effective academic leadership, while being careful to do so when outlooks are positive and not only during shaky organisational situations (Peterson 2016). These can be grouped into social skills (e.g. communicate effectively, be a team player, accept criticism), personal capabilities (e.g. show empathy and patience, be decisive and fair, accept change, be well-organised, have a vision, know how to negotiate) and knowledge of academia (e.g. be a successful scholar, know the institution and how to navigate its politics) (Grajfoner, Rojon, and Eshraghian 2022). These competencies can be obtained with formal (e.g. mentoring and training) or informal activities (e.g. learning-by doing, networking, advice from experienced colleagues).
- *Assist women who are interested in becoming academic entrepreneurs*, i.e. create a spin-off out of their research results or launch a consulting business in their areas of expertise by providing the opportunities and activities that increase their self-efficacy, motivation, access to financing, mentoring and networking (Parker et al. 2017). For instance, encourage women to participate in academic-industry research centres and partnerships, support them in expanding heterophilous social networks, and provide them with entrepreneurship education and mastery experiences (experiences where an individual successfully accomplishes a goal (Bandura, Freeman, and Lightsey 1999)) that can help them acquire key entrepreneurship competencies in a safe environment, and match them with senior academic entrepreneurs that can provide positive persuasion and encouragement.

Career-development recommendations relevant at any career stage

Students, faculty and institutions alike benefit when the work environment is conducive to creativity and knowledge creation. We have summarised below some key recommendations that can support and sustain women at every stage of their career in academia.

- *Create a safe and fair environment in academia*, which includes establishing an Ombuds Office⁴. This Office helps mediate work-related conflicts in confidentiality, and may implement implicit bias training programs targeted towards individuals involved in hiring and promotion committees, to help them assess their own biases, and provide them with research-based evidence, going beyond the ethical and moral grounds, that can help them dismantle common-held stereotypes (Liu, Brown, and Sabat 2019).
- *Establish policies and programs that support work-life balance* to allow flexible work arrangements (e.g., part-time work, flexible work hours), paid and unpaid leaves of absence

⁴The Ombuds Office idea was proposed originally in the Scandinavian countries to protect citizens against arbitrary and wrongful governmental actions. It has the authority to file complaints, undertake judicial action and propose reforms (Kutner 1968)

for personal or family reasons, stop-the-clock options (Berg and Seeber 2018), and quality childcare/elderly care options. It is critical that these programs support women at all stages in their careers as women continue to play a major role in caregiving. Be aware that the nature of the responsibilities can change from caring for young children to caring for instance for elderly parents or adult children with special needs (Philipsen et al. 2017). It is also of paramount importance to ensure fairness and alleviate the fear factor (K. Ward and Wolf-Wendel 2004) that both faculty and institutions can experience about effectively applying these policies, in particular with regards to losing academic credibility.

- *Support women to engage career development opportunities* such as networking events (e.g. the Grace Hopper Conference (*Grace Hopper Celebration 2023*)), mentoring/sponsoring activities, membership in professional associations, and training programs that help acquire critical non-technical skills such as time management, project management, grant writing and negotiation.

Setting up a Mentoring Program

This section provides an overview of steps that may be taken when setting up a mentoring program, providing insight on how to address different mentoring needs, create a pool of mentors, match mentors and mentees, and on the format and frequency of the meetings. The section then moves on to identify ways to sustain and monitor progress.

Getting started

The first step in defining the goals of the program is to establish the purpose of the mentoring, whether it be retaining, career progression, or supporting the transition to another field or career. Setting up a mentoring program can be a rewarding and impactful initiative. Here are some steps to help you get started:

1. Define your objectives: Determine the purpose and goals of your mentoring program. Clarify the intended outcomes, such as skill development, career advancement, retaining talent, or professional or personal growth.

“During the Ph.D., interviewees looked to their supervisors for guidance in academic writing and thinking, networking, and general ‘socialization in the discipline.’”
Shaik, Adams, and Vincke 2016

“Scholarly independence, educational skills, and the development of constructive professional relationships within the institution and beyond are crucial for career development of junior faculty.”

Zellers, Howard, and Barcic 2008; Chao, Walz, and Gardner 1992

“Skill development is crucial when moving from PhD to Professor, and to become “fully functioning members of the scientific community” will require one to “able to prepare grant applications, review manuscripts, speak at conferences and engage with scientific administrators in a constructive manner (...), giving them all the skills necessary to carve out their own niches in the academic world.”

Lee, Dennis, and Campbell 2007

2. Identify the participants: Decide who will be involved in the program. You can do this by surveying your colleagues to see a) who is interested; b) what they need (support

in publishing, applying for funding, promotion, etc). Remember to consider the specific needs and preferences of both the mentors and mentees.

3. Recruit mentors: Reach out to potential mentors who possess the skills, knowledge, and experience relevant to the program's objectives. Consider creating an application process to evaluate their qualifications and commitment. Engage colleagues within or outside the University (current or emeritus) based on their experience and skills (promotion, networking, publishing etc). Consider how to make mentoring attractive to your colleagues, especially to mentors – formal recognition of the work, award a small amount of money, access to a research fund, or time *in lieu* (buy out) of other duties e.g. reduced load of admin or teaching etc.. Mentors can benefit also from a training process aimed at helping them to interact in a productive way with the mentees, setting clear goals and expectations on both sides, managing emotions properly, practising active listening, etc. This kind of training is usually offered by coaching experts and contributes to lessen the initial fears of mentors who might perceive mentoring as a too stressing process.

“When establishing a mentoring network, ‘networking diversity’ – i.e. mentors from diverse backgrounds – and ‘networking range’ – i.e. the extent to which mentors, ‘originate from different contexts or social origins’ – should be ensured.”

Dobrow and Higgins 2005

4. Recruit mentees: Attract mentees who are interested in receiving guidance and support. Promote the program through internal communications. Clearly communicate the benefits, obligations and expectations of being a mentee.
5. Pair mentors and mentees: Match mentors and mentees based on their goals, interests, and compatibility. Consider their personalities, areas of expertise, and the desired duration of the mentoring relationship. Decisions such as ‘should the mentor come from the same discipline as the mentee’; ‘should the mentor be the same gender as the mentee’; ‘should the mentor be internal or external to the university’ should be decided on a ‘case by case’ basis, and on the needs of the mentee. Provide an opportunity for mentors and mentees to meet and establish rapport before committing to the partnership. Be creative – the mentor:mentee can be individuals or a group, depending on needs and preferences of all. A mechanism must be in place to ensure that all participants are safe, and all parties have an opt out option, with a safe pathway to exit if the relationship does not work.

“The matching process is based on a set of common characteristics or similar interests and relevant experience.”

Zellers, Howard, and Barcic 2008

“It is worth considering matching female mentees with female mentors, as studies have noted that the male style of mentoring may “not fit the socialization and styles of most women and their orientation to integration rather than separation, interdependence rather than either dependence or independence and collaborative rather than competitive task engagement.”

Whittaker and Montgomery 2012

“In matching mentors and mentees, mentor profiles can also be made available to be viewed by prospective mentees, who may indicate their preferences and they are then matched to one accordingly.”

Bean, Lucas, and Hyers 2014

6. Establish guidelines: Develop a framework for the mentoring program, including guidelines, expectations, and timelines. Define the frequency and duration of meetings, communication methods, and confidentiality agreements. Ensure that both mentors and mentees are aware of their roles and responsibilities.

“Mentees consider frequent regularly scheduled, one-on-one, confidential time with their mentors important to establish a positive and fruitful collaboration, with a study showing that the mentees prefer in-person meetings once a month.”

Bean, Lucas, and Hyers 2014

“Online mentoring can facilitate finding more suitable mentors. However, on-site mentoring should be given priority considering the importance of establishing local mentors from the home institution as they can provide “critical input into sharing heuristic knowledge needed for successfully navigating a particular place or work environment.”

Whittaker, Montgomery, and Martinez-Acosta 2015; Zambrana et al. 2015

“It is advisable to have a Code of Ethics such as the one developed by The European Mentoring & Coaching Council.” Association for Coaching and EMCC 2021

Sustaining the Program and Managing Progress

Once the groundwork for your mentoring program is laid out and the initial setup is complete, the focus shifts towards maintaining its momentum and ensuring its effectiveness. This phase involves establishing clear guidelines, providing ongoing support and resources, monitoring the progress of mentoring relationships, and making necessary adjustments to optimise outcomes. The following outline some activities that could be considered in this scope:

1. Provide training and resources: Offer training sessions or workshops for mentors to enhance their mentoring skills. Provide resources such as templates, toolkits, or recommended reading materials. Encourage mentors to share their expertise and knowledge effectively.
2. Monitor progress and provide support: It is crucial to maintain a regular ‘check-in’ with mentors and mentees to assess the progress of their mentoring relationships. Address any challenges or concerns that may arise. Offer ongoing support, guidance and resources to ensure the success of the program.
3. Evaluate and adjust: Periodically evaluate the effectiveness of the mentoring program. Gather feedback from mentors and mentees through surveys or interviews. Use this information to make necessary adjustments, improve the program, and align it with the evolving needs of participants.
4. Recognise and celebrate achievements: Acknowledge the efforts and accomplishments of both mentors and mentees. Celebrate milestones, success stories and positive outcomes to motivate and inspire others to participate in the program.

Setting up a mentoring program requires careful planning, effective communication, and ongoing commitment. It is crucial to have sufficient resources (human, financial, etc.) if you are planning a program.

References

- Association for Coaching and EMCC (2021). *Global Code of Ethics*.
- Bandura, Albert, William H. Freeman, and Richard Lightsey (1999). *Self-efficacy: The exercise of control*.
- Bean, Nadine M., Lisa Lucas, and Lauri L. Hyers (2014). “Mentoring in higher education should be the norm to assure success: Lessons learned from the faculty mentoring program, West Chester University, 2008–2011”. In: *Mentoring & Tutoring: Partnership in Learning* 22.1, pp. 56–73.
- Berg, Maggie and Barbara K. Seeber (2018). “The slow professor”. In: *The Slow Professor*. University of Toronto Press.
- Bian, Xinyi and Jia Wang (2019). “Women’s career interruptions: an integrative review”. In: *European Journal of Training and Development*.
- Cardel, Michelle et al. (2020). “Turning chutes into ladders for women faculty: A review and roadmap for equity in academia”. In: *Journal of Women’s Health* 29 (5), pp. 721–733.
- Cate, Leandra, La Wanda W. M. Ward, and Karly S. Ford (Oct. 2022). “Strategic Ambiguity: How Pre-Tenure Faculty Negotiate the Hidden Rules of Academia”. English (US). In: *Alternative Higher Education* 47.5, pp. 795–812. ISSN: 0742-5627. DOI: [10.1007/s10755-022-09604-x](https://doi.org/10.1007/s10755-022-09604-x).
- Chao, Georgia T., Patm Walz, and Philip D. Gardner (1992). “Formal and informal mentorships: A comparison on mentoring functions and contrast with nonmentored counterparts”. In: *Personnel psychology* 45.3, pp. 619–636.
- Dobrow, Shoshana R. and Monica C. Higgins (2005). “Developmental networks and professional identity: A longitudinal study”. In: *Career development international* 10.6/7, pp. 567–583.
- Draude, Claude (2023). “Working with Diversity in Informatics”. In: *Hochschuldidaktik Informatik HDI 2021 (Commentarii informaticae didacticae)* (13), pp. 13–33.
- Ely, Robin J. and David A. Thomas (2020). “Getting serious about diversity”. In: *Harvard Business Review* 98 (6), pp. 114–122.
- EPFL Excellence in Africa Annual Report* (2001).
- Grace Hopper Celebration* (2023). <https://ghc.anitab.org/>.
- Grajfoner, Dasha, Céline Rojon, and Farjam Eshraghian (2022). “Academic leaders: In-role perceptions and developmental approaches”. In: *Educational Management Administration & Leadership*, p. 17411432221095957.
- Hall, Douglas T (1996). “Protean careers of the 21st century”. In: *Academy of management perspectives* 10.4, pp. 8–16.
- (2004). “The protean career: A quarter-century journey”. In: *Journal of Vocational Behavior* 65.1, pp. 1–13. ISSN: 0001-8791. DOI: <https://doi.org/10.1016/j.jvb.2003.10.006>.
- Hall, Gene E. and Shirley M. Hord (2015). *Implementing change: Patterns, principles and potholes (4th ed.)* Pearson.
- Hollywood, Amelia et al. (2020). “‘Overwhelmed at first’: the experience of career development in early career academics”. In: *Journal of further and higher education* 44.7, pp. 998–1012.
- Huisman, Marieke and Alexander Serebrenik (2021). *Women in Dutch Computer Science: Best Practices for Recruitment, Onboarding and Promotion*.
- Huizen, Johannes Cornelis van et al. (2020). “Alice and Eve: a celebration of women in computer science”. In: *Engaging, Engineering, Education: Book of Abstracts, SEFI 48th Annual Conference*.
- Inkson, Kerr et al. (2012). “Boundaryless careers: Bringing back boundaries”. In: *Organization studies* 33.3, pp. 323–340.

- June, Audrey Williams (2016). “The uncertain path to full professor”. In: *The Chronicle of Higher Education*.
- Kübler-Ross, Elisabeth (1969). *On Death and Dying*. Routledge.
- Kutner, Luis (1968). “Habeas Scholastica: An Ombudsman for Academic Due Process-A Proposal”. In: *U. Miami L. Rev.* 23, p. 107.
- Lee, Adrian, Carina Dennis, and Philip Campbell (2007). “Nature’s guide for mentors”. In: *Nature* 447.7146, pp. 791–797.
- Liu, Sin-Ning C., Stephanie E. V. Brown, and Isaac E. Sabat (2019). “Patching the “leaky pipeline”: Interventions for women of color faculty in STEM academia”. In: *Archives of Scientific Psychology* 7.1, p. 32.
- Llorens, Anaïs et al. (2021). “Gender bias in academia: A lifetime problem that needs solutions”. In: *Neuron* 109 (13), pp. 2047–2074.
- Musselin, Christine (2009). *The market for academics*. Routledge.
- Parker, Marla et al. (2017). “Barriers to academic entrepreneurship among women: a review of the constituent literatures”. In: *Gender and Entrepreneurial Activity*.
- Peterson, Helen (2016). “Is managing academics “women’s work”? Exploring the glass cliff in higher education management”. In: *Educational Management Administration & Leadership* 44.1, pp. 112–127.
- Philipsen, Maike et al. (2017). “Academic womanhood across career stages: a work-in-life perspective on what was, is, and could be”. In: *Community, Work & Family* 20.5, pp. 623–644.
- Rogers, Ronald W. (1975). “Protection motivation theory of fear appeals and attitude change”. In: *The Journal of Psychology* 91 (1).
- Royal Society Great Britain (2010). *The scientific century: securing our future prosperity*.
- Shaik, Farah Jeelani, Helène Adams, and Caroline Vincke (2016). “Gender sensitive mentoring programme in Academia: a design process”. In: *Garcia working papers*.
- Sorcinelli, Mary Deane and Deborah A. Billings (1992). “The Career Development of Pretenure Faculty: An Institutional Study.” In.
- Stefan, Melanie (2010). “A CV of failures”. In: *Nature* 468.7322, pp. 467–467.
- Ward, Kelly and Lisa Wolf-Wendel (2004). “Fear Factor: How Safe Is It to Make Time for Family?” In: *Academe* 90.6, pp. 28–31. DOI: [10.2307/40252703](https://doi.org/10.2307/40252703).
- Whittaker, Joseph A. and Beronda L. Montgomery (2012). “Cultivating diversity and competency in STEM: Challenges and remedies for removing virtual barriers to constructing diverse higher education communities of success”. In: *Journal of Undergraduate Neuroscience Education* 11.1, A44.
- Whittaker, Joseph A., Beronda L. Montgomery, and Veronica G. Martinez-Acosta (2015). “Retention of underrepresented minority faculty: strategic initiatives for institutional value proposition based on perspectives from a range of academic institutions”. In: *Journal of Undergraduate Neuroscience Education* 13.3, A136.
- Yassinskaya, Natalya et al. (2010). “Mind the Gap: Women in STEM Career Breaks”. In: *Journal of Technology Management & Innovation* 5.1, pp. 140–151.
- Zambrana, Ruth Enid et al. (2015). ““Don’t leave us behind” The importance of mentoring for underrepresented minority faculty”. In: *American Educational Research Journal* 52.1, pp. 40–72.
- Zellers, Darlene F, Valerie M Howard, and Maureen A Barcic (2008). “Faculty mentoring programs: Reenvisioning rather than reinventing the wheel”. In: *Review of educational research* 78.3, pp. 552–588.

This booklet highlights the challenges and barriers faced by women in academia and offers actionable strategies to address them. It underscores the need for inclusivity and diversity, in keeping with formal obligations outlined in EU treaties. Despite various degrees of success, persistent invisible barriers continue to impede many women's progress.

This booklet advocates for a cultural shift within academic organisations to support women's advancement, emphasising the importance of organisational change rather than individual adaptation. It highlights the significance of managerial acknowledgement of the need for change and active support for women's career development. Strategies for fostering this cultural shift include initiatives focused on career development and mentoring.

Career development programs tailored to women in academia are essential to support and guide transitions across different career stages. Additionally, setting up mentoring programs is a valuable tool for supporting women's professional and personal development. This booklet outlines steps to establish and sustain effective mentoring programs.

Overall, achieving a culture change within academic organisations requires a multifaceted approach and sustained commitment and investment from all stakeholders. By implementing concrete actions, academic institutions can create a more inclusive environment conducive to the success and advancement of women in academia.

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